Optimizing Water Resources Through Technology

Ordnance Multi-Use Water Project General Contractor RFP

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Executive Summary

Background

The Umatilla Basin, much like many regions in the State of Oregon, is an over-appropriated basin in both its surface and groundwater resources. There is more demand for water to accommodate the regional value-added agriculture economy as well current and future municipal and industrial demands. These demands have also resulted in significant ecological and environmental impacts to the Umatilla River system and aquifers connected to the river.

Years of collaborative planning, study and project modelling/monitoring have led to a strategic, multi-project plan to improve environmental conditions in the Umatilla River system, stabilize and recover both water quantity and quality of stressed groundwater aquifers and ensure a sustainable, drought resilient economy for the Mid-Columbia Region of Northeast Oregon.

The Ordnance Multi-Use Water Project is a key sustainability project in the region and the Umatilla/Columbia River recharge component is a significant first step in advancing aquifer recharge testing and operations in an effort to recover the Ordnance Alluvial Aquifer for both human and environmental benefit.

The Ordnance Project includes three phases and one Umatilla/Columbia River Recharge Component:

Phase I – Columbia River supply line from a newly installed NOAA approved “No-Take” fish screen and pumpstation on the Columbia River to the northeast property line of the Ordnance Chemical Depot. This phase will serve municipal and industrial needs within the City of Umatilla’s city limit boundaries and urban growth boundary west of the Umatilla River as well as provide place holder capacity for water supply to Phase II and Phase III of the Ordnance Project.

Phase II – Depot water supply line extending from the northeast corner of the Ordnance Depot to customers on the Depot.

Phase III – Ordnance Alluvial Aquifer recharge using winter Columbia River water. This phase includes the construction of a water supply line from Phase II to the Ordnance Alluvial Recharge Basin, to be constructed during the Umatilla/Columbia River Recharge Component, as well as additional upgrades to the groundwater monitoring network and potential recovery and distribution systems to future customers.

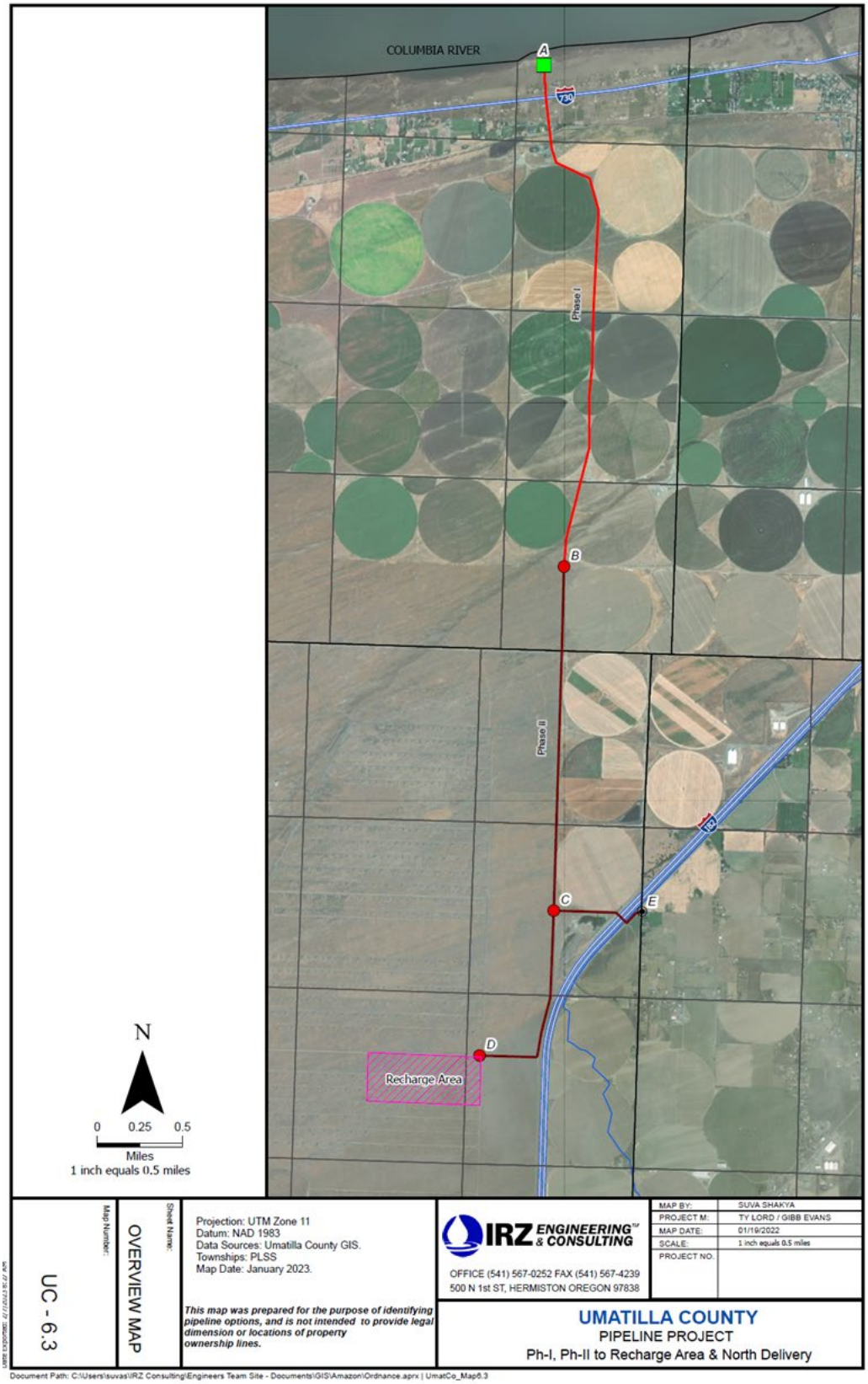


Figure i: Map of Ordnance Multi-Use Water Project

Project Overview

The design of the Ordnance Multi-Use Water Project was done in collaboration with multiple stakeholders, but will be owned by Umatilla County, Oregon. The system is designed to deliver up to 45 cfs of Columbia River water.

Following is a summary of project:

- A single river pumping station will be built to meet the total requirements of the system. This station consists of an existing intake manifold, a concrete pump slab, a building for the electrical gear, an intake screen airburst system and a hydropneumatic (surge) tank (See Figure ii).
- The total flow for the pumpstation is 20,196 gallons per minute (gpm).
- The total horsepower (hp) at the pumping station at full build out is 3,200 hp, comprised of four 800 HP pumps and motors. The maximum hp expected in phase 1 is 250 hp. Two 250 HP pumps and motors will be installed.
- The project was broken into multiple design and construction phases.
- A total of two delivery points were used in the design to deliver water for all participating landowners along the Phase 1 portion of the pipeline.
- The 3-mile-long Phase 1 pipeline is proposed to be constructed South from the River Pumping Station (location A) to the Edge of the Depot Property (Location B) (see Figure-i)..
- The 3.25-mile-long Phase 2 pipeline is proposed to be constructed South from Edge of the Depot Property to the Recharge Area (see Figure-i).
- The mainline will consist of both lined and coated steel pipe and FRP pipe.

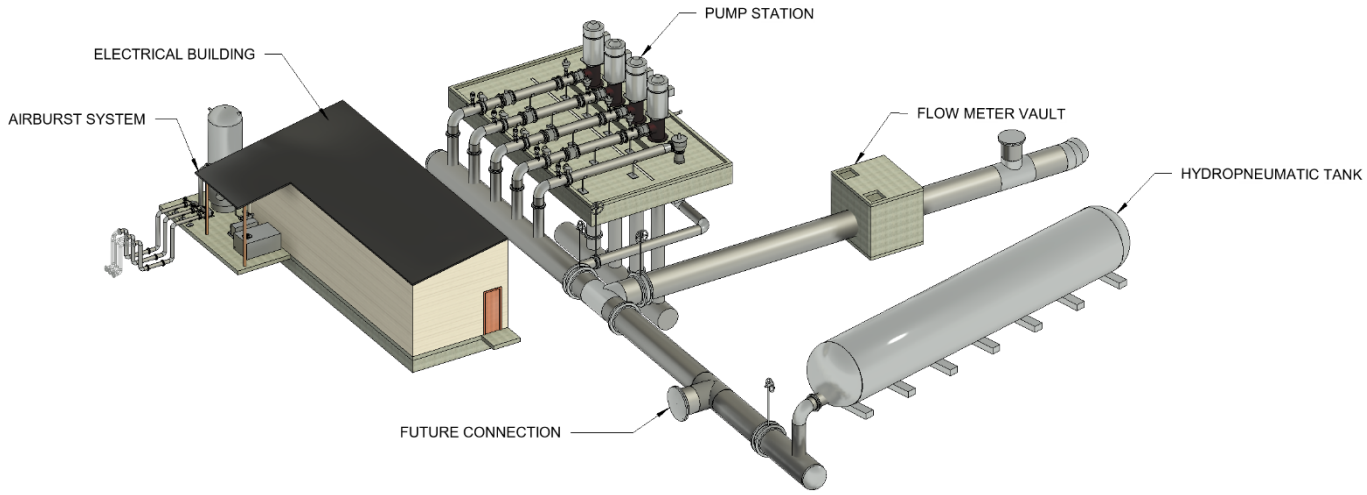


Figure ii: Exterior Isometric View of the Ordnance Pumping Station.

1 Contents

1 Scope of Work

1.1 Scope of Work Summary

Umatilla County invites qualified proposers to submit proposals to provide services described in the Request for Proposal (RP) to construct Phases 1 and 2 of the Ordnance Multi-Use Water Project.

Contractor Shall provide all necessary personnel, materials and services that may be required to construct the following major components of the project.

- Construct New River Pumping Station
- Construct Phase 1 Pipeline
- Construct Phase 2 Pipeline

Umatilla County is currently procuring Long Lead Equipment for this project. The major items include the following:

- Large Valves (noted on plan set)
- VFDs
- Soft Starts and MCC
- Pump and Motor Assemblies
- Discharge Manifolds
- Steel Fabricated Parts at Delivery Points
- Steel Pipe and Fittings
- Steel Casing
- FRP Pipe and Fittings

1.2 Scope of Work List

1. Attend weekly meetings during Phase 1 and Phase 2 design to provide recommendations.
    a. Phases 1 & 2 Design is expected to be complete by 12/1/23.
2. Attend weekly meetings during Construction and provide safety and health, progress, and schedule updates. Provide milestone updates and detailed two-week work window forecast.
3. Coordinate and oversee all work with all sub-contractors.
4. Install all valves, manifolds and appurtenances associated with this project, per plans and specifications. Contractor is required to coordinate with all material suppliers to ensure that all materials required to complete the work in this contract is ordered and will arrive on site in a manner that will allow completion of the work according to the work schedule.
5. Dust control and fire prevention is the responsibility of the Contractor. It is required that you have at a minimum a 3,000-gallon water truck within ¼ mile of any location where work is being done, for these purposes.
6. Contractor will need to secure a source of water for both fire prevention and for use during construction.
7. Contractor is responsible for locating all existing buried infrastructure prior to performing any construction in that area.
8. Contractor may encounter existing buried infrastructure, these items may include, but are not limited to, pipe, cable or concrete. Should the Contractor damage these, the Contractor will

need to repair these after the new infrastructure is installed, however there will be no change order issued for dealing with these random crossings.

9. Contractor will be responsible for all repairs to pipe and pipe connections immediately upon discovery of problems at startup to minimize down time of farming operations.
10. Contractor shall maintain and restore all roads and staging areas used during construction to pre-existing conditions.
11. Common excavation is defined, as the excavation of all material not classified as Rock Excavation.
12. Rock excavation is defined as the removal of rock by systematic and continuous drilling and blasting, if allowed, and hammering, breaking, splitting, or other approved methods. Rock is defined as material including boulders, solid bedrock, or ledge rock, which, by actual demonstration, cannot be reasonably excavated with suitable power excavation equipment. Suitable machinery is defined as a track-mounted hydraulic excavator of the 52,800 to 72,500-pound class equipped with a single shank ripper. The Owner's Representative may waive the demonstration if the material encountered is well-defined rock. The term "rock excavation" shall be understood to indicate a method of removal and not a geological formation. If material which would be classified as rock by the above definition is mechanically removed with equipment of a larger size than specified, it shall be understood that any added costs for the removal of material by this method shall be included in the price for common excavation. In trench excavations, boulders or pieces of concrete below grade larger than one half (1/2) cubic yard will be classified as rock if blasting, hammering, breaking, or splitting is actually required and used for their removal from the trench. If material, which would be classified as rock by the definition above and elsewhere within these specifications, is mechanically removed without blasting, hammering, breaking, or splitting, it will be considered common excavation. If equipment larger than the "suitable machinery" as defined above is brought on the project site for the sole purpose of rock removal without blasting, hammering, breaking, or splitting, then such removal will be considered rock excavation.
13. Blast or saw rock in areas where encountered. Excavation, bedding and backfill in these areas will be done by over excavating trench by 12" and either crushing excavated material to meet bedding specification and using it for bedding and backfill or exporting excavated material and importing suitable bedding and backfill material.
14. All ground that has been disturbed by construction activity must be restored to original conditions and left with an approved erosion control surface.
15. Any excavation through crop ground must be done by excavating the top two feet of soil, setting it aside, and then placing it as the top two feet of the backfill.
16. Procure all permits required for construction (building, electrical etc.) that are not identified as Owner supplied below:
    a. Owner Supplied Permits/Easements
        i. Umatilla County Road Crossing Permits
            1. Contractor to supply all necessary bonds and traffic plans.
        ii. Oregon Department of Transportation (ODOT) Road Crossing Permits
            1. Contractor to supply all necessary bonds and traffic plans.
        iii. West Extension Irrigation District (WEID) Canal Crossing Permit
        iv. Pipeline Easements

v. BPA Transmission Line Crossing Permit
vi. Williams Gas Line Crossing Permit

17. Coordinate delivery, receive, offload, and stage all Owner supplied materials.
    a. Contractor is responsible for all Owner supplied materials upon receipt from manufacturer/supplier.
    b. Spare pipe and fittings that will not be installed but will need to be offloaded are as follows:
        i. 600 LF of 58" x 0.8125" wall steel casing
        ii. 160 LF of 48" x 0.375" wall steel pipe
        iii. 860 LF of 1,300mm FRP pipe
        iv. 3,860 LF of 1,100mm FRP pipe
        v. 2 – 1,300mm tees
        vi. 2 – 1,300mm x 48" Flanges
        vii. 25 – 1,300mm couplers
        viii. 50 – 1,300mm gaskets
        ix. 4 – 1,100mm tees
        x. 4 – 1,100mm x 42" Flanges
        xi. 25 – 1,100mm couplers
        xii. 50 – 1,100mm gaskets
        xiii. 2 – 1,100mm elbows (45 and 90 deg)
18. Furnish and install all gaskets and bolt packs.
    a. No gaskets or bolt packs will be Owner supplied.
19. For all locations within this project that require new electrical service the Owner will supply primary power and a step-down transformer (4160V or 480V as required) within 75ft of the new electrical panels. The Contractor will be responsible for installing all new electrical from the step-down transformer out, which shall include a new meter and current transformer (CT) cabinet as needed. The meter and CT cabinet shall be installed per the utility providers requirements.
20. Structural foundation overexcavation and re-compaction per ATLAS Technical Consultants Geotechnical Report section 7.1.1. Existing elevation of pump station slab site and electrical building site is approximately 271 ft and expected water level is approximately 269 ft.
21. Provide pump station site grading utilizing soil adjacent to site approx. 3,000 yds of cut and 3,000 yards of fill. Fill shall be compacted to 90% unless under structures where 95% is required.
22. Install pump station concrete mat foundation according to plans.
23. Install electrical building foundation according to plans.
    a. All floor mounted electrical gear will be installed on a concrete housekeeping pad 4" in height.
    b. At this stage of the design the electrical building foundation has not been finalized. The foundation design will be dependent on the load reactions received from the building manufacturer.
24. Furnish and install pre-engineered steel building with a minimum of R19 insulation in the walls and ceiling. All insulation shall be white backed with a continuous vapor retardant membrane.
25. Furnish and install all 120/208V electrical panels, outlets and lighting.
26. Furnish and install all instrumentation, conduit and wiring.

a. Programming and integration will be completed by G6 Engineering.

27. Furnish and install electrical building HVAC system.
    a. Contractor to provide HVAC design verification and mechanical drawings.
    b. System shall be variable refrigerant volume (VRV).
    c. Fan units shall be overhead in Electrical Room.
    d. System will have two cooling/heating zones (Control Room and Electrical Room).
        i. System shall maintain 75F in Control Room and 85F in Electrical Room.
    e. Total building cooling load expected to be approx. 20 tons.
28. Furnish and install airburst system electrical.
    a. All Owner supplied items are indicated in drawing set.
29. Furnish and install all airburst system compressor, piping and appurtenances.
    a. All Owner supplied items are indicated in drawing set.
30. Furnish and install airburst system air receiver tank, 6" steel piping, manifolds, valves and stainless-steel piping.
    a. All Owner supplied items are indicated in drawing set.
31. Furnish and install 6" HDPE pipelines from airburst system manifold to existing stainless steel piping at edge of the Columbia River.
32. Install hydropneumatic tank foundation according to plans.
    a. At this stage of the design the hydropneumatic tank foundation has not been finalized. IRZ assumes that the foundation will be a series of strip footings. The foundation design will be dependent on the load reactions received from the tank manufacturer.
33. Install Owner supplied hydropneumatic tank. IRZ's current assumption is the tank will weigh approximately 50,000 lbs and be 10-12ft in diameter and 40-60ft long.
34. Furnish and install 48" x 0.5" wall, lined and coated steel piping between hydropneumatic tank outlet and 48" discharge manifold isolation valve according to plans.
    a. Final dimensions for this tie-in will be determined once shop drawings are received from the tank manufacturer.
35. Installation of Owner supplied 4160V electrical gear. Owner supplied electrical gear will include one (1) main breaker, and two (2) soft start panels with power factor correction capacitors in a single line up and two (2) Variable Frequency Drives (VFD).
36. Furnish and install electrical cable and conduit from electrical gear to motors. Conduit to temporary pumps 3T and 4T shall be sized for 800hp motor conductors.
37. Installation of Owner supplied 48" x 0.5" wall discharge manifolds and valving.
38. Furnish and install pump discharge piping from pump discharge head flange to 18" flange on 48" discharge manifold.
        i. All Owner supplied items are indicated in drawing set.
39. Furnish and install 18" pressure relief piping and valves from 18" flange on 48" discharge manifold to Pump #1 intake riser.
        i. All Owner supplied items are indicated in drawing set.
40. Furnish and install 18" drain piping and valves from 18" flange on 48" discharge manifold to Pump #1 intake riser and modify four (4) existing 24"x 0.375" wall intake manifold risers.
        i. All Owner supplied items are indicated in drawing set.
41. Furnish and install 48" GE panametrics flow meter and precast vault adjacent to pump station.
    a. Flowmeter is Owner supplied.

42. Furnish and install 550 LF of 8ft tall chain link security fence with 3 strands of barbed wire and one gate location with two 12 ft access gates and a single man gate.
43. Furnish and install 4" of ¾" minus rock around pump station site approx. 250 yds.
44. Install 2,650 Linear Feet (LF) of Owner supplied 48" x 0.375" wall steel mainline from station -00+10 to 26+40 per specification 03 05 24.
45. Install 58" bore across Highway 730 from station 9+75 to 11+00.
    a. 58"x 0.8125" wall steel casing is Owner Supplied
    b. Contractor to supply and install casing spacers, ends seals and pressure grout to ODOT specifications.
46. Remove existing concrete structure on North side WEID canal supporting existing 42" STL pipeline.
    a. Existing 42" pipeline is cement mortar lined (CML).
        i. Contractor shall repair any damaged section of pipeline or cement mortar lining to Owner's satisfaction.
    b. Provide Temporary support to existing 42" pipeline to ensure CML is not damaged.
47. Install WEID canal crossing and concrete structures per plans.
48. WEID canal crossing earthwork for pipe cover and road widening approx. 230 yards of fill compacted to 95%.
49. Install 48" mainline check valve assembly, 18" drain bypass assembly and vault (Station 26+00).
    a. All Owner supplied items are indicated in drawing set.
50. Furnish and install radio communication repeating tower, radios, and associated communication panels adjacent to Station 26+00.
51. Install 13,706LF of Owner supplied 1300mm FRP mainline from station 26+40 to 163+46 according to specification 33 05 36.
52. Install 100LF of 64" wall steel casing under Williams Gas Line from Station 68+40 to 69+40.
    a. This casing can be installed as an open cut crossing,
    b. 64"x 0.375" wall steel casing is Owner Supplied.
    c. Contractor to supply and install casing spacers and ends seals.
53. Install mainline airvents, drain assemblies and pre-cast vaults.
    a. All Owner supplied items are indicated in drawing set.
54. Install City of Umatilla (COU) delivery point (Station 163+55) manifolds, flowmeter, vaults and electrical according to plans.
    a. All Owner supplied items are indicated in drawing set.
55. Furnish and install radio communication tower, radio antennas, communication panels and instrumentation at Station 163+55.
56. Furnish and install 350 LF of 8ft tall chain link security fence with 3 strands of barbed wire and one gate location with two 12 ft access gates and a single man gate.
57. Furnish and install 4" of ¾" minus rock around COU Delivery Point site approx. 100 yds.
58. Pressure test Phase 1 mainline and pump station according to specifications.
59. Install 3,252LF of Owner supplied 1300mm FRP mainline from station 163+64 to 196+16 according to specification 33 05 36.
60. Install 13,972LF of Owner supplied 1100mm FRP mainline from station 196+28 to 336+00 according to specification 33 05 36.

61. Furnish and install radio communication tower, radio antennas, communication panels and instrumentation at Station 336+00.
62. Furnish and install 42" GE panametrics flow meter and precast vault at Station 336+00.
    a. Flowmeter is Owner supplied.
63. Pressure test Phase 2 mainline according to specifications.
64. Contractor shall deliver and offload all excess pipe material and appurtenances to the Recharge Basin area adjacent to station 336+00.

1.3 Contractor's Qualifications

- Have a current license issued by the Construction Contractors Board in compliance with chapter 701 ORS, which must have been in effect at the time of bid submittal.
- At least 10 years of successful experience constructing systems of same size as specified in this RFP.
- At least 5 years of successful experience installing FRP and Steel mainlines.
- Be capable of meeting the warranty and response time outlined in Section 3.4.

The following contractors have been prequalified to propose.

- Tapani,Inc
- Rotschy, Inc

1.4 Project Goals

Complete Phase 1 and Phase 2 meeting agreed schedule and budget.

2 Project Background

The Umatilla Basin, much like many regions in the State of Oregon, is an over-appropriated basin in both its surface and groundwater resources. There is more demand for water to accommodate the regional value-added agriculture economy as well current and future municipal and industrial demands. These demands have also resulted in significant ecological and environmental impacts to the Umatilla River system and aquifers connected to the river.

Years of collaborative planning, study and project modelling/monitoring have led to a strategic, multi-project plan to improve environmental conditions in the Umatilla River system, stabilize and recover both water quantity and quality of stressed groundwater aquifers and ensure a sustainable, drought resilient economy for the Mid-Columbia Region of Northeast Oregon.

The Ordnance Multi-Use Water Project is a key sustainability project in the region and the Umatilla/Columbia River recharge component is a significant first step in advancing aquifer recharge testing and operations in an effort to recover the Ordnance Alluvial Aquifer for both human and environmental benefit.

The Ordnance Project includes three phases and one Umatilla/Columbia River Recharge Component:

Phase I – Columbia River supply line from a newly installed NOAA approved “No-Take” fish screen and pumpstation on the Columbia River to the northeast property line of the Ordnance Chemical Depot. This phase will serve municipal and industrial needs within the City of Umatilla’s city limit boundaries and urban growth boundary west of the Umatilla River as well as provide place holder capacity for water supply to Phase II and Phase III of the Ordnance Project.

Phase II – Depot water supply line extending from the northeast corner of the Ordnance Depot to customers on the Depot.

Phase III – Ordnance Alluvial Aquifer recharge using winter Columbia River water. This phase includes the construction of a water supply line from Phase II to the Ordnance Alluvial Recharge Basin, to be constructed during the Umatilla/Columbia River Recharge Component, as well as additional upgrades to the groundwater monitoring network and potential recovery and distribution systems to future customers.

The Ordnance Multi-Use Water Project system will require a new pump station on the Columbia River. The pump station will be located adjacent to the existing Grimmway river pump station as shown at location A in Figure 1. The system will share Grimmway’s intake screens and intake piping. The Grimmway intake screen and manifold will have 30 cfs of non-interruptible capacity dedicated to the Ordnance system, which is beyond the maximum pumping rate for Grimmway’s Farm. It is anticipated that during periods when Grimmway is not pumping at its full capacity that additional interruptible capacity in the intake may be available up to a total of 45 cfs for the Ordnance River Pumping Station capacity. An additional 5 cfs of capacity has been proposed to be added to the Ordnance Multi-Use Project Pipeline and supplied from a separate source. Therefore, the total capacity in the phase 1 portion of the pipeline upon full build-out will be 50 cfs.

The new River Pump Station will have a total capacity of 45cfs (20,200 gpm) divided equally between four vertical turbine pumps at a total head of 485 feet upon full build out. The river pump station will

require an upgrade to the electrical substation that currently serves the Grimmway river pumping station. The system will not need any additional booster pumps to convey water from the river to the delivery points.

The pipeline will consist of approximately 30,960 feet (ft) of Fiberglass Reinforced Polymer (FRP) pipe and 2,650 feet of 48-inch steel pipe. The pipeline reaches its peak elevation of around 664 feet at about 18,600 feet from the river. The minimum allowable pressure at this point is 10 psi while the resulting design pressure at this point is approximately 20 psi.

The Recharge Basin will be located on the Depot property and will be capable of infiltrating 45 cfs of Columbia or Umatilla River water.

The phase 1 portion of the pipeline will begin at the new river pumping station and will end at the edge of the Depot property boundary (see line AB in red in Figure 1). This portion of the pipeline will have a capacity of 50 cfs. The pipeline length up to the Depot property boundary is approximately 16,450 ft which includes the 2,650 ft of steel pipe. At the end of the pipeline there will be a 48-inch connection to continue south for Phase 2 and a take-off to continue east for the Industrial Use Pipeline Project at location B in Figure 1.

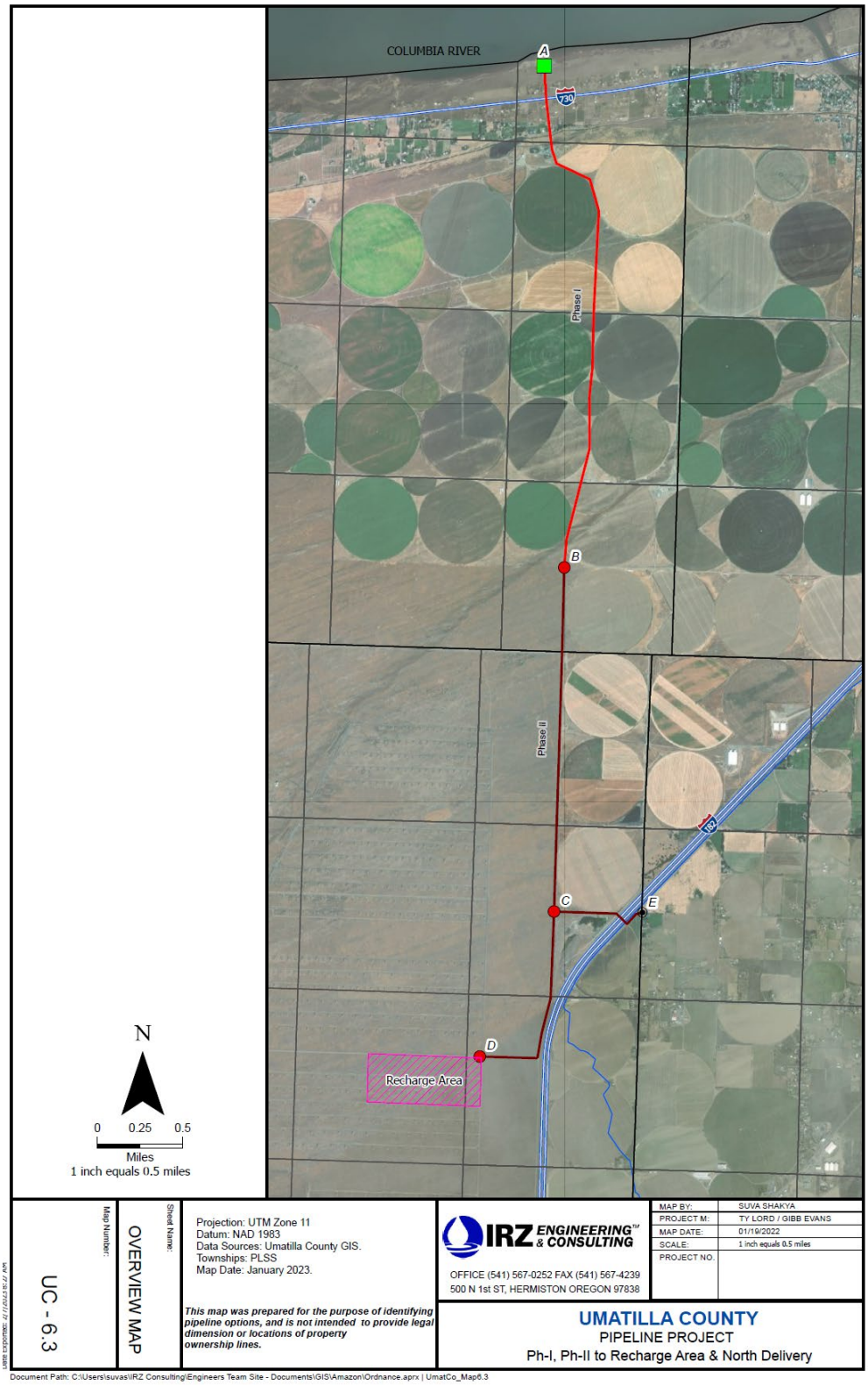


Figure 1. Map of Ordnance Multi-Use Water Project.

2.1 System Description

A single river pumping station is proposed to be built to meet the 45 cfs requirements of the system. An additional 5 cfs of capacity of the pipeline will be delivered to the pipeline from a separate source that is outside of this projects scope. The total flow used for the design of the river pumping station is 20,196 gallons per minute (gpm) and 22,440 gpm for the pipeline.

During Phase 1 operation there will only be one user in the system. This user's peak demand is 1,400 gpm. Two temporary pumps will be installed for Phase 1 operation to meet the Phase 1 system demand.

2.2 Pump Station Overview

2.2.1 Pumps

The total horsepower (hp) required for pumping units is 3,200 hp. A total of four vertical turbine pumps will be installed to achieve the desired flow (20,200 gpm) and head requirements. The pump configuration entails four 800 hp vertical turbine pumps. The pumps will each be capable of producing 5,050 gpm at 515 feet (ft) of head.

Two temporary pumps will be installed to each meet the Phase 1 peak system demand of 1,400 gpm and a minimum of 700 gpm.

2.3 Pipeline Overview

2.3.1 Pipe Sizes and Materials

The pipeline begins after the river pumping station discharge manifold with a 48-inch diameter steel pipeline. Table 2 provides an overview of pipe specifications.

Table 1. General Pipeline Specifications Between Stations.

Station Start	Station End	Material	Nominal Diameter in (mm)	Pressure Class psi (bar)	Approximate Length ft
-00+10'	26+40'	STL	48	406	2,650
26+40'	196+28'	FRP	51(1300)	290 (20)	16,988
196+28'	336+00'	FRP	42 (1100)	145 (10)	13,972
				Total Approximate Length	33,610

2.3.2 Geotech

IRZ subcontracted with Atlas Engineering out of Boise, Idaho, to perform on site boring, as well as soils testing along the pipeline route. At the time of this report 6 borings been completed, four holes to 15-foot depth and two holes to 20-foot depth, along the proposed Phase 1 pipeline route only. The Phase 1 geotechnical report can be found in the Appendix.

2.4 Easements and Permits

The river pumping station and the first 550 ft of pipeline will be located within the Corp Real Estate easement. The pipeline will then transfer on to Onyx Land Company LLC Property for approximately 1,550 ft. Within this section, the pipeline will cross Umatilla County Road 1282 (Southshore Drive) and Oregon Department of Transportation Highway 730. Southshore drive will require a county road crossing permit and Highway 730 will require a ODOT highway crossing permit. All road crossing permits will be acquired by Umatilla County prior to construction. Directly following Onyx Land Companies property, the pipeline will enter into West Extension Irrigation District's (WEID) easement. This portion of the pipeline has been fully approved by WEID and the United Stated Bureau of Reclamation. Following the WEID canal easement, the pipeline enters into the second landowner's property, N&C Land LLC. The pipeline continues on N&C property for approximately 6,200 ft before going back onto Onyx property for the remainder of the pipeline route.

Umatilla County Currently has recorded easement across all Onyx Land Company LLC property across the N&C Land LLC property. These easements will allow the pipeline to be installed as needed across the landowner's property and a final as-built survey will define the 60 ft easement with the pipeline centered within this final easement.

See the plan and profile drawings (Sheets C2000 – C2013) in Appendix A for additional clarity.

2.5 Intake Manifold

2.5.1 Existing Intake Screens and Air Burst System

The existing intake screens consist of three 42-inch diameter by 162-inch stainless steel wedge wire screens. Each screen is equipped with a 6-inch stainless steel air burst pipeline to allow each screen to be burst individually to remove any material build up. When the original system was installed the 6-inch air burst lines were installed up to the water's edge, brought to surface and capped with a blind flange. A majority of the components required for the remainder of the air bust system were purchased by the owner at the time but were not installed. As part of the Ordnance River Pumping Station some of those components will be utilized to finish the air burst system.

The air burst system will be controlled with the pump station PLC and will be installed within the electrical building. The PLC will operate the three 6-inch pneumatic controlled valves. The system will also include an air compressor (sized for both the airburst and hydropneumatic tank), 2,200-gallon main air receiver tank, 5-gallon receiver tank and three 6-inch HDPE pipelines.

See the air burst detail drawings (Sheets M1200 – M1203) and plan and profile sheet (C2100) in Appendix A for additional clarity.

2.5.2 Existing Intake Manifold

The Ordnance River Pumping Station will utilize an existing 42-inch intake manifold that is currently tied into the existing 72-inch intake pipeline. The 72-inch intake pipeline and 42-inch intake manifold were originally constructed around 2010.

The existing 42-inch intake manifold consists of approximately 40 ft of 42-inch standard wall pipe with four 24-inch risers all spaced 6 ft on center. All four risers are needed to pump the total 45 cfs the pump station is designed for.

2.5.3 Pump Station Foundation

A reinforced concrete mat foundation will be designed to provide adequate bearing capacity and strength to withstand the loads associated with vertical turbine pumps, intake manifold and discharge piping. Building Code Requirement for Structural Concrete (ACI 318-14) and Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) will be used appropriately to design the foundation. See the attached geotechnical report for addition considerations that still need to be accounted for in the design.

2.6 Discharge Piping

2.6.1 Design Approach

The discharge piping consists of all flanged appurtenances, steel spools and elbows starting at the discharge flange of the pump and leading to a common 48-inch nominal diameter discharge manifold. All steel pipe will be lined and coated. All flanges used in this station are proposed to be AWWA C207 Class F Ring flanges. See drawing sheets M1000 through M1005 in Appendix A for additional detail on pumps, motors, and discharge piping.

2.6.2 Discharge Line

There is a total of four 18-inch discharge lines at the pumping station. The typical discharge pipe and appurtenances are as follows;

- Immediately out of the pump, a dismantling joint will be used.
- Following the dismantling joint a short spool of flanged steel pipe will be used. A half coupler will be welded to this pipe to allow a connection for a deep-set air vent..
- A wafer style check valve will be bolted following the previous steel spool.
- Following the check valve, a five-diameter length spool will be installed to allow for streamlines to straighten.
- A magnetic flow meter will bolt to the five-diameter spool.
- A two-diameter spool will follow the flow meter.
- Flanged to the aforementioned spool, will be a butterfly valve.
- Following the butterfly valve, a flanged and welded spool will elbow 90 degrees into the common 48-inch discharge manifold. Directly before the elbow, a half coupler and continuously acting air vent will be installed. to ensure

2.6.3 Drain/Pressure Relief Line

On the end of the discharge manifold, a welded drain/pressure relief line will be installed. This line will be plumbed from the discharge manifold back into the side of the intake manifold. A hydraulically actuated diaphragm valve will be used for this system.

2.6.4 Discharge Manifold

The 48-inch discharge manifold will be constructed out of 0.5-inch wall steel pipe that is lined and coated. A 36-inch access port is to be constructed as part of the discharge piping. This port will be sealed shut with the use of a blind flange.

2.7 Electrical Building

It is proposed that the electrical building be pe-engineered steel building with, insulated walls and roofing. It will be constructed on a reinforced concrete foundation.

2.8 Power and Electrical

The general layout of the electrical system, immediately following the step-down transformer providing 4160 Volt (V) service provided by UEC, will begin with a main disconnect. Following the main disconnect, conduit and wire will be installed connecting to the switchgear, soft-starts and VFDs. An uninterruptible power source (UPS) will be utilized to keep power to the programmable logic controller (PLC) in the event of a power outage at the station. A step-down transformer from 4160V to 480V will be installed to provide power to the HVAC system for the electrical building. A step down from a 480V to 120V will be installed for all lighting for the structures. G6 Engineering has provided an electrical schematic of the pumping station. This schematic shows each electrical component that is proposed to be used in the station, as well as design loads. The schematic is shown in drawing sheet E1000 in Appendix A.

2.9 HVAC and Cooling

2.9.1 Electrical Building

The electrical gear area is to be cooled to maintain a temperature of 85° Fahrenheit based on the 0.4% per The American Society of Heating, Refrigeration and Air-Conditioning Engineering (ASHRAE) Standard. The small control room will have its own zone and will be maintained at 75° Fahrenheit. The electrical building will use variable refrigerant volume (VRV) HVAC as the means of cooling the space. The ASHRAE Ventilation Standard 90.1 associated with Hermiston, Oregon was used to determine that the maximum outdoor design temperature of 98.8° Fahrenheit.

The electrical gear heat rejection to the space has been assumed to be approximately 170,000 BTU/hour. These numbers will need to be verified by the electrical gear suppliers. The current numbers have been calculated form empirical data and past experience. The heat loads calculated below represent the peak heat produced in the electrical building.

Table 11 shows the assumptions that were used for the heat gain for each piece of equipment. All following values are in BTU/hour.

Table 2. Electrical Equipment/Building Cooling Load

Electrical Equipment/Building Cooling Load			
Type	QTY	Btu/hr/Unit	Total Btu/hr
800 hp Soft Start	2	11,000	22,000
800 hp VFD	2	62,000	124,000
Misc. Electrical Loads	1	7,000	7,000
Building Loads	1	19,000	19,000
Total			172,000

2.10 Mainline

2.10.1 Mainline Alignment

The alignment of the pipeline is based on the existing intake manifold location for the pumping station, paralleling an existing 42-inch irrigation pipeline, minimizing disturbance to irrigated acreage and constructability.

2.10.2 Mainline Check Valve

A 48-inch check valve will be installed at station 26+00. This location corresponds to the end of the 48-inch steel portion of the pipeline and the beginning of the 1,300mm FRP pipe. The check valve will be installed within a cast in place vault. On either side of the vault 36-inch inspection ports will be installed (one on either side of the check valve), a dismantling joint and a valved 16-inch bypass pipe to allow a majority of the pipeline to be drained at the pump station site.

See the pipeline detail drawings (Sheet C4012) in Appendix A for additional clarity.

2.10.3 Thrust Restraint

All thrust restraint will utilize cast in place concrete thrust blocks.

2.10.4 Road Crossings

Highway 730 crossing will be bore and jack type road crossings. A 58-inch steel casing with casing spacers and casing end sleeves will be utilized at this location. The annular space between the carrier pipe and casing will be pressure grouted to meet Oregon Department of Transportation's (ODOT) requirements. All graveled county roads, County Road 1282 (Southshore Drive), and paved roads within the depot site area will be open cut road crossings. The pipeline will not be installed in a steel sleeve for these open cut crossings. See drawing sheets C3000 through C3003 in Appendix A for details on typical road crossings.

2.10.5 Williams Gas Line Crossing

The Williams Gas line crossings will be an open cut crossing. A 64-inch steel casing with casing spacers and casing end sleeves will be utilized at this location to span the 75 ft right of way. See drawing sheets C3010 in Appendix A for details on this cased crossing.

2.10.6 Buried Utilities

Along the proposed pipeline alignment there are several utilizes including petroleum lines, internet/telephone lines, power distribution lines, and existing irrigation pipelines. All these utilities will need to be located and verified prior to construction.

2.11 Hydropneumatic Tank

The tank size at this point in the design will require a total volume of 30,000 gallons. The liquid volume required is 16,500 gallons. The tank will be installed on a reinforced concrete foundation in accordance with the manufacturers design.

2.12 SCADA System

2.12.1 Design Approach

At this point in the design, a preliminary study has been accomplished regarding the supervisory control and data acquisition (SCADA) system. The SCADA System will provide the following advantages to the system;

- Monitoring of the flow rate through each discharge line at the pump station.
- Monitoring the discharge pressure at the pump station.
- Monitoring the flowrate and pressure at each delivery point.
- Monitoring motor winding temperature, upper and lower bearing temperatures, and vibration.
- Control of the pump station.
    - The system will monitor the pressure at the end of Phase 1 and will maintain that pressure by utilizing the VFDs as well as turning on and off pumps at the station.
- Monitor the liquid volume in the hydropneumatic tank.

G6 Engineering provided a Piping and Instrument Diagram (P&ID) to convey how the system will be controlled and monitored (see drawing sheet E2000 in Appendix A). Dual pressure transducers will be used for redundancy purposes at every location where monitoring pressure is required. The head provided at the pump station will be controlled by the pressure at the end of the Phase 1 portion of the pipeline.

All controls integration and programming will be complete by G6 Engineering.

2.12.2 SCADA Communications

The proposed frequency for the radio communication system would be 50-60 Gigahertz (Ghz). For the Phase 1 portion of the design a radio antenna would need to be installed on the electrical building at the pump station site. A 20 meter (m) tall repeater tower would need to be installed at the top of the hill on the South side of the WEID's canal and a second 20 m tower would need to be installed at the end of the Phase 1 pipeline. The repeater tower is needed due to the existing terrain between the pump station and the end of Phase 1. The existing terrain would not allow for line-of-sight communication without the use of a 90 meter (m) tall tower at the pump station site. Two locations for the repeater are being proposed as part of the design package. The first location would be along the current pipeline alignment on N&C Land LLC. property. The second location would be East of the alignment approximately 0.75 miles on Onyx Land Company LLC.

See radio communications drawing sheets E2100-R2104 for additional clarity.

3 Requirements

3.1 Significant Issues

3.1.1 Native Soil Conditions Along Alignment

The native soil along the alignment primarily consists of sand with large cobbles (river rock). This material is not suitable for pipe backfill. All backfill will need to be processed or replaced with suitable backfill.

3.1.2 Construction Access

The pipeline alignment between stations 2+00 and 26+00 have minimal access and work will need to be completed in a tight corridor due to existing infrastructure and easement widths within this section.

3.2 Time Period for Completion of the Project

Construction of the pipeline cannot begin until irrigation season is complete **(November 1st, 2023.)** The river pumping station and Phase 1 portion of the pipeline must be complete and operational by **March 1st, 2024.**

All of Phase 2 can be constructed within the irrigation season. Completion of Phase 2 can be negotiated with the Contractor. It is expected that the Contractor will complete Phase 1 first and then move directly into Phase 2 Construction.

All FRP and Steel Pipe is currently expected to be begin delivery as early as 9/1/23 be all on site by 10/1/23.

3.3 Safety and Environmental Compliance

The Contractor shall perform all work in such a manner to comply with all local, Federal, and OSHA regulations.

3.4 Warranty Period and Response Time

If within two (2) years from the date of completion, the pipeline, pumpstation and all appurtenances or any part thereof installed as new shall prove to be defective in installation, material, or workmanship the General Contractor shall warrant replacement or repair to the satisfaction of the Owner's Representative at no expense to the Owner.

During the two-year warranty period the General Contractor shall be onsite with repair equipment including but not limited to excavation equipment within 12 hours of notice from the Owner's Representative.

4 Proposal Process

4.1 Schedule of RFP Events

- RFP Advertised - 3/15/23
- MANDATORY Pre-Proposal Meeting and Walk Though – 3/21/23
- Requests for Information (RFI) Due – 4/5/23
- Responses to RFI Due Date - 4/12/23
- Proposal Due Date – 4/19/23
- Proposal Review Process – 4/19/23 - 4/25/23
- Intent to Award Date – 4/26/23

4.2 Pre-Proposal Meeting

A pre-proposal meeting will be held at IRZ Consulting, 500 N 1st Street Hermiston Oregon on **March 21st 2023 at 9:00AM PDT.** Attendance is required for all Contractors planning to submit a proposal. The objective of the pre-proposal meeting is to provide an informal meeting to discuss the contents of the RFP in detail and clarify any questions potential proposers may have.

It is requested that questions or clarification be sent in writing to the following email address ordnanceproject@umatillacounty.gov prior to the meeting.

Following the meeting a visit to the project site will be conducted to allow potential proposers to see the current site conditions. The site visit is expected to last 4 hrs. The site visit will consist of driving on dirt roads in varying conditions, please plan accordingly.

4.3 Proposal Due Date

All proposals must be presented in a sealed envelope to the Umatilla County Board of Commissioners before **10:00AM PDT on April 19th 2023**. Bid submitted electronically or by fax will not be accepted.

Proposals may not be changed of withdrawn after the opening of proposals.

4.3.1 Proposal Binding

All proposals shall be valid for sixty (60) calendar days from the proposal due date.

4.3.2 Right to Reject Bids

The Board of Commissioners reserves the right to reject any or all proposals, accept the proposal deemed most satisfactory to the County, or terminate this Request for Proposal at any time.

4.3.3 Bids submitted by mail shall be addressed to:

Umatilla County
Attn. Board of Commissioners
216 S. E. 4th Street
Pendleton, Oregon 97801

4.4 Official Contacts

Questions regarding RFP must be directed to the County and submitted in writing to the following email address ordnanceproject@umatillacounty.gov . Questions are due no later than **April 5th, 2023.**

5 Proposal Form and Content

5.1 General Information/Requirements

Proposals shall be prepared simply and economically, providing straightforward, concise, descriptions of the proposer's capabilities to satisfy the requirements of this RFP. Emphasis shall be on completeness and clarity of the content of the proposal.

The proposal shall be consecutively numbered on all pages. Organize the proposal in accordance with Section 5.2 through 5.11.

Provide one paper copy.

Letter of Transmittal

All proposals must include a dated letter of interest by the principal of company acknowledging interest of team and intent to meet RFP requirements.

- By providing a signed letter of your interest, you acknowledge that you have received and reviewed all RFP documents and supplemental documents listed in the RFP.
- The letter may summarize the key provisions of the proposal.
- Include the name, address, email address, and telephone number of the proposer and the name, title, address, email address and telephone number of the person authorized to represent the proposer and to whom the County shall direct correspondence.

5.2 Project Understanding

The proposer shall include a statement to demonstrate its understanding of the project, including but not limited to:

- Key project issues and goals.
- The role of the proposer in meeting project goals.

- The key project milestones and issues associated with meeting milestones.
- The key deliverables required by the project.

5.3 Minimum Qualifications

The Bidder must:

- Have a current license issued by the Construction Contractors Board in compliance with chapter 701 ORS, which must have been in effect at the time of bid submittal.
- At least 10 years of successful experience constructing systems of the same size and scope as specified in this RFP.
- At least 5 years of successful experience installing FRP and Steel mainlines.
- Be capable of meeting the warranty and response time outlined in section 3.4.

5.4 General Qualifications

The County intends to award this contract to a single firm to provide the services required. Proposals must identify a single person as project manager to work with the County, and other personnel who will support project activities. The contractor must identify subcontractors and assure responsibility for any subcontractor's work and shall be responsible for the day-to-day direction and internal management of the contactor effort.

Proposals shall demonstrate the qualifications and experience of the personnel who will work directly with the County rather than describing the general experience and qualifications of the firm. The focus shall be on recent project experience performed by key team members within the last 10 years that is relevant to the scope of work outlined in this RFP. Include the following information:

5.4.1 Company Experience

- Provide a list of at least 3 projects that your firm has constructed in the last 5 years that are similar in scope and type to the proposed project.
    - Project name/location.
    - Year complete/current status.
    - Client Name and contact information.
    - Project description and scope of services.
    - Statement of relevance to the services outlines in this RFP.
- Provide references from your three most recent projects (underway or recently completed) of similar size and scope.

5.4.2 Personnel Experience

- Identify key team members of your proposed construction team that will be participating in this project. Including principles, project, executives, project managers, superintendents, engineers, and construction administrative personnel.
- Identify specific past experience of the key team individuals that will be directly participating in this project.
- Identify any self-performed work that you team is capable of that could help the project's schedule and quality.

5.5 Project Approach

The proposer shall include a detailed statement of its approach to the project and schedule. Include the following information:

- Proposers are encouraged to improve upon the tasks, work items, or other elements described in this RFP. If Proposers have significant proposed modifications of the work items and scope of work presented in this RFP, these proposed modifications shall be explained.
- Describe your approach to the overall management and integration of all activities required by the scope of work, including quality assurance, responsibility, and cost control measures.
- Provide any additional information about proposer's project approach that would be beneficial to the proposal review team.
- Provide a description of your approach to bidding out the project. Identify any subcontractors you plan to use.
- Discuss your approach and plan to address to site access constraints.
- Discuss your approach and plan to address meeting pipe backfill requirements.
- Explain your approach to managing site access, safety, and security.
- Identify any concerns with long lead items that may or may not be procured by the County and how you plan to mitigate potential impacts to schedule and project cost.
- Explain your approach to erosion controls and stormwater management and identify any concerns.

5.6 Warranty Repair Approach

- Describe your approach to the meet the 12hour response time requirement during the two-year warranty period.
- Provide any additional information about proposer's ability to provide additional repair work outside the warranty period that would be beneficial to the proposal review team.

5.7 Project Schedule

- Provide a milestone construction schedule showing the proposed length of time to get to the project to substation completion.
    - The schedule shall include completion dates for the River Pumping Station, Phase 1 Pipeline, Phase 2 Pipeline and major milestones.
        - The river pumping station and Phase 1 portion of the pipeline shall be complete and operational by March 1st, 2024.
- Provide any suggestions for accelerating the schedule recognizing logistical issues involved.
- Note long lead items (including Owner Supplied) and potential impacts.

5.8 Costs

Provide a line-item cost per task and quantity on the bid sheet provided.

All labor rates shall be calculated at prevailing wage rates. Contractors will certify the wage standards are met during project implementation.

A contingency value of $250,000 for the Phase 1 portion of the project and $125,000 for Phase 2 has been pre-determined. This contingency is to cover all justifiable change orders approved by the County.

This contingency value has been set to account for potential changes to the final drawing/specification packages.

5.9 Financial Information

Provide letter(s) from sureties and insurance providers including bond rate, current bonding capacity, and aggregate bonding capacity. Proposers must demonstrate they currently have capacity to obtain performance and payment bonds in the amount of the proposed price.

5.10 Additional Information

Provide any other information the proposer feels applicable to the evaluation of the proposal or of their qualifications for completing the project. Use this section to address those aspects of your services that distinguish your firm from other firms. Additional information shall be considered when evaluating the proposers Project Approach and Schedule.

5.11 Subcontractors/Supplier Solicitation and Utilization

Bidders shall list any subcontractor that will complete services in excess of $50,000. Include the name of the contact for the subcontractor, tasks, and total estimated amount allocated to the subcontractor.

- Identify key team members of your proposed subcontractor team that will be participating in this project.
- Identify specific past experience of the key subcontractor individuals that will be directly participating in this project.

6 Evaluation and Selection of Proposals

6.1 Clarifications

The County reserves the right to seek written clarification of each proposal submitted. The County also reserves the right to require other evidence of minimum qualifications, technical, managerial, financial or other abilities prior to selection.

6.2 Evaluation Criteria

The County will select based on the evaluation of the written proposals. Proposals will be evaluated on responses to the base bid. The County may elect to interview any or all proposers. The County reserves the right to select based only on evaluation of the written proposals and not conduct any interviews. Written proposals and interviews will be evaluated based on the following criteria.

15% Project Understanding
25% Qualifications/Experience/Future Support
40% Approach/Project Work Plan/Project Schedule
20% Cost

6.3 Method of Selection

A technical committee will evaluate each submitted written proposal, to determine whose proposal is the most advantageous to the County, based on the evaluation criteria outlined above. The technical committee will then provide a written recommendation to the Board of Commissioners for the highest ranked responsive bidder. The Board of Commissioner will then review the recommendation, vote, and award the contract.

6.4 Single or Multiple Contracts

The County will select one firm to provide all services for Phases 1 and 2 of the Ordnance Project as identified in this bid.

6.5 Notice of Intent to Award

Upon completion of the evaluation process, the County will notify the proposers of its number one selection by electronic email.

6.6 Selection Protest

Proposers who disagree with the selection may protest the decision. The judgement used in the scoring by individual evaluators is not ground for appeal. The selection protest must be submitted in writing within seven (7) calendar days of the Notice of Intent to Award. The protest shall be submitted to the Board of Commissioners at the following address:

Umatilla County
Attn. Board of Commissioners
216 S. E. 4th Street
Pendleton, Oregon 97801

The selection protest must state all relevant facts that establish that all higher ranked proposers were ineligible for selection due to their proposals being nonresponsive or the proposer themselves was not responsible. A written decision will be sent to the protestor.

7 Public Improvement Requirements

This is a public improvement project and is subject to the requirements of Oregon law for public improvements.

A. Each proposal must contain a statement as to whether the proposer is a resident bidder as defined by ORS 279A.120.

B. All proposals must be accompanied by a bid bond on a surety company authorized to do business in the State of Oregon in the amount of 5 percent of the total bid price, payable to Umatilla County, conditioned upon the successful proposer entering into a contract with the County for the proposed equipment and services. A certified or cashier's check or letter of credit issued by an insured institution as defined in ORS 706.008, in the same amount may also be submitted. In case of failure or refusal of the successful proposer to enter into a contract, the bond or security submitted with the proposal may be forfeited as liquidated damages because of such failure or default.

C. Pursuant to ORS 279C.370, within two working hours after the date and time of the deadline when bids are due, the proposer shall submit a disclosure of any first-tier subcontractor that will be furnishing labor and materials and whose contract value is equal to or greater than (a) five percent of the total project bid or $15,000, whichever is larger; or (b) $350,000, regardless of the percentage of the total project bid. The disclosure will include the name of each subcontractor, the category of work that each subcontractor will be performing, and the dollar value of each subcontract, and be in substantially the form set out in ORS 279C.370(2). Failure to name such subcontractors will render the proposal nonresponsive and void. Proposals and subcontractor disclosures shall be delivered to the County's representative appointed to receive bids. Fax transmissions of the subcontractor's listings are acceptable.

D. No proposal shall be received or considered unless the proposer is licensed with the Construction Contractors Board and the proposer cannot be on the list established by the Construction Contractors Board for those contractors or subcontractors not to be considered qualified to hold or to participate in a public contract for a public improvement.

E. No proposal will be received or considered unless the proposal contains a statement by the proposer as a part of its proposal that the proposer will comply with the provisions of the applicable prevailing wage rate and law.

F. Upon award of the contract, the Contractor will be required to post, at its expense, a performance bond and a payment bond, as required by ORS 279C.380. The bonds shall be filed with the County, through the contact named in this document, no later than 10 days after the contract is awarded and must be for the amount of the contract. The bond shall be executed by a surety company authorized to do business in the State of Oregon. Umatilla County shall be payee.

G. This project is subject to Oregon state prevailing wage rates. Bidder covenants and agrees to comply with the provisions of ORS 279C.830, including the payment of the applicable prevailing rate wage and the posting of a public works bond pursuant to ORS 279C.836. The Contractor shall pay the existing rate of wage which may be paid to workers in each trade or occupation required for such public work employed in the performance of the contract either by the Contractor or subcontractor or other person or doing or contracting to do the whole or any part of the contemplated by the contract, and such workers shall be paid not less than the specified minimum hourly rate of wage as set forth in the "Prevailing Wage Rates."

8 BOLI Prevailing Wage Requirements

A. The Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates, as outlined in this section.

B. This RFP and the resulting Contract are subject to the following BOLI prevailing wage rate requirements and the prevailing wages rates set forth in the following booklet, as amended, which is incorporated herein by reference with the same force and effect as though fully set forth herein, and is available at the following web link:

Prevailing Wage Rates for Public Works Contracts in Oregon, issued January 5, 2023[, as amended on January 11, 2023].

Prevailing Wage Apprenticeship Rates for Public Works Contracts in Oregon, issued January 5, 2023 [as amended on January 11, 2023].

These BOLI wage rates are available online at:

https://www.oregon.gov/boli/employers/Pages/prevailing-wage-rates.aspx
https://www.oregon.gov/boli/employers/Pages/prevailing-wage-rates.aspx

C. Because the project involves federal funds, this RFP and the resulting Contract are subject to federal Davis-Bacon Act and Related Acts requirements, in addition to BOLI requirements. The Contractor shall pay the higher of the BOLI wage rates and fringe benefits, as identified in the above BOLI wage rate booklet, or the federal wage rates and fringe benefits listed in the publication "General Wage Determinations Issued Under the Davis-Bacon and Related Acts" that is last published prior to the Bid Closing date set forth in this RFP. Proposers may obtain the applicable federal rates through the following U.S. Department of Labor link: http://sam.gov. Proposers are advised that federal Davis-Bacon rates may be amended at any time prior to the proposal opening date and that contractors remain responsible for meeting federal Davis-Bacon Act and Related Acts requirements and State of Oregon prevailing wage rate requirements.

9 General Information

9.1 Addenda

The County may modify the RFP at any time up to seven (7) days prior to the RFP due date, by issuance of a written addendum to all proposers.

9.2 Cancellation, Delay or Suspension or Solicitation; Rejection or Proposals

The County may cancel, delay, or suspend this solicitation if in the best interest of the County as determined by the County. The County may reject any or all proposals, in whole or in part, if in the best interest of the County as determined by the County.

9.3 Incurred Costs

The County is not liable for any costs incurred by a proposer in the preparation and/or presentation of a proposal.

9.4 Ownership of Documents

Any material submitted by a proposer shall become the property of the County. Materials submitted after a contract is signed will be subject to the ownership provision of the executed contract.

APPENDIX A – Engineering Package

A.1 – Specifications

TABLE OF CONTENTS

SPECIFICATIONS

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies cast-in place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes necessary for furnishing cast-in-place concrete and epoxy grout.

B. All concrete for this project shall achieve a minimum 28-day compressive strength of 4,000 psi.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

A. Concrete Mix: Provide mix design data and supporting test documentation.

B. Product Data: Provide data on any proposed admixtures and curing compounds.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Unless otherwise specified provide wood, steel, or other suitable forms in contact with concrete that will provide a smooth form finish.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed with bar sizes per structure details.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type 1 gray.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4-inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M and potable.

E. Waterstops:

1. For new construction waterstops shall be Flat Ribbed style constructed from flexible PVC (polyvinyl chloride). Manufactured by Sika, product number 781 or approved equal.

2. For new construction cast existing concrete waterstops shall be an adhesive hydrophilic waterstop designed to swell in the presence of water. Manufactured by Henry, HF302 Hydro-Flex Waterstop or approved equal.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

C. Plasticizing, retarding admixtures may be used in ready mix concrete for this project provided additional attention is paid to curing and finishing. Include details of retarding agents in mix design provided to Engineer.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9-oz./sq. yd. when dry.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

A. Expansion - and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces.

C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing, and plasticizing agents; capable of developing a minimum compressive strength of 6,000 psi in 28 days.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

E. The maximum water-cementitious materials (w/cm) for all concrete on this project shall be 0.5.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to latest edition of CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

A. Project location will require attention to concrete batching and mixing times. Contractor will be required to prepare and submit a plan for review by Owner Representative prior to placement of any concrete for the project. This plan should address the mix design to be used, any proposed

admixtures, timing of water mixing and batching, and other details to confirm that concrete quality and strength standards are met.

B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116 and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

C. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide a batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final placement.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.2 STEEL REINFORCEMENT

A. Clean reinforcement steel of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

B. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with wire ties, bar supports, rebar chairs, or blocking to maintain minimum concrete cover and positioning with floor, slabs, and wall sections. Do not tack weld crossing reinforcing bars.

C. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

D. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.3 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Position and install joints so strength and appearance of concrete are not impaired.

1. Use an approved bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
2. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
3. Unless otherwise indicated on drawings, install shrinkage crack control joints with even spacing at maximum of 8 ft. on center.

3.4 CONCRETE PLACEMENT

A. Notify Owner Representative at least 48 hours in advance of concrete placement. Do not place concrete until Owner Representative has accepted site preparations, sub-base material, and other pre-placement activities.

B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

C. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Cold-Weather Placement: Comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

E. Hot-Weather Placement: Comply with ACI 301. Maintain concrete temperature below 90 degrees F at time of placement.

3.5 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in any holes, defects, and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Use epoxy bonding agents or similar materials to insure integrity and quality of any patching is consistent with original concrete.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.6 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, concrete thrust blocks, and other surfaces according to ACI 308.1, by one or a combination of the following methods:

1. Water.
2. Continuous water-fog spray.
3. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
4. Curing and Sealing Compound:

a. Thrust Blocks:
1) Apply uniformly to exposed concrete and under any formwork, once removed, in a continuous operation by power spray or roller according to manufacturer's written instructions.
2) Repeat process 24 hours later and apply a second coat.
3) Maintain continuity of coating and repair damage during curing period.
4) Cure Time
a) Prior to backfilling, cure for a minimum of 48 hours and to laboratory test results confirming at least 50% of the design strength.

b. Slabs and Floors:
1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later and apply a second coat.
4) Maintain continuity of coating and repair damage during curing period.

3.7 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas where indicated by the Engineer. Remove and replace concrete that cannot be repaired and patched to Engineers approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing, and cracks in excess of 0.01-inch-wide or that penetrate to reinforcement, or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shoring, bracing, and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change. Concrete slump for this project shall be 4" +/- 1 inch.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

   a. Air content for concrete batched for this project shall fall within a range of 5-1/2% to 8%.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

   b. Cast and field cure two sets of two standard cylinder specimens for each composite sample, unless otherwise indicated.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   b. Concrete for this project shall achieve a minimum 28-day compressive strength of 4,000 psi.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Measure floor, wall and slab flatness, levelness and plumbness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION

SECTION 13 82 00 – IRRIGATION PUMPS

PART 1 – GENERAL

1.1 SCOPE

A. These Specifications cover general mechanical requirements for pumps. For additional requirements and related work, refer to other Technical Specifications and the construction drawings.

B. The CONTRACTOR shall furnish and install the pumps; complete with all accessories, anchor bolts, tools, and spare parts; in accordance with these specifications and as shown on the drawings. The CONTRACTOR shall furnish all materials required for servicing and conducting operating test, including lubricating oil and grease.

The lubricating oil and grease shall be in accordance with the pump manufacturer's recommendations.

Anchor bolts and sole plates shall be furnished and installed as depicted in the construction drawings.

Motors for the vertical turbine pumps shall be furnished in accordance with Section 13 82 01 Irrigation Pump Motors.

Electrical terminations and piping connections shall be completed by Others.

Contractor will need to coordinate with Others for the installation of the pump assemblies to ensure centerlines of the discharge flange match discharge piping.

C. Items specified in this Technical Specification are intended to define the required conditions under which all pumps must operate. All applicable sections, as determined by the ENGINEER, shall control the work outlined in the Contract Documents.

D. This is a phased project. The installation of the pumping assemblies will be completed in two phases.
   a. Phase 1 (Temporary Pump Arrangement)
      i. Two (2) Permanent Pumps as shown in Table 16A and construction drawing.
      ii. Two (2) Temporary Pumps as shown in Table 16B and construction drawings.
   b. Phase 2 (Permanent Pump Arrangement)
      i. Four (4) Permanent Pumps as shown in Table 16A and construction drawings.
   c. It is the Owner's preference that as many components be common between the Temporary Pump Assemblies and Permanent Pump Assemblies. The discharge heads for both the Temporary and Permanent Pumps shall share the following items at a minimum.
      i. Sole Plate
      ii. Discharge Head Mounting Plate Hole Pattern and Diameter
      iii. Discharge Flange Size
      iv. Discharge Flange Centerline Height

1.2 TYPE AND DESCRIPTION

The pumps, as shown in the construction drawings, shall be vertical turbine pumps suitable for direct connection to a vertical solid-shaft synchronous motor. Rotation may be in either direction. The weight of the rotating parts of the pump, including any unbalanced hydraulic thrust of the pump impellers, shall be carried by a thrust bearing in the motor. The pump shall be suitable for outdoor operation at an elevation of 275 feet and with an ambient temperature of 45 °C. The pump shall be designed to operate safely at the maximum speed attainable in the reverse direction of rotation due to water returning through the pump at times when the power supply to the motor is interrupted and the discharge valve fails to close. Maximum reverse speed shall be determined using the heads listed in tables 16A and 16B. The water to be pumped may contain varying amounts of sand, silt, and aquatic growth.

1.3 SUBMITTALS

A. Vertical Turbine Pumps

1. Approval Data

The CONTRACTOR shall provide commercial products data including the manufacture's name, type, model, size, dimensions, weights, and a certified pump performance curve from the pump manufacturer for each of the actual pumps to be furnished on the project. The curves shall show the head, capacity, efficiency, NPSH required, and brake horsepower over the complete operating range of each pump from zero capacity to the maximum capacity including the design points. The curves shall include reduced speed conditions down to one-half the design speeds or the speed required to achieve the reduced speed capacity shown in table 16A and 16B whichever is lower.

2. Drawings

Certified sectional assembly drawings shall be provided with parts and materials lists. Materials list shall indicate components common between Temporary and Permanent Pump Assemblies. Provide a certified drawing for all flow conditioning baskets.

3. Service Manual

A service manual for each pump shall be supplied which includes sectional assembly drawings, parts and material lists, and all applicable test reports.

4. Warranty

The warranty shall include coverage of all pumps, columns, shafts, bearings, seals, and wear plates for a period of two years from substantial completion. The warranty shall cover any problems created from vibration, manufacturing defects, or other defective work.

B. Qualifications:

1. SUPPLIER (Pump Manufacturer)
   a. Provide written documentation that meets or exceeds the requirements in 1.4A of this section.
2. CONTRACTOR (Pump Supplier/Installer)
   a. Provide written documentation that meets or exceeds the requirements in 1.4B of this section.

1.4 QUALIFICATIONS

A. SUPPLIER:
   1. At least 10 years of successful experience producing products as specified.

B. CONTRACTOR:
   1. At least 20 years of successful experience installing equipment as being furnished.
   2. Provide references for at least 3 completed projects supplying similar size and materials as specified.
   3. Access to a service center within 50 miles of Hermiston, Oregon.

1.5 STORAGE OF EQUIPMENT

The CONTRACTOR shall provide secure storage facilities for all pumps before they are installed. Any equipment that is damaged while in storage shall be replaced at the CONTRACTOR's expense.

The two (2) Permanent Pumps that will not be installed until Phase 2 (Permanent Pump Arrangement) will need to be assembled and tested according to this specification. They will then need to be disassembled and crated for long-term indoor storage prior to shipment.

1.6 VERTICAL TURBINE PUMPS

A. General

The CONTRACTOR shall furnish and install vertical turbine pumps. The pumps shall be SIMFLO, Ingersoll-Dresser (Flowserve), Goulds, Floway, National, or approved equal. All pumping equipment shall be furnished and installed in accordance with requirements of AWWA E101, Vertical Turbine Pumps – Line Shaft and Submersible Types.

B. Operating Conditions

Table 16A. Operating Conditions and Design Requirements for Pumps 1 through 4.

Primary Design Capacity	5,050 gpm @ 515 ft TDH
Minimum Allowable Efficiency at Primary Design Point	82 percent
Secondary Design Capacity	N/A
Minimum Allowable Efficiency at Secondary Design Point	N/A
Reduced Speed Capacity	2,250 gpm @ 440 ft TDH
Maximum Pump Speed	1,200 RPM
Depth of Pump Can	See construction drawings
Minimum Available Submergence	4 ft.
Discharge Flange Size	18 in. diameter, Class 300 (See Construction Drawings)
Motor Size	800 hp
Motor Voltage	4,160 volt, 3-Phase
Suction Strainer Required?	No

All internal pump losses, including column and discharge head losses, are included into the total head listed.

C. Performance Characteristics

The pumps shall be non-overloading for the motor at any point on the pump curve without considering the service factor. The pumps shall be designed to start and stop against a closed discharge check valves with the discharge line full of water and to operate satisfactorily over the expected range of total heads.

The head capacity curve of the pump shall have a continuously rising head characteristic with decreasing capacity over the expected range of total heads.

B. Operating Conditions

Table 16B. Operating Conditions and Design Requirements for TEMPORARY Pumps 1 and 2.

Primary Design Capacity	1,400 gpm @ 515 ft. TDH
Minimum Allowable Efficiency at Primary Design Point	82 percent
Secondary Design Capacity	N/A
Minimum Allowable Efficiency at Secondary Design Point	N/A
Reduced Speed Capacity	700 gpm @ 440 ft TDH
Maximum Pump Speed	1,200 RPM
Depth of Pump Can	(See Construction Drawings)
Minimum Available Submergence	4 ft.
Discharge Flange Size	18 in. diameter, Class 300 (See Construction Drawings)
Motor Size	250 hp (Confirmed by Pump Manufacturer)
Motor Voltage	4,160 volt, 3-Phase
Suction Strainer Required?	No

All internal pump losses, including column and discharge head losses, are included into the total head listed.

C. Performance Characteristics

The pump shall be non-overloading for the motor at any point on the pump curve without considering the service factor. The pump shall be designed to start and stop against a closed discharge check valve with the discharge line full of water and to operate satisfactorily over the expected range of total heads.

The head capacity curve of the pump shall have a continuously rising head characteristic with decreasing capacity over the expected range of total heads.

PART 2 – MATERIALS

2.1 DESIGN AND MANUFACTURE

The pumps shall be furnished in accordance with the requirements of these specifications. The components of the pump shall be made of materials' equal to those specified in table 16C. The same material combination shall be used on all identical pumps. Special consideration shall be given to the pump design to ensure that the natural frequency of vibration (reed frequency) of the combined discharge head assembly and motor after installation is at least 10 percent greater than the pump full speed or no greater than 70 percent of the pump full speed. If, after installation, it is found that the pumping unit does not meet this requirement, the Contractor shall modify the discharge head assembly as required to meet this requirement. The CONTRACTOR's plan for any such discharge head modification shall be reviewed and approved by the ENGINEER before implementation. The use of frequency adjusting devices (such as washers) between the discharge head assembly and the motor will not be permitted.

Table 16C. - Vertical Turbine Pumps - Materials of Construction

Item	*Unified Number	Material	BHN
Discharge Head		Steel	
Discharge Column		Steel	
Bowls			
Bottom 2 or 3 Stages		Cast Iron	
Top 2 Stages		Ductile Iron	
Bowl Wearing Rings	S40300-S44004	Stainless Steel	>300
Impeller	C95300-C95700,	AL-Br	
	C95800	Ni-AL-Br	
Impeller Wearing Rings	C95300-C95700,	AL-Br	>160
	C95800	Ni-AL-Br	>160
Bowl Shaft	S40300-S44004	Stainless Steel	**
Top Shaft	S40300-S44004	Stainless Steel	**
Line Shaft	S40300-S44004	Stainless Steel	**
Intermediate Bowl Bearings		Bronze	
Suction Case Bearing			
Line-Shaft Bearing		Bronze	
		Fluted Neoprene	

* ASTM DS-56A: Unified numbering system of metals and alloys.

** Chrome-plated sections of not less than 0.01-inch thickness and not less than 500 BHN shall be provided at all bearing wear surfaces.

The pump bowls, column pipe, and discharge head shall be designed for a maximum pressure equivalent to 150% of the primary design head.

2.2 PUMP COLUMN AND DISCHARGE HEAD ASSEMBLY

The pump shall be supported from its base by means of a vertical discharge column with a horizontal discharge located above the supporting base. The centerline of the discharge shall be at the elevation indicated on the construction drawings. The top of the discharge head will be register fit to match the motor.

The discharge head assembly shall include a sole plate to be grouted into the concrete foundation according to the construction drawings. The sole plate thickness shall be in accordance with pump manufacturer's recommendations. The sole plate and discharge head mating surfaces shall be machined flat to within .002 inches per foot.

The discharge column shall be of steel pipe not lighter than that recommended by ANSI/AWWA E101 for vertical turbine pumps. Discharge columns larger than those listed in ANSI/AWWA E101 shall be made of straight-seam pipe in accordance with ASTM A 134 or A 139, with a wall thickness not less than 0.375 inches. The pump shall be furnished with a fabricated plate steel discharge head assembly. Fabricated plate steel discharge heads shall be provided with mitered elbow with not less than two mitered joints (three segments). The steel discharge elbow shall have a wall thickness of not less than that specified above for the column. The discharge head shall be designed to withstand the maximum bulkhead discharge pressure without undue deflection. The pump discharge shall terminate in a flanged connection.

2.3 BOWL ASSEMBLY

The pump bowl and suction case shall be designed for easy removal of the impeller and bearings. Bowls for enclosed impellers shall be provided with replaceable wearing rings where there are close-running clearances between the impeller and the bowl. The surfaces of all vanes used to direct the flow of water through the suction case and pump bowl shall be as smooth as practicable and free of blow holes, chilled areas, slag, or foreign matter. The suction case shall have a bell-mouth inlet designed to reduce entrance losses and shall have a sufficient number of vanes to support the lower guide bearing. Means shall be provided in the bowl assembly to sustain the weight of the impeller and pump shaft when dismantling the pump. A sand collar shall be provided on the bowl shaft above the suction case bearing.

2.4 IMPELLERS

The impellers shall be designed to minimize cavitation and shall be fastened to the shaft in such a manner as to make it readily removable. The impeller shall include a replaceable wearing ring where there are close-running clearances between the impeller and the bowl. The wearing ring shall be shrunk fit, utilizing an interference fit of 0.0005 inch per inch of ring inside diameter.

The water passages of the impeller shall be hand finished to remove rough spots and excessive irregularities. The rotating parts shall be balanced dynamically to the pump manufacturer's quality control standards provided the residual imbalance during the operating tests, performed after installation at the jobsite, does not exceed the limits established by the Hydraulic Institute.

The Contractor shall warrant the impeller against excessive cavitation for a period of 3 years from the date the pump is placed in service. Cavitation will be considered excessive when the amount of material removed from the impeller exceeds 0.00004 pound per square foot of inlet area of first-stage impeller per hour of operation. Excessive cavitation shall be corrected by modification and repair of the impeller, or by replacement of the impeller with an improved design. Following such modification and repair or replacement of the impeller, the warranty period shall begin again from the date the unit is placed back in service. During the warranty period, the unit will not be operated outside the head range specified or with suction level below that specified except during startup,

filling discharge lines, or for short accidental periods. Erosion or damage caused by suspended matter in the water and corrosion caused by the chemical composition of the water are not intended to be covered by the Contractor' s warranty.

2.5 SHAFTS

The pump shafts shall have a chrome-plated section of not less than 500 Brinell hardness at the bowl bearings, intermediate bearings, and the packing box wearing surfaces and shall be of ample size to operate without objectionable distortion or vibration at maximum speed in both the forward and the reverse directions. The shaft couplings shall be threaded. The ends of shafts 2 inches in diameter and larger shall have male and female fit, to ensure alignment. For a solid-shaft motor, a readily adjustable, solid-type flanged coupling shall be provided between the pump and motor shafts for adjusting the elevation of the pump impeller with reference to the pump bowl.

2.6 PUMP BEARINGS (WATER LUBRICATED)

The pump shall have an open line shaft with a stuffing box and a shaft guide bearing located where the shaft leaves the discharge head and shall have sufficient shaft guide bearings spaced not over 10 feet apart to maintain the alignment of the pump shaft and to prevent vibration. The bowl assembly shall be equipped with adequate bearings, including a suction case bearing below the first - stage impeller. The bowl assembly of multistage pumps shall be provided with water- lubricated, intermediate-bowl bearings. The line shaft guide bearings shall be water lubricated.

2.7 VANED FLOW CONDITIONING BASKETS

A. Pump Manufacturer to provide vaned flow condition baskets as indicated for all vertical turbine pumps.
B. Provide basket design approved by nationally recognized Hydraulic Institute Testing Laboratory.
C. Basket Minimum Design Criteria
    a. Minimum basket clearance from intake floor: 4 inches
    b. Minimum basket height: Equal to intake bell diameter (D) divided by three (D/3).
    c. Vane Spacing:
        i. Varies based on diameter.
        ii. Not to exceed 15 degrees.
    d. Bottom grating depth to spacing aspect ratio 1:1 and minimum of 75% open area.
    e. Headloss Coefficient K: 0.70
    f. Material Type: 316L stainless steel
D. Pump manufacturer to coordinate the method of securing the basket to the pump intake bell.
E. Manufacturer: Flow Optimizers, LLC.

2.8 NAMEPLATES

The following information shall be contained on the nameplate as a minimum:

F. Customer Tag Number for Pumps 1 through 4
   a. ORDNANCE #1
   b. ORDNANCE #2
   c. ORDNANCE #3
   d. ORDNANCE #4

G. Customer Tag Number for TEMPORARY Pumps 1 and 2.
   a. ORDNANCE #3T
   b. ORDNANCE #4T

H. Serial Number

I. Head Model

J. Pump Model

K. Number of Stages

L. RPM

M. Pump Design Conditions (flow, TDH, and power)

2.9 TOOLS AND ACCESSORIES

The Contractor shall furnish one set of all special tools required for complete assembly and disassembly of the pump and all other appurtenances and accessories that may be required to make the Unit complete and ready for operation.

PART 3 – EXECUTION

3.1 GENERAL

All equipment shall be furnished and installed as shown on the drawings and in accordance with the equipment manufacturer’s instructions.

3.2 SHOP ASSEMBLY AND TESTING

The pump shall be completely assembled in the shop to ensure correct fitting of all parts. The mating sections of each pump shall be assembled in the shop to ensure correct fitting of all parts and shall be matchmarked before shipment to ensure correct assembly in the field. The pump bowls and discharge heads shall be tested hydrostatically under a pressure not less than the greater of the following:

A. 150 percent of the pressure that will occur in that part when the pump is operated at rated conditions for the given application of the pump.

B. 125 percent of the pressure which would occur in that part when operating at rated pump speed for the given application, but with the pump discharge valve closed.

The hydrostatic test pressure shall be held for not less than 5 minutes after all leaks have been stopped. Each pump shall be tested at the manufacturer's shop or at another test facility agreed upon by the ENGINEER, to establish that the performance requirements of these specifications and the warranties under this contract have been fulfilled. The performance test shall be made with the pump and motor assembled as an operating unit. Readings shall be taken at a minimum of five points including one point each within 2 percent of the rated total head, minimum expected head, and maximum expected head, listed in tables 16A and 16B. The test shall be conducted at full speed and,

unless otherwise specified, the test procedure and instruments used shall conform to the Hydraulic Institute Standards, 14th Edition. Acceptance shall be based upon the Hydraulic Institute's Acceptance Grade of 1U.

3.3 INSTALLATION

A. General. - The correct assembly and alignment of all parts of the pumping unit shall be the CONTRACTOR's responsibility. An anti-seize compound meeting the requirements of Federal Specification TT- S-1732 shall be applied to the shaft threads before the shaft is assembled. The CONTRACTOR shall furnish all shims, anchor bolts, complete with adjusting nuts and washers as required, and other devices necessary for installing the pumping units.

The pumping unit shall be installed under the supervision of a qualified erection engineer from the pumping unit manufacturer, at no additional cost to the Owner. The unit shall be installed in accordance with the manufacturer's installation instructions. Any damage caused by the CONTRACTOR shall be repaired or the damaged part replaced, by and at the expense of the CONTRACTOR, as approved by the ENGINEER. All couplings and flange faces shall be cleaned thoroughly of all dirt and burrs before connection to ensure tight fit and true alignment. The finished surfaces of all flanged joints shall be coated with joint compound before bolting.

B. Installation. - The pump (without motor) and discharge head shall then be lowered into position and connected to the discharge piping. The level and flatness of the discharge head and sole plate shall be checked at four locations spaced 90° apart using a machinist's level calibrated at 0.0005 inch per division. The top machined surface of the discharge head shall be adjusted to 0.002 inch per foot maximum deviation from horizontal. After final leveling and alignment, the base shall be anchored by tightening the upper nuts on the anchor bolts evenly to manufacturer's recommended torque specification.

The motor shall then be mounted to the discharge head. The clearance between the mating surfaces shall not exceed 0.005 inch prior to bolting down the motor. The motor shaft of the unit shall be turned by hand to ensure free rotation. After electrical connections have been made and correct direction of rotation is determined, the pump shaft of the unit shall be connected to the motor shaft, and vertical adjustment of the pump impeller shall be made in accordance with the manufacturer' s instructions.

C. Servicing and testing. - After the pumping unit is installed, it shall be completely lubricated, adjusted, and cleaned. All lubricating devices shall be checked for correct operation. Lubricating oil and grease shall be furnished by the CONTRACTOR in accordance with the pumping unit manufacturer' s recommendations.

Without additional cost to the Owner, the CONTRACTOR shall clean the foundation to ensure that all construction waste and accumulated debris have been removed. This final cleaning of the station will be witnessed by a representative of the Owner. Any damage to the pumping units or related equipment during initial startup due to foreign objects left on the station decks shall be corrected at the CONTRACTOR's expense.

Before initially energizing the pump motors, the CONTRACTOR shall have successfully tested all pumping plant control, monitoring, and protective circuits.

After being serviced, the pumping unit shall be given an operating test under load for a period of at least 8 hours or as directed by the Owner's Representative. The tests shall be conducted by the CONTRACTOR and witnessed by the Owner. During the tests, the operation of the pumping unit shall be observed carefully and recorded as to noise, vibration, and motor-bearing temperatures. Vibration levels shall not exceed the limits recommended by the Hydraulic Institute Standards, 14th Edition, Figure 77. Without additional cost to the Owner, the CONTRACTOR shall make

any changes and correct any errors for which he is responsible as determined by the Owner's Representative.

END OF SECTION

SECTION 13 82 01 – IRRIGATION PUMP MOTORS

PART 1 – GENERAL

1.1 SCOPE

A. These Specifications cover general mechanical requirements for medium voltage vertical squirrel cage induction motors. For additional requirements and related work, refer to other Technical Specifications and the drawings.

B. The Contractor shall furnish and install motors for pumping units in accordance with this paragraph and as were shown on the drawings.

C. Work governed by these specifications includes manufacture, testing, delivery, and installation of equipment constructed in accordance with the requirements presented herein.

1.2 TYPE AND DESCRIPTION

A. Motors shall be vertical, solid shaft, and, except as specified, shall conform to NEMA MG1. Motors shall be suitable for installation in the space and position shown on the drawings.

B. Motors shall be U.S. or G.E..

C. The Contractor shall coordinate all equipment for the unit, including pump, motor, and motor control equipment so components are compatible.

1.3 CODES AND STANDARDS

A. All equipment shall be fabricated, assembled, and tested in accordance with the most current applicable standards as defined by the following institutions:

1. American National Standards Institute (ANSI).
2. Institute of Electrical and Electronic Engineers (IEEE).
3. National Electrical Manufacturers' Association (NEMA).
4. Anti-Friction Bearing Manufacturers' Association (AFBMA).

1.4 SUBMITTALS

A. Approval Data

1. Preliminary Dimension Print and Frame Size
2. Approximate Motor Weight
3. Complete Motor Nameplate Information
4. Motor Performance Data, including the following:
   a. Guaranteed minimum efficiencies at 100%, 75% and 50% of full load.
   b. Guaranteed minimum power factor at 100%, 75% and 50% of full load.
   c. Locked Rotor Current
   d. Full Load Current
   e. Starting Torque
   f. Full Load Torque
   g. Breakdown Torque

B. Drawings
    1. Certified Dimension Prints
    2. Recommended Spare Parts List Priced

C. Service Manual and Warranty
    1. Operation and Maintenance Manuals
    2. Connection Diagrams
    3. Test Reports as Specified
    4. Manufacturer Warranty Documentation

D. Qualifications:
    1. SUPPLIER (Motor Manufacturer)
        a. Provide written documentation that meets or exceeds the requirements in 1.5A of this section.
    2. CONTRACTOR (Pump Installer)
        a. Provide written documentation that meets or exceeds the requirements in 1.5B of this section.

1.5 QUALIFICATIONS

A. SUPPLIER
    1. At least 30 years of successful experience installing equipment as being furnished.

B. CONTRACTOR (Pump Installer)
    1. At least 20 years of successful experience installing equipment as being furnished.
    2. Provide references for at least 3 completed projects supplying similar size and motors as specified.
    3. Access to a service center within 50 miles of Hermiston, Oregon.

1.6 STORAGE OF EQUIPMENT

The CONTRACTOR shall provide secure storage facilities for all motors before they are installed. Any equipment that is damaged while in storage shall be replaced at the contractor’s expense.

1.7 CONDITIONS OF SERVICE

A. Motors shall be suitable for continuous operation on a three-phase, sixty hertz system rated 4,160 volts.

B. Motors shall be designed to operate at rated load in a maximum ambient temperature of 40°C at a maximum altitude of 1,000 meters.

C. The location of installation will be outdoors.

PART 2 – MATERIALS

2.1 DESIGN REQUIREMENTS

A. General

1. Motors shall be capable of withstanding all normal forces which may be imposed upon them during the course of normal operation, including starting and normal stops.
2. All motors shall be VFD rated (magnet wire and one insulated bearing) and shall be able to start and accelerate the connected load to full load speed with 90% of rated voltage at the motor terminals.
3. Motors shall be capable of continuous operation at full load and rated frequency with a voltage variation of ±10%.
4. Motor starting current shall not exceed a value equal to 750% of the motor full load current.

B. Enclosure

1. Motors shall be furnished with Weather Protected, Type I (WP-I) enclosure type.
2. Openings on all Weather Protected designs shall be covered with metal guard screens having a mesh size no larger than 1/8 inch square.
    a. Weather Protected Type I designs shall be furnished with removable, cleanable and reusable screens over intake air openings.
3. Enclosures shall be of fabricated steel or cast-iron construction in accordance with the manufacturer's standard design. Canopy caps shall be of aluminum, cast iron or sheet metal and shall be easily removable for maintenance purposes.

C. Motors to be installed in locations where moisture may collect shall be furnished with drain openings and plugs.

D. Stator Construction

1. Stator laminations shall be of fully processed steel. Each lamination surface shall be given the necessary treatment so as to have core plate type C-5 insulation.
2. Stator windings for system shall be form wound of rectangular copper magnet wire. Aluminum magnet wire is not acceptable. Coil extensions shall be blocked and braced sufficiently to minimize movement during normal starting and running conditions at full rated voltage.
3. Insulation
    a. Insulation system shall be Class F material or better.
4. Temperature rise shall not exceed the limits defined by NEMA for Class B insulation systems while operating at nameplate horsepower, frequency and voltage.

E. Rotor Construction

1. Rotors shall be of cast or fabricated aluminum or fabricated copper / bronze in accordance with manufacturer's standard design.

F. Bearings

1. Bearings supplied shall be of type and size sufficient to satisfy thrust loading requirements for each motor in accordance with manufacturer's standard design. Bearings shall be rated for an in-service B-10 life of 8,800 hours.
2. Thrust Bearings
    a. Motors shall be designed and constructed with thrust bearings on top to allow inspection and/or replacement without requiring complete disassembly of motor.
    b. Thrust bearings shall be deep-groove ball, angular contact ball or spherical roller type. Bearings mounted back-to-back or in tandem are acceptable and may be furnished when required according to manufacturer's standard design.
        i. Deep-groove ball bearings shall be used only on normal thrust design motors and shall be capable of handling thrust loads in either direction.
        ii. High thrust design motors shall be supplied with angular contact ball bearings whenever possible and in accordance with manufacturer's standard design.
        iii. Where thrust requirements restrict the use of angular contact bearings, spherical roller bearings shall be furnished.
            - When required, motors furnished with spherical roller bearings shall also be provided with a system of coils in the oil reservoir for the circulation of cooling water.
            - Spherical roller bearings shall be spring loaded to keep the lower bearing race in contact and prevent bearing damage during starting and momentary up thrust conditions.
3. Guide Bearings
    a. Guide bearings shall be deep-groove ball type and shall be located at the bottom of the motor.
    b. Guide bearings may be stacked when necessary, according to manufacturer's standard design to accommodate specified up thrust conditions.
    c. Guide bearings or bearing assemblies shall be provided with sufficient means for preventing the leakage of lubricant or entrance of foreign matter along the shaft.
4. Lubrication
    a. Thrust bearings shall be oil lubricated and contained in an oil reservoir with oil sight level gauge and oil fill and drain openings with plugs.
    b. Deep-groove ball bearings furnished as thrust bearings for normal thrust motors shall be grease lubricated. When furnished as guide bearings for high thrust units, they shall be oil lubricated.
        i. All 800 hp motors shall be furnished with guide bearings and shall be oil lubricated.
        ii. Grease lubricated bearings shall be furnished with provisions for in-service positive lubrication. A drain shall be provided to guard against over lubrication.

G. Noise Level

1. Sound pressure levels shall be measured according to IEEE 85 and shall not exceed 90 decibels as measured on the A-Weighted Scale at a distance of five (5) feet from any motor surface under no load, free field conditions.

H. Nameplates

1. Motor nameplates shall be of stainless steel and shall be securely fastened to the motor frame with pins of a like material.
2. The following information shall be contained on the motor nameplate as a minimum:
    a. Rated Horsepower
    b. Full Load Speed
    c. Frequency
    d. NEMA KVA Code and Design Letter (when applicable)
    e. Rated Voltage
    f. Manufacturer's Serial Number
    g. Service Factor
    h. Insulation Class
    i. Maximum Ambient
    j. Full Load Current at Nameplate Voltage
    k. Frame Size Designation

I. Terminal Boxes

1. Terminal boxes shall be of fabricated steel or cast-iron construction to be compatible with the motor enclosure specified and when possible, shall be diagonally split and capable of rotation in 90°increments. Boxes not suitable for rotation must be capable of top entry.
2. The area in which the main terminal box is connected with the motor frame shall be fully gasketed in order to prevent entrance of foreign matter into the motor and to provide support for the stator leads where they pass through the motor frame.
3. A properly sized grounding terminal shall be mounted in the main terminal box when specified.
4. The main terminal box shall be sufficiently oversized to allow stress cone terminations of shielded power cables and to allow mounting of any surge capacitors, lightning arrestors or current transformers as may be specified.

J. Leads

1. Main motor leads shall have EPDM or equal type jackets and shall be permanently tagged for identification.
2. The relationship between lead markings and the direction of rotation shall be indicated on a separate motor nameplate.

2.2 ACCESSORIES

A. Space Heaters

1. Motors shall be furnished with space heaters to provide sufficient wattage to maintain the internal temperature of the motor at a level approximately 10°C above the ambient temperature while the motor is not in operation.
2. Space heaters shall be rated for operation on a single phase, 60 hertz, 120 or 240 VAC system. Space heaters shall have leads brought out in a separate terminal box.

B. Protective Devices

1. Stator winding protection shall consist of following:

a. Six (6) 120 ohm nickel resistance-type temperature detectors (RTD's) embedded in the stator windings, two (2) per phase. Each detector shall have its leads wired to an auxiliary terminal box.

2. Bearing protection shall consist of the following:
   a. Two (2) 120 ohm nickel resistance-type temperature detectors (RTD's), one (1) per bearing, mounted as closely as possible to the outer surface of each bearing. Each detector shall have its leads wired to a terminal block located in an auxiliary terminal box.
   b. One (1) vibration switch Robertshaw 366A8 or approved Equal.
   c. Surge protection shall be provided in the form of surge capacitors and lightning arrestors mounted, one per phase in the main terminal box.

PART 3 – EXECUTION

3.1 GENERAL

All equipment shall be furnished and installed as shown on the drawings and in accordance with the equipment manufacturer's instructions.

3.2 TESTING

A. When specified, motor shall be given a complete initial test in accordance with IEEE 112 method B and shall include the following items:
   1. Current Balance
   2. High Potential Test
   3. Vibration Test
   4. Winding Resistance
   5. Locked Rotor Current
   6. No Load Running Current
   7. Full Load Heat Run
   8. Full Load Percent Slip
   9. Efficiency at 100%, 75% and 50% Load
   10. Power Factor at 100%, 75% and 50% Load

B. A certified test report shall be submitted to the purchaser upon completion of all required tests.

C. Purchaser reserves the right to witness any or all of the tests specified to be performed. Prices for this shall be included as a separate item in the seller's quotation.

END OF SECTION

SECTION 22 15 13 – GENERAL SERVICE COMPRESSED AIR PIPING

PART 1 - GENERAL

1.1 SCOPE

A. These Specifications cover materials and fabrication of the air-burst piping and hydropneumatic supply piping.

1.2 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 250 psig or less.

1.3 DEFINITIONS

A. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 250 psig.

B. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig or less.

1.4 REFERENCES

A. American Society of Mechanical Engineers (ASME)

1. ASME Section IIC – Welding Rods, Electrodes, and Filler Metals
2. ASME Section VIII – Rules for Construction of Pressure Vessels
3. ASME Section VIII, Div. 1 – Stainless Steel Pressure Vessels
4. ASME Section VIII, Div. 1 and 2 – B36.19M Stainless Steel Pipe
5. ASME Section IX – International Boiler & Pressure Vessel Code: Welding and Brazing Qualifications

B. American National Standards Institute (ANSI)

1. ANSI/AWS D10.18 – Stainless Steel Pipe Welding

1.5 SUBMITTALS

A. Qualifications:

1. The CONTRACTOR
   a. Provide written documentation that meets or exceeds the requirements in 1.6 A of this section.

B. Shop Drawings:

1. Showing all dimensions and welding details to be approved by the ENGINEER prior to fabrication.

C. Certifications

1. The Supplier(s) shall furnish a certified affidavit of compliance that meets or exceeds the requirements of these specifications for all pipe, fittings, and flanges furnished.

1.6 QUALIFICATIONS

A. CONTRACTOR:

1. Fabrication (Shop Fabricated Pipe, Fittings, or Specials):
   a. At least 10 years of successful experience fabricating pipe as being furnished.
   b. Skilled welders, welding operators, and tackers who have adequate experience in methods and materials to be used shall do all the welding.
   c. Welders shall maintain current qualifications, for the welds they are performing, under the provision of AWS B10.18 or ASME Section IX.

d. Machines and electrodes similar to those in the work shall be used in qualification tests.
e. The CONTRACTOR shall furnish all materials and bear the expense of qualifying welders.

PART 2 - PRODUCTS

2.1 PIPE, FITTINGS, AND FLANGES

A. Stainless Steel Pipe: Schedule 10, Grade 304.
B. Steel Pipe: Schedule 40, ASTM A53 Grade B.
C. HDPE Pipe: SDR 9, PE4710 Resin.
B. Stainless Steel Butt-Welding Fittings: ANSI B16.9, Schedule 10.
C. Steel Butt-Weld Fittings: AMSI B16.9, Schedule 40.
D. Stainless Steel Flanges: ANSI B16.5 Forged, Slip-On, Raised-Face, Class 150.
E. Steel Flanges: ANSI B16.5 Forged, Slip-On, Raised-Face, Class 150.
F. HDPE Flanges: SDR 9, PE4710 Resin Stub Ends with Stainless or Cast-Iron Backing Rings as specified on plan set.

2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.
    1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
        a. Narrow-Face Type: For Raised-Face, Class 150, stainless steel flanges.
B. Flange Bolts, Nuts, and Lock Washers: ASME B18.2.1, stainless steel, Grade 304.
C. Welding Filler Metals: Use welding materials appropriate for wall thickness and chemical analysis of stainless steel or steel pipe being welded.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Compressed-Air Piping between Air Compressors and Receivers: Use the following piping materials for each size range: 2-inch and below; Schedule 40, galvanized-steel pipe; threaded, malleable-iron fittings; and threaded joints.
B. High-Pressure Compressed-Air Distribution Piping: Use the following piping materials for each size range: 8-inch and 6-inch; schedule 10, stainless-steel pipe, schedule 40 ASTM A53B steel pipe lined and coated according to specification 33 05 24 Steel Pipe, or SDR 17, 4710 HDPE as specified in the drawing sheets.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
B. Install piping concealed from view and protected from physical contact by station occupants, unless otherwise indicated and except in equipment rooms and service areas.
C. Install piping adjacent to equipment and machines to allow service and maintenance.
D. Install air and drain piping with 1 percent slope downward in direction of flow.
E. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

F. Equipment and Specialty Flanged Connections:
   1. Use steel companion flange with gasket for connection to steel pipe.
   2. Use cast-copper-alloy companion flange with gasket and brazed joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

G. Flanged joints may be used instead of specified joint for any piping or tubing system.

H. Install pressure gage on discharge piping from air compressor and on receiver.

I. Install piping to permit valve servicing.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Stainless-Steel Piping: Join according to AWS D10.18/D10.18M.

E. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

F. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.

3.4 VALVE INSTALLATION

A. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

B. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

C. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.5 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near air compressors.

C. Install air-line pressure regulators in branch piping to equipment.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

3.6 CONNECTIONS

A. Install unions, in piping 2-inch and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping 6-inch and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.7 HANGER AND SUPPORT INSTALLATION

A. Individual, Straight, Horizontal Piping Runs:
   1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
   2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

B. Support horizontal piping within 12 inches of each fitting and coupling.

C. Install hangers for Schedule 10, stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 6 (DN 150): 21 feet (6.4 m) with 3/4-inch (19-mm) rod.
   2. NPS 8 (DN 200): 24 feet (7.3 m) with 3/4-inch (19-mm) rod.

D. Install supports for vertical, Schedule 10, stainless-steel piping every 15 feet (4.6 m).

3.8 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties.

3.9 FIELD QUALITY CONTROL

A. Perform field tests and inspections.
   1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
   2. Repair leaks and retest until no leaks exist.

B. Prepare test reports.

END OF SECTION

SECTION 26 18 39 RVSS – MEDIUM-VOLTAGE SWITCH GEAR & MCC

PART 1 – GENERAL

1.1 Scope

A. This specification defines the requirements for the design, manufacture, and test of one complete Medium Voltage Switch gear unit (i.e assembly). The unit shall consist of the following :
   a. One Main Service Entry and service rated main breaker and service disconnect.
   b. Interconnecting power distribution bus work to all sections.
   c. Two power distribution feeder sections to power externally mounted and connected VFD, each with fused load break switch.
   d. Two RVSS (Reduced Voltage Solid State) motor control sections each with fused load break switch.

B. Refer to the Single Line Diagram included for layout and sizing arrangements.

C. The unit shall be NEMA Type I enclosure with door gasketing. The electrical system is 4160V, 3 phase, 60 Hz, 60 kV BIL.

1.2 Type and Description

A. The switch gear unit shall be UL listed and shall consist of a metal-enclosed, free-standing, dead front, vertical steel structure.

B. The unit shall be NEMA Type I enclosure with door gasketing. The electrical system is 4160V, 3 phase, 60 Hz, 60 kV BIL.

1.3 Submittals

A. The motor control manufacturer shall submit standard submittal drawings and information on the proposed equipment at the time of bid.

B. As-Built Drawings and Instruction Manuals: Three (3) copies of equipment instruction manuals for material purchased under these specifications shall be furnished. Each copy shall thoroughly address equipment installation, operation and maintenance. Each copy shall also include final test reports, equipment drawings, and renewal parts lists for all replaceable parts and assemblies. Manuals shall be bound by a durable means, properly indexed to identify contents and clearly labeled to indicate the project and equipment covered.

C. A material list shall be furnished listing the quantity, rating, type, and manufacturer's catalog number of all equipment on each unit.

D. Installation, operating and maintenance instructions shall cover all the equipment furnished including all motor controls, protective relays, power fuses, auxiliary relays, etc., and shall include characteristic curves of each power fuse.

PART 2 – MATERIALS

2.1 Codes and Standards

A. The assemblies shall be constructed, wired and tested in accordance with all applicable sections of the latest listed Standards and Codes.

B. American National Standards Institute, Inc. (ANSI)/IEEE C37

C. IEC

D. IEEE 519

E. UL347A

F. National Electrical Manufacturers Association (NEMA)

G. NEC / NFPA

H. It shall be the manufacturer's responsibility to be, or to become, knowledgeable of the requirements of these Standards and Codes.

2.2 Power Requirements and Service Conditions

A. The units shall operate from a 3 phase, 4160Vac, 60Hz system.

B. Operating Temperature will not exceed 40^{O}C. The RVSS equipment will be in a controlled atmosphere building with low relative humidity, non-condensing. Internal space heaters are required for when the unit is not in service. The project is at 500 ft above sea level in a seismic zone 2B.

2.3 Switch Gear Design Requirements

A. The switchgear shall have a voltage rating of 4.76 kV, with one main circuit breaker and one feeder circuit breaker. Switchgear construction shall be NEMA 1, non-walk-in outdoor. The switchgear will be used in a 4160V, 3-phase, 60 Hz system. It shall be composed of factory assembled metal clad cubicles. The circuit breakers shall be designed with vacuum interrupter technology and shall incorporate a spring-operated stored energy mechanism which shall include a shunt trip device.

B. Rated Maximum Voltage 4.76 kV
C. Operating Voltage 4160 V
D. Main Bus Continuous Rating 1000 A
E. Main and ground bus material shall be tin platted copper
F. Control bus DC Voltage (Nom.) 48 VDC
G. Circuit Breaker Interrupting 40 kA
H. Close and Latch 65 kA Peak
I. Breaker Interrupting Time 3 cycles
J. Temperature rise of the switchgear will be in accordance with the latest revision of ANSI C.37.20 for Metal-Clad switchgear.
K. The equipment shall be completely factory assembled and tested prior to shipment.
L. The design shall be bottom entrance and exit conductor arrangements.
M. The compartment door shall be securely held with tamper-resistant hinges and sealed with tamper-resistant fasteners. Compartment doors will include provisions for padlocking.
N. Distribution class, 6kV lightning arrestors shall be furnished on the incoming bus, one per phase.
O. Each main breaker compression lugs shall be, 2 hole for 500 kcmil copper conductor, two per phase for line shall be furnished. All lugs shall be rated "Copper Only" and be rated for 12 ton compression tool.
P. Circuit breaker cart / truck and rails shall be furnished if required for removal and installation of power circuit breaker from cubicle.
Q. Supplier shall furnish one remote racking mechanism to facilitate racking the power circuit breaker without standing in front of the cubicle. Remote mechanism shall be powered by 120 VAC power.

2.4 Power Circuit Breakers

A. The power circuit breakers shall be electrically operated, 3-pole, draw-out type, with electric motor and manual charging of a spring type stored energy operating mechanism. The power circuit breakers shall be provided with self-aligning line-side and load-side disconnecting devices. Breaker racking system shall allow smooth, consistent breaker movement with the door closed and have three positions in addition to the withdrawn position; disconnect, test and connected.

B. The draw-out mechanism shall hold the breaker rigidly in the CONNECTED (primaries and secondaries engaged), TEST (primary contacts disconnected and shutter closed, but control

contacts engaged) and DISCONNECTED (both primary and secondary contacts disengaged) positions, with the door closed.

C. Interlocks shall be provided which will prevent connecting the breaker to, or disconnecting it from, the bus stabs unless the breaker is OPEN (tripped), assuring proper sequencing and safe operation. The close springs of the circuit breaker will automatically discharge when the breaker is released from the cell by pulling in on the truck latch assembly.

2.5 RVSS Design Requirements

A. The line-up shall include two RVSS motor control units containing the following:
   1. Tin plated 1000 copper power and 600A ground bus
   2. A main non-load break isolating switch and operating handle for each starter
   3. Vacuum contactors as required
   4. Three (3) current limiting power fuses, as appropriate for motor protection
   5. Three (3) current transformers, one per phase and (1) zero sequence current transformer
   6. Control power transformers
   7. Low voltage control panels
   8. Space for necessary auxiliary control and metering devices
   9. Provide for bottom entry of supply cables. Include 2 hole compression lugs for 3/0 CU wire, 1 per phase. Include one, 2 hole compression lug for #6 CU ground conductor. For feeder circuits include 2 hole compression lugs for 3/0 CU wire, 1 per phase with one 2 hole compression lug for #6 AWG CU ground conductor. Lugs shall be rated "Copper Only" and be rated for 12 ton compression tool.

B. Each structure shall have two (2) non-removable base sill channels and removable lifting angles or brackets for handling and installation.

C. Each RVSS unit shall be divided into three (3) isolated compartments:
   1. Main power and ground bus compartment
   2. Power cell compartment
   3. Low voltage compartment

D. Metal or glastic barriers shall be provided between each vertical section, between the low voltage compartment and the power cell and/or main power bus compartment and between the power cell and main power bus compartment. Personnel shall have access to the low voltage compartment, with the controller energized, without being exposed to any medium voltage.

E. Mechanical interlocking shall be provided to prevent the opening of any power cell door or medium voltage compartment until the non-load break isolating switch is fully in the open position (the external operating handle must be in the "OFF" position).

F. As standard all exterior and interior metal parts shall be painted ANSI 61 medium light gray. All metal back plates in the power cell and low voltage compartments shall be painted high gloss white for high visibility. Field "touch-up" spray can(s), matching the enclosure color, shall be supplied. The horizontal/vertical bus work and the bus in the main power cell(s) shall be braced and tested in accordance with NEMA ICS 2-3 and U.L. 347 (paragraph 32). The bus work and cabling shall be braced to withstand 40 kA maximum fault duty.

G. The continuous tin plated copper ground bus shall be provided along the entire length of the motor control center line-up.

H. The main power cell of each control shall have an externally operated, 3-pole, gang operated, fixed mounted, load break isolating switch. In the "OFF" position, the isolating switch shall provide a means of grounding appropriate medium voltage power cell components, bleeding off hazardous stored energy, thus providing safe operation and maintenance.

I. The contactors shall have a maximum nominal voltage rating of 5000 volts, 60 Hz and a minimum interrupting rating of 3000 amps.
J. Each motor control unit shall include the following items:
   1. Nameplates - black on white
   2. Control wire markers - shrink type, point to point
   3. Control wire, MTW or approved equal
   4. Control wire terminals - non insulated locking fork type
   5. Motor control cubicle space heater - 250 VAC
   6. Terminal blocks - GE EB 27 or equal
   7. Red & Green LED indicating lights
   8. Start & Stop function shall be incorporated into SEL 710
   9. Local / Remote selector switch - Standard C/H
   10. CPT as appropriate
   11. PT's as required
   12. Provide control for motor space heaters
   13. Shorting blocks for current transformers located in LV control compartment
   14. Load cable bottom entry. Include 2 hole compression lugs, one per phase for 1/0 CU.
   15. Load cable ground: Include one two hole compression lug for #6 AWG CU ground.
K. Motor RTD Functions
   1. Each RVSS unit shall monitor six RTD's installed in the motors. Each motor will be provided with (4) Winding RTD's, and (2) Bearing RTD's. The RVSS shall shutdown when RTD values are reach trip levels. Tripped levels with be determined based on the motor manufacturers recommendations.
   2. If the manufacturers RVSS unit does not support all six motor RTD's inputs, it is recommended the Schweitzer Engineering 710 Motor Protection relay be included to support these inputs. This relay shall we wired back to the RVSS units to activate an external trip when the values reach tripped levels. Tripped levels with be determined based on the motor manufacturers recommendations.

2.6 Load Break Switches

A. Fused Load Break Switch shall be rated 5 kV, 200A (minimum), 60 kV BIL and meet standards as described in ANSI 37, most recent edition.
B. Features shall include viewing window, external operating handle with provisions for locking and, to the extent possible, match the RVSS Motor Control line-up.
C. 200A Power Fuses shall be included, one per phase for each RVSS and VFD power feeder sections.

PART 3 – EXECUTION

3.1 Shipping

A. All accessory items shall be shipped with the switchgear. Boxes and crates containing accessories will be clearly marked with the contents.

3.2 Warranty

A. The manufacturer shall warranty the design, material and workmanship of the motor control for a period of 18 months from time of delivery. This shall not exceed 12 months from the date of commissioning. Warranty shall cover defects of materials, design or manufacture.

3.3 Training

A. The manufacturer shall provide startup training and testing/commissioning for each line-up. This will require a minimum of two site visits.

END OF SECTION

SECTION 26 18 39 VFD – MEDIUM-VOLTAGE VARIABLE FREQUENCY DRIVES

PART 1 – GENERAL

1.1 Scope

A. This specification defines the requirements for the design, manufacture, test, quality control/quality assurance and shipment of high performance, high efficiency Medium Voltage Variable Frequency Drive (VFD) packages. The Variable Frequency Drives shall be Yaskawa, ABB, Allen Bradley, or Eaton.

B. VFD units shall be sized per the following:

a.	Input Voltage	4.16 kV, 3 ph
b.	Output Voltage	4.16 kV, 3 ph
c.	SCCR Rating	65 kA RMS
d.	Motor Rating	800 HP
e.	Motor Poles	6
f.	Motor RPM	1200 RPM

1.2 Type and Description

A. This specification defines the performance requirements, power quality control requirements (for both input and output power), functional and protective features of the VFD, as well as Operator interface. The VFD is one component of a larger system. There are other specifications for medium voltage switchgear serving this equipment. This specification is limited to the VFD and its interface with other components of the system.

1.3 Submittals

A. The VFD manufacturer shall submit standard submittal drawings and information on the proposed equipment at the time of bid.

B. As-Built Drawings and Instruction Manuals: Three (3) copies of equipment instruction manuals for material purchased under these specifications shall be furnished. Each copy shall thoroughly address equipment installation, operation and maintenance. Each copy shall also include final test reports, equipment drawings, and renewal parts lists for all replaceable parts and assemblies. Manuals shall be bound by a durable means, properly indexed to identify contents and clearly labeled to indicate the project and equipment covered.

C. A material list shall be furnished listing the quantity, rating, type, and manufacturer's catalog number of all equipment on each unit.

D. Installation, operating and maintenance instructions shall cover all the equipment furnished.

PART 2 – MATERIALS

2.1 Codes and Standards

A. The assemblies shall be constructed, wired and tested in accordance with all applicable sections of the latest listed Standards and Codes.

B. American National Standards Institute, Inc. (ANSI)/IEEE C37

C. IEC

D. IEEE 519

E. UL347A

F. National Electrical Manufacturers Association (NEMA)

G. NEC / NFPA

H. It shall be the manufacturer's responsibility to be, or to become, knowledgeable of the requirements of these Standards and Codes.

2.2 Power Requirements and Service Conditions

A. The VFD shall operate from a 3 phase, 4160Vac, 60Hz system and control power shall be derived from the main power source internally within the assembly.

B. Operating Temperature will not exceed 40^{o}C. The VFD equipment will be in a controlled atmosphere building with low relative humidity, non-condensing. Internal space heaters are required for when the unit is not in service. The project is at 500 ft above sea level in a seismic zone 2B.

2.3 Performance requirements

A. The VFD shall be able to control an 800 horsepower, 3 phase ac induction motor by using a Pulse Width Modulation (PWM) algorithm to provide adjustable voltage and frequency from a fixed power source. The VFD must be capable of overload protection settings for motors down to 250HP and up to 800 HP.

B. The VFD shall have a minimum efficiency of 97% at rated speed and full load. This efficiency shall include effects of associated transformers, reactors, filters and power factor correction components.

C. The VFD shall have a minimum overload capability of 110% for 1 minute and 120% for 15 seconds, each for 1event every 10 minutes.

D. The VFD shall produce a sinusoidal output waveform with minimal total harmonic distortion without supplemental filtering. The VFD must comply with IEEE 519 as it applies to influence on the power system and output to the motor terminals.

E. The VFD shall have as a minimum the following control features and functions:

1. Acceleration and Deceleration (accel/decel) Control: The VFD shall have four (4) independent sets of accel/decel ramps to optimize process control. Each of the eight (8) ramps shall have a range of adjustment of 0.1 to 6000 seconds. An additional accel/decel set shall be provided for jog mode, and an additional decel ramp shall be provided for Fast Stop.
2. "S curve" Acceleration and Deceleration Control: The VFD shall have an S curve function to soften the start and end of the accel and decel ramps. Four (4) independent S curve functions shall be provided, one each for accel start, accel end, decel start and decel end.
3. Speed Reference: The VFD shall have the capability of setting speed from the built-in digital operator, a remote signal of either 0 to10VDC or –10 to +10VDC, 4-20ma, or serial communication. Analog input resolution shall be 0.03Hz.
4. Preset Speeds: The VFD shall be capable of operating at one of seventeen (17) internally preset speeds, selectable by contact closure or serial communication.
5. Increase or Decrease Speeds by Contact Closure: The VFD shall be capable of accelerating or decelerating for the length of time a contact closure is made (digital M.O.P. function).
6. Upper and Lower Speed Reference Limits: The VFD shall have internally adjustable parameters to limit the upper and lower speeds of the VFD regardless of the speed reference command.
7. Jump Frequencies: The VFD shall have three (3) jump frequency settings to avoid mechanical resonance. The jump frequency bandwidth shall be adjustable.
8. PID Function: The VFD shall have an internal Proportional-Integral-Differential (PID) control function (with sleep mode) to minimize external control requirements.

2.4 Protective Functions

A. Motor and Load Protection.
   1. Motor Overload Protection: The VFD shall calculate motor overload based on torque requirements and motor parameters. The motor overload detection level shall be adjustable. The motor overload protection time constant shall be adjustable. Actions taken at time of overload shall be selectable from decelerate to stop, coast to stop, Fast Stop at the Fast Stop deceleration time, or continue operation while outputting a motor overload signal.
   2. Torque limit: The VFD shall be provided with an adjustable torque limit function for machine protection.
   3. Overtorque and Undertorque Detection: The VFD shall have independently adjustable overtorque and undertorque detection levels. Action taken at time of detection shall be selectable between stopping the VFD or continuing operation while outputting an overtorque or undertorque detection signal.
   4. Overcurrent Detection: The VFD will detect output overcurrent and react according to selected operation settings.
   5. Stall Prevention: The VFD shall have a stall prevention function during acceleration. The purpose is to prevent the motor from exceeding its breakdown torque level while accelerating a high inertia load, and stalling. Stall prevention shall be selectable between two (2) implementations:

      - Stopping acceleration until the output current reduces below the stall prevention setpoint, or
      - Intelligent Acceleration, where the drive continues to accelerate at the stall prevention current level.

B. Power Transient Protection
   1. Automatic Restart After Power Loss: The VFD shall be capable of restarting automatically after a loss of incoming power. The power loss time shall be adjustable to as long as 25.5 seconds, rating dependent. Upon restart, the VFD shall utilize a speed search function to capture the coasting motor and return it to set speed. Note: Requires that control power be maintained (Uninterruptible Power Supply (UPS) optional).
   2. Automatic Restart After a Fault: The VFD shall be capable of restarting automatically after an internal fault trip. The number of restart attempts and the maximum restart time shall be adjustable. Upon restart, the VFD shall utilize a speed search function to capture the coasting motor and return it to set speed.
   3. Input Overvoltage: The VFD shall trip in the event of an input overvoltage greater than 120% of nominal voltage. The overvoltage detection time shall be adjustable to as long as 2 sec.
   4. Input Undervoltage: The undervoltage level (AUV) shall be adjustable to prevent nuisance trips when the application can tolerate brief undervoltage conditions. The undervoltage level shall be adjustable to as low as 65% of nominal voltage.
   5. Momentary Power Loss: The VFD shall provide for momentary power loss recovery protection when a loss of input power occurs for a maximum of up to 2 seconds. When power is restored, the VFD shall execute a speed search function to capture the motor and smoothly accelerate to set speed. Note: Requires that control power be maintained (Uninterruptible Power Supply (UPS) optional).
   6. Kinetic Energy Braking (KEB): The VFD shall be capable of remaining in operation during an input power loss by absorbing stored mechanical energy from the load, decelerating as necessary to maintain operation. Requires uninterruptible Power supply (UPS) for control power (optional, or by others).

C. General Protective Functions
   1. Loss of Frequency (Speed) Reference: If selected by parameter setting, the VFD shall be capable of continuing operation after loss of frequency reference. “Loss of frequency reference” is defined as a drop in frequency reference of over 90% in 400msec.
   2. Output Phase Loss: The VFD shall be capable of detecting the loss of one or two output phases, shut down the VFD and announce the fault.
   3. Output Ground fault: The VFD shall be capable of detecting an output ground fault condition. The output ground fault detection level and time shall be adjustable. Action taken at the time of ground fault detection shall be selectable among no action (detection disabled), coast to rest, or continue operation and provide a “Ground Fault” digital output

D. Motor RTD Functions
   1. Each VFD unit shall monitor six RTD’s installed in the motors. Each motor will be provided with (4) Winding RTD’s, and (2) Bearing RTD’s. The VFD shall shutdown when RTD values are reach trip levels. Tripped levels with be determined based on the motor manufacturers recommendations.
   2. If the manufacturers VFD does not support all six motor RTD’s inputs, it is recommended the Schweitzer Engineering 710 Motor Protection relay be included to support these inputs. These relays shall we wired back to the VFD units to activate an external trip when the values reach tripped levels. Tripped levels with be determined based on the motor manufacturers recommendations.

2.5 Operator Interface/Communications

A. Digital Operator: The VFD shall be provided with a Digital HMI Operator interface for basic control functions and monitoring.
B. Personal Computer (PC) Interface: The VFD shall be provided with a PC interface to monitor operating status for maintenance and control. Software shall be provided by the VFD manufacturer to expedite setup, store drive data, recover fault history, and provide a ‘trace’ function to display (selectable) drive operating functions in real time.
C. Communications: The VFD shall be capable of communicating and being controller by a PLC through an ethernet connection using a Ethernet/IP (Allen Bradley) protocol.

2.6 Reliability

A. Design Considerations: The VFD shall be designed for high reliability using Insulated Gate Bipolar Transistors (IGBTs) and the high reliability, low power base driver circuitry afforded by an IGBT based design.

2.7 Enclosure

A. The VFD enclosure shall be free standing, frame and panel construction. NEMA Type 1 gasketed. All components shall be accessible from the front.
B. The VFD enclosure shall be air cooled with door mounted filters and roof mounted exhaust fans. The filters shall be removable and cleanable. Loss of cooling air flow detection shall be standard.
C. The VFD enclosure shall be painted ANSI 61 gray semi-gloss on both interior and exterior surfaces.

2.8 Lugs

A. Provide for bottom entry of supply cables. Include 2 hole compression lugs for 1/0 CU wire, 1 per phase. Include one, 2 hole compression lug for #6 AWG CU ground conductor. Lugs shall be rated "Copper Only" and be rated for 12 ton compression tool.

PART 3 – EXECUTION

3.1 Shipping

A. All accessory items shall be shipped with the VFD. Boxes and crates containing accessories will be clearly marked with the contents.

3.2 Warranty

A. The manufacturer shall warranty the design, material and workmanship of the VFD for a period of 18 months from time of delivery. This shall not exceed 12 months from the date of commissioning. Warranty shall cover defects of materials, design or manufacture.

3.3 Training/Commissioning

A. The supplier shall provide initial startup inspection and commissioning support for each unit.
B. VFD Commissioning shall be performed by Startup Engineers certified and trained by the VFD Manufacturer.
C. Factory Training: The VFD Manufacturer shall offer training on the VFD product at the manufacturer's location. Manuals and training/support documentation shall be provided. Factory training details and fees shall be included during the bid proposal phase.
D. User Site Training: The VFD manufacturer shall also offer training at the end user location. This training shall be tailored to the specific application and shall be quoted separately from the bid proposal.

3.4 Factory Test/Witness Test

A. Standard Factory Test: Individual components and subassemblies shall be tested to the VFD manufacturer's standards. System test of the complete VFD shall include a load test driving a motor.
B. Witness Test: The VFD manufacturer shall allow the customer to witness tests during the standard factory testing at no charge. A custom witness test to accommodate customer's schedule shall be available for additional charge.

3.5 Service and Maintenance

A. The VFD Manufacturer shall maintain a team of qualified Field Service Engineers to provide field service and maintenance support. That service and support team shall be located within a 200 mile radius of Hermiston, Oregon.
B. Field repair shall be limited to replacement at the subassembly level, i.e. power cell, control board, etc. Subassembly repair and retest shall be provided at the VFD manufacturer's site to ensure Quality Control.

3.6 Spare Parts

A. The VFD manufacturer shall supply a list of recommended spare parts with prices as part of the bid.

3.7 Deviations to this Specification

A. Any deviations from or exceptions to this specification shall be defined in writing with the bid.

END OF SECTION

SECTION 31 23 33 – EXCAVATION, TRENCHING, AND BACKFILL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavation, trenching and backfill necessary for the construction of the facilities as indicated on the plans including, but not limited to water transmission lines, appurtenance vaults, and other structures.

B. Use the latest version of all references, standards, laws, or regulations related to this section.

1.2 RELATED SECTIONS

A. 03 30 00 – Cast In-Place Concrete

B. 33 05 07 – Boring and Jacking

C. 33 05 24 – Steel Pipe

D. 33 05 36 – Fiberglass Pipe

E. 33 05 31 – PVC Pipe

F. 33 14 11 – Pipeline General Requirements

G. Geotechnical Report

1.3 REFERENCES

A. ASTM International (ASTM)

1. ASTM D698 – Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-in. Drop [Standard Proctor Test]
2. ASTM D2487 – Classification of Soils for Engineering Purposes [Unified Soil Classification System]

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

1. AASHTO SSHB - Standard Specifications for Highway Bridges

C. Other Standards

1. Manual on Uniform Traffic Control Devices

1.4 SUBMITTALS

A. Rock Crushing Equipment and Procedures

B. Screening Equipment and Procedures

C. Compaction Method

D. Competent Person

E. Detectable Warning Tape

1.5 DEFINITIONS

A. Bedding, Haunching, and Initial Backfill Zones: Defined herein and on the standard pipe trench detailed drawing.

B. Soil Materials: Summarized in the table in 2.1 A of this Section and defined in ASTM D2487.

C. Overexcavation: Excavation performed for the convenience, fault, or operation of the Contractor beyond specified or directed excavation lines.

D. Rock Excavation:

1. Solid Rock: Large masses of igneous, metamorphic, or sedimentary rock which, in the judgment of the Owner Representative, cannot be excavated without drilling, blasting, ripping equipment, or other specialized equipment not normally on the job site.
2. Loose Rock: Individual boulders and other detached stones having a volume of one cubic yard or more.
3. Fragmented Rock: “Solid Rock” or “Loose Rock” that is ripped or blasted to 12” minus material.

E. Excess Excavated Materials: Materials which are not used or processed for use as backfill material and waste materials from such processing.

F. Nuisance water that can be removed through the use of 4-inch sump or trash pumps is not considered dewatering

G. Dewatering is defined as the lowering and controlling of groundwater tables and hydrostatic pressures of a job site by pumps larger than 4 inch, wellpoints, or drainage systems.

PART 2 - PRODUCTS

2.1 BEDDING, HAUNCHING, AND INITIAL BACKFILL MATERIAL

A. Native soil material

1. Soil properties are provided in Table 2.1 below.
2. Screen to a maximum size per 2.1 E of this Section.

Table 2.1 Summary of Native Soil Properties

Soil Color	Field Description	Depth (ft) bgs	Classification	USCS Classification	Optimum Moisture	Dry Density (lb/ft^3)
Brown to Dark Brown	Dry to slightly moist, very loose to medium dense, fine grained sand and trace coarse gravel.	5 to 7	Silty Sand	SM	10.6%	122.2
Light Brown to Dark Brown	Dry to moist, medium dense to very dense, with fine to coarse-grained sand and fine to coarse gravel	2 to 16.5	Silty Gravel with Sand	GM	Too Granular to Test	Too Granular to Test
Brown	Dry to slightly moist, dense to very dense, with fine to coarse-graines sand and fine to coarse gravel	0 to 21.5	Poorly Graded Gravel with Silt	GP-GM	Too Granular to Test	Too Granular to Test
Brown to Light Brown	Dry to slightly moist, medium dense to very dense, with fine grain sand and fine to coarse gravel.	10 to 12	Silty Sand with Gravel	SM	7.1%	135.9
Brown to Dark Brown	Dry to slightly moist, loose to medium dense, with fine to medium-grained sand	10 to 12	Silty Sand	SM	18.0%	112.4
Brown	Dry to slightly moist, medium dense to very dense, with fine to coarse-grained sand and fine to coarse gravel	10 to 12	Silty Sand with Gravel	SM	9.1%	129.5
Brown	Dry to slightly moist, medium dense to very dense, with fine to coarse-grained sand and fine to coarse gravel	0 to 21.5	Silty Sand with Gravel	SM	Too Granular to Test	Too Granular to Test

Note: The full soil property information is provided in the Geotechnical Report.

B. Native excavated rock material

1. Rock material used as backfill shall be crushed and/or screened meeting the following gradation requirements.
   a. Crushed stone, pea gravel, river rock, or gravel embedment (GW, GP)

Sieve Size	Amount Passing Percent by Weight
1/2-inch	100
3/8-inch	85 - 100
No. 4	10 - 30
No. 8	0 - 10
No. 16	1

C. Import material

1. Consists of a sand, sandy gravel, or fine gravel meeting the following gradation requirements.
   a. Crushed stone, pea gravel, river rock, or gravel embedment (GW, GP)

Sieve Size	Amount Passing Percent by Weight
1/2-inch	100
3/8-inch	85 - 100
No. 4	10 - 30
No. 8	0 - 10
No. 16	1

   b. Sand embedment (SP, SW)

Sieve Size	Amount Passing Percent by Weight
1/2-inch	100
3/8-inch	85 - 100
No. 4	50 - 100
No. 16	30 - 80
No. 100	0 - 10
No. 200	0 - 5

D. Do not use expansive clays in compacted backfill.

E. Maximum particle size of material

1. Bedding, haunching, and initial backfill
   a. Placed withing 1foot under and over pipe and within 2 feet outside the pipe.
      1) Steel pipe sections: maximum: 1/2 inch.
      2) FRP sections: maximum: 1 inch.
      3) PVC sections less than 12” OD: maximum: 3/4 inch
      4) PVC sections greater than 12” OD: maximum: 1 inch

2. General backfill
   a. Placed in areas beyond 1foot under and over pipe and within 2 feet outside the pipe: maximum 1 inches

2.2 WARNING TAPE

A. Detectable 3 inches wide.

B. Printed with “Caution Buried Water Line Below” for water transmission lines.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise directed per the plans, perform operations so that land can be restored to original conditions.

B. Trenching and excavation work shall be done in accordance with proper emphasis on safety as determined by the Contractor to conform to recommended safety standards such as OSHA 1910 and 1926.

C. A Competent Person, as defined by OSHA 1926, shall be always on site when excavation work is being completed.

D. Provide suitable sheeting, shoring, and bracing, as required, in conformance with OSHA regulations.

E. Several permits have been obtained and are located in the Appendices, Contractor is responsible to obtain additional permits, as required.

F. Repair damage resulting from settlement, slides, cave-ins, water pressure, and other causes.

G. Provide adequate signs, barricades, fences and amber lights and take all necessary precautions to protect the work and the safety of the public in all construction areas.

   1. Placement of construction signs and barricades shall conform to the “Manual on Uniform Traffic Control Devices.”
   2. Protect barricades and obstructions at night by amber signal lights that burn from sunset to sunrise. Barricades shall also be of substantial construction, painted white or with reflective paint to increase their visibility at night.
   3. Perform work without obstruction to traffic or inconvenience to the public and the residents in the vicinity of the work.

H. The maximum open trench allowed during the day at each location shall not exceed 300 feet or 100 feet when groundwater is present, with no open trench allowed overnight, unless specifically approved by the Owner Representative.

I. Railroad, Road, and Utility Crossings

1. Comply with all construction and material requirements of authorities having jurisdiction.
2. Road Crossings - always Maintain one lane of traffic open.

J. Clearing trees, brush, or rocks prior to or during construction is considered incidental to excavation work.

K. All methods of compaction shall be approved, by the Owner Representative, prior to construction.

L. Compaction methods utilizing mechanical equipment not designed for compaction will not be approved.

3.2 EXCAVATION

A. Remove trees and stumps from excavation and site.

B. Stockpile excavated materials which meet or will be processed to meet material requirements for backfill in pipe trenches until processed or used as backfill material.

C. Install facilities as staked, centered in excavation, unless otherwise approved by Owner Representative.

D. Maintain surface drainage away from trenching or excavation.

E. Remove unsuitable materials from excavation as shown on the plans or as authorized by the Owner Representative.

F. Maintain a minimum 1-foot clearance between outer surface of structure being installed and wall of excavation.

G. Slope end of open trench with 3:1 Slope at end of work day.

3.3 ROCK EXCAVATION

A. Excavation

1. Fragmented rock.
   a. Properly blasted or ripped solid and loose rock will produce fragmented rock.
   b. Excavate to provide a minimum of 24 inches of clear space around pipe (or appurtenance).
   c. Refill to the required elevation with approved bedding material.

2. Crush or screen excavated rock per 2.1 B of this Section for use as bedding or backfill material.
3. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with other backfill materials, except as approved by the Owner Representative.

B. Blasting

1. The Contractor is responsible for damage and injury caused by blasting operations.

2. The Contractor shall drill, and blast all encountered solid and loose rock, as defined in this section, to produce fragmented rock.
3. Comply with all laws, ordinances, applicable safety code requirements and regulations relative to the storage and use of explosives, and the protection of life and property.
4. No blasting shall be done within 25 feet of finished pipelines.
5. The open end of finished pipelines shall be closed and covered to a depth of 1 foot or greater before each blast.
6. Blasts shall be covered with suitably weighted plank coverings or mattresses to confine all materials lifted by blasting.
7. Erect suitable barricades and/or warning signs on all public thoroughfares leading to the site of blasting operations.
8. Give adequate audible warning before each blast.
9. Proper blasting activities shall produce fragmented rock as defined in this section.

C. Blasting measurement

1. Unit of measure is cubic yards.
2. Solid rock.
   a. Measure from top of rock to a point 12 inches below the invert of the pipe (or appurtenance) and 24 inches from each side of the pipe (or appurtenance).

3. Loose rock.
   a. Measurement includes only those rocks or boulders that are individually one cubic yard or more in volume and that do not provide clearances of:
      1) 12 inches below the invert of the pipe (or appurtenance)
      2) 24 inches from each side of the pipe (or appurtenance)

3.4 OVER EXCAVATION

A. When foundation material is over excavated beyond specified or directed lines, fill the over excavation with backfill materials and compact in accordance with 3.8 of this Section.

B. If foundation material is over excavated by being disturbed or loosened during excavation, compact material in place or remove and replace with backfill material and compact in accordance with 3.8 of this Section.

3.5 TRENCHING

A. Bottom width:

1. No less than 4 feet wider than the outside diameter of the pipe or outer diameter plus two times the width of compaction equipment, whichever is greater, unless approved by Owner Representative.

B. Depth: Provide minimum cover as specified, or depths shown on plans.

3.6 BEDDING

A. Over-excavate 12 inches below bottom of pipe or structure and provide acceptable bedding material as directed by the Owner Representative.

B. In areas of rock excavation, over-excavate 12 inches below bottom of pipe or structure and provide acceptable bedding material by:

1. Crushing and/or screening the excavated rock in accordance with 2.1 B of this Section, or
2. Borrowing acceptable native material, in accordance with 2.1 A of this Section, from another part of the alignment as directed by the Owner Representative, or
3. Importing acceptable bedding material from offsite in accordance with 2.1 C of this Section.

C. Unauthorized over excavation shall be backfilled with acceptable bedding material at the Contractor's expense.

D. Do not drop material directly on pipe.

E. Place bedding material below bottom of pipe before pipe is laid. Grade bedding material parallel to bottom of pipe.

F. Place material to widths and depths shown on drawings.

G. Place material in 6 inch lifts at same elevation on both sides of pipe to prevent unequal loading and displacement of pipe while backfilling.

3.7 HAUNCHING AND INITIAL BACKFILL

A. If native soil in the general vicinity of the excavation cannot provide uniform, stable pipe support, use and provide acceptable haunching or initial backfill material as directed by the Owner Representative.

B. In areas of rock excavation, provide acceptable material by:

1. Crushing and or screening the excavated rock in accordance with 2.1 B of this Section, or
2. Borrowing acceptable native material, in accordance with 2.1 A of this Section, from another part of the alignment as directed by the Owner Representative, or
3. Importing acceptable material from offsite in accordance with 2.1 C of this Section.

C. General.

1. Provide complete and uniform bearing and support for the pipe structure.
   a. Allowances for bell holes or couplings shall be in accordance with specific pipe material Sections.

2. Work material under and around the pipe to ensure full pipe support.
3. Prevent movement of the pipe during placement of material.
4. Avoid contact between the pipe and mechanical compaction equipment.

D. No frozen clods, saturated, foreign, or organic materials will be allowed.

E. Compact in 6-inch lifts from the bottom of the trench to 12 inches above the pipe crown.

3.8 BACKFILL & COMPACTION

A. Unless approved by the Owner Representative, all buried components shall be inspected by Owner Representative prior to backfilling.

B. After properly backfilling and approval by Owner Representative of components, backfill remainder of excavation with acceptable native material, free from large clods, stones 5 inches or larger, organic material or frost chunks.

1. Place backfill carefully and spread in uniform layers 12 inches or less, so that spaces about rocks and clods will be filled.

C. Place backfill for over excavation performed outside specified or directed pay lines for excavation, in the same manner as specified for adjacent backfill or embedment.

D. Do not drop material directly on pipe.

E. Place backfill lifts to the same elevation on both sides of the pipe to prevent unequal loading and displacement of pipe. Elevation difference of backfill lifts on either side of pipe shall not exceed 6 inches.

F. All backfill shall be compacted in the specified lifts utilizing mechanical equipment designed for compaction.

1. Backfill to be compacted in accordance with this Section.
2. Maximum lift height of other backfill: 1 foot.

G. Backfill above compacted backfill may be placed as soon as compacting of backfill is completed and approved by Owners Representative.

1. Placing of this backfill shall be delayed at locations designated by the Owner Representative for compacted backfill sample collection for testing.
2. Place other backfill over compacted backfill and pipe as approved by the Owner Representative, if backfilling operations are interrupted for more than 24 hours.

H. Compact other backfill in 6-inch lifts to a density not less than 90% of the maximum dry density, determined by ASTM D698.

I. In cases where the Contractor performs unacceptable methods of compaction, the work on the project will cease until an acceptable method of compaction has been approved by the Owner Representative. The Owner Representative has the right to delay work until soil samples along the project alignment are taken for the purpose of developing a proctor for testing the compaction of the soil backfilled in the trench.

J. Compact with mechanical tamper, after initial backfill, to a density not less than 95% of the maximum dry density, determined by ASTM D698 for the entire depth of the trench through a roadway, driveway, utility crossing, or under foundations.

K. Backfill and compact around manholes, valve boxes, and other appurtenances in 6-inch lifts to a density not less than 95% of the maximum dry density, determined by ASTM D698.

L. Repair any trenches improperly backfilled or where settlement occurs, then refill and compact to a density not less than 95% of the maximum dry density, determined by ASTM D698.

M. Restore surface to the required grade and compaction by spreading out any excess material over width of the disturbed area.

N. Remove and dispose of all surplus backfill materials to a location approved by the Owner Representative.

O. Backfill and Compacting Operations:

1. Shall not fall behind pipelaying and excavation operations,
2. When pipe laying is not in progress, including the noon hours, close the open ends of the pipe to prevent foreign objects, water, or animals from entering the pipe.
3. At the end of each shift:
    a. Maximum open trench ahead of pipelaying is 150 feet.
    b. Backfill is within 150 feet of pipelaying.
    c. For trenches left open overnight,
        1) Cap exposed end of the pipeline.
        2) Fence open trench with temporary safety fence.

4. If backfilling and compacting fall behind pipelaying operations, immediately stop excavation, pipelaying, and backfill operations; cap the pipe and set up temporary fencing. Do not proceed with exaction, pipelaying, or backfilling operations until directed by the Owner Representative.

P. Keep internal supports in place until backfill has been placed and compacted above the bottom of the pipe to a minimum height of 0.7 times the diameter.

Q. When tests indicate insufficient density of compacted backfill about pipe:

1. Remove backfill above compacted backfill.
2. Compact backfill until proper density is obtained
3. Replace backfill above compacted backfill
4. This work shall be at the Contractor's expense.

3.9 BEDDING, HAUNCHING, INITIAL BACKFILL, AND BACKFILL COSTS

A. Costs to crush, screen, separate, load, transport, place, compact, or purchase native soils, excavated rock material used as backfill, discarded excavated rock, import bedding, import haunching, import initial backfill, and all other bedding, haunching, initial backfill, and backfill related costs necessary for contractor to complete the work in accordance with the plans and specifications shall be incidental to the contract and at the expense of the Contractor.

3.10 CONTRACTOR FIELD QUALITY TESTING

A. Testing:

1. Independent testing laboratory shall perform sampling, testing, and reporting in accordance with this Section.
2. Independent testing laboratory shall be approved by the Owner Representative.
3. Notify the independent testing laboratory and Owner Representative 24 hours before compaction work begins and 24 hours before significant change in compaction operations (major change in equipment or procedure used).
4. Notify the independent testing laboratory and Owner Representative immediately of equipment change.
5. Notify Owners Representative within 2 hours, if testing does not meet specified requirements.
6. Testing Method:
    a. Nuclear Method in accordance with ASTM D6938

7. Testing Frequency:
    a. At a minimum, perform test at frequencies specified as follows:
        1) One test per day, regardless of the amount of material placed
        2) During new work, new work crew, or new equipment:
            a) One test every 50 cubic yards of placed backfill
        3) After a successful work operation pattern is established, as approved by the Owner Representative:
            a) One test every 200 cubic yards of placed backfill
    b. Perform additional tests at sites considered questionable by the Owner Representative; including but not limited to:
        1) Suspected incomplete compaction
        2) Surfaces that may have become excessively wet or dry since compaction
        3) Compacted surface torn up by subsequent equipment travel
        4) Other similar circumstances
        5) Frequency of additional testing is at discretion of the Owner Representative

B. Contractor Support:

1. Provide timely access to areas for density testing and excavate and level an area in compacted material to provide a surface for testing.
    a. Test fills compacted by sheepsfoot rollers 1 or 2 lifts below surface.

2. Owner Representative may select location of testing.
3. Dig test pits, as requested, to examine compacted soil against structures or pipe.
4. Backfill test pits to original requirements.

C. Costs:
1. All acceptance tests, failed tests, re-tests, additional tests requested by the Owner Representative or Contractor, additional soil sampling and laboratory proctor testing, associated reporting, digging test pits, backfill and compaction of test pits, and all other testing related costs necessary for contractor to complete the work in accordance with the plans and specifications shall be incidental to the contract and at the expense of the Contractor.

3.11 WARNING TAPE INSTALLATION

A. Install warning tape over both edges of the water transmission lines 30 inches and larger in diameter in trench 2 foot above the top of pipe in non-cultivated areas and 1 foot above the pipe in cultivated areas.

B. Install warning tape over center of water transmission lines smaller than 30 inches in trench 2 foot above the top of pipe in non-cultivated areas and 1 foot above the pipe in cultivated areas.

3.12 REMOVAL OF NUISANCE WATER

A. Remove nuisance water entering the trenches.

B. Nuisance water that can be removed using 4 inch or smaller, sump or trash pumps is not considered dewatering. The cost shall be incidental to the contract and at the expense of the Contractor.

C. Keep trenches free from water until waterlines, fittings, valves, vaults, and other appurtenances are in place and sealed against the entrance of water.

D. Prevent all water, earth, or any foreign material from entering any pipe or component .

E. Keep trenches free from water until the components are in place, sealed against the entrance of water, and backfill has been placed and compacted above the water level.

3.13 PROTECTION

A. Owner reserves the right to direct the Contractor to place a sufficient amount of backfill material over compacted backfill within 72 hours after compacting of backfill has been completed.

B. No construction equipment shall travel over the pipe until backfill and compaction activities have been completed.

3.14 LOCATE EXISTING UTILITIES

A. Field locate all existing underground utilities.

1. Utilize state “811” or “one-call” hotlines.
2. Contact all other utility owners not covered by the state “one-call” hotlines.

3.15 UTILITY CONFLICTS

A. Protect existing utilities from damage during excavation and backfilling operations.

B. Provide temporary support for existing water, gas, telephone, power, or other utility services that cross the trench until backfilling of trench is complete

1. Compact backfill under disturbed utilities per 3.8 J of this Section.
2. Repair or replace any damaged existing utilities, at no additional cost to the project.

3.16 MOVING FENCES AND MINOR STRUCTURES

A. Remove and reset culverts, drainage pipes or other minor structures that fall within the alignment of the new construction, to their original location and grade.

B. Visit the project site and determine actual conditions regarding the existence of old car bodies, abandoned houses, fences, driveways, trees, stumps, brush, sidewalks, approaches, and other miscellaneous obstacles to construction.

C. Unless specifically referenced in a bid item, no separate payment will be made for the removal or replacement of these items.

END OF SECTION

SECTION 33 05 07 BORING AND JACKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Boring and jacking primarily associated with pipeline, road, railroad, and other utility line crossings.

1.2 RELATED SECTIONS

A. 31 23 33 – Excavation, Trenching, and Backfill

B. 33 14 11 – Pipeline General Requirements

C. 33 05 24 – Steel Pipe

1.3 REFERENCES

A. Oregon Standard Specifications for Construction

1.4 SUBMITTALS

A. Casing

B. Casing Spacers

C. Steel Carrier Pipe

D. Grout

E. Pipe End Seals

1.5 QUALITY ASSURANCE

A. The materials and construction methods specified herein are minimum requirements. Where the appropriate state/local codes require more stringent materials or execution methods, they shall apply.

B. Notify the Owner of any planned deviation from these specifications before proceeding so any price changes or quantity adjustments may be made.

PART 2 - PRODUCTS

2.1 STEEL PIPE CASING

A. ASTM A139, Grade B or equivalent.

1. Steel shall be minimum of 35,000 psi yield strength.

B. Casing 48 inches in diameter or larger:

1. Minimum wall thickness of 0.75 inch.

C. Ends shall be beveled for field butt welding, and joints shall be welded around the entire circumference and ground smooth.

2.2 CASING SPACERS

A. Non-metallic, projection type equal to RACI type spacer.

2.3 GROUT

A. One part portland cement, five parts sand, and seven parts 3/8 inch maximum size rounded aggregate by volume, or as approved by Engineer.

2.4 PIPE END SEALS

A. 1/8” rubber wrap around end seal.

B. Stainless steel clamps.

C. Equal to Model W, as manufactured by Pipeline Seal and Insulator, Inc.

PART 3 - EXECUTION

3.1 GENERAL

A. No portion of the drill rig shall be within 15 feet of the roadway, railway, stream, or utility being crossed, unless specifically shown on the plans.

B. Traffic signage shall comply with the requirements of the highway authority.

C. Contractor shall notify appropriate agency one week prior to utility installation within right-of-way or easement, unless otherwise required per the applicable permit.

D. When drilling operations are conducted for a stream crossing, protection for the free and safe flow of the waterway is required.

1. Comply with Storm Water Pollution Prevention Plan.

3.2 BORING AND JACKING

A. Install casing by boring where indicated on the plans.

1. Comply with the local governing authority for the circular annulus size allowed for the size casing installed.
2. Maintain depth of cover as indicated on plans.
3. Use suitable guide rails in the approach pit.

B. Install the size casing indicated on the plans.

C. Deviation from line and grade of carrier pipe shall not exceed the following limits:

1. Water transmission main and branch lines.
   a. 1 foot per 100 feet of transmission main or branch line.
   b. Maintain minimum bury depth as indicated on plans.

D. Install casings for water transmission main and branch lines prior to the installation of pipe within 100 feet of the crossing for the main or service line under construction.

E. Casing connections shall be as follows:

1. Steel pipe casing.
   a. Connections shall be full depth circumference welds conforming to welding requirements of Section 33 05 24 – Steel Pipe.
      1) Watertight.
      2) Strength equal to casing.

F. Install casing spacers on the carrier pipe in accordance to the manufacturer's recommendations.

1. Space casing spacers at a span of minimum span of 3 feet.
2. Carrier pipe bells shall not contact the casing.

G. Grouting

1. Grout voids outside casing in accordance with Oregon Standard Specifications for Construction Section 00406.46.
2. Placing fill in casing in accordance with Oregon Standard Specifications for Construction Section 00406.48.

H. Install end seals on casing in accordance to manufacturer's recommendations.

I. Install casing spacers on the carrier pipe in accordance to the manufacturer's recommendations.

1. Space casing spacers at a span of minimum span of 3 feet.
2. Carrier pipe bells shall not contact the casing.

END OF SECTION

SECTION 33 05 24 – STEEL PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Pipe materials referenced by other sections for use in the pipeline.

B. Use the latest version of all references, standards, laws, or regulations.

1.2 RELATED SECTIONS

A. 03 30 00 – Cast In-Place Concrete

B. 33 05 07 – Road Crossings

C. 33 05 31 – PVC Pipe

D. 33 05 36 – Fiberglass Pipe

E. 33 14 11 - Pipeline General Requirements

1.3 REFERENCES

A. ASTM International (ASTM)

1. ASTM A139/A139M – Electric Fusion (Arc) – Welded Steel Pipe
2. ASTM A283/A283M - Low and Intermediate Tensile Strength Carbon Steel Plates
3. ASTM E165/E165M - Liquid Penetrant Examination for General Industry
4. ASTM A36/A36M – Carbon Structural Steel
5. ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

B. American Water Works Association (AWWA)

1. AWWA C200- Steel Water Pipe - 6 In and Larger
2. AWWA C206 - Field Welding of Steel Water Pipe
3. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In Through 144 In.
4. AWWA C208 – Dimensions for Fabricated Steel Water Pipe Fittings
5. AWWA C210 – Standard for Liquid Epoxy Coating System for the Interior and Exterior of Steel Water Pipe.
6. AWWA C213 – Standard for Fusion Bonded Epoxy Coating System for the Interior and Exterior of Steel Water Pipe.
7. AWWA C216 – Heat-Shrink Cross-Linked Polyolefin Coatings for Exterior of Special Sections, Connections and Fittings
8. AWWA C222 – Standard for Polyurethane Coating System for the Interior and Exterior

of Steel Water Pipe.
9. AWWA M11 – Steel Water Pipe: A Guide for Design and Installation

C. Other Standards

1. ANSI/AWS B2.1 – Specification for Welding Procedure and Performance Qualification
2. NSF/ANSI 61 – Standards for materials in contact with drinking water

1.4 SUBMITTALS

A. Supplier's Bid Package
1. Supplier's standard bid package.
2. Material delivery schedule and estimated number of truck loads to be delivered and offloaded by the Contractor.
3. References for at least 3 completed projects supplying similar size and materials, as specified.

B. Qualifications

1. Supplier:
a. Provide written documentation that meets or exceeds the requirements in 1.5A and C of this section.

2. Contractor:
a. Provide written documentation that meets or exceeds the requirements in 1.5B of this section.

C. Manufacturer Shop Drawings:
1. Show pipeline layout, including stations, elevations, and fitting fabrication details.
2. Show fitting fabrication details.

D. Lining and Coating Material Data Sheets.
E. Alternate pipe and fitting layout, if applicable.

1.5 QUALIFICATIONS

A. Supplier:

1. Pipe Manufacturer:
a. At least 10 years of successful experience producing products as specified.
b. Provide references for at least 3 completed projects supplying similar size and materials, as specified.

2. Welder (Shop Fabricated Pipe, Fittings, or Specials):
a. Skilled welders, welding operators, and tackers who have adequate experience in methods and materials to be used shall do all of the welding.
b. Welders shall maintain current qualifications, for the welds they are performing, under the provision of AWS B2.1 or ASME Section IX in accordance with AWS D1.1.
c. Machines and electrodes similar to those in the work shall be used in

qualification tests.
d. The Supplier shall furnish all materials and bear the expense of qualifying welders.

B. Contractor:

1. Installation:
   a. At least 10 years of successful experience laying pipe with type of joint being furnished.
   b. Provide references for at least 3 completed projects installing similar size and materials, as specified.

2. Welder (Field Welds of Joints or Repair):
   a. Skilled workers, welding operators, and tackers who have adequate experience in methods and materials to be used shall do all of the welding.
   b. Welders shall maintain current qualifications under the provision of AWS B2.1 or ASME Section IX in accordance with AWS D1.1.
   c. Machines and electrodes similar to those in the work shall be used in qualification tests.
   d. The Contractor shall furnish all materials and bear the expense of qualifying welders.

1.6 VERIFICATIONS

A. Welding Requirements

1. All welding procedures used to fabricate pipe shall be qualified under the provision of AWS B2.1, AWS D1.1, or ASME Section IX.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Supplier Delivery Requirements
1. Meet delivery schedule according to the bid documents.
2. Supplier to coordinate all deliveries directly with the Contractor.
3. Receiving will only occur Monday through Friday, 7am to 3pm PST.
4. Deliveries outside of the receiving time may be held over to the next scheduled delivery date at the Contractor's discretion. Any costs incurred due to not meeting the delivery schedule requirements will be covered by the Manufacturer at no additional expense to the Owner.

B. Prevent damage during loading, transporting, unloading, laying, and at final storage location.

1. Supplier to provide:
   a. Padded bolsters curved to fit under outside of pipe.
   b. Heavy padding under ties during transportation and storage.

C. Support and store pipe above ground surface.

D. Owner will inspect pipe once it is delivered.

E. Replace or repair, as approved by the Engineer, pipe, linings, or coatings that are damaged:

1. During initial shipment at the Supplier's expense.

2. During storage, shipment from staging area to the final placement, or installation at the Contractor's expense.

PART 2 - PRODUCTS

2.1 STEEL PIPE

A. Steel Pipe with OD 30" or greater:

1. Electric fusion (arc) welded helical-seam steel pipe: ASTM A139, grade E.
2. Steel shall be minimum of 52,000 psi yield strength.
3. Fabricated in accordance with AWWA C200 Except:
   a. Steel Sheet: ASTM A139 grade E

B. Steel Pipe with OD less than 30":

1. ASTM A53, grade B.
2. Steel shall be minimum of 35,000 psi yield strength.
3. Fabricated in accordance with AWWA C200.

C. Pipe Diameter:

1. Unless otherwise labeled on the Bid Schedule or plans, all pipe bid items are to be furnished as finished outside diameter (OD) for pipes above 12-inches.

D. Minimum Steel Wall Thickness of Pipe:

1. As shown in Bid Schedule or as otherwise shown on the drawings.

E. Prepare pipe ends for field welding. Lay back all coatings and linings 4" or per lining and coating manufacturers recommendation whichever is greater.

2.2 FITTINGS

A. Unless otherwise shown on the plans:

1. All fittings and special fittings shall be in accordance to AWWA C208 and AWWA M11.
2. Pipe material shall be the same material and pressure class and wall thickness as the adjoining pipe.
3. Provide reinforcement for AWWA C200 fittings in the form of collars, wrappers, or crotch plates, in accordance with AWWA M11.

B. The maximum deflection angle for each mitered section shall not exceed 22.5 degrees.

C. Pipe Diameter:

1. All pipe bid items are to be furnished as finished outside diameter (OD) for pipes above 12-inches.

D. Tees:

1. Tees for blowoffs, air valves, manways, and branch lines as shown on drawings and specified in AWWA C 208.
2. Tee length, minimum: As shown on drawings or as required for blocking.

E. Welding:

1. AWS D1.1.
2. Lifting eyes and other handling devices: Made part of fitting before lining and coating are applied.
3. Temporary or permanent welding for convenience of the Contractor: Not permitted on areas where welding will damage lining and coating.

F. Coating and lining in accordance with 2.4 of this section.

G. Fasteners:

1. See section 2.5.

H. Closure Section Joints: Sleeve coupling.

2.3 JOINTS

A. All joints shall meet or exceed the pressure class of the adjoining pipe.

B. The standard joint shall be an external butt weld joint with root, fill, and cover passes unless otherwise noted on the plans.

C. Butt Weld

1. Conform to AWWA C206 and as shown in AWWA M11 Chapter 6.
2. Holdbacks for coatings and linings shall be provided and indicated on the shop drawings.

D. Mechanical Couplings

1. Conform to AWWA C219 and AWWA C227
2. Equal to Smith Blair Style 411, Baker Style 200, Victaulic Depend-O-Loc, or approved equal
3. Pipe ends for mechanical couplings shall be:
   a. Lined to the end of the pipe

E. Flanged

1. Conform to flange schedule as listed in the construction plans, in accordance with AWWA C207.
2. Pipe ends for flanged joints shall be:
   a. Lined and coated to the end of the pipe or back of the flange.

3. Faces shall be shop coated with a soluble rust preventive compound.
4. Gaskets (applicable for pressures up to appurtenance pressures as listed in the plans)
   a. Over 150 psi: Shall be a ring gasket, minimum of 1/16-inch thick, synthetic fiber with nitrile (NBR) binder
      1) Equal to Garlock Style 3000 or approved equal.
   b. 150 psi and under: Shall be a ring gasket, minimum of 1/16-inch thick, red rubber binder
      1) Equal to Garlock No. 22 or approved equal.

5. Fasteners for Flanges
   a. See 2.5 of this section.

6. All unwelded pipe joints shall be bonded for electrical continuity in accordance with the Pipe Manufacturer's recommendations unless otherwise specified in the plans.

2.4 LININGS AND COATINGS

A. Unless otherwise noted in the Bid Schedule or plans, all steel pipe and fittings shall be polyurethane lined and coated or lined and coated with fusion bonded epoxy.

B. Polyurethane Lining

1. Meet or exceed AWWA C222
2. Minimum thickness of 20 mils, in accordance with SSPC-PA-2
3. Lining shall be continuous to the end of the pipe except where field welding is indicated
4. Lining repair shall be per AWWA C222 and manufacturer's recommendations.
5. Lining shall meet NSF/ANSI 61 for use with potable water.

C. Polyurethane Coating

1. Meet or exceed AWWA C222
2. Minimum thickness of 25 mils, in accordance with SSPC-PA-2
3. Coating shall be continuous to the end of the pipe except where field welding is indicated.
4. Coating repair shall be per AWWA C222 and manufacturer's recommendations.

D. Fusion Bonded Epoxy Lining

1. Meet or exceed AWWA C213
2. Minimum thickness of 16 mils, in accordance with SSPC-PA-2
3. Lining shall be continuous to the end of the pipe except where field welding is indicated
4. Lining repair shall be per AWWA C213 and manufacturer's recommendations.
5. Lining shall meet NSF/ANSI 61 for use with potable water.

E. Fusion Bonded Epoxy Coating

1. Meet or exceed AWWA C213
2. Minimum thickness of 16 mils, in accordance with SSPC-PA-2
3. Coating shall be continuous to the end of the pipe except where field welding is indicated
4. Coating repair shall be per AWWA C213 and manufacturer's recommendations.

2.5 FASTENERS

A. Bolts, Nuts, and Washers – unless otherwise indicated, all bolts, nuts, and washers shall be:

7. Bolts and studs shall be ASTM A193/A193M Grade B7. Bolting shall have product marking in accordance with ASTM A193/A193M and ASTM A962/A962M.
8. Nuts shall be ASTM A194/A194M Grade 2H heavy hex nuts or ASTM A563 heavy hex nuts for 1-inch and smaller.
9. Washers shall meet the requirements of ASTM F436.
10. Minimum bolt lengths shall be in accordance with AWWA C207.

B. Protection: All fasteners shall be protected with wax tape in accordance with AWWA C217.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Flanged Joints

1. Preparation for installation:
   a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe.
   b. Clean flanges by wire brush before installing flanged fittings, taking care to protect any linings or coatings applied to the pipe.
   c. Clean flange bolts and nuts by wire brush, lubricate with anti-seize.

2. Installation:
   a. Place gasket
   b. Insert nuts, washers, and bolts (or studs)
   c. Finger tighten.
   d. Progressively tighten opposite bolts uniformly around the flange to the proper tension as described in AWWA C604.
   e. Do not encase flanged joints in concrete.
   f. If leak occurs under pressure testing, relieve pressure, loosen or remove nuts, reset or replace gasket, reinstall or re-tighten bolts and nuts.

3.2 JOINT LINING AND COATING

A. Field joints for pipe with shop applied polyurethane lining and coatings.

1. Line field joints with polyurethane coating in accordance with AWWA C222.
2. Coat field joints with polyurethane coating in accordance with AWWA C222.

B. Field joints for pipe with shop applied fusion bonded epoxy.

1. Line field joints with liquid epoxy coating compatible with fusion bond epoxy in accordance with AWWA C210.
2. Coat field joints with liquid epoxy coating compatible with fusion bond epoxy in accordance with AWWA C210.

3.3 TESTING

A. Shop Testing

1. Unless otherwise indicated, all required shop tests shall be performed at the expense of the Supplier.
2. No additional payment will be made, all testing costs shall be included within the Bid Schedule items.

B. Field Testing

1. Unless otherwise indicated, all required field tests shall be performed at the expense of the Contractor.
2. No additional payment will be made, all testing costs shall be included within the Bid Schedule items.

END OF SECTION

SECTION 33 05 36 – FIBERGLASS PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Pipe materials referenced by other sections for use in the pipeline.

B. Use the latest version of all references, standards, laws, or regulations.

1.2 RELATED SECTIONS

A. 31 23 33 - Excavation, Trenching, and Backfill

B. 33 05 24 – Steel Lined Pipe

C. 33 14 11 - Pipeline General Requirements

1.3 REFERENCES

A. ASTM International (ASTM)

1. ASTM D3517 - Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pressure Pipe
2. ASTM D4161 - Fiberglass (Glass-Fiber-Reinforcing Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
3. ASTM F477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

B. American Water Works Association (AWWA)

1. AWWA C950 - Fiberglass Pressure Pipe
2. AWWA M45 - Fiberglass Pipe Design

1.4 SUBMITTALS

A. Supplier’s Bid Package

1. Supplier's standard bid submittal package.
2. Pipe delivery schedule and estimated number of truck loads to be delivered and offloaded by the Contractor.
3. Typical packaging, load arrangement and estimated weights for truck deliveries.
4. Recommended offloading procedures and equipment.
5. Cutsheets for recommended pipe and coupler system to be installed within steel cased road crossings.

6. Recommended installation procedure for installation of recommended pipe and coupler system through steel cased road crossings.
7. References for at least 3 completed projects supplying similar size and materials, as specified.

B. Manufacturer Shop Drawings:

1. Show pipeline layout, including stations, elevations, and fitting fabrication details.
2. Show fitting fabrication details.
3. Show exact dimensions of joints, and diameter of rubber gasket including tolerances, and other major dimensions.
4. Show maximum draw and maximum deflection dimensions from interior of coupler.
5. Manufacturer's certificate that pipe and fittings are suitable for non-potable irrigation water pressure pipe service.

C. Installer Joint Repair Plan:

1. Proposed equipment, materials, and procedures for repairing leaks in pipe joints.

D. Installer Joint Testing Equipment:

1. Provide the make and model of joint testing equipment.

E. Qualifications:

1. Supplier:
   a. Provide written documentation that meets or exceeds the requirements in 1.5A and C of this section.

2. Contractor:
   a. Provide written documentation that meets or exceeds the requirements in 1.5B of this section.

F. Alternate pipe and fitting layout, if applicable.

G. Installer's Lifting Plan, Transporting Plan and Equipment.

1.5 QUALIFICATIONS

A. Supplier (Pipe Manufacturer):

1. At least 10 years of successful experience producing products, as specified.
2. Provide references for at least 3 completed projects supplying similar size and materials, as specified.
3. If providing steel fittings or specials, see Section 33 05 24 – Steel Pipe for steel and welding qualifications.

B. Contractor (Pipe Installer):

1. At least 10 years of successful experience laying pipe with type of joint being furnished.

2. Provide references for at least 3 completed projects installing similar size and materials, as specified.
3. Contractor's personnel shall be trained by the FRP manufacturer's representative and install at least 10 joints in the presence of the manufacturer's representative.
4. If steel fittings or specials, are used see Section 33 05 24 – Steel Pipe for steel and welding qualifications.

1.6 DELIVERY, STORAGE AND HANDLING

A. Supplier Delivery Requirements

1. Meet delivery schedule according to the bid documents.
2. Supplier shall coordinate all deliveries directly with the Contractor.
3. Deliver a minimum of 10 truckloads per day to the destination shown on bid documents.
4. Receiving will only occur Monday through Friday, 7am to 3pm PST.
5. Deliveries with less than 10 truck loads or outside of the receiving time may be held over to the next scheduled delivery date at the Contractor's discretion. Any costs incurred due to not meeting the delivery schedule requirements will be covered by the Manufacturer at no additional expense to the Owner.

B. Prevent damage to pipe and fittings during loading, transporting, unloading, storage, and installation.

C. Package, handle, and ship in accordance with manufacturer's recommendations.

D. Transport pipe and fittings on padded bolsters either curved to fit the outside of the pipe or using triangular chocks. Use heavy padding under ties.

E. Support and store pipe above ground surface. Do not allow bells, couplings, or spigots to contact each other or the ground.

F. Use manufacturer's instructions for handling of pipe.

G. Replace or repair, as approved by the Owner's Representative, pipe that is damaged:

1. During initial shipment at the Supplier's expense.
2. During storage, shipment from staging area to the final placement, or installation at the Contractor's expense.

PART 2 - PRODUCTS

2.1 PIPE

A. Fiberglass Pipe: Shall In accordance with AWWA C950 and ASTM D3517.

1. Pressure pipe utilizing either a continuous filament wound process or centrifugally cast process with:
   a. Type 1: glass fiber-reinforced thermosetting polyester resin mortar.
   b. Liner 1 or 2: reinforced thermoset liner.

c. Grade 1 or 3: polyester resin surface layer.
d. Class: see Bid Schedule and plans for required line pipe sizes and pressure classes.
e. Pipe Stiffness: 36 psi minimum.

2. The design is laid out primarily in 40-foot nominal lengths for straight runs and 20-foot lengths for curves, with shorter lengths, fittings, and/or special pieces, as required per the plans.
   a. If the nominal length cannot be produced or an alternative nominal length is proposed, the Supplier shall submit the proposed nominal length(s).
      1) If the proposed nominal length is longer than 40-feet, the Supplier shall also submit an alternate pipe and fitting layout of the alignment with the bid proposal.
      2) Any alternative length layout shall meet current design minimum and maximum bury depths along current alignment.

3. The pipe sizes as listed in the plans and Bid Schedule already assume that the pipe is to be double nested (one smaller diameter pipe within a single larger diameter pipe).
   a. Additional nesting beyond double nesting is not allowed.
   b. The Station at which the pipe changes from a larger diameter to a smaller diameter can be moved to ensure there is equal lengths of each size of pipe for efficient nesting.

B. Design pipe for the maximum sustained working pressure and the surge pressure.

1. The maximum sustained and surge pressures are considered the same and are defined by the head classes shown on pipeline plan and profile drawings and listed in the Bid Schedule.

2.2 FITTINGS

A. Tees, bends, adapters, and connections at structures and encasements: As shown on the Plans and Bid Schedule.

B. The manufacturer shall label each piece, fitting or special piece in accordance with the Engineer approved shop drawing of the pipe laying schedule. The markings shall be on the outside of the pipe and include, at a minimum:

1. In accordance with ASTM 3517 Section 9.1
2. Fittings and/or special pieces shall also include markings at each end of pipe to indicate:
   a. Top of pipe

3. Pipe Insertion Line
   a. The insertion line shall be located on each end of the pipe. The insertion line shall be located around the full circumference of the pipe and shall be fully visible when the joint is installed correctly.

C. Fittings: Unless otherwise specified, all fittings shall be fabricated from fiberglass.

1. Fiberglass Fittings: In accordance with AWWA M45 and AWWA C950.
   a. Installed in accordance with 33 14 11 – Pipeline General Requirements and manufacture’s recommendations.

2. Steel Fittings: In accordance with Section 33 05 24 – Steel Pipe

2.3 JOINTS

A. All joints shall meet or exceed the pressure class of the adjoining pipe.

B. Fiberglass Coupling

1. The joints shall be in accordance of ASTM 4161.
2. Elastomeric Sealing Gaskets: Manufactured and tested in accordance with ASTM F477.
3. Couplings shall include a center register.
4. Allow a minimum of 1 degree of angular deflection.
   a. No mitered end pipes will be allowed to achieve angular deflection at a joint.

C. Mechanical Couplings

1. Conform to 2.4 of Section 33 14 11 – Pipeline General Requirements

D. Flanged

1. Conform to 2.5 of Section 33 14 11 – Pipeline General Requirements
2. FRP flanges shall be full face. Flange faces with O-ring grooves will not be accepted.
   a. Manufacturer to provide recommendation for gasket style, type, durometer and recommended maximum torque requirement.

2.4 FRP JOINT TESTING EQUIPMENT

A. Double bladder joint tester as manufactured by Lansas Series 433, Petersen Series 145, or approved equal.

2.5 FABRICATION

A. Fiberglass Fittings:

1. Fiberglass fittings and couplings shall be designed, manufactured, and tested in accordance with AWWA C950, ASTM D3517, and/or ASTM D4161, as applicable.
2. Fiberglass fittings should resist the same pressure conditions as the adjacent pipe.

B. Polyurethane Lined and Coated Fabricated Steel Fittings:

1. Conform to Section 33 05 24 – Steel Pipe

2.6 CONCRETE

A. Concrete in Encasements, Blocking and Collars: Section 03 33 00 - Cast-in-Place Concrete.

B. Other methods of restraint may be used, as approved by the Engineer.

C. Plan, profile and restraint system shown on drawings require modification if alternate methods are used.

2.7 SOURCE QUALITY TESTING

A. Fiberglass:

1. Test in accordance with AWWA C950 or ASTM D3517 as applicable.

B. Fiberglass Fittings: Pipe outlets for manways, air valves, blowoffs, turnouts (branch lines), manifolds, and reducers as shown on drawings.

1. Pipe Outlets for manways, air valves, blowoffs, manifolds, and turnouts:
   a. Hydrostatic test in accordance with industry standards to meet or exceed the required pressure class as shown in the Bid Schedule and plans.
   b. Use a fiberglass reinforcement collar connection as shown on the plans.

C. Fabricated Steel Fittings:

1. Conform to Section 33 05 24 – Steel Pipe

2.8 SOURCE QUALITY ASSURANCE

A. Approval for Shipment:

1. Pipe and fitting approval will be determined by inspection, during and after manufacture.
2. Notify the Engineer at least 14 days before manufacturing pipe and fittings and 3 days before shipping pipe and/or fittings.
3. The Owner has the right to inspect pipe and fittings and will approve for shipment of those which have been manufactured and tested in accordance with these specifications.

2.9 TECHNICAL PROJECT SUPPORT

A. Manufacturer’s Representative

1. The manufacturer shall provide a manufacturer’s representative available for offsite and onsite technical support, during the duration of the project.
2. Technical support shall include, but is not limited to:
   a. Technical questions related to design, manufacture, and installation of FRP, couplings, or other provided materials
   b. Proper installation techniques, including bedding preparation, setting pipes, joining pipes, haunching, backfill, compaction, and checking for pipe deformation.

B. Offsite Support

1. The manufacturer shall provide a manufacturer’s representative that is available for technical installation or product questions by email and phone Monday through Friday from 8:00 AM – 5 PM local time.

C. Onsite Support

1. Prior to Installation:
   a. Supplier shall have a representative on site to inspect pipe as it is being offloaded.
      1) The Supplier's Representative shall be knowledgeable about the types of materials being supplied and be a competent person as defined by OSHA.
      2) The Supplier's Representative shall inspect the Contractor's offloading equipment and be competent enough to provide recommendations.
      3) The Supplier's Representative shall inspect the pipe and fittings for damage that occurred during delivery and during offloading.
         a) If damage is found the Supplier shall notify the Owner's Representative before the end of the shift.
      4) Supplier shall provide Owner's Representative a daily report summarizing the findings within 1 week of receipt of the delivery.

   b. The supplier shall provide a manufacturer's representative to lead an onsite 4 hours pipe installation training, including but not limited to:
      1) Review of the entire manufacturer's installation guide
      2) Answer questions from Contractor, Construction Manager, Engineer, or Owner's Representatives

2. During Installation of First Joints:
   a. The manufacturer's representative shall be onsite training of proper installation techniques of the first ten joints installed.
   b. The manufacturer's representative shall be onsite for a minimum of five full workdays to observe construction techniques and train Contractor's personnel.

3. Duration of the Installation:
   a. The manufacturer's representative shall provide periodic onsite installation assistance at the following schedule, including but not limited to:
      1) One onsite trip for every month of installation for a minimum of 7 hours at the job site.
      2) In the event of reoccurring failed deflection and/or joint tests, the Contractor or Owner's Representative may require additional onsite trips to observe and properly train Contractor's personnel.
   b. The manufacturer shall provide onsite Contractor training for internal and external joint laminations.
      1) The quantity of laminations shall be based on the manufacturer's requirements to complete the training.
         a) The quantity of required laminations shall be identified as part of the bid.
      2) Training will be limited to 6 individuals.
      3) Training will need to be coordinated with the Contractor and Owner's Representative.
      4) Manufacturer shall supply all training personnel, materials, specialty tools and equipment necessary to complete the training.
      5) If additional equipment is required that cannot be supplied by the Manufacturer a list of required equipment shall be supplied with the bid for the Contractor to provide.

D. Support Costs

1. Costs related to the offsite support and onsite support shall be included in the cost of the FRP, couplings, or other provided materials at the unit cost per the established bid unit prices. No additional payment shall be made for support costs, with the following exception:
    a. If failed joint tests require more than one onsite trip per month of installation, the costs associated with travel and the manufacturer's representative time shall be at the Contactor's expense.

2.10 ACCEPTABLE MANUFACTURER

1. Manufacturer of pipe, fittings, and special pieces shall be Flowtite, Fiberstrong, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pipe in accordance with Section 33 14 11 – Pipeline General Requirements

B. Joining Pipe:

1. Follow manufacturer's recommendations for installation.
2. Inspect pipe end and/or coupling, elastomeric gasket, and sealing surfaces for damage.
3. Before assembling pipe joints, clean gasket, bell or coupling, especially the groove, and the spigot with a rag, brush, or paper towel to remove dirt or foreign material.
4. Placing Elastomeric Gasket:
    a. Spigot Groove Method:
        1) Follow manufacturer's recommended practices for gasket installation.
        2) Apply manufacturer's approved joint lubricant to spigot interior and elastomeric gasket.
        3) After placing elastomeric gasket in spigot groove, equalize elastomeric gasket cross section by inserting a tool such as a large screwdriver under the elastomeric gasket and moving it around the periphery of the pipe spigot.
    b. Coupling Groove Method:
        1) Follow manufacturer's recommended practices for gasket installation. Typically this method is factory installed.
    c. Integral Gasket Method:
        1) Follow manufacturer's recommended practices for gasket installation.

5. Lubricant:
    a. Keep clean.
    b. Apply with dedicated, clean applicator brushes.

6. Fit pipe units together, spigot to bell or coupling, and draw the joints together so that the bells or couplings and spigots are fully engaged.
    a. Inspect the exterior of the joint using the insertion line to verify the pipe is installed into the coupler per manufacturers recommendation.

b. Use a feeler gauge around the circumference of the pipe per the manufacturers recommendation to verify the gasket is installed correctly.

7. Do not swing or "stab" the joint and do not suspend the pipe and swing it into the bell or coupling.
8. Fit pipe units together in a manner to avoid twisting or otherwise displacing or damaging the elastomeric gasket.
9. After inserting the spigot and prior to releasing any slings, the gasket should be checked for placement with a feeler gauge per manufacturer recommendations. If gasket is displaced or rolled, immediately separate the pipe, check gasket for damage, replace gasket if necessary, and reinstall the joint.
10. Maintain pipe securely in final position.

3.2 PIPE DEFLECTION

A. Allowable vertical pipe diameter deflection after backfilling is complete.

1. Decrease, maximum: 3 percent of inside diameter.
2. Elongation, maximum: 1.5 percent of inside diameter as measured when backfill reaches pipe crown.
3. Any pipe unit that is deflected vertically more than 8% will be removed from service and identified on the exterior and interior as trash. This pipe unit shall not be re-used.

B. The Contractor shall take deflection tests within 1 week after backfilling is completed, by measuring internal diameters as described below. Deflection tests need to be coordinated with Owner’s Representative, 48 hours in advance to allow the Owner’s Representative to witness the testing.

C. Measurement Frequency:

1. Midpoint of pipe section at approximate 80 feet intervals (every other pipe) for the first 500 feet of backfilled pipe, and once every 200 feet intervals (every fourth pipe) thereafter.
2. In areas of deep burial or where special problems are encountered, the frequency of measurements may be increased at the discretion of Owner’s Representative.

D. Measurements:

1. Measure vertical and horizontal diameter at approximate midpoint of pipe unit.
2. Record pipe deflections and station where measurements were taken.
3. Provide measurements to Owner’s Representative in the form of a test report weekly.

E. Mark inside of pipe at the location the test was completed with the following information with a permanent marking pen for future reference.
   a. Station Number
   b. Date of Test
   c. Initials of Tester
   d. Measurement of Horizontal and Vertical Diameter Recorded

F. If a pipe unit deflection exceeds the allowable.

1. Tape a 6-inch piece of reflective tape at the location.
2. Take measurements in adjacent pipe units to determine extent of excessive deflection.
3. Contact Owner's Representative before the end of the shift and notify them of what was found.
4. Provide deflection data to Owner's Representative.

G. Additional direction will be provided after deflection data is analyzed.

1. Take corrective action that including removing and replacing pipe that exceeds allowable deflection tolerance.

3.3 Joint Measurements and Testing

A. Allowable maximum draw and angular deflection after backfilling is complete.

1. The maximum draw and angular deflection tests will be completed from the interior of the joint and will be based upon the manufacturer's recommendation for each pipe size.
   a. EXAMPLE: 1,100mm coupler maximum draw: 1-inch
   b. EXAMPLE: 1,100mm maximum angular deflection: 1-inch

B. The Contractor shall complete all joint measurements and testing within 24 hours of backfill being completed, by taking measurements as described below. Tests need to be coordinated with Owner's Representative, 48 hours in advance to allow the Owner's Representative to witness the testing.

C. Measurement/Testing Frequency:

1. At every joint.

D. Measurements/Testing:

1. Joint Air Testing
   a. Field test each joint in accordance with ASTM C1103, with the following exception:
      1) Pressurize the void volume to 10 psi for 5 seconds with an allowable pressure drop of 1 psi.

2. Maximum Draw Verification
   a. Maximum distance between center register and spigot end of pipe.
   b. Note any damage to spigot ends or center register such as cracking or crushing.

3. Angular Deflection Verification
   a. First measurement: The largest gap between spigot ends.
   b. Second measurement: The gap between spigot ends 180 degrees from the first measurement.
   c. Angular Deflection Measurement is equal to the difference between the first and second measurement.

E. Provide measurements and joint air testing results to Owner's Representative in the form of a test report weekly.

F. Mark inside of pipe with the following information with a permanent marking pen for future reference.
   a. Joint Number
   b. Date of Tests
   c. Initials of Tester
   d. Air Test Results (Pass/Fail)
   e. Measurement of Maximum Draw Recorded
   f. Calculated Angular Deflection Measurement Recorded
   g. Measurement of Largest Gap Recorded (at measurement point)
   h. Measurement of 180 Degree from Largest Gap Recorded (at measurement point)
   i. Spray paint around the location of any damage found.

G. If a pipe unit exceeds the allowable max draw, angular deflection or damage is found.

   1. Tape a 6-inch piece of reflective tape at the location.
   2. Contact Owner's Representative before the end of the shift and notify them of what was found.
   3. Provide test data to Owner's Representative.

3.4 TESTING

A. The Owner's Representative shall complete random field testing in accordance with Sections 3.2 and 3.3 of this specification.

   1. If the Owner's Representative finds that the Contractor has failed sections of pipe or joints that were tested by the Contractor and not reported, the Contractor shall hire a third-party Contractor to complete all field testing.
      a. It will be up to the Owner's Representative to determine if all testing that had been completed up to this point will need to be re-tested by the third-party Contractor.

   2. No additional payment will be made to the Contractor for the costs incurred by the third-party Contractor.

B. Shop Testing

   1. Unless otherwise indicated, all required shop tests shall be performed at the expense of the Supplier.
   2. No additional payment will be made, all testing costs shall be included within the Bid Schedule items.

C. Field Testing

   1. Unless otherwise indicated, all required field tests shall be performed at the expense of the Contractor.
   2. No additional payment will be made, all testing costs shall be included within the Bid Schedule items.

END OF SECTION

SECTION 33 14 11 – PIPELINE GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Water transmission pipeline.
2. Filling and testing water.

1.2 DEFINITIONS

A. Pipe sizes and classes as designated on plan and profile drawings.

B. Unless specific reference is made to diameter of pipe, pipe diameters shown on drawings and used in this section are outside diameters for steel carrier pipe, inside diameters for steel casing pipe, and nominal diameters for fiberglass reinforced pipe (FRP).

C. Pipe designations shown on drawings and in this section establish minimum requirements for pipe types allowed.

1.3 RELATED SECTIONS

A. 31 23 33 – Excavation, Trenching, and Backfill

B. 33 05 24 – Steel Lined Pipe

C. 33 05 36 – Fiberglass Pipe

D. 33 05 31 – PVC Pipe

1.4 REFERENCES

A. ASTM International (ASTM)

1. ASTM A139/A139M – Electric Fusion (Arc) – Welded Steel Pipe
2. ASTM C150/C150M - Portland Cement
3. ASTM A193/A193M - Alloy Steel and Stainless Steel Bolting Materials
4. ASTM A194/A194M - Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts
5. ASTM F436 – Hardened Steel Washers
6. ASTM A563 – Carbon and Alloy Steel Nuts
7. ASTM A962 – Common Requirements for Bolting Intended for Use at Any Temperature from Cryogenic to the Creep Range
8. ASTM C1103 – Joint Testing of Installed Precast Concrete Pipe Sewer Lines

B. American Water Works Association (AWWA)

1. AWWA C200 – Steel Water Pipe 6” and Larger
2. AWWA C207 - Steel Pipe Flanges for Waterworks Service Sizes 4 In. Through 144 in.
3. AWWA C208 – Dimensions for Fabricating Steel Water Pipe Fittings
4. AWWA C217 – Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines
5. AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe
6. AWWA C227 – Bolted, Split-Sleeve Restrained and Nonrestrained Couplings for Plain-End Pipe
7. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances
8. AWWA C604 - Installation of Steel Water Pipe 4 in. and Larger
9. AWWA C950 - Fiberglass Pressure Pipe

C. American Society of Mechanical Engineering / American National Standards Institute (ASME/ANSI)

1. ASME/ANSI B16.5 – Pipe Flanges and Flanged Fittings

D. International Organization for Standardization (ISO)

1. ISO 9001 - Quality Management

E. Food and Drug Administration (FDA)

1. FDA Food Safety Modernization Act (FSMA) Rule on Produce Safety

1.5 SUBMITTALS

A. Filling and Testing Plan:

1. Proposed rate, time, and procedure for:
   a. Cleaning the pipeline.
   b. Filling the pipeline.
   c. Field and pressure testing the system.

1.6 DELIVERY, STORAGE AND HANDLING

A. Place pipe in Staging Areas, as indicated on the plans or as otherwise designated by Owner’s Representative.

B. Deliver to the closest Staging Area to the location where the material, size, and pressure class of pipe, fitting, special piece will be installed, unless otherwise approved by the Engineer.

1.7 QUALIFICATIONS

A. Refer to the pipe manufacturer specifications for required certifications.

1. 33 05 24 - Steel Pipe
2. 33 05 36 - Fiberglass Pipe
3. 33 05 31 – Polyvinyl Chloride (PVC) Pipe

PART 2 - PRODUCTS

2.1 PIPE MATERIALS IN CONTACT WITH WATER

A. All materials that come in direct contact with the irrigation water shall be applicable for non-potable irrigation water in accordance with the FDA Produce Safety Rule.

2.2 PIPE MATERIALS

A. Listed in the following sections:

1. 33 05 24 - Steel Pipe
2. 33 05 36 - Fiberglass Pipe
3. 33 05 31 – Polyvinyl Chloride (PVC) Pipe

2.3 PIPE ACCESSORIES

A. Air Valve Assemblies: See the Construction Plans.

B. Turnout Assemblies: See the Construction Plans.

2.4 JOINTS

A. Mechanical Couplings

1. Conform to AWWA C219 and AWWA C227
2. Equal to Romac 400, Smith Blair Style 411, Baker Style 200, or approved equal.
   a. For flange to compression style fittings use Romac FC400 series or approved equal.

3. Pipe ends for mechanical couplings shall be:
   a. Lined to the end of the pipe
   b. Coatings holdbacks will only be used in areas where field welding is indicated

4. Pipe used for use with sleeve-type couplings shall have plain ends at right angle to the axis.

B. Expansion Joint

1. Conform to AWWA C221
2. Minimum travel shall be 2-inches for each expansion joint
3. Material shall be stainless steel or NSF 61 certified
4. Equal to Baker Series 403, Romac Style EJ400, or approved equal
5. Pipe ends shall be flanged joints in accordance with AWWA C207 Class D

C. Flanged

1. Conform to flange schedule as listed in the construction plans, in accordance with AWWA C207 or ANSI/ASME B16.5
2. Pipe ends for flanged joints shall be:
   a. Lined and coated to the end of the pipe or back of the flange
3. Faces shall be shop coated with a soluble rust preventive compound.
4. Gaskets (applicable for pressures up to appurtenance pressures as listed in the plans)
   a. Over 150 psi: Shall be a ring gasket, minimum of 1/16-inch thick, synthetic fiber with nitrile (NBR) binder
      1) Equal to Garlock Style 3000 or approved equal.
   b. 150 psi and under: Shall be a ring gasket, minimum of 1/16-inch thick, red rubber binder
      1) Equal to Garlock No. 22 or approved equal.
5. Fasteners for Flanges
   a. See 2.5 of this section.

2.5 FASTENERS

A. Bolts, Nuts, and Washers – unless otherwise indicated, all bolts, nuts, and washers shall be:

1. Bolts and studs shall be ASTM A193/A193M Grade B7. Bolting shall have product marking in accordance with ASTM A193/A193M and ASTM A962/A962M.
2. Nuts shall be ASTM A194/A194M Grade 2H heavy hex nuts or ASTM A563 heavy hex nuts for 1-inch and smaller.
3. Washers shall meet the requirements of ASTM F436.
4. Minimum bolt lengths shall be in accordance with AWWA C207.

B. Protection: All fasteners shall be protected with wax tape in accordance with AWWA C217.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform cleaning, filling and testing after backfill has been placed to finished grade or as approved by Engineer.

B. Several permits have been obtained and are located in the Appendices, Contractor is responsible to obtain additional permits, as required.

3.2 INSTALLATION

A. Pipe installation shall conform to the following, in order of precedence, unless otherwise approved by the Engineer:

1. Section 33 14 11 – Pipeline General Requirements
2. Applicable AWWA Design and Installation Guide
    a. AWWA M11: Steel Pipe – A Guide for Design and Installation
        1) AWWA C 604 - Installation of Steel Water Pipe 4 in. and Larger
    b. AWWA M45: Fiberglass Pipe Design
3. Manufacturer's Installation Recommendations
4. Pipe Specification, as applicable
    a. Section 33 05 24 – Steel Pipe
    b. Section 33 05 36 – Fiberglass Pipe
    c. Section 33 05 31 – Polyvinyl Chloride (PVC) Pipe
5. Section 31 23 33 – Excavation, Trenching, and Backfill
6. Construction Plans

B. Pipe Handling

1. Handle pipe to avoid damage by using slings or padding between metal equipment and the pipe.
2. Direct use of cables or chains without padding is prohibited.
3. Inspect each pipe before lowering the pipe into the trench.
4. Lower pipe into the trench and place pipe in position such that no soil gets inside the pipe and pipe is not damaged.
5. Repair any damage in accordance with appropriate Section for pipe material damaged.

C. Excavate, trench, and backfill pipe trench in accordance with Section 31 23 33 - Excavation, Trenching, and Backfill.

D. Grade pipe trenches to provide uniform slope along bottom of pipe.

E. At joints involving bells or collars, provide holes at joint of ample size to:

1. Prevent bells or collars from coming in contact with subgrade
2. Apply the exterior weld and coating (for steel pipe or steel to steel joints)
3. Permit inspection of the entire joint after the next pipe section is installed
4. Keep pipe trenches free of water during pipelaying operations.

F. Install the pipe to line and grade as shown on drawings.

1. On grades exceeding 10 percent, lay pipe uphill.

G. Keep openings to installed pipe closed with watertight plugs during work stoppage, including end of work day, breaks, work delays.

H. After pipelaying and joining operations are completed, clean inside of pipe and remove debris.

I. If pipe is flooded during construction, clear floodwater by draining and flushing with water, or other approved method, until pipe is clean.

J. Changes in Alignment and Grade:

1. Where shown on the drawings, makes changes in alignment and grade with miter bends.
2. Make other changes in alignment and grade by providing small deflections between adjacent pipe. Do not exceed manufacturer's deflection tolerances.
3. Lay ends of each section of pipe on the theoretical centerline of the curve and to the grade shown on the drawings within the laying tolerances prescribed above.

K. Expansion Joints: The initial setting of expansion joints could be set fully expanded, fully closed, or at a partially expanded position. Prior to installation, the Contractor shall coordinate with the Engineer to establish the proper setting for the ambient temperature.

L. Thrust Restraint:

1. Type of restraint, as shown on the plans.
2. Minimum restrained joint length as shown on the plans.
3. Couplings:
   a. Restrained joint couplings in combination with concrete blocking, encasements, and/or collars.

4. Thrust Blocks:
   a. Concrete in encasements, blocking and collars in accordance with Section 03 33 00 - Cast-in-Place Concrete.

5. Mitered Bends:
   a. Mitered bends as shown on the plans.

6. Joint restraint couplings to lengths shown on drawings.
   a. Double bell with rubber gaskets and locking rods.

7. Alternate methods of coupling restraint may be used if approved by the Engineer.

M. Closure Sections:

1. Use closure sections where necessary as determined by the Contractor, subject to the approval of the Owner's Representative.
2. Follow manufacturer's recommendations.

N. Backfill operations shall be maintained to avoid having an excessive amount of exposed installed pipe. Schedule work so that at no time will pipe remain in the trench more than 48 hours before backfill is placed to original ground surface or to other specified backfill limits shown on the drawings, without written approval by the Engineer.

O. After pipelaying and joining operations are completed, clean inside of pipe and remove debris. When pipelaying is not in progress, keep ends of pipelines closed.

P. Lay pipe to lines and grades shown on drawings or established by the Engineer to the following tolerances:

3.3 TOLERANCES

A. Total departure from established alignment and grade as shown on the plans:

1. Horizontal Alignment = 2 foot maximum
2. Vertical Alignment = 0.25 foot maximum

B. Exceptions:

1. Location of fittings and bends may be adjusted to accommodate a full stick of pipe and to minimize field cuts, provided that new high spots are not created or excess bury depth is not created by the new alignment and upon approval by the Engineer.
2. Pipe layout and/or shop drawings, as approved by the Engineer.

3.4 CONSTRUCTION STAKING

A. Staking provided to the Contractor by Engineer

1. Project Control and Benchmarks
   a. Hubs for horizontal and vertical control will be placed at various points throughout project.

2. Electronic Files
   a. The Engineer shall provide AutoCAD electronic files to the contractor's surveyor for construction staking purpose.

B. Contractor's Responsibility

1. Hire a Professional Land Surveyor for construction staking.
   a. The cost shall be incidental to the contract and at the expense of the Contractor.

2. Water Transmission Main and Appurtenance Staking
   a. Offset of Horizontal or Centerline staking.
   b. Appurtenance (air relief vault, fittings, manway, etc.) staking.
   c. Road bore location staking.

3. Set alignment staking, offset staking, location of appurtenance staking, supplementary staking, grade staking, offsets, cut stakes, temporary bench marks, additional control points, and all other staking necessary for contractor to complete the work in accordance with the plans and specifications.
4. Provide all staking materials for contractor staking to include hubs, lathe, flagging, paint and other material needed to provide construction staking.
5. Request clarification from the Engineer regarding conflicts before proceeding with installation of facilities.
6. Preserve all control and benchmarks, until such time as the pipeline or other facilities are installed.
7. Control and benchmarks stakes needing replacement due to Contractor error or negligence must be replaced by Contractor, at no cost to the contract.
8. All permanent survey points/markers (i.e. property corners) and bench marks not directly in the line of work shall be preserved.
9. Replace all permanent survey markers disturbed or destroyed using a Professional Land Surveyor, at no cost to the contract.
10. Provide evidence of reestablishment of permanent survey markers to the Engineer and copy of stamped and approved monument re-establishment documentation from the appropriate jurisdiction (state, county, etc.).

3.5 FILLING PIPELINE

A. Owner's new pumping station, water source, and pumps shall be used to fill and test the pipeline.

B. Contractor shall notify the Owner at least fourteen (14) calendar days in advance of the anticipated schedule for filling the pipeline.

C. The Owner or Owner's representative shall operate the pumping station.

D. Pipeline fill rate, maximum: One pump operating at 5,050 gpm.

E. Maintain pipeline completely filled for at least 72 hours before testing.

3.6 CONTRACTOR FIELD QUALITY TESTING

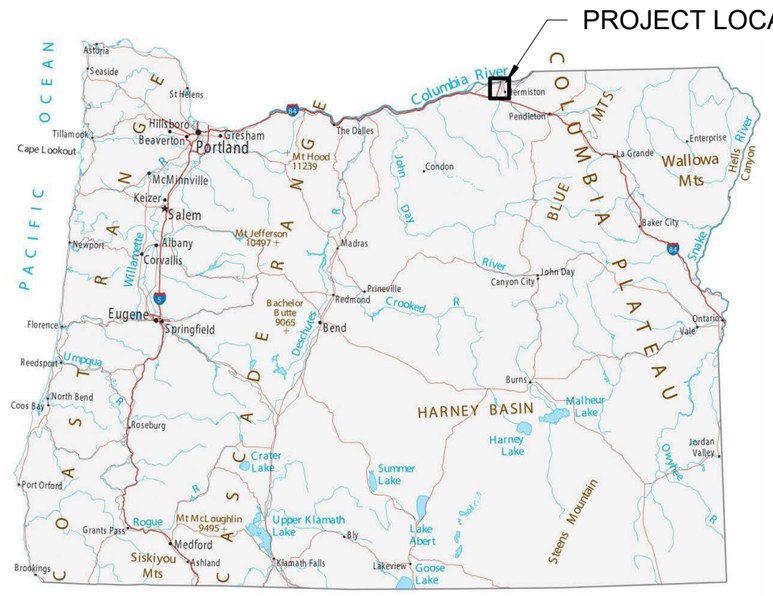
A. Hydrostatic Testing

1. After the pipeline has been filled per Section 3.5, pressurize the pipeline to maximum operating pressure (210psi) at STA 0+00.
2. Hold the pressure for a minimum of 4 hours.
3. Drive the entire pipeline, looking for leaks.
4. If visible leaks are encountered, drain that portion of the pipeline, repair and repeat.
5. Acceptance of test shall be upon approval of the Owner's Representative.

END OF SECTION

A.2 – Engineering Drawing Set

ORDNANCE PROJECT - PHASE 1 & 2
UMATILLA COUNTY
UMATILLA COUNTY, OREGON - 2023



LOCATION MAP

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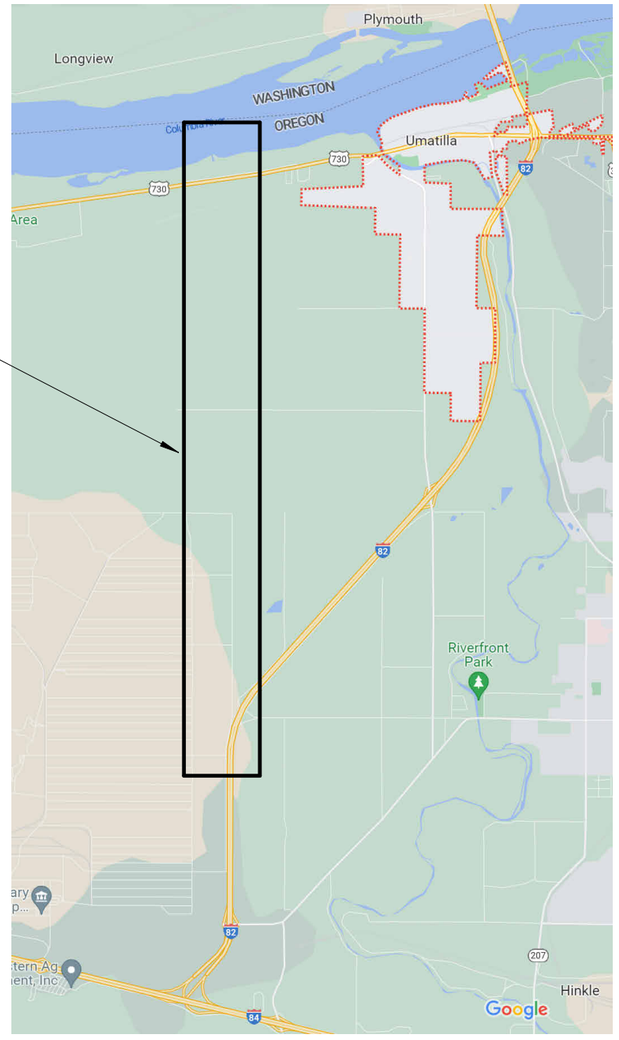

VICINITY MAP

NOT TO SCALE

PROJECT TEAM

OWNER

UMATILLA COUNTY
ATTN: JOHN SHAFER
PHONE: (541)-278-6203
EMAIL: john.shafer@umatillacounty.gov

ENGINEER

IRZ CONSULTING
ATTN: TY LORD, PE
PHONE: (541)-571-0252
EMAIL: ty.lord@irz.com

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	
PROJECT	675-20-001

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

UMATILLA COUNTY

ORDNANCE PROJECT

NO.	DESCRIPTION	DATE
1		
2		
3		
4		

0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
COVER SHEET

Drawing Number
G1000

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DRAWN MIKE CARSON
DESIGNED TY LORD
APPROVED -
DATE MARCH 2023
SCALE NTS
PROJECT 675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
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Revisions

N0.	Description	Date
1		
2		
3		
4		

0 SCALE CHECK 1"

Stamp:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name:
TABLE OF CONTENTS

Drawing Number:
G1001

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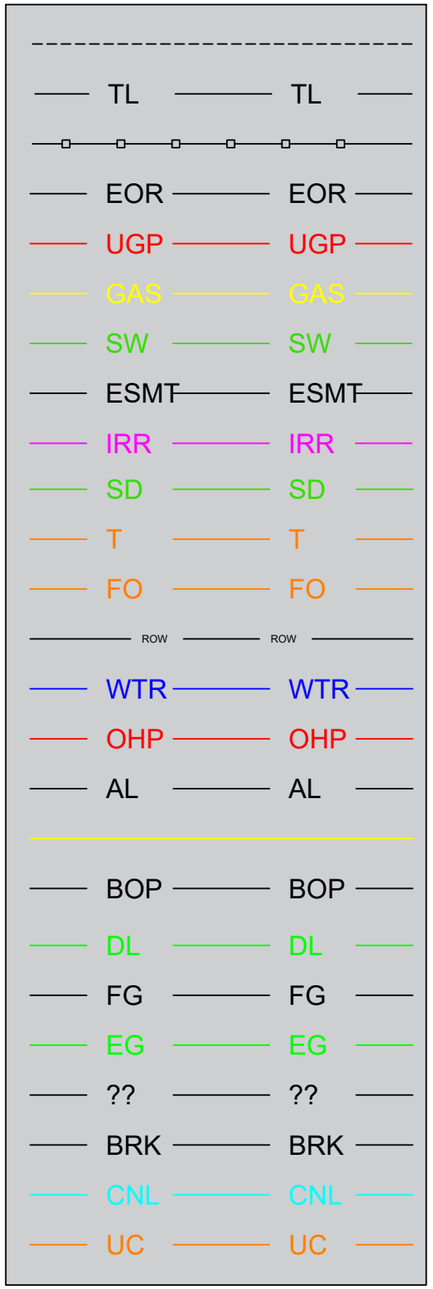
ABBREVIATIONS

CODE ABBREVIATIONS			
CODE	DESCRIPTION	CODE	DESCRIPTION
ADP	PVC FLANGED ADAPTER	IPS	IRON PIPE SIZE PVC PIPE
BFV	BUTTERFLY VALVE	ISO	ISOMETRIC
BOP	BOTTOM OF PIPE	MAX	MAXIMUM
CAV	CONTINUOUS ACTING AIR VENT	MIN	MINIMUM
CL	CENTER LINE	NL	NIPPLE
CMP	CORRUGATED METAL PIPE	O.D.	OUTSIDE DIAMETER
DIA	DIAMETER	PLT	PLATE
EG	EXISTING GRADE	RED	REDUCER
EL	ELBOW	SPL	SPOOL
ELEV	ELEVATION	SS	STAINLESS STEEL
FG	FINISHED GRADE	STA	STATION
FL	FLANGE	STL	STEEL
GV	GATE VALVE	THRU	THROUGH
HAND	HANDLE	TYP	TYPICAL
I.D.	INSIDE DIAMETER	WT	WEIGHT

LINE STYLE LEGEND



1 / 4001 VIEW NUMBER / SHEET NUMBER

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING

500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

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Sheet Name: GENERAL NOTES #1

Drawing Number: G1002

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1 GENERAL CONSTRUCTION NOTES

1. THE "CONTRACTOR" AS REFERENCED IN THESE PLANS SHALL REFER TO THE COMPANY OR PERSON PERFORMING THE INSTRUCTED WORK. IF THE OWNER CHOOSES TO PERFORM ALL OR A PORTION OF THE WORK, THEY SHALL ASSUME THE DUTIES OF THE CONTRACTOR FOR THAT TASK.

2. PRIOR TO CONSTRUCTION, THE OWNER SHALL CONDUCT A PRE-CONSTRUCTION MEETING WITH THE ENGINEER AND CONTRACTORS. AT THE MEETING, THE DIVISIONS OF LABOR OF CONSTRUCTION TASKS SHALL BE CLEARLY REVIEWED AND CONFIRMED AS THEY RELATE TO THE CONSTRUCTION PLANS AND AWARDED CONTRACTS. THE ENGINEER SHALL NOT BE HELD RESPONSIBLE FOR GAPS OR OVERLAP IN CONSTRUCTION.

3. CONSTRUCTION SHALL BE PER THE LATEST VERSION OF THE OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION 2021 OR THE CONSTRUCTION PLANS, WHICHEVER IS MORE STRINGENT.

4. CONTRACTOR SHALL FURNISH AND INSTALL EVERYTHING REQUIRED TO PROVIDE COMPLETE AND OPERABLE FACILITIES AS SHOWN HEREIN. IF THERE IS AN OMISSION ON THE PLANS, SUCH OMISSION SHALL NOT BE CONSTRUED TO MEAN THAT THE CONTRACTOR IS NOT REQUIRED TO FURNISH OR PROVIDE EVERYTHING THAT IS NECESSARY TO PROVIDE COMPLETE AND OPERABLE FACILITIES.

5. ANY CHANGES TO THE DESIGN AS SHOWN IN THESE CONSTRUCTION DRAWINGS MUST BE REVIEWED AND APPROVED BY THE ENGINEER BEFORE CHANGES ARE MADE. THIS INCLUDES CHANGES REQUESTED BY THE OWNER'S REPRESENTATIVE AND SUBCONTRACTORS.

6. ANY CHANGES MADE WITHOUT PRIOR APPROVAL ARE AT THE CONTRACTORS RISK AND IF NOT APPROVED THE CONTRACTOR SHALL BE RESPONSIBLE TO CORRECT OR REDO WORK AS DIRECTED BY THE ENGINEER, AT NO ADDITIONAL COST TO THE CONTRACT.

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING MONUMENTS, OTHER SURVEY MARKERS, STREET SIGNS, UTILITIES, IRRIGATION LINES, PAVEMENT, TREES, FENCES, AND ANY OTHER IMPORTANT OBJECTS ON OR ADJACENT TO THE JOB SITE AS DETERMINED BY THE OWNER'S REPRESENTATIVE OR ENGINEER.

8. CONTRACTOR SHALL CONTACT OREGON UTILITY NOTIFICATION CENTER 1-(800)-332-2344 TO MARK AND IDENTIFY UNDERGROUND UTILITIES PRIOR TO EXCAVATION.

9. CONTRACTOR SHALL LEGALLY DISPOSE OF ALL EXCESS MATERIAL. TRASH MUST BE DISPOSED OF LEGALLY OFF SITE.

10. ALL "OR EQUAL" ITEMS ARE SUBJECT TO REVIEW AND APPROVAL OF THE ENGINEER.

11. CONTRACTOR SHALL PROVIDE, MAINTAIN, AND BE RESPONSIBLE FOR ALL EROSION AND SEDIMENT CONTROL STRUCTURES AND PRACTICES AND MEET THE REQUIREMENTS OF ANY AGENCY HAVING JURISDICTION.

12. UPON THE COMPLETION OF WORK, THE CONTRACTOR SHALL PROVIDE A SET OF RECORD DRAWINGS TO THE OWNER.

13. CONTRACTOR SHALL NOTIFY AND COORDINATE WITH THE OWNER'S REPRESENTATIVE PRIOR TO, DURING, AND AT THE COMPLETION OF CONSTRUCTION ACTIVITY.

14. IF WITHIN TWO (2) YEARS FROM THE DATE OF COMPLETION, THE PIPELINE, AND ALL APPURTENANCES OR ANY PART THEREOF INSTALLED AS NEW SHALL PROVE TO BE DEFECTIVE IN INSTALLATION, MATERIAL, OR WORKMANSHIP THE CONTRACTOR SHALL WARRANT REPLACEMENT OR REPAIR TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE AT NO EXPENSE TO THE OWNER.

15. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN AS AN APPROXIMATE LOCATION ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THEIR FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. CONTRACTOR SHALL CONTACT PROPERTY OWNERS TO GAIN INFORMATION ON PRIVATE UTILITIES.

16. ALL CONTRACTORS WORKING WITHIN THE PROJECT BOUNDARIES ARE RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE SAFETY LAWS OF ANY APPLICABLE JURISDICTIONAL BODY.

2 PIPELINE CONSTRUCTION

1. THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE PIPELINE TESTING. TESTING SHALL BE IN ACCORDANCE WITH PROJECT SPECIFICATION 33 14 11 PIPELINE GENERAL REQUIREMENTS. THE ENGINEER OR DESIGNATED REPRESENTATIVE WILL BE PRESENT FOR THE TESTING.

2. CONTRACTOR SHALL USE PIPE BEDDING MATERIAL PER SPECIFICATIONS 31 23 33 EXCAVATION, TRENCHING & BACKFILL.

3. CONTRACTOR SHALL USE TRENCH BACKFILL MATERIAL PER PLANS AND 31 23 33 EXCAVATION, TRENCHING & BACKFILL.

4. PIPELINE SHALL HAVE A MINIMUM COVER DEPTH AS SPECIFIED IN THE PROFILE SHEETS.

5. INSTALL PIPE WITH UNIFORM SLOPES AND STRAIGHT ALIGNMENTS WHERE POSSIBLE, AVOID LOCALIZED HIGH AND LOW POINTS (TYP).

6. MAXIMUM DEFLECTION AT PIPE JOINTS SHALL NOT EXCEED THE MANUFACTURERS SPECIFICATIONS.

7. INSTALL THRUST BLOCKS FOR ALL PIPE FITTINGS AND ACCESSORIES WHERE SHOWN IN THE PROJECT PLAN AND DETAIL SHEETS.

8. CONTRACTOR TO PREVENT FIELD SCAR IN TRENCH AREA BY STOCKPILING AND REPLACING TOP 2 FEET OF TOPSOIL AS TOP LAYER ACROSS FARMED FIELDS.

9. ALL STEEL PIPE AND FABRICATED STEEL ASSEMBLIES SHALL BE LINED AND COATED PER SPECIFICATIONS 33 05 24 STEEL PIPE.

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-001

UMATILLA COUNTY

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IRZ ENGINEERING & CONSULTING™
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OFFICE (541) 567-0252 FAX (541) 567-4239

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Sheet Name:
GENERAL NOTES #2

Drawing Number:
G1003

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3 PIPELINE DESIGN CRITERIA AND ASSUMPTIONS

1. SOURCE OF WATER: COLUMBIA RIVER

2. PIPELINE LENGTH AND MATERIAL : 2,650 LF OF 48-IN DIAMETER STL PIPE, 17,000 LF OF 1,300MM DIAMETER FRP PIPE AND 14,000 LF OF 1,100MM DIAMETER FRP PIPE .

3. PIPE PROVIDED BY OWNER AND DELIVERED NEAR THE PROJECT SITE IN UMATILLA COUNTY, OREGON.

4. PIPE DESIGN CAPACITY: 50 CFS (22,440 GPM)

5. CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING STICKS TO LENGTH AS REQUIRED.

6. CONTRACTOR SHALL BE RESPONSIBLE FOR RECEIVING UNLOADING, LOADING AND MOVING PIPE FROM STOCKPILE AREA TO LOCATION WHERE IT IS INSTALLED.

4 PRE-CAST CONCRETE VAULTS

1. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF PRE-CAST VAULTS, DESIGNED AND STAMPED BY MANUFACTURERS ENGINEER.

2. VAULT LIDS TO BE RATED FOR HS20 LOAD WHEN INSTALLED FLUSH WITH GRADE.

3. VAULT LIDS SHALL BE DESIGNED BY MANUFACTURER TO INCLUDE LIFTING EYES AND HAVE THE ABILITY TO BE REMOVED.

4. ALL PIPE PENETRATIONS SHALL BE INSTALLED WITH A FLEXIBLE RUBBER CONNECTION.

5. VAULTS SHALL INCLUDE LADDER RUNGS AND FALL PROTECTION.

6. VAULTS SHOWN WITH CONCRETE FLOORS SHALL INCLUDE FLOOR DRAINS. VAULT FLOOR SHALL BE SLOPED WITH MINIMUM 1% TOWARDS EXIT POINT.

5 CONCRETE NOTES

1. DESIGN STRENGTHS;
   F'C = 4,000 PSI
   FY = 60,000
2. CONCRETE COVER
   UNLESS OTHERWISE NOTED,PROVIDE CONCRETE COVER FOR REINFORCING AS FOLLOWS :
   CONCRETE CAST AGAINST EARTH: 3"
   ALL OTHERS: 2"
3. REINFORCING STEEL FOR CONCRETE SHALL CONFORM TO ASTM A615 GRADE 60 FOR DEFORMED BARS AND SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH CURRENT EDITION OF CRSI "MANUAL OF STANDARD PRACTICE" AND "PLACING REINFORCING BARS" BASED ON THE CURRENT ACI 318 BUILDING CODE. EXCEPT REINFORCING TO BE WELDED SHALL CONFORM TO ASTM A706, GRADE 60
4. ALL DETAILING, FABRICATION, AND INSTALLED OF REINFORCING BARS, UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE ACI MANUAL OF STANDARD PRACTICE. SEE SPECIFICATIONS FOR ADDITIONAL REINFORCING PLACEMENT REQUIREMENTS
5. REFER TO OTHER DISCIPLINE DRAWINGS PRIOR TO CONSTRUCTION FOR EMBEDDED ITEMS AND PENETRATIONS NOT SHOWN ON STRUCTURAL DRAWINGS. AS REQUIRED TO ACCOMMODATE ALL WORK SHOWN OR SPECIFIED IN THE CONTRACT DOCUMENTS AND OTHERWISE REQUIRED FOR THE FURNISHING OF A FUNCTIONALLY COMPLETE PROJECT. REINFORCE AROUND OPENINGS PER STANDARD STRUCTURAL DETAILS UNLESS OTHERWISE SHOWN.
6. PROVIDE 3/4" CHAMFER AT ALL EXPOSED EDGES AND 1/2" CHAMFERS AT JOINTS AS SHOWN. NOT ALL CHAMFERS MAY BE SHOWN ON DRAWINGS.
7. FIELD ADJUST REINFORCING AT OPENINGS AND EMBEDDED ITEMS AS INDICATED.
8. CONTINUOUS WATER STOP SHALL BE INSTALLED IN JOINTS SUBJECT TO STATIC WATER PRESSURE .
9. ABSOLUTELY NO WELDING OR REINFORCING BARS OR TORCHING TO BEND REINFORCING BARS SHALL BE ALLOWED WITHOUT SPECIFIC APPROVAL FROM ENGINEER.
10. SPLICE LOCATION IN CONCRETE SLABS, BEAMS, AND GIRDERS: REINFORCING STEEL SHALL NOT BE SPLICED AT ZONES OF MAXIMUM TENSILE STRESS, UNLESS OTHERWISE NOTED ON DRAWINGS.
11. ALL WALL REINFORCING BARS SHALL BE CONTINUOUS AROUND CORNERS AND THROUGH COLUMNS OR PILASTERS UNLESS OTHERWISE NOTED . REINFORCING BARS SHALL BE EXTENDED INTO CONNECTION WALLS AND LAPPED ON THE OPPOSITE FACE OF THE CONNECTING WALLS.
12. VERTICAL WALL AND COLUMN BARS SHALL BE LAPPED WITH DOWELS FROM BASE SLAB OR FOOTING AND SHALL EXTEND TO THE TOP REINFORCEMENT OF ELEVATED SLABS VERTICAL COLUMN BARS SHALL BE TERMINATED AT THE TOP WITH A STANDARD 90- DEGREE HOOK UNLESS OTHERWISE NOTED.

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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Revisions

N0.	Description	Date
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0 SCALE CHECK 1"

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Sheet Name: GENERAL NOTES #3

Drawing Number: G1004

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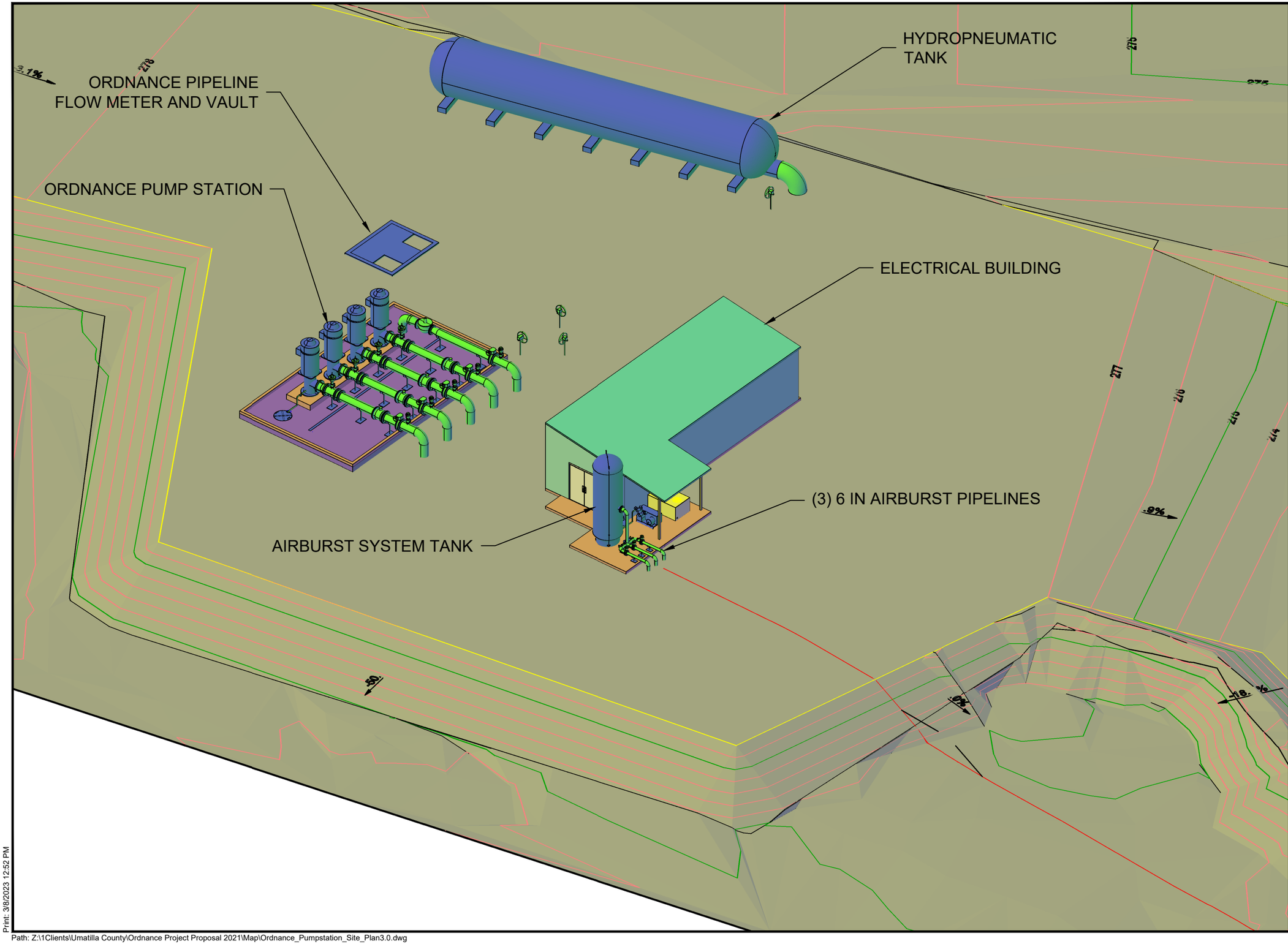

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PROJECT	675-20-001

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PUMP STATION SITE ISO

Drawing Number:

C1000

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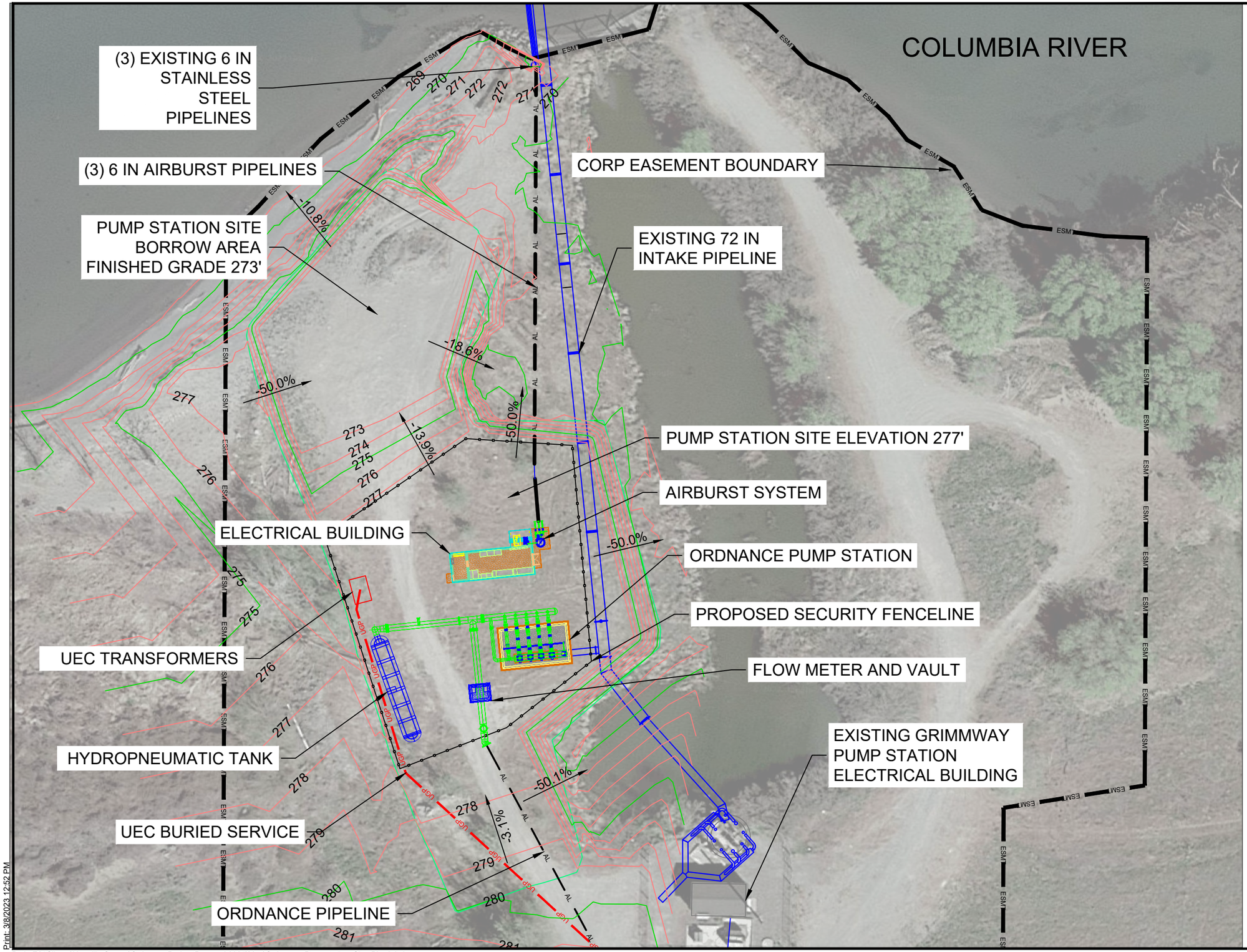

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APPROVED	-
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PROJECT	675-20-001

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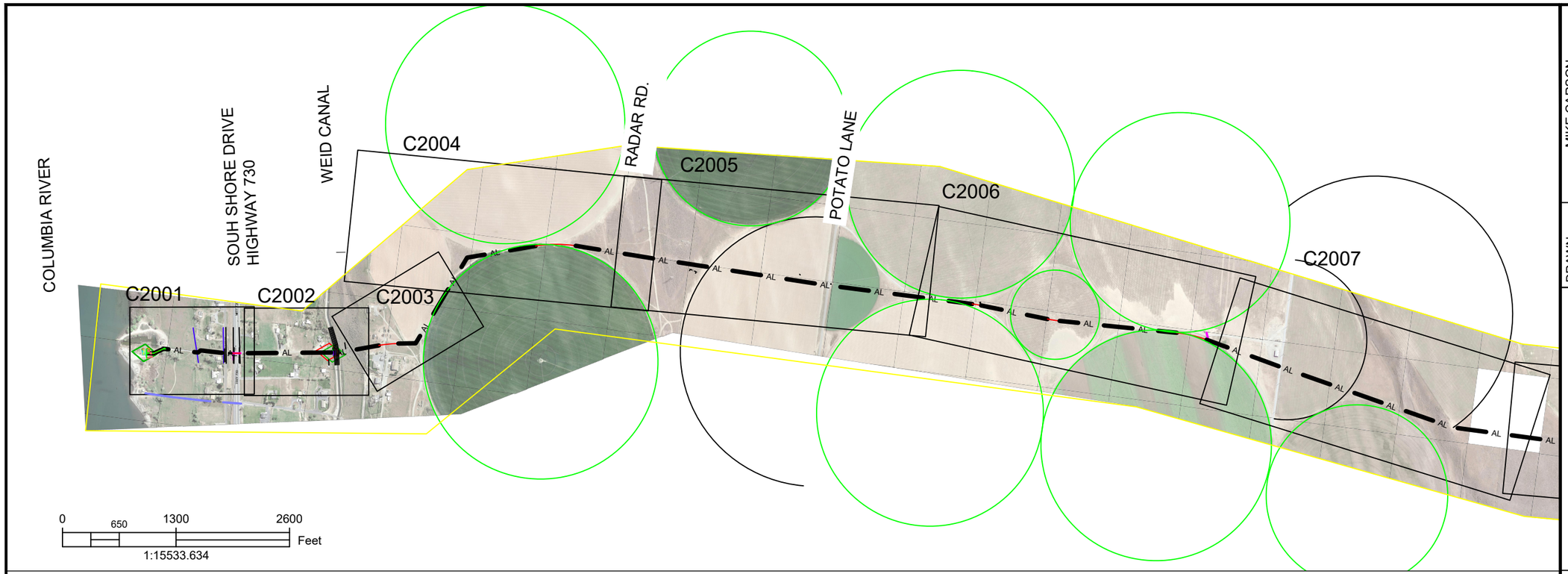

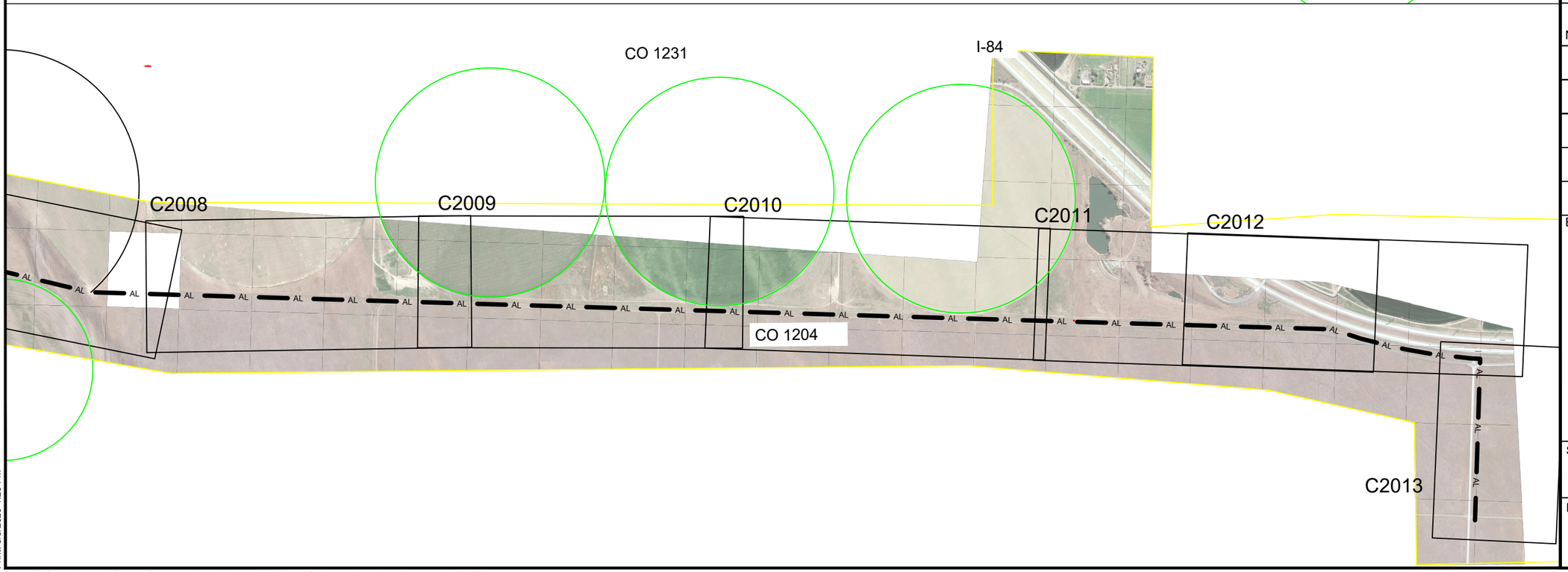

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	JAN 2023
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PROJECT	675-20-001

UMATILLA COUNTY
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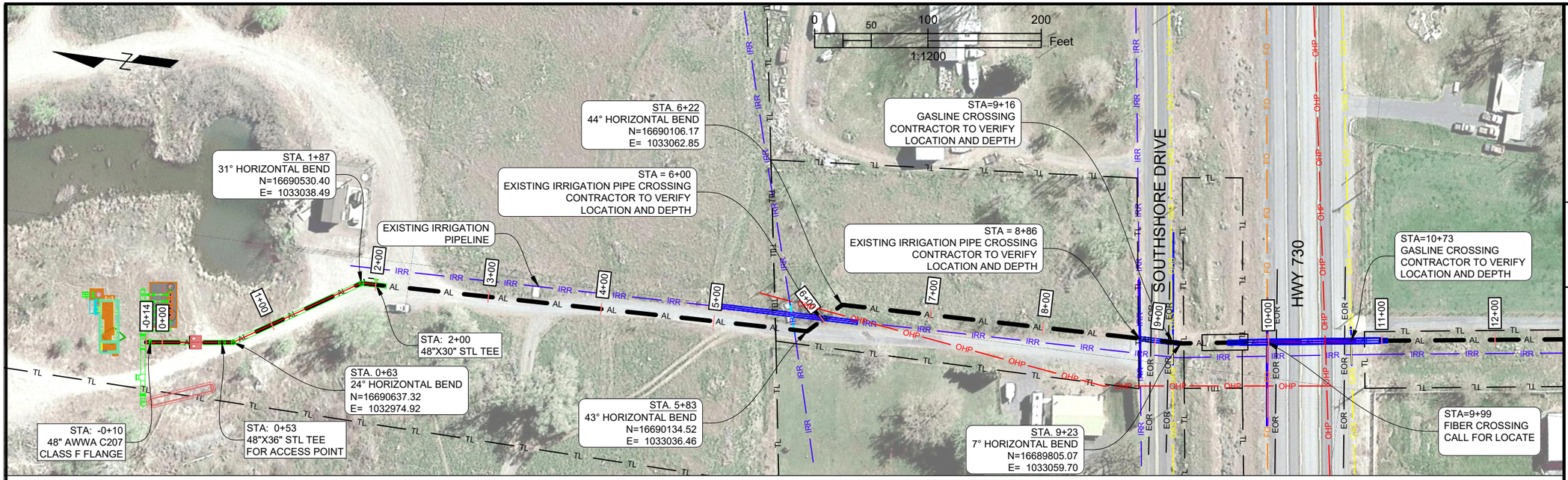

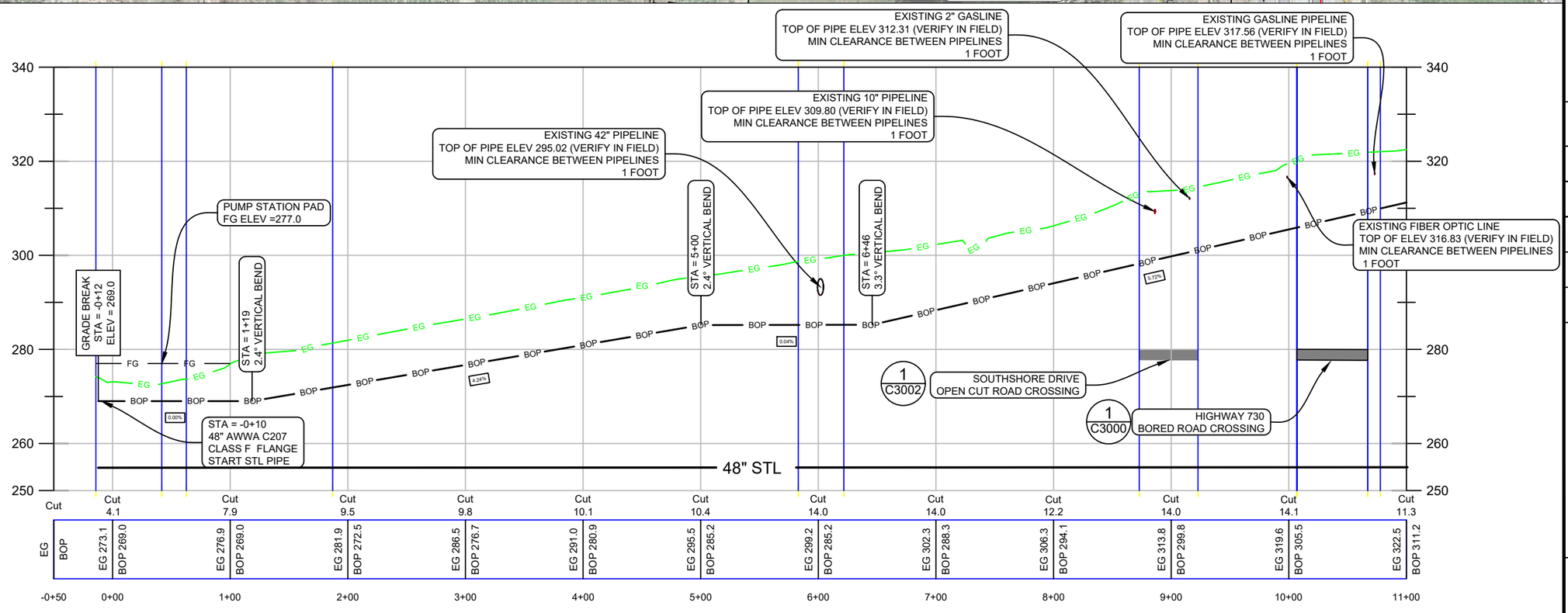

PROFILE VIEW: ORDNANCE MAIN 1 (3) (2) (1)
STA -0+50 TO STA 11+00
VERTICAL EXAGGERATION:4X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	JAN 2023
SCALE	1" = 100'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

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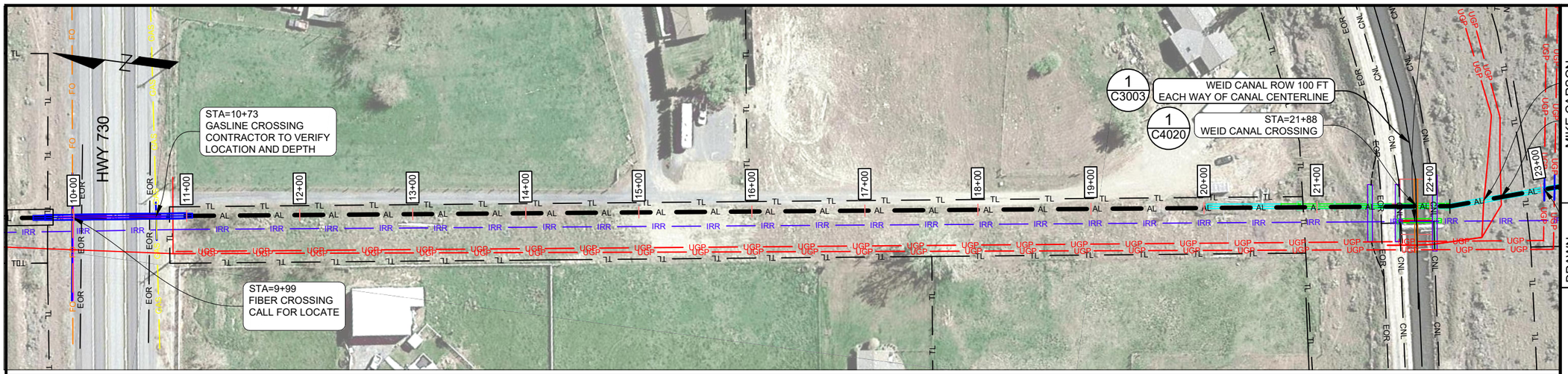

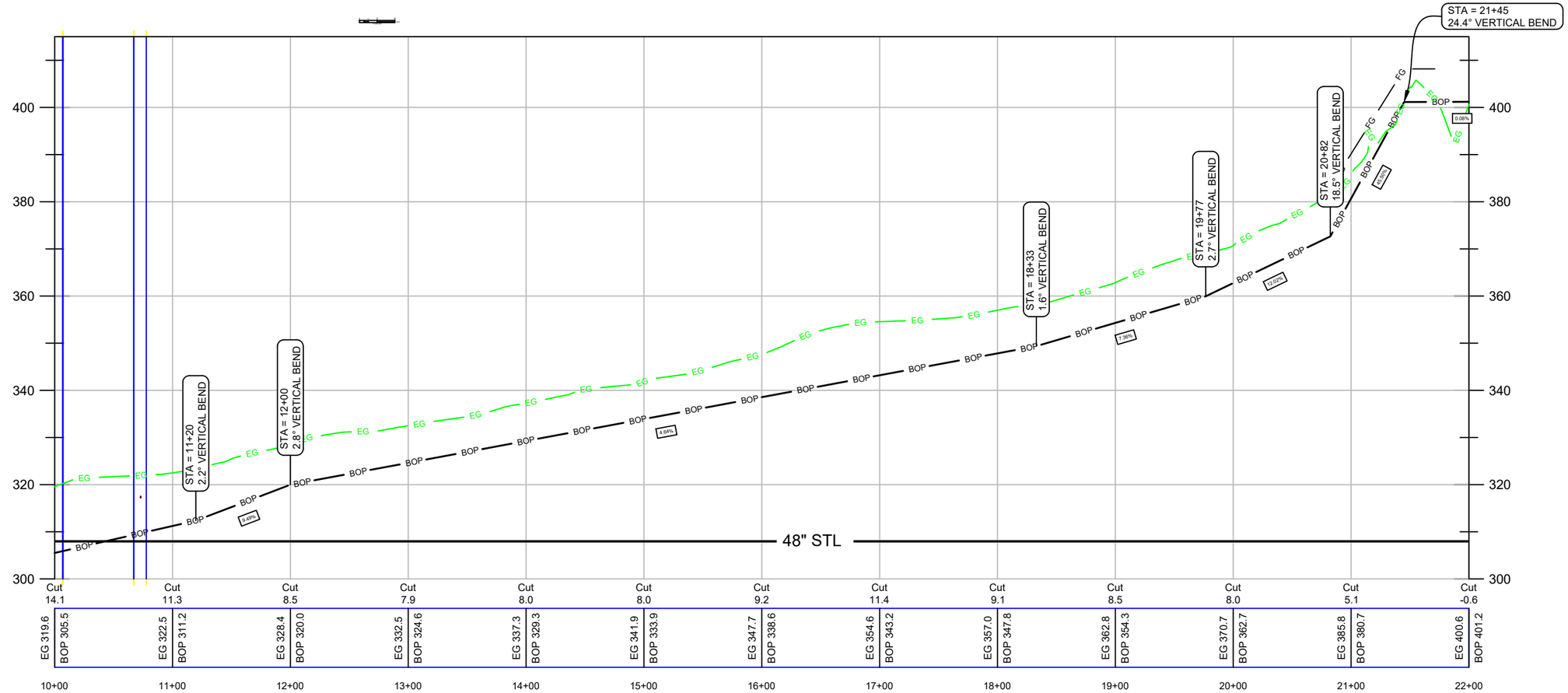

PROFILE VIEW: ORDNANCE MAIN 1 (3) (3)
STA 10+00 TO STA 22+00
VERTICAL EXAGGERATION:4X

Cut=(EG-BOP)
EG / BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
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APPROVED	-
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SCALE	1" = 100'
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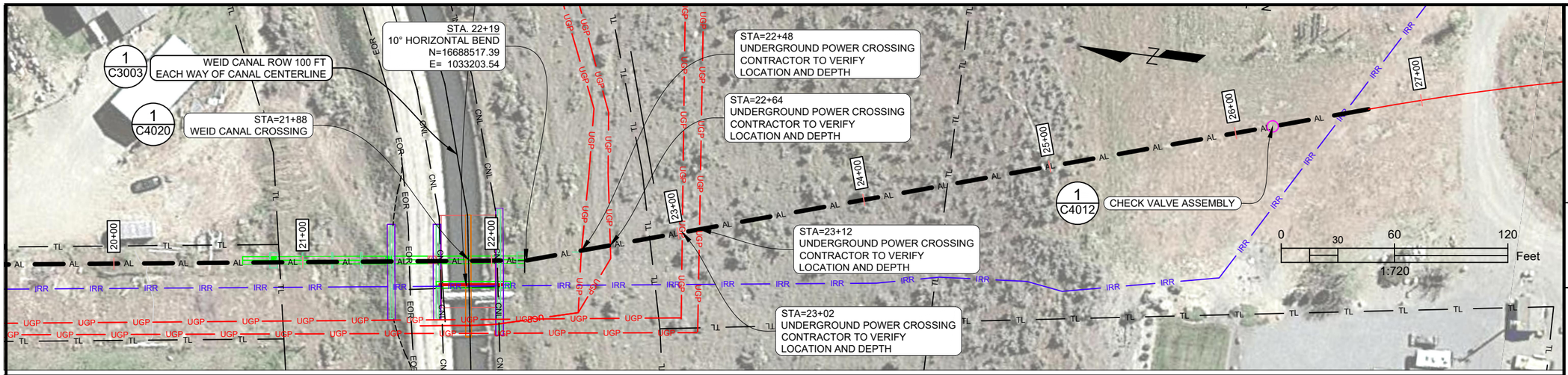

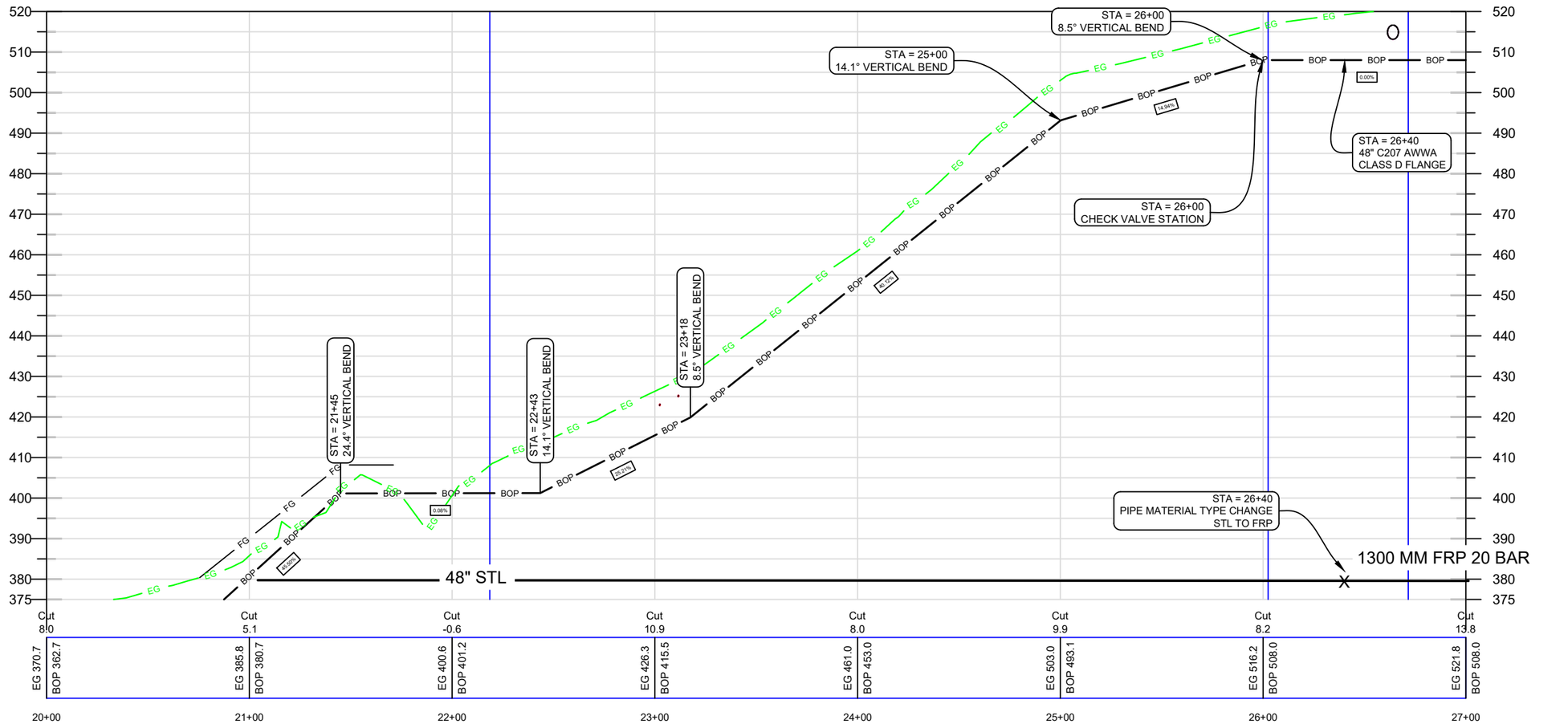

PROFILE VIEW: ORDNANCE MAIN 1 (3) (3) (1)

VERTICAL EXAGGERATION: 2X

Cut=(EG-BOP)

EG / BOP

STA NUM

NOTES:
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AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	JAN 2023
SCALE	1" = 100'
PROJECT	675-20-001

UMATILLA COUNTY
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Drawing Number:
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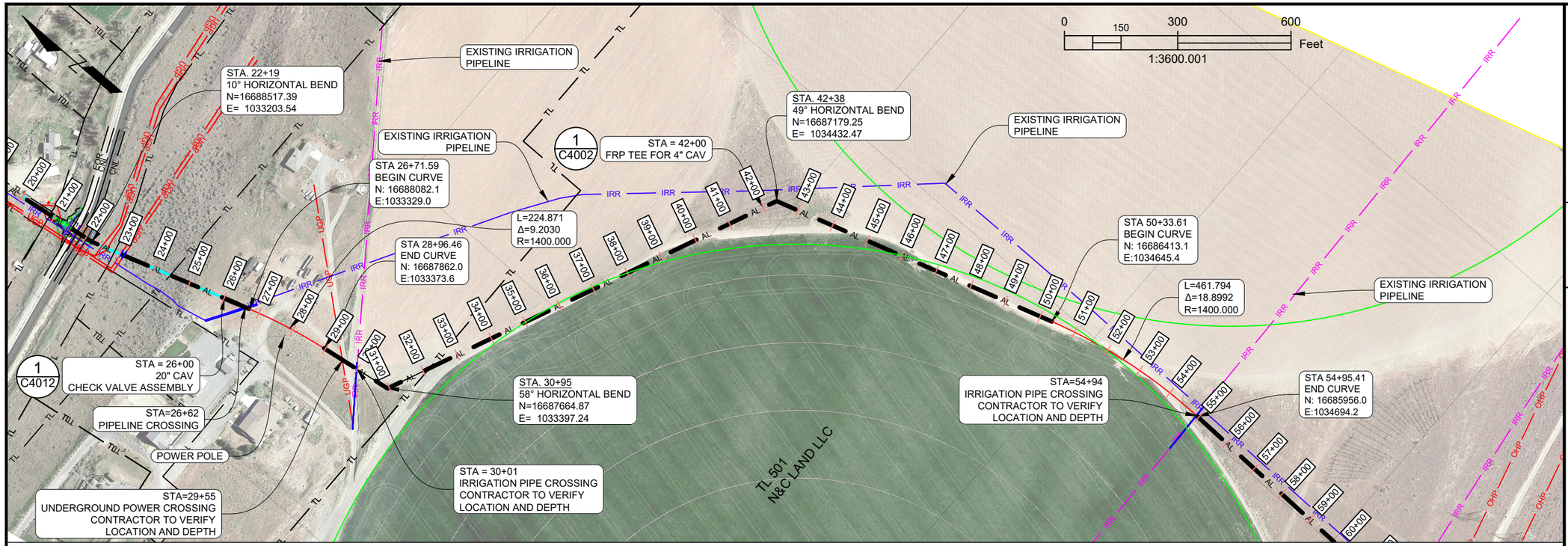

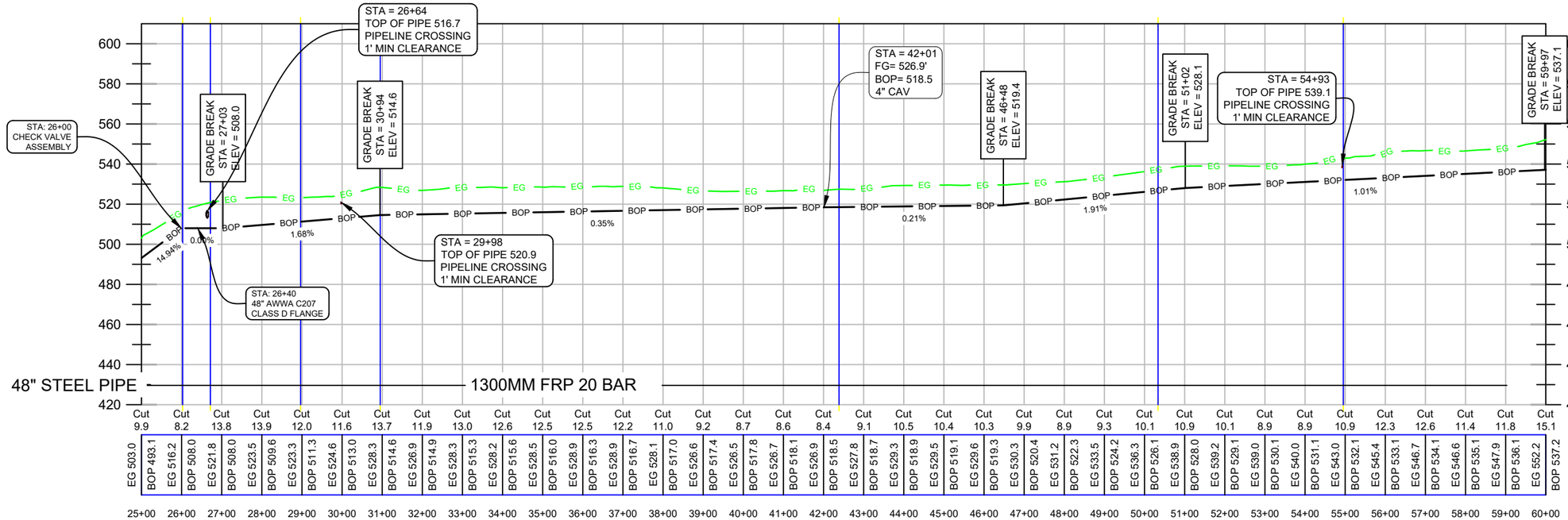

PROFILE VIEW: ORDNANCE MAIN 2 (1)
STA 25+00 TO STA 60+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
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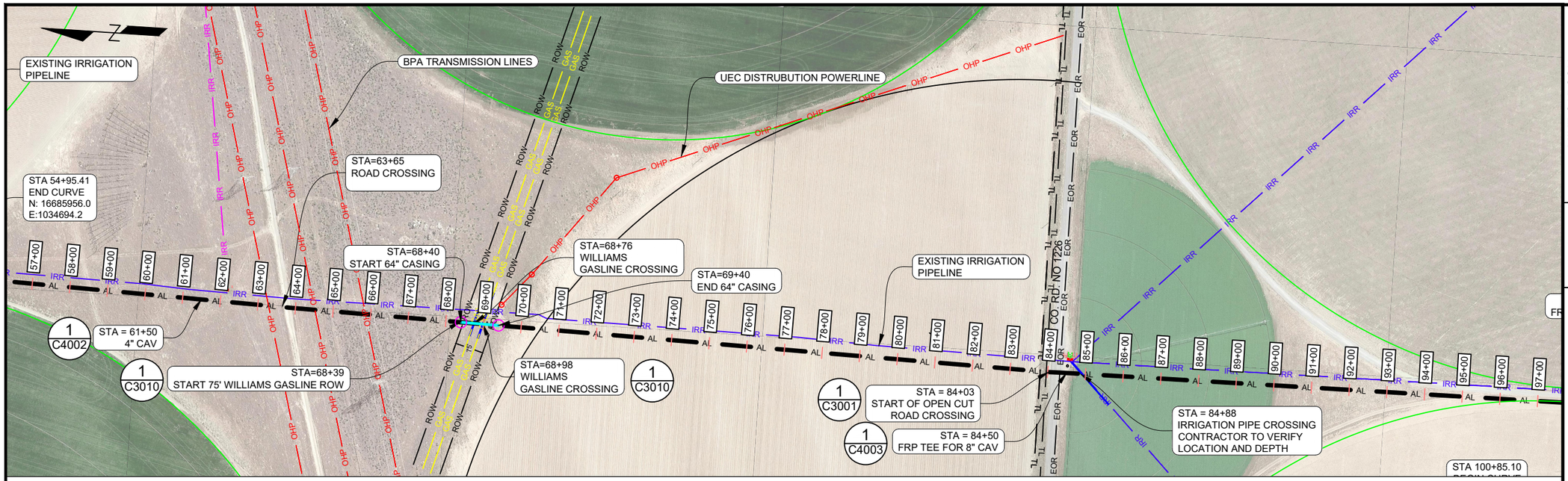

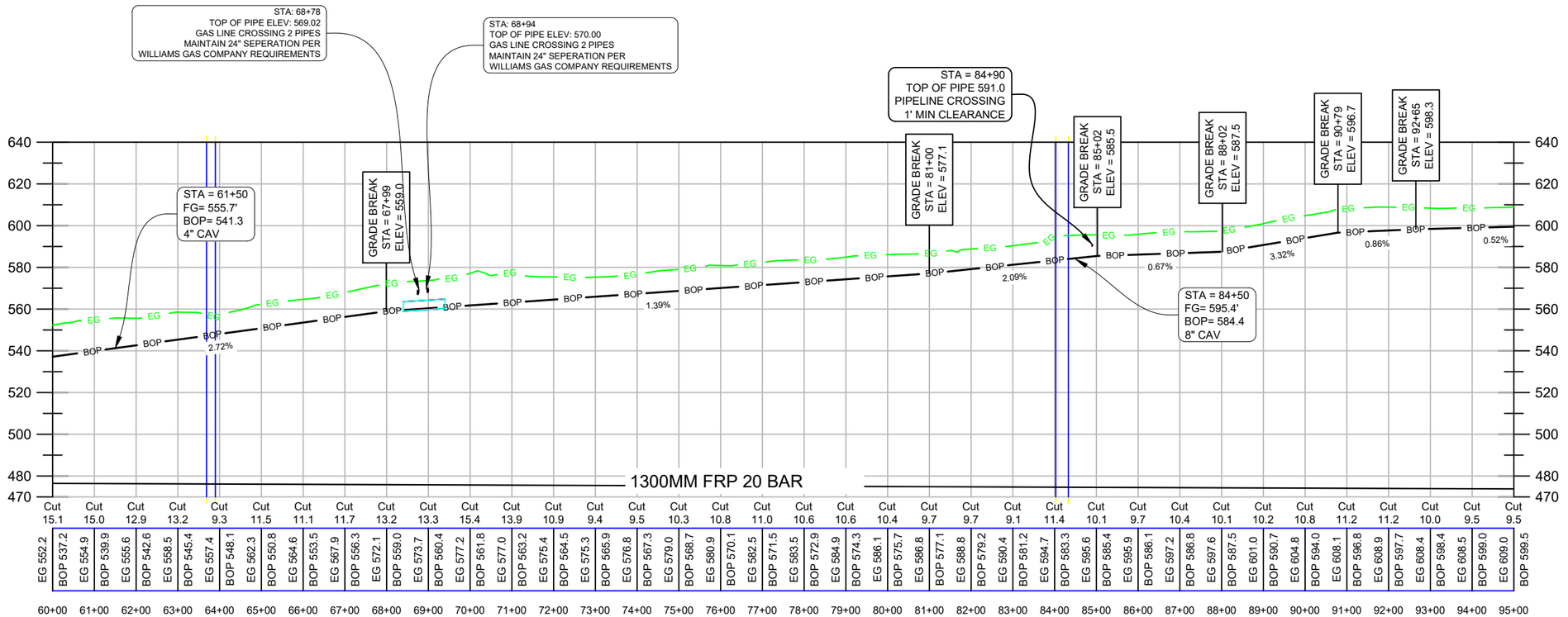

PROFILE VIEW: ORDNANCE MAIN 3 (1)
STA 60+00 TO STA 95+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

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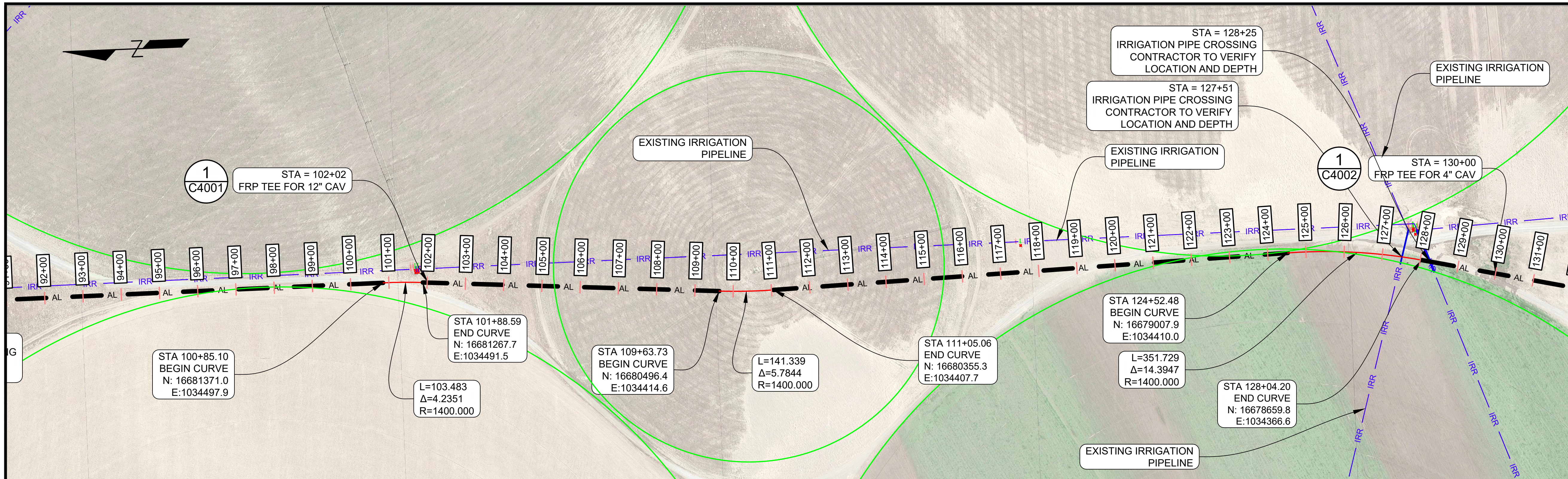

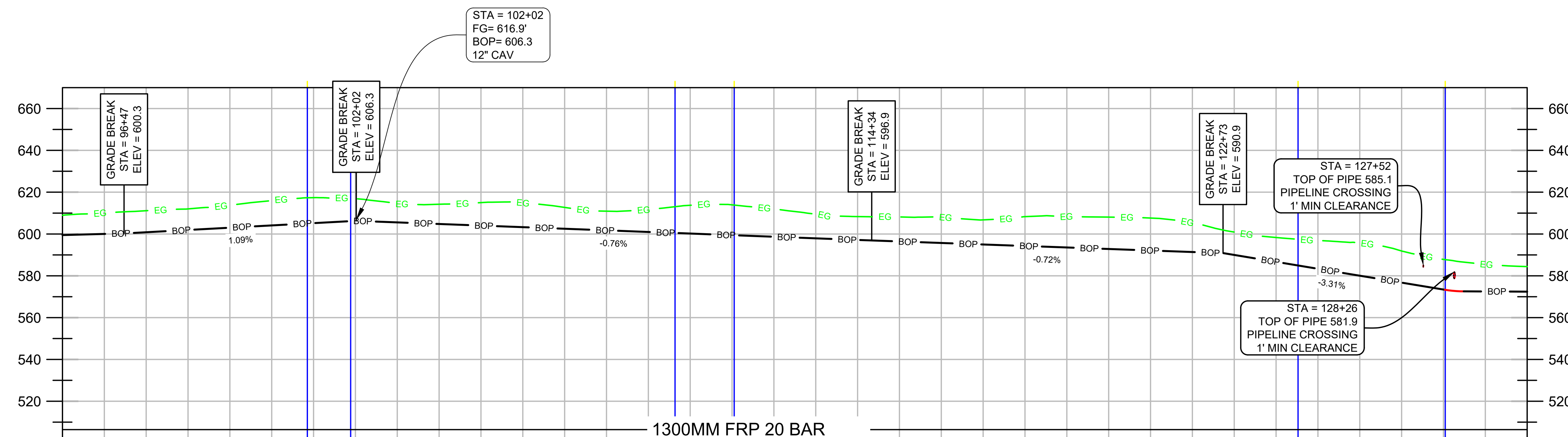

STA	EG	BOP	Cut
95+00	609.0	599.5	9.5
96+00	610.2	600.0	10.2
97+00	611.1	600.8	10.3
98+00	612.0	601.9	10.1
99+00	613.8	603.0	10.7
100+00	616.0	604.1	11.9
101+00	617.4	605.2	12.2
102+00	616.9	606.3	10.6
103+00	614.6	605.6	9.1
104+00	614.2	604.8	9.4
105+00	615.0	604.0	11.0
106+00	614.9	603.3	11.7
107+00	612.7	602.5	10.2
108+00	610.9	601.7	9.2
109+00	611.7	601.0	10.8
110+00	613.7	600.2	13.5
111+00	613.9	599.5	14.5
112+00	612.0	598.7	13.3
113+00	609.5	597.9	11.6
114+00	608.3	597.2	11.2
115+00	608.2	596.4	11.7
116+00	608.1	595.7	12.4
117+00	606.7	595.0	11.8
118+00	608.3	594.3	14.0
119+00	608.3	593.6	14.7
120+00	608.1	592.8	15.2
121+00	607.6	592.1	15.5
122+00	605.3	591.4	13.9
123+00	600.9	590.0	10.9
124+00	598.3	586.7	11.6
125+00	596.9	583.4	13.5
126+00	595.7	580.1	15.6
127+00	591.9	576.7	15.1
128+00	587.8	573.4	14.4
129+00	585.5	572.5	13.0
130+00	584.4	572.4	12.0

PROFILE VIEW: ORDNANCE MAIN 4 (1)
STA 95+00 TO STA 130+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG | BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

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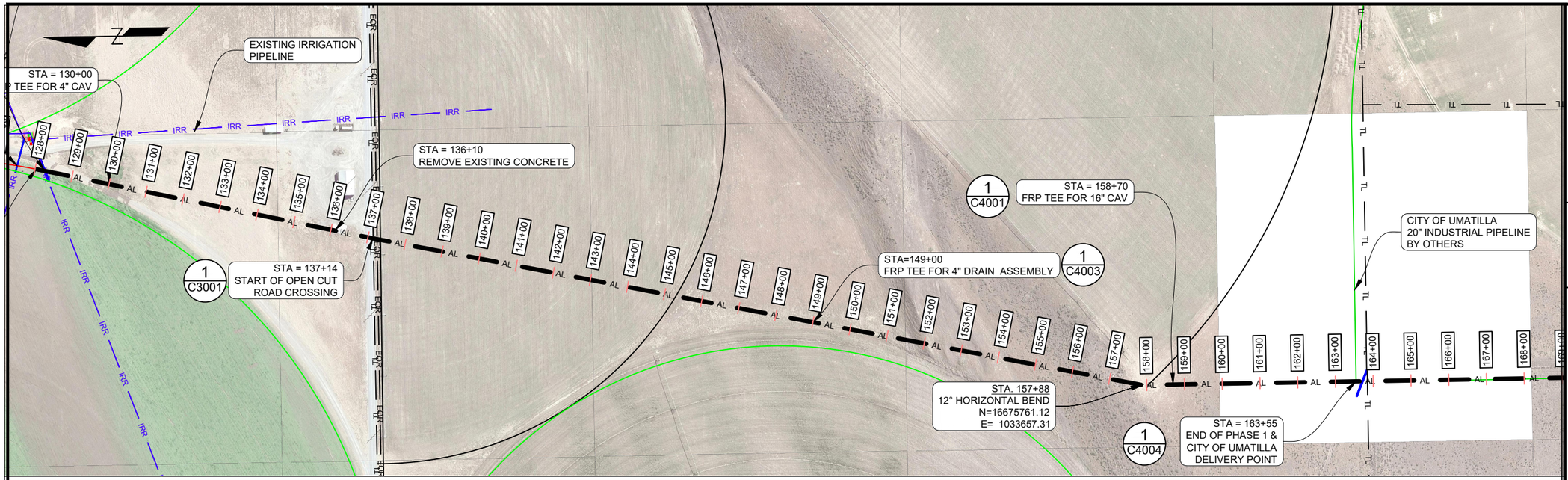

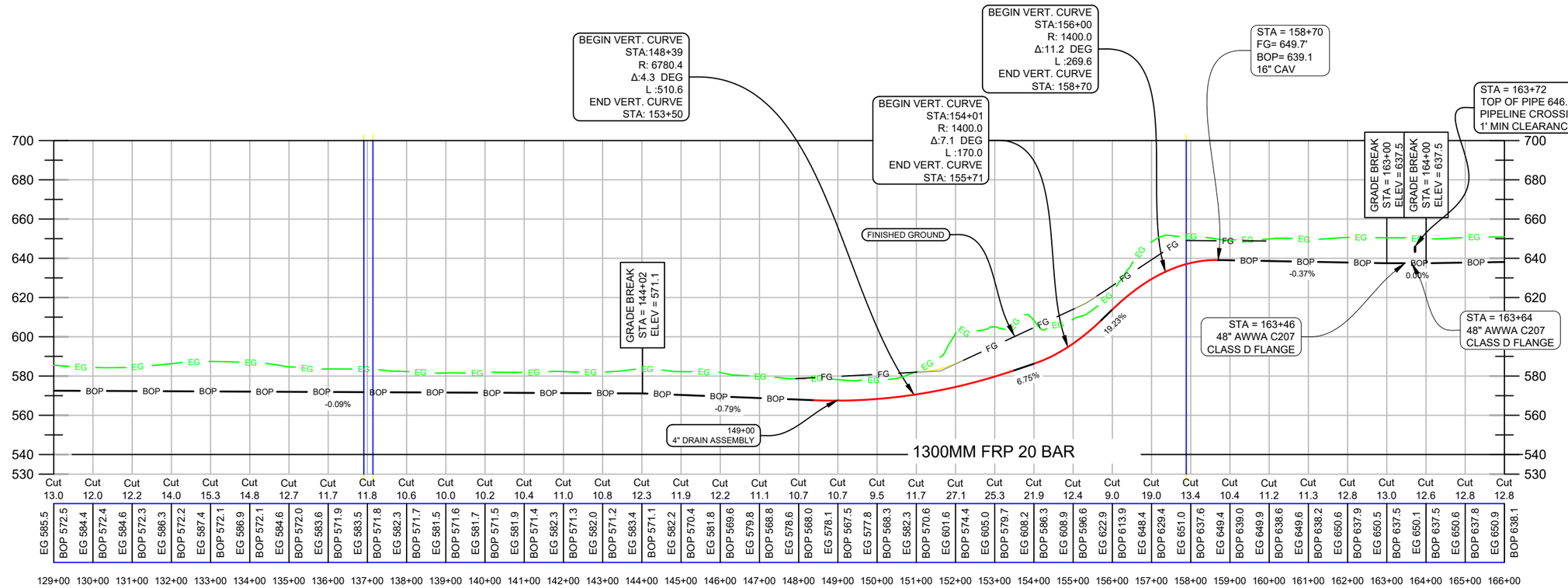

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13.0	12.0	12.2	14.0	15.3	14.8	12.7	11.7	11.8	10.6	10.0	10.2	10.4	11.0	10.8	12.3	11.9	12.2	11.1	10.7	10.7	9.5	11.7	27.1	25.3	21.9	12.4	9.0	19.0	13.4	10.4	11.2	11.3	12.8	13.0	12.6	12.8	12.8	
EG 585.5	BOP 572.5	EG 584.4	BOP 572.4	EG 584.6	BOP 572.3	EG 586.3	BOP 572.2	EG 587.4	BOP 572.1	EG 586.9	BOP 572.1	EG 584.6	BOP 572.0	EG 583.6	BOP 571.9	EG 583.5	BOP 571.8	EG 582.3	BOP 571.7	EG 581.5	BOP 571.6	EG 581.7	BOP 571.5	EG 581.9	BOP 571.4	EG 582.3	BOP 571.3	EG 582.0	BOP 571.2	EG 583.4	BOP 571.1	EG 582.2	BOP 570.4	EG 581.8	BOP 569.6	EG 579.8	BOP 568.8	EG 578.6	BOP 568.0	EG 578.1	BOP 567.5	EG 577.8	BOP 568.3	EG 582.3	BOP 570.6	EG 601.6	BOP 574.4	EG 605.0	BOP 579.7	EG 608.2	BOP 586.3	EG 608.9	BOP 596.6	EG 622.9	BOP 613.9	EG 648.4	BOP 629.4	EG 651.0	BOP 637.6	EG 649.4	BOP 639.0	EG 649.9	BOP 638.6	EG 649.6	BOP 638.2	EG 650.6	BOP 637.9	EG 650.5	BOP 637.5	EG 650.1	BOP 637.5	EG 650.6	BOP 637.8	EG 650.9	BOP 638.1
129+00	130+00	131+00	132+00	133+00	134+00	135+00	136+00	137+00	138+00	139+00	140+00	141+00	142+00	143+00	144+00	145+00	146+00	147+00	148+00	149+00	150+00	151+00	152+00	153+00	154+00	155+00	156+00	157+00	158+00	159+00	160+00	161+00	162+00	163+00	164+00	165+00	166+00			

PROFILE VIEW: ORDNANCE MAIN 7 (1)
STA 129+00 TO STA 166+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

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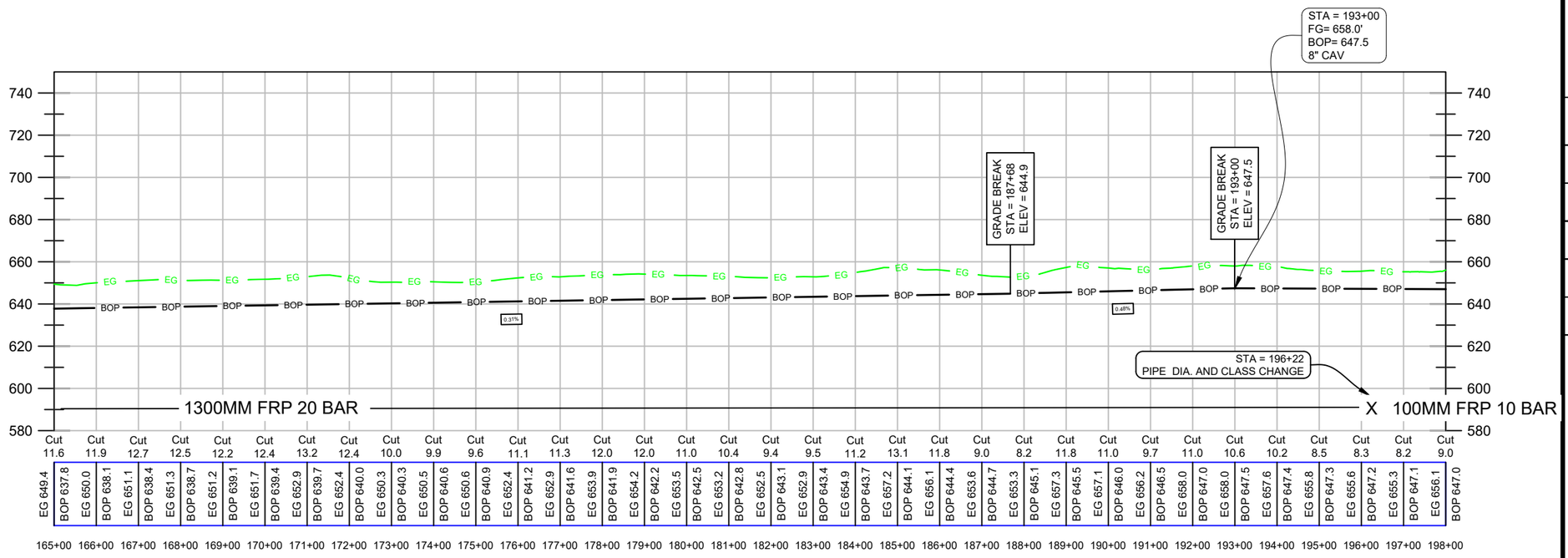

PROFILE VIEW: ORDNANCE MAIN 8 (1)
STA 165+00 TO STA 198+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

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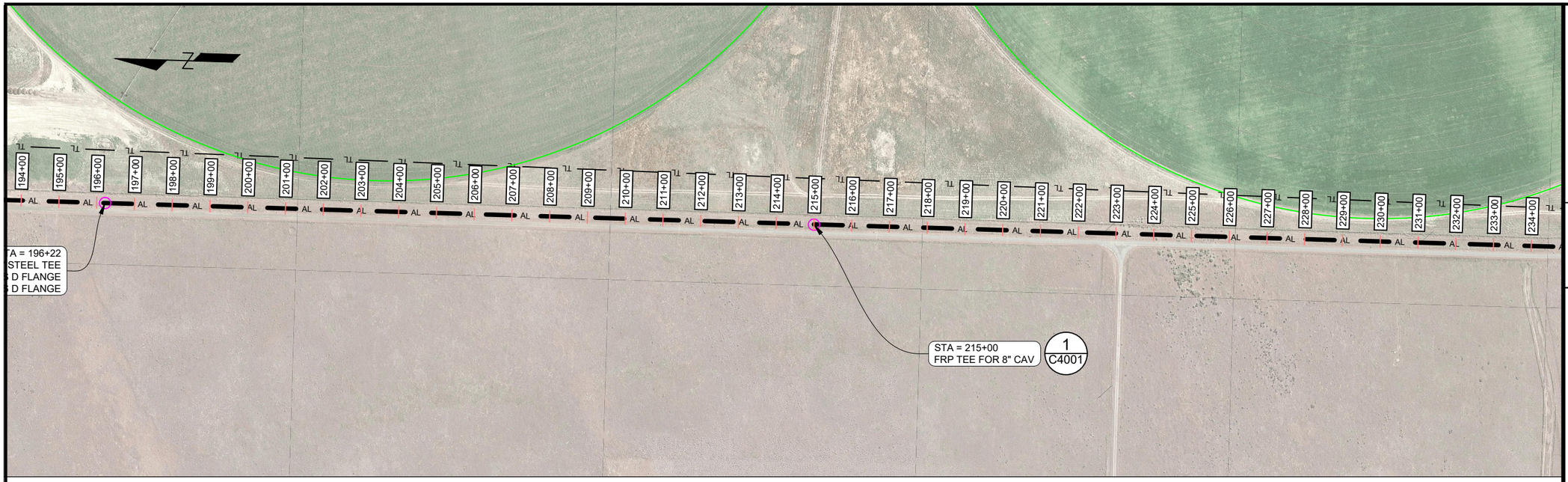

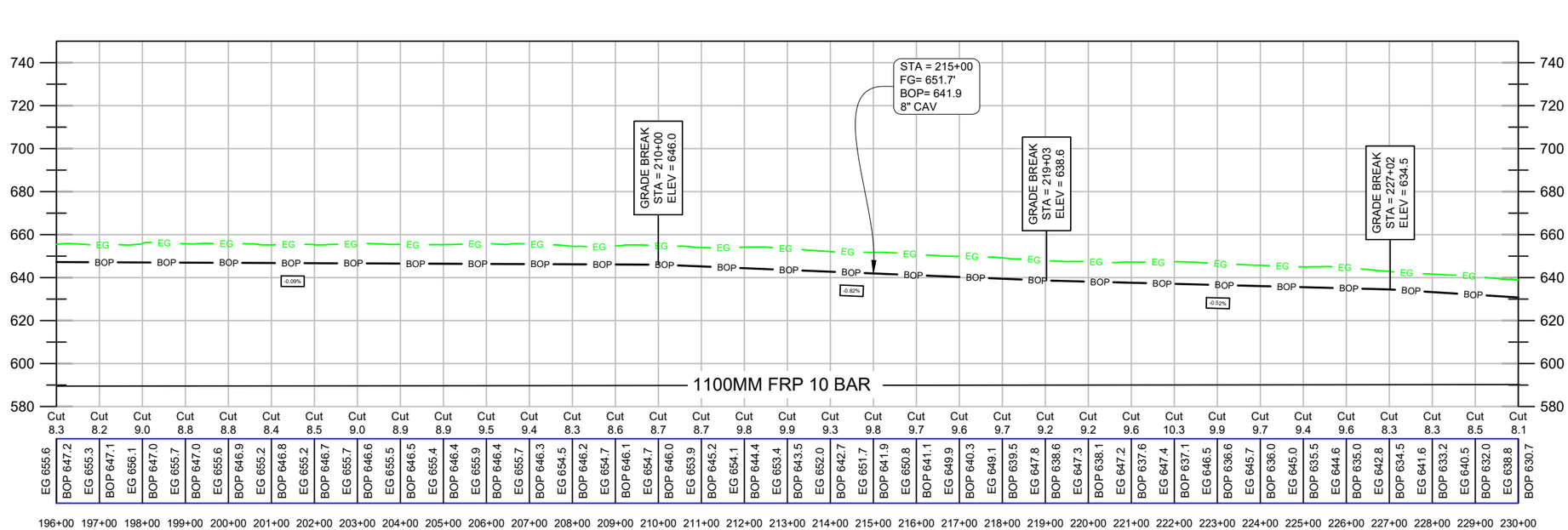

PROFILE VIEW: ORDNANCE MAIN 8 (1) (1)
STA 196+00 TO STA 230+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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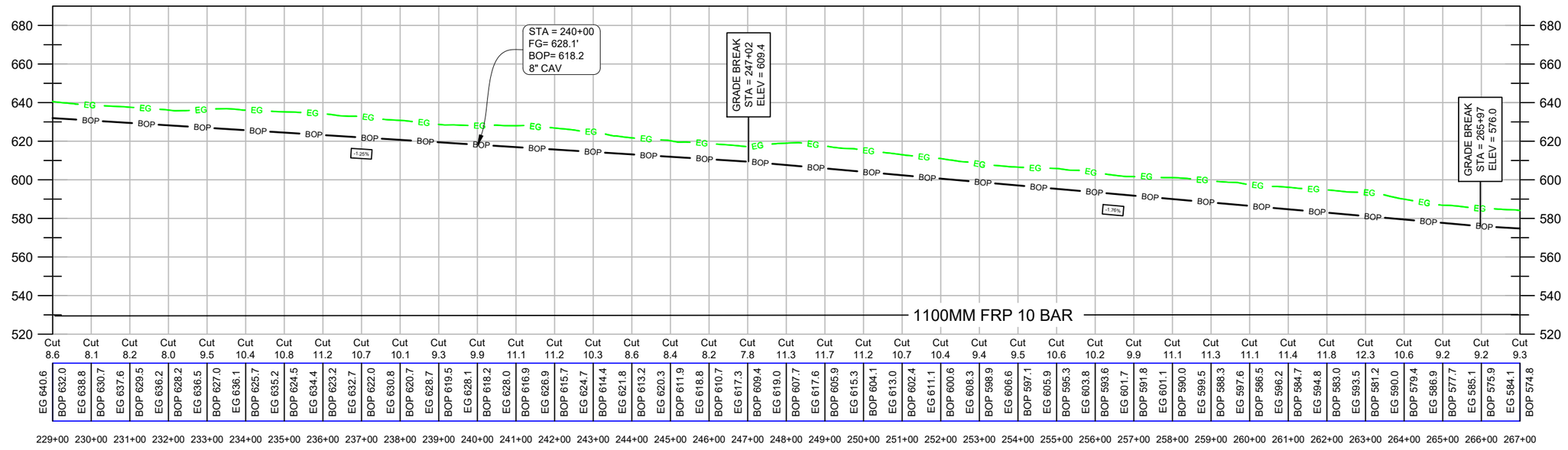

PROFILE VIEW: ORDNANCE MAIN 8 (1) (2)
STA 229+00 TO STA 267+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG | BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
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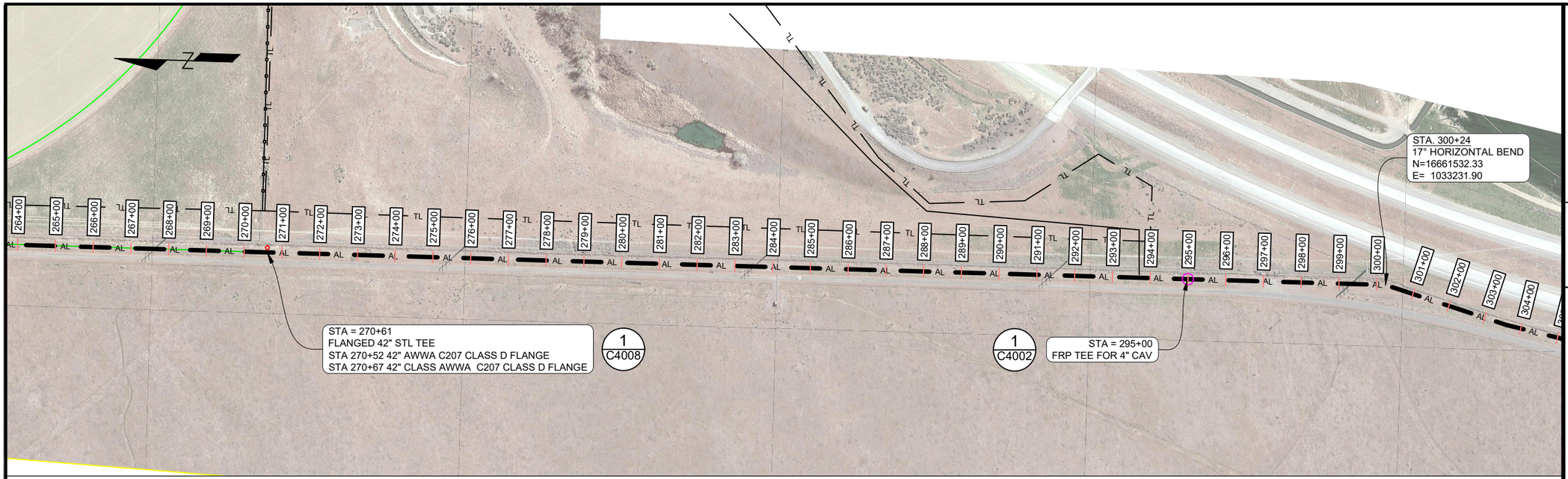

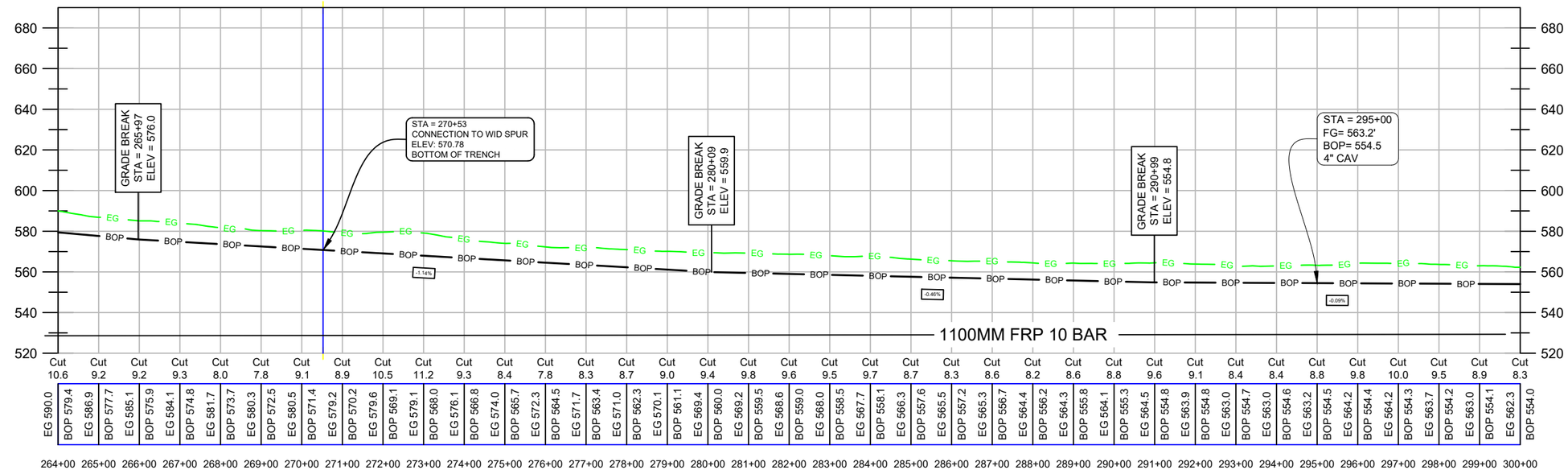

	264+00	265+00	266+00	267+00	268+00	269+00	270+00	271+00	272+00	273+00	274+00	275+00	276+00	277+00	278+00	279+00	280+00	281+00	282+00	283+00	284+00	285+00	286+00	287+00	288+00	289+00	290+00	291+00	292+00	293+00	294+00	295+00	296+00	297+00	298+00	299+00	300+00
Cut	10.6	9.2	9.2	9.3	8.0	7.8	9.1	8.9	10.5	11.2	9.3	8.4	7.8	8.3	8.7	9.0	9.4	9.8	9.6	9.5	9.7	8.7	8.3	8.6	8.2	8.6	8.8	9.6	9.1	8.4	8.4	8.8	9.8	10.0	9.5	8.9	8.3
EG	590.0	586.9	577.7	585.1	575.9	584.1	574.8	581.7	573.7	580.3	572.5	580.5	571.4	579.2	570.2	579.6	569.1	579.1	568.0	576.1	566.8	574.0	565.7	572.3	564.5	571.7	563.4	571.0	562.3	570.1	561.1	569.4	560.0	569.2	559.5	568.6	559.0
BOP	579.4	577.7	575.9	574.8	573.7	572.5	571.4	570.2	569.1	568.0	566.8	565.7	564.5	563.4	562.3	561.1	560.0	559.5	559.0	558.5	558.1	557.6	557.2	556.7	556.2	555.8	555.3	554.8	554.8	554.7	554.6	554.5	554.4	554.2	554.3	554.2	554.1
EG	586.9	577.7	585.1	584.1	581.7	580.3	580.5	579.2	579.6	579.1	576.1	572.3	571.7	571.0	570.1	569.4	569.2	568.6	568.0	567.7	566.3	565.5	565.3	564.4	564.3	564.1	564.5	563.9	563.9	563.0	563.0	563.2	564.2	564.2	563.7	563.0	562.3
BOP	579.4	577.7	575.9	574.8	573.7	572.5	571.4	570.2	569.1	568.0	566.8	565.7	564.5	563.4	562.3	561.1	560.0	559.5	559.0	558.5	558.1	557.6	557.2	556.7	556.2	555.8	555.3	554.8	554.8	554.7	554.6	554.5	554.4	554.2	554.3	554.2	554.1
EG	590.0	586.9	577.7	585.1	575.9	584.1	574.8	581.7	573.7	580.3	572.5	580.5	571.4	579.2	570.2	579.6	569.1	579.1	568.0	576.1	566.8	574.0	565.7	572.3	564.5	571.7	563.4	571.0	562.3	570.1	561.1	569.4	560.0	569.2	559.5	568.6	559.0
BOP	579.4	577.7	575.9	574.8	573.7	572.5	571.4	570.2	569.1	568.0	566.8	565.7	564.5	563.4	562.3	561.1	560.0	559.5	559.0	558.5	558.1	557.6	557.2	556.7	556.2	555.8	555.3	554.8	554.8	554.7	554.6	554.5	554.4	554.2	554.3	554.2	554.1
EG	590.0	586.9	577.7	585.1	575.9	584.1	574.8	581.7	573.7	580.3	572.5	580.5	571.4	579.2	570.2	579.6	569.1	579.1	568.0	576.1	566.8	574.0	565.7	572.3	564.5	571.7	563.4	571.0	562.3	570.1	561.1	569.4	560.0	569.2	559.5	568.6	559.0
BOP	579.4	577.7	575.9	574.8	573.7	572.5	571.4	570.2	569.1	568.0	566.8	565.7	564.5	563.4	562.3	561.1	560.0	559.5	559.0	558.5	558.1	557.6	557.2	556.7	556.2	555.8	555.3	554.8	554.8	554.7	554.6	554.5	554.4	554.2	554.3	554.2	554.1

PROFILE VIEW: ORDNANCE MAIN 8 (1) (2) (4)
STA 264+00 TO STA 300+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

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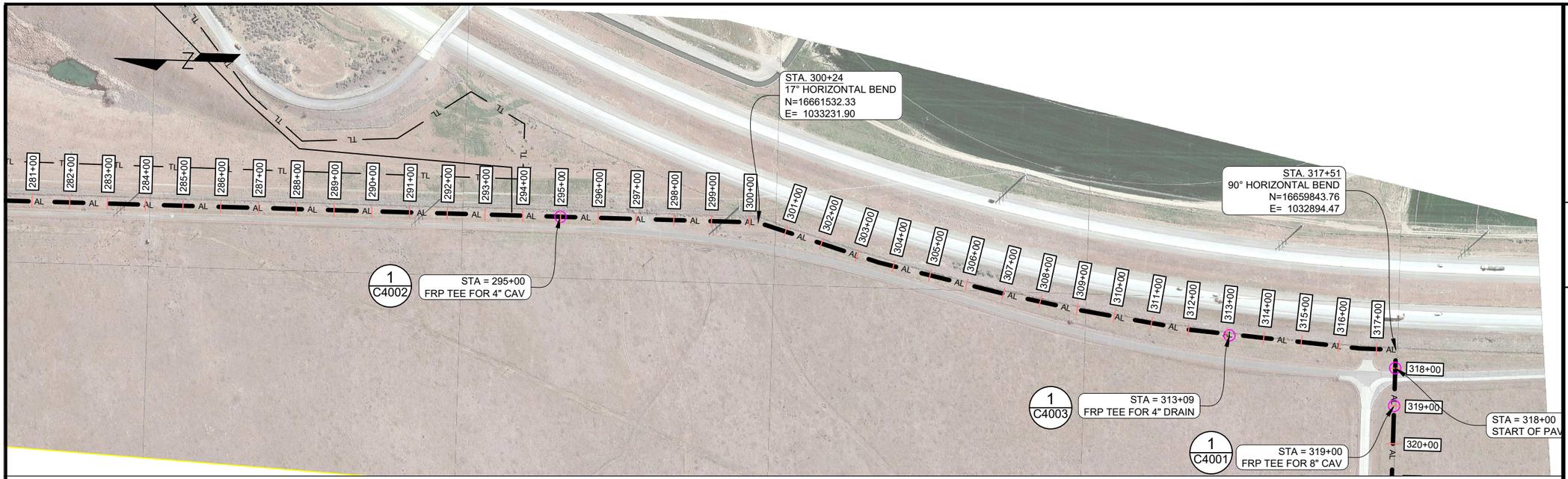

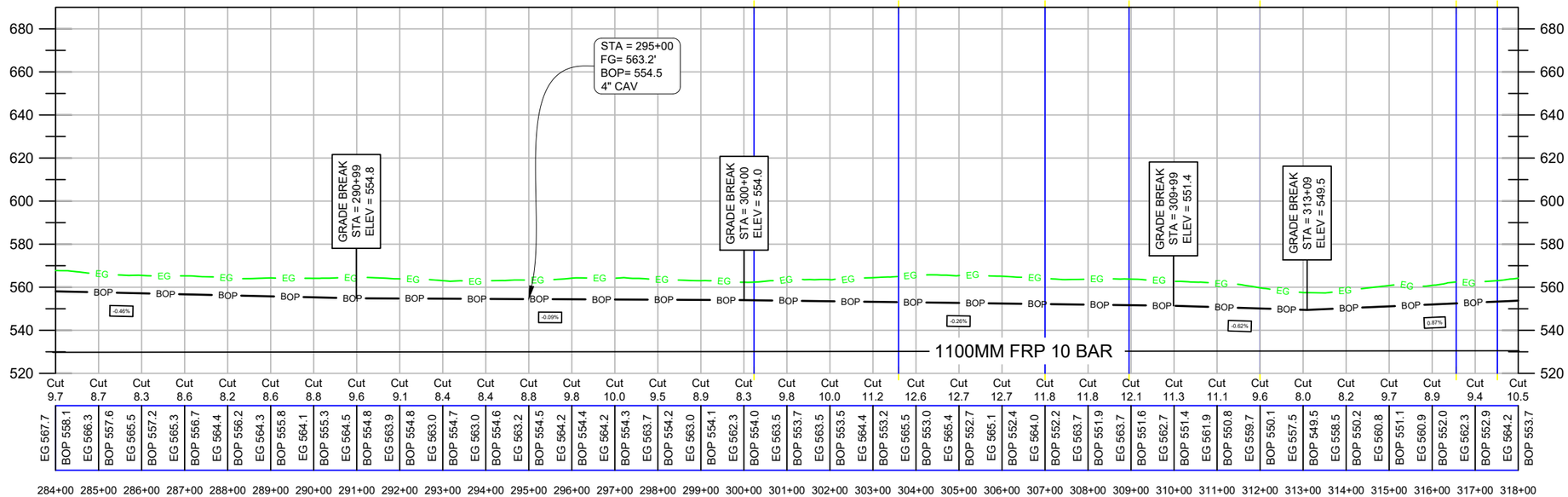

PROFILE VIEW: ORDNANCE MAIN 8 (1) (2) (2)
STA 284+00 TO STA 318+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG
BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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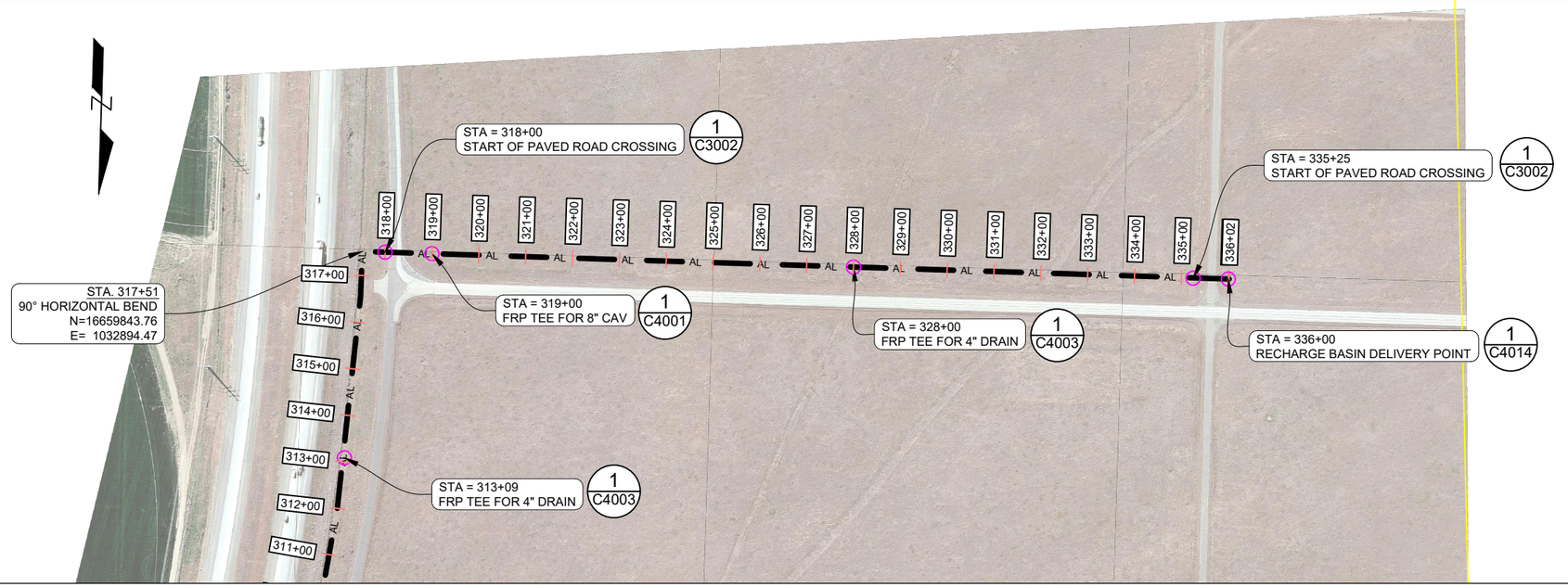

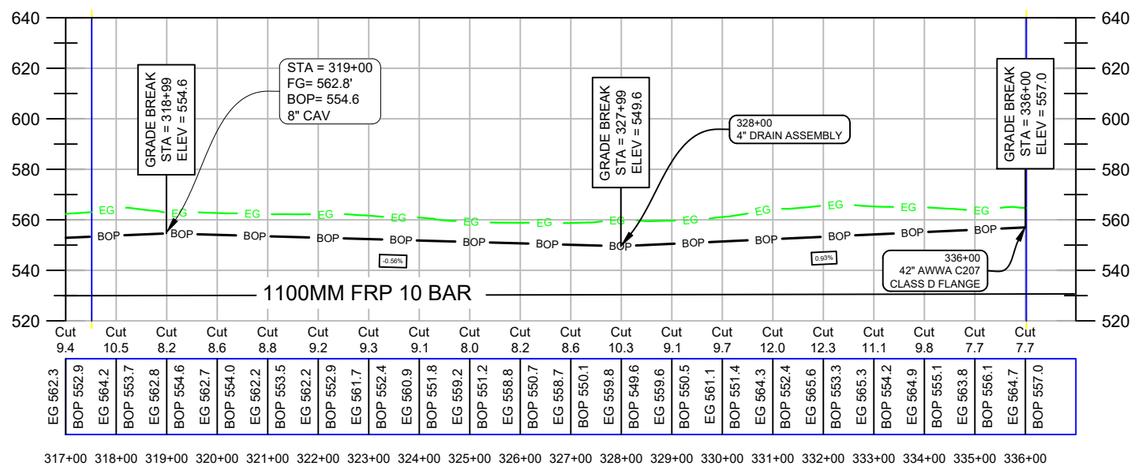

PROFILE VIEW: ORDNANCE MAIN 8 (1) (2) (3)
STA 317+00 TO STA 337+00
VERTICAL EXAGGERATION:5X

Cut=(EG-BOP)
EG / BOP
STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

Revisions

N0.	Description	Date
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0 SCALE CHECK 1"

Stamp:

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Sheet Name:
PLAN / PROFILE

Drawing Number:
C2013

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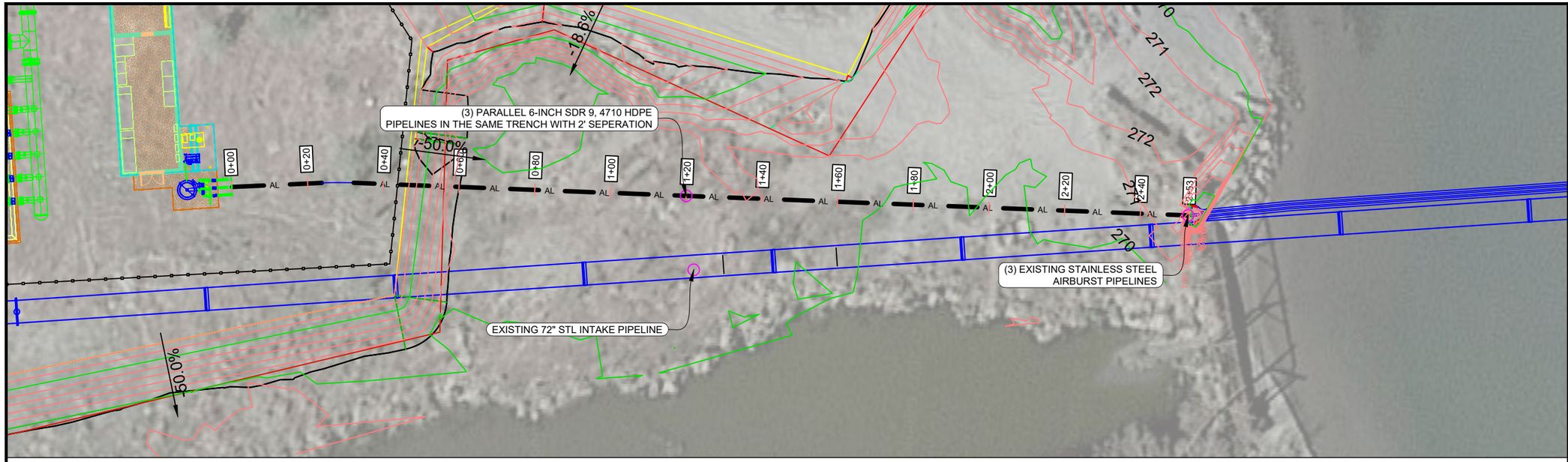

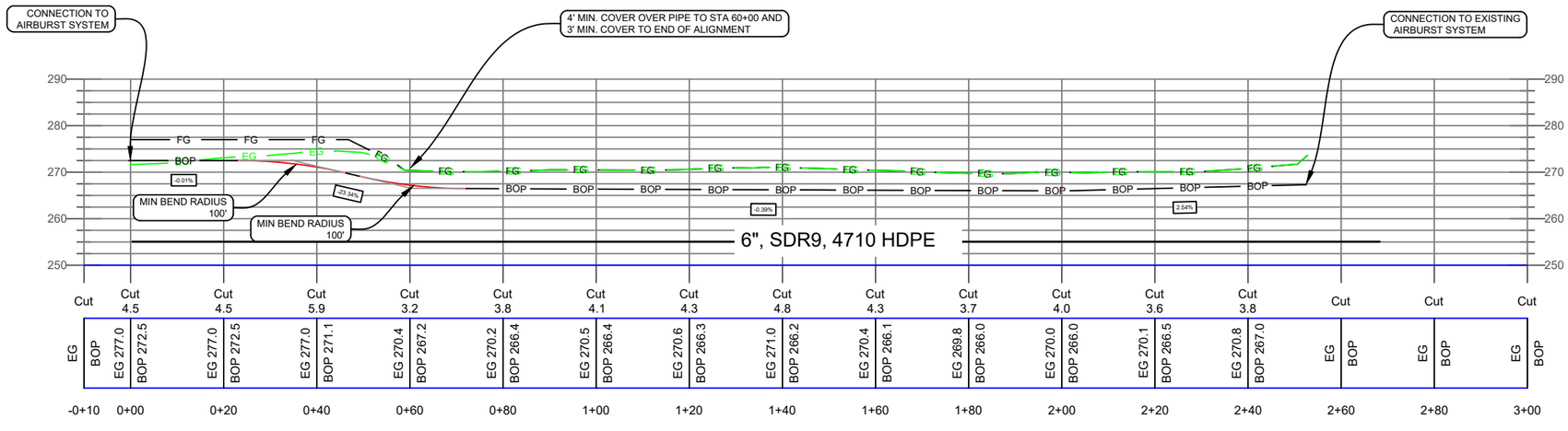

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING™
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

Revisions

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Sheet Name:

AIR BURST PLAN/PROFILE

Drawing Number:

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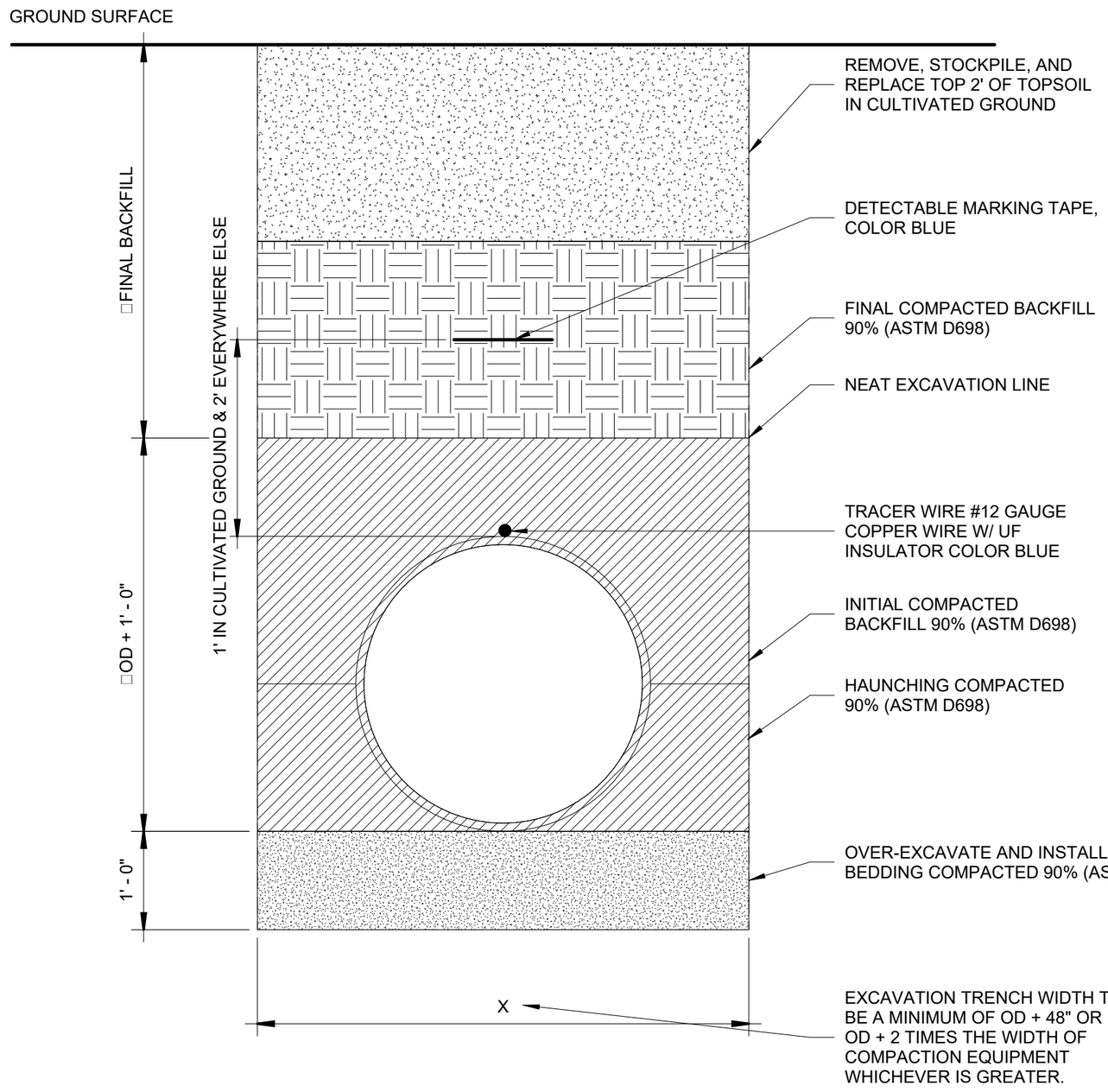

1 Typical Trench Detail
3/4" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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Engineer of Record:

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Sheet Name
TYPICAL TRENCH X-SECTION

Drawing Number
C2500

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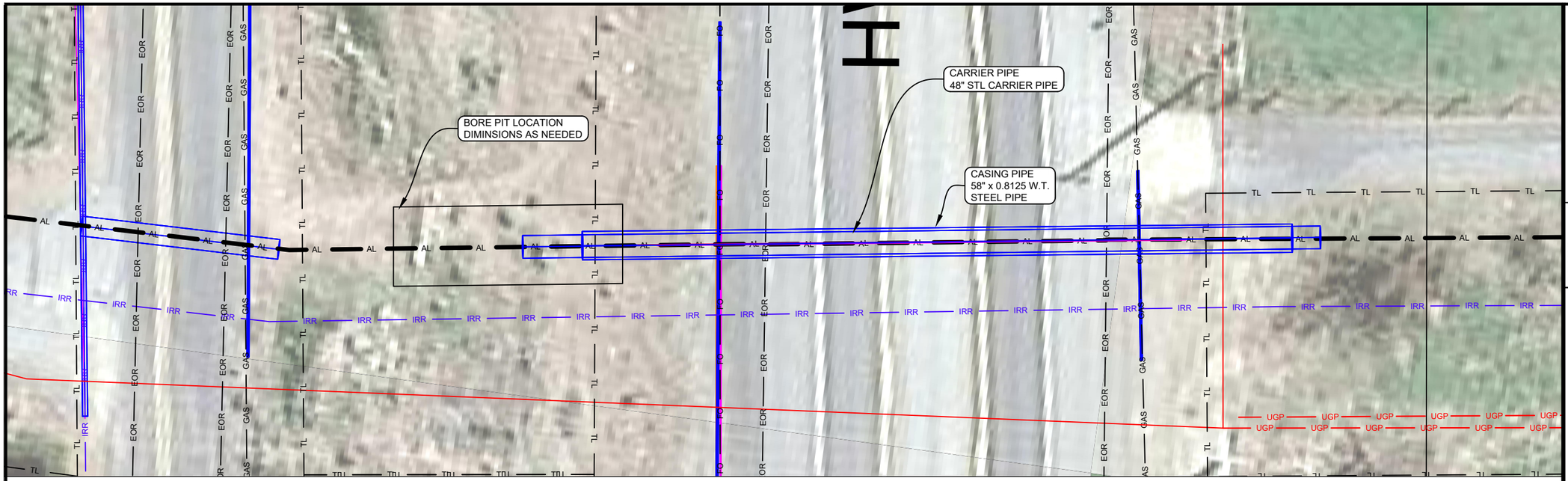

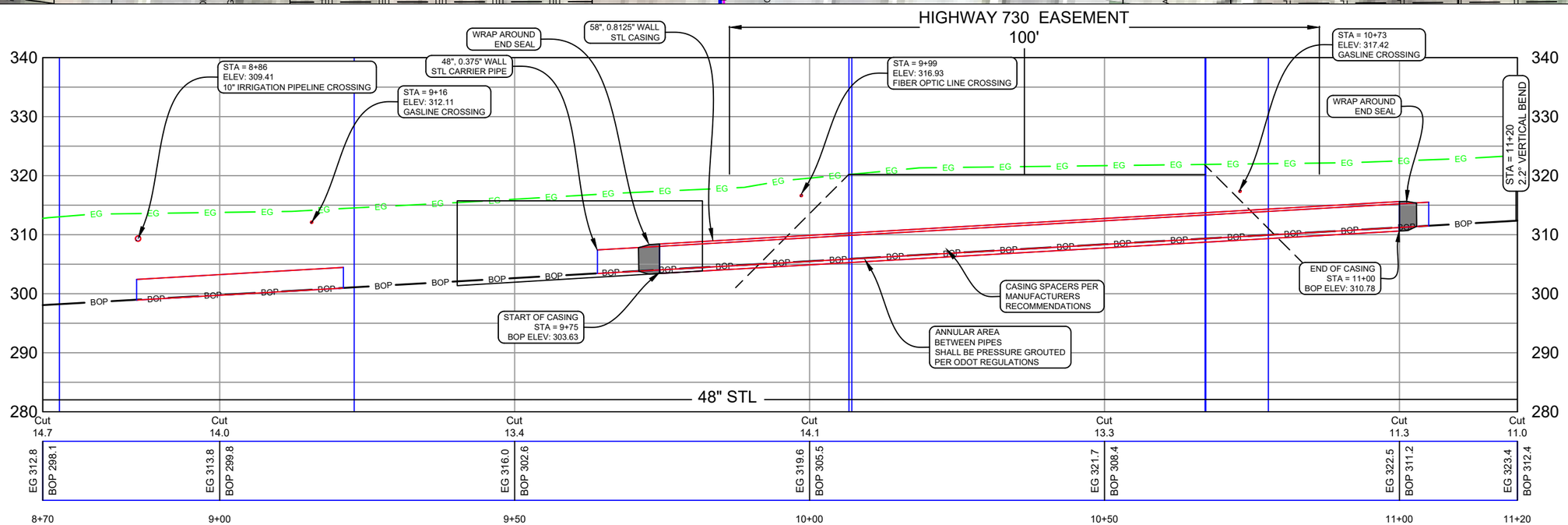

SOUTHSHORE DRIVE OPEN CUT

HIGHWAY 730 BORED CROSSING

1
C4003

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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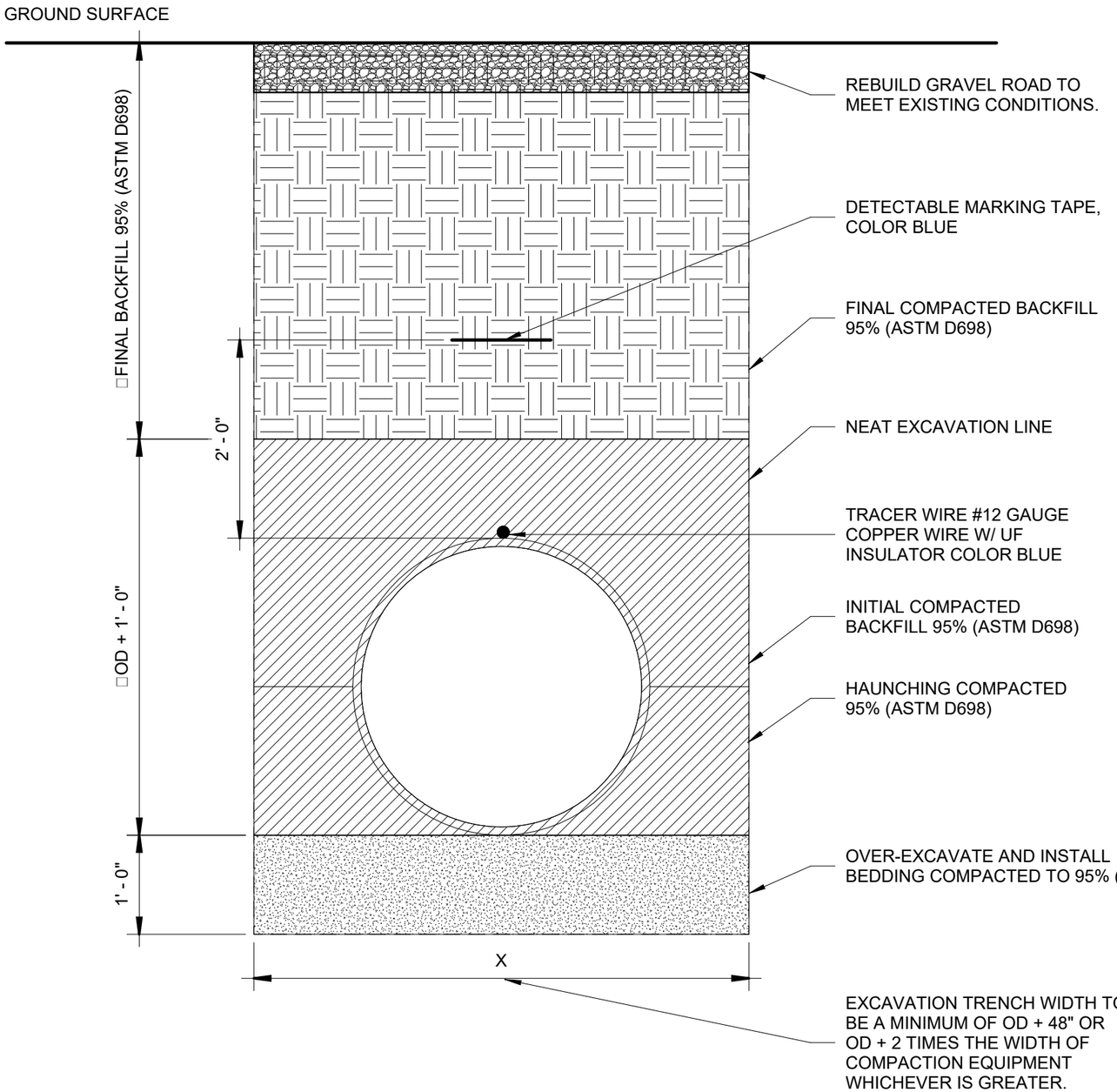

1 Gravel Road Trench Detail
3/4" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING™
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Engineer of Record:

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Sheet Name
GRAVEL ROAD TRENCH X-SECTION

Drawing Number
C3001

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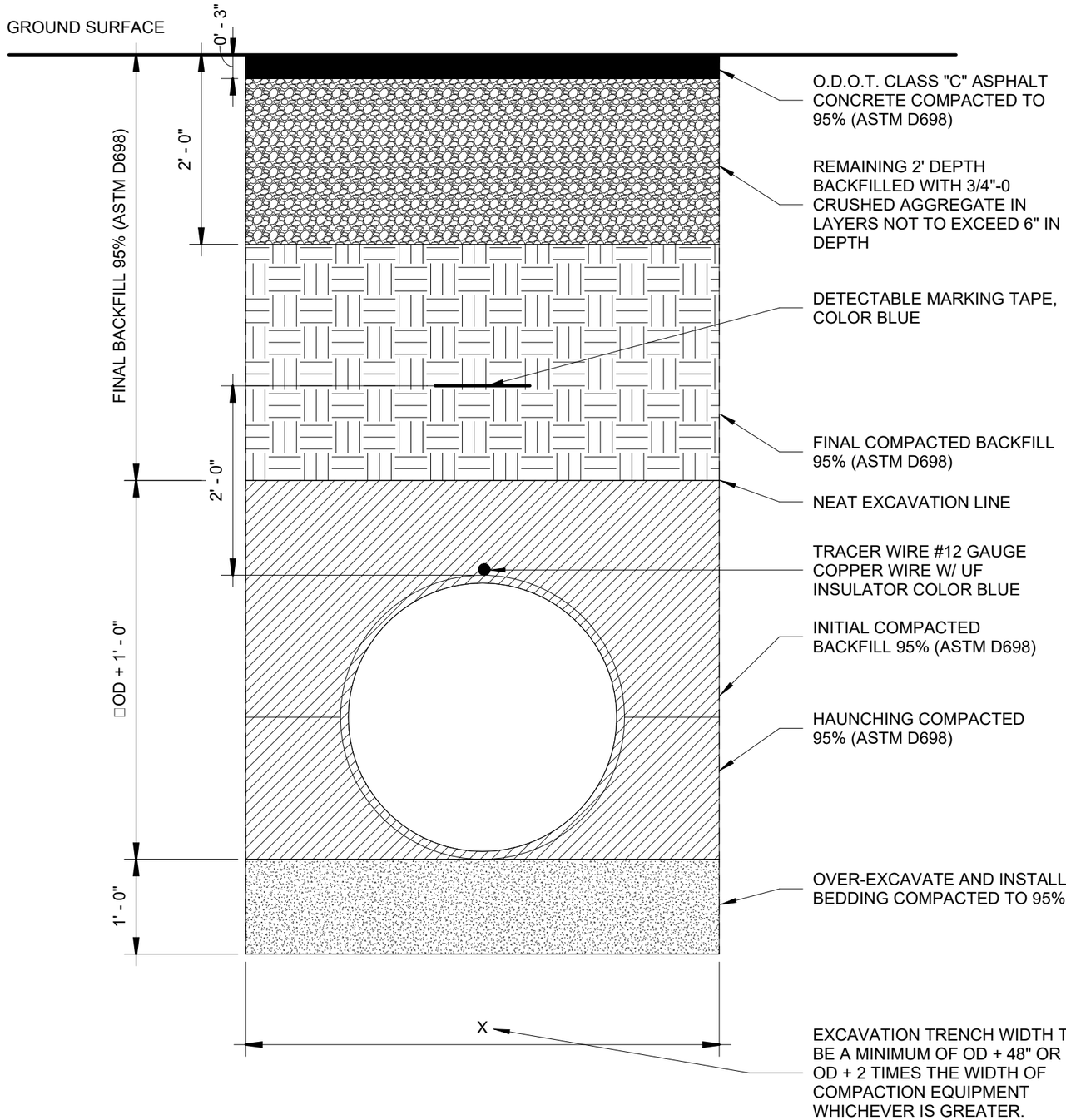

1 PAVED ROAD TRENCH X-SECTION
3/4" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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IRZ ENGINEERING™ & CONSULTING
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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
PAVED ROAD TRENCH X-SECTION

Drawing Number
C3002

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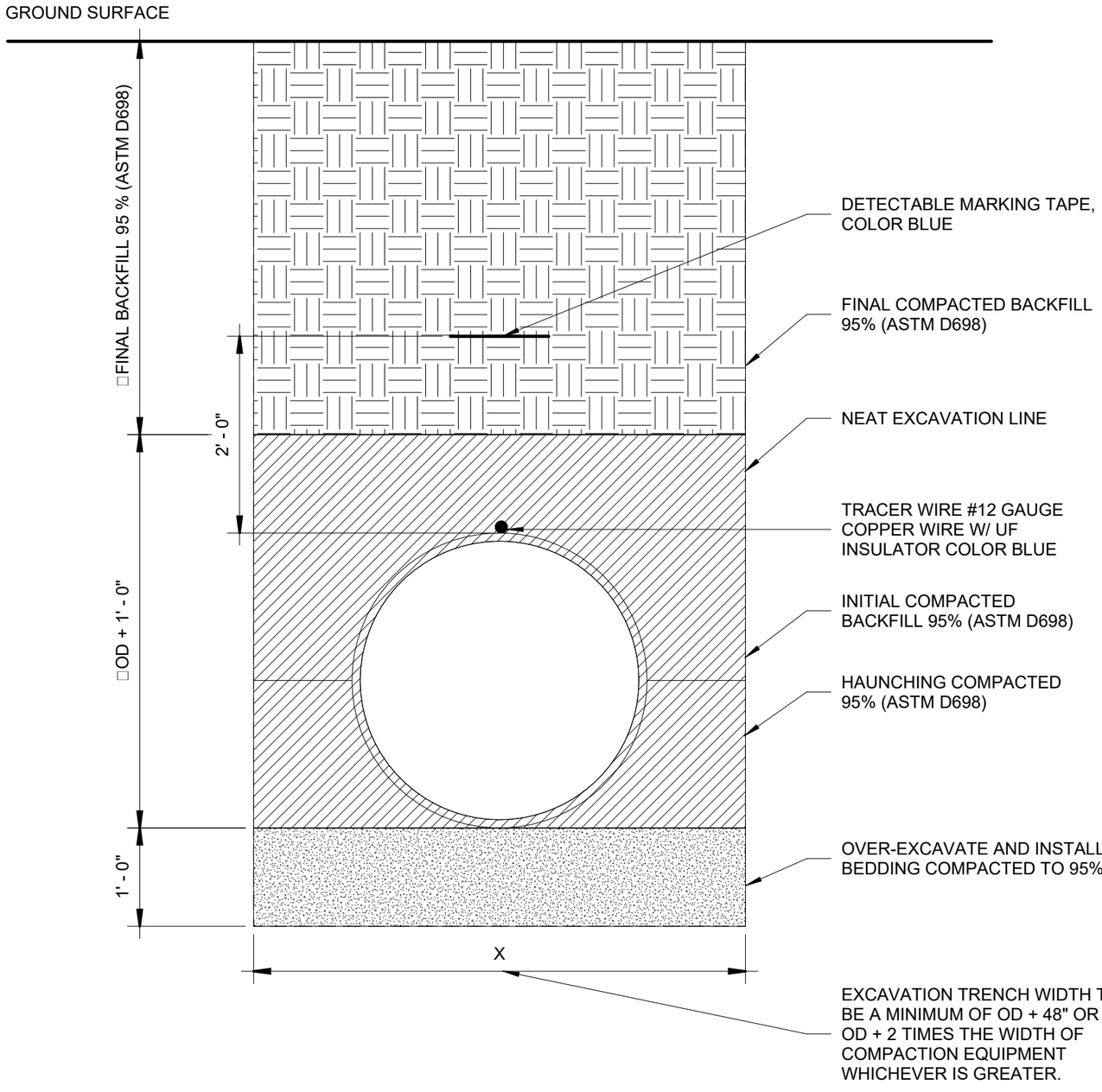

1 WEID Trench Detail
3/4" = 1'-0"

DRAWN	CG
DESIGNED	TL
APPROVED	-
DATE	07/05/22
SCALE	3/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

REGISTERED PROFESSIONAL ENGINEER
96512PE
OREGON
SEPT. 08, 2020
JAMES LORD
EXPIRES: 12/31/24

Sheet Name
WEID TRENCH X-SECTION

Drawing Number
C3003

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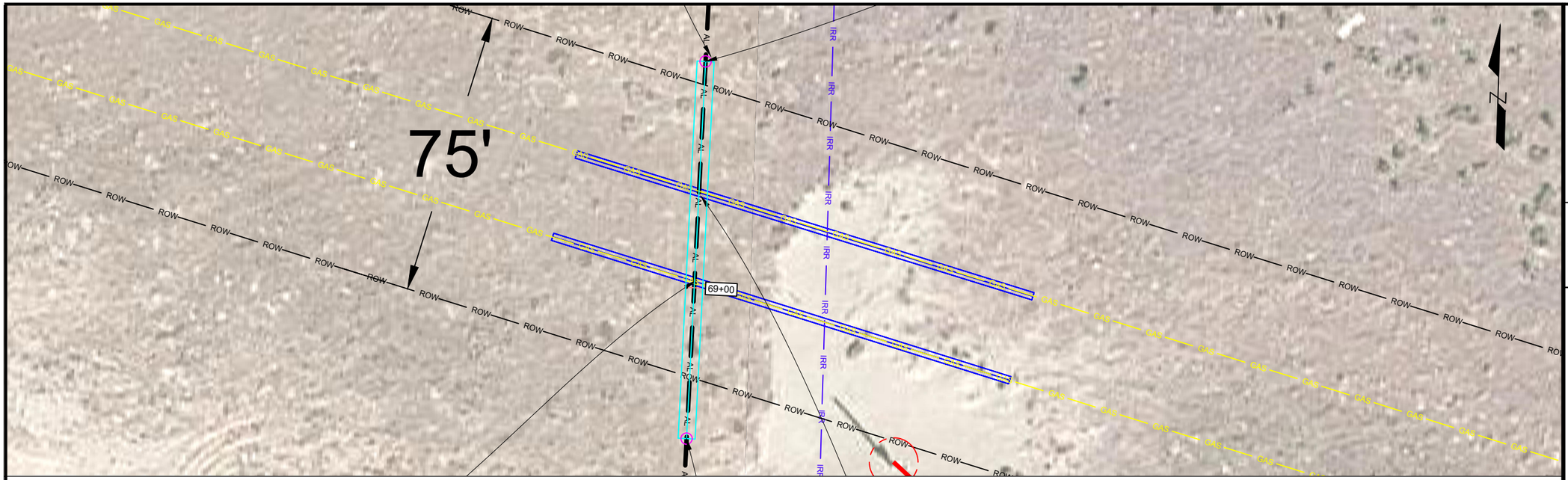

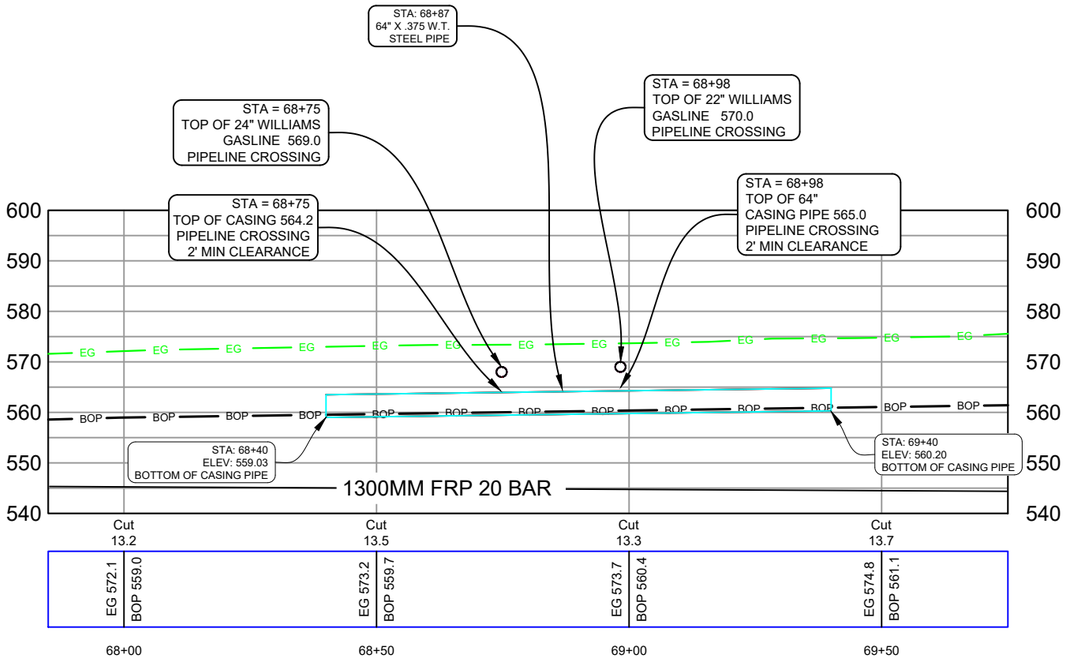

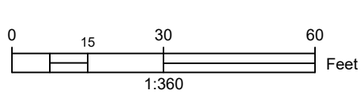

Cut=(EG-BOP)

EG | BOP

STA NUM

NOTES:
CUT - EXISTING GROUND SURFACE (EG) - BOTTOM OF PIPE (BOP).
AT GRADE BREAKS DEFLECT PIPE JOINTS PER MFG. SPEC
MAINTAIN 4-FT COVER
PIPE CROSSINGS MAINTAIN 1-FT CLEARANCE.
PROJECTION: UTM83-11IF

DRAWN	MIKE CARSON
DESIGNED	MIKE CARSON
APPROVED	-
DATE	JUNE 2022
SCALE	1" = 300'
PROJECT	675-20-001

UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

Revisions

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Sheet Name:
PLAN / PROFILE

Drawing Number:
C3010

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AIR VENT SCHEDULE

STATION (FT)	SHEET	TYPE	CONNECTION TYPE	XX" SIZE	ORIFACE SIZE
26+00	C4008	CRISPIN VR201/AL40/S20S	FLANGED	20"	0.313
42+00	C4002	CRISPIN AL40/S20S	THREADED	4"	0.313
61+50	C4002	CRISPIN AL40/S20S	THREADED	4"	0.313
84+50	4001	CRISPIN VR81/AL40/S20S	FLANGED	8"	0.313
102+02	4001	CRISPIN VR121/AL40/S20S	FLANGED	12"	0.375
130+00	C4002	CRISPIN AL40/S20S	THREADED	4"	0.375
158+70	4001	CRISPIN VR161/AL40/S20S	FLANGED	16"	0.438
163+55	C4005	CRISPIN VR81/AL40/S20S	FLANGED	8"	0.438
193+00	4001	CRISPIN VR81/AL40/S20S	FLANGED	8"	0.438
215+00	4001	CRISPIN VR81/AL40/S20S	FLANGED	8"	0.438
240+00	4001	CRISPIN VR61/AL40/S20S	FLANGED	6"	0.438
270+61	C4008	CRISPIN AL40/S20S	THREADED	4"	0.375
270+61	C4008	CRISPIN VR81/AL40/S20S	FLANGED	8"	0.438
295+00	C4002	CRISPIN AL40/S20S	THREADED	4"	0.375
319+00	4001	CRISPIN VR81/AL40/S20S	FLANGED	8"	0.375
336+00	C4015	CRISPIN AL40/S20S	THREADED	4"	0.313

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
MAINLINE AIR VENT SPECIFICATIONS

Drawing Number
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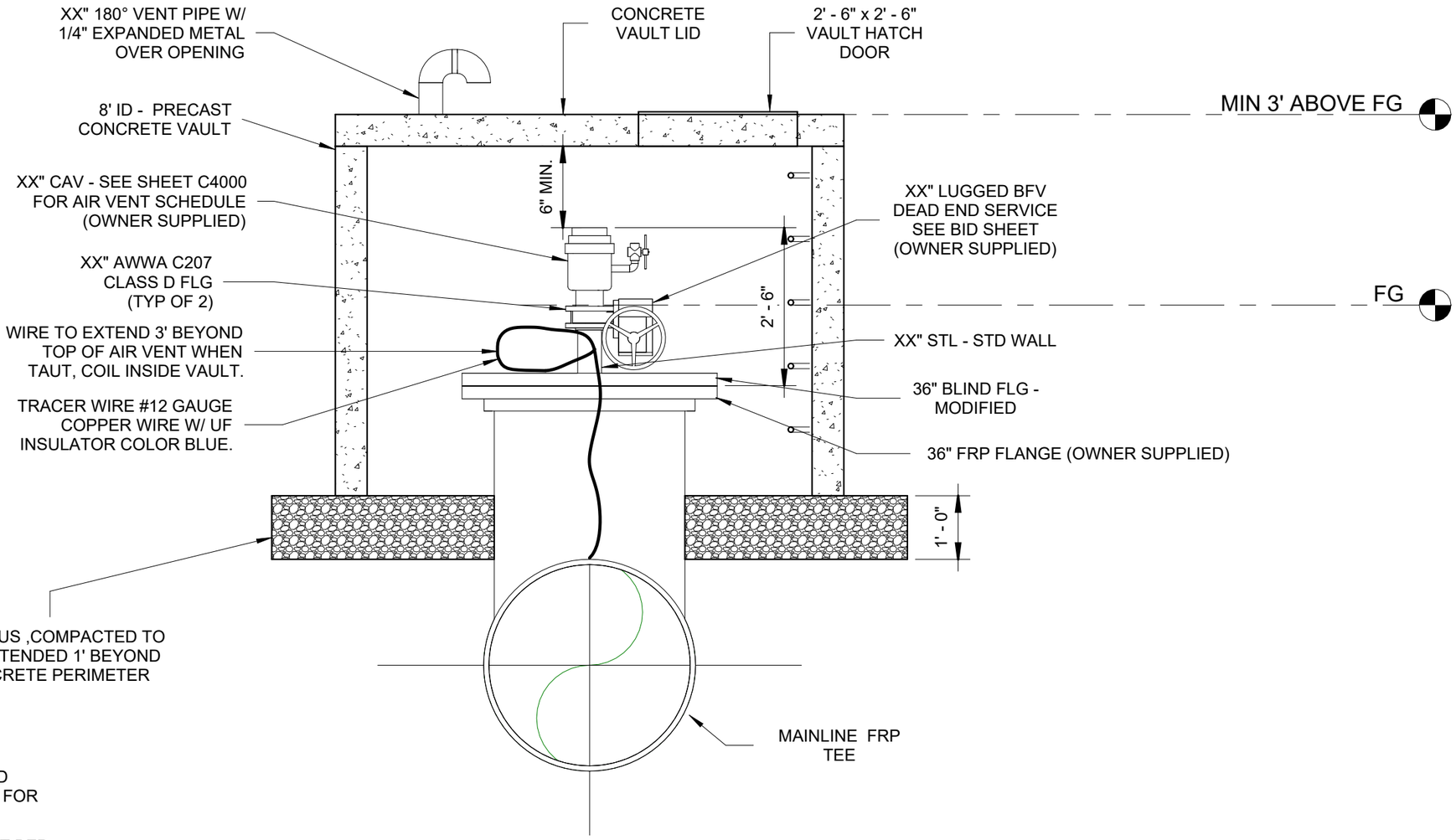

NOTE: SEE PLAN AND PROFILE DRAWINGS FOR CUT DEPTHS.

NOTE:LINE AND COAT PER SPECIFICATION 33-05-24.

2 FLANGED AIR VENT SECTION VIEW

1/2" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name: FLANGED AIR VENT

Drawing Number: C4001

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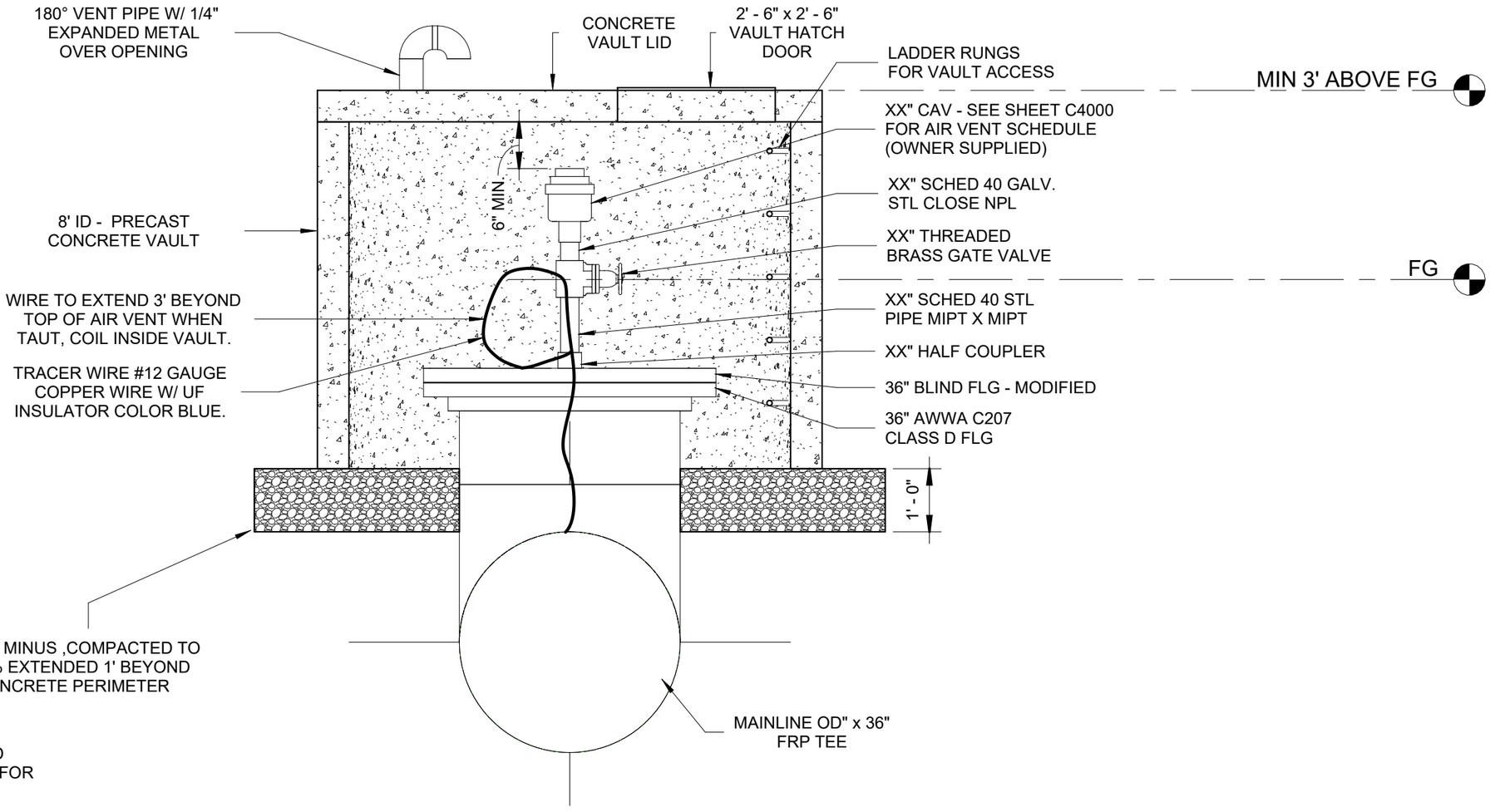

NOTE: SEE PLAN AND PROFILE DRAWINGS FOR STATIONING.

NOTE: LINE AND COAT PER SPECIFICATION 33-05-24. GALVANIZED PIPE IS ALSO AN APPROVED EQUAL.

(2) THREADED AIR VENT SECTION VIEW
1/2" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
THREADED AIR VENT

Drawing Number
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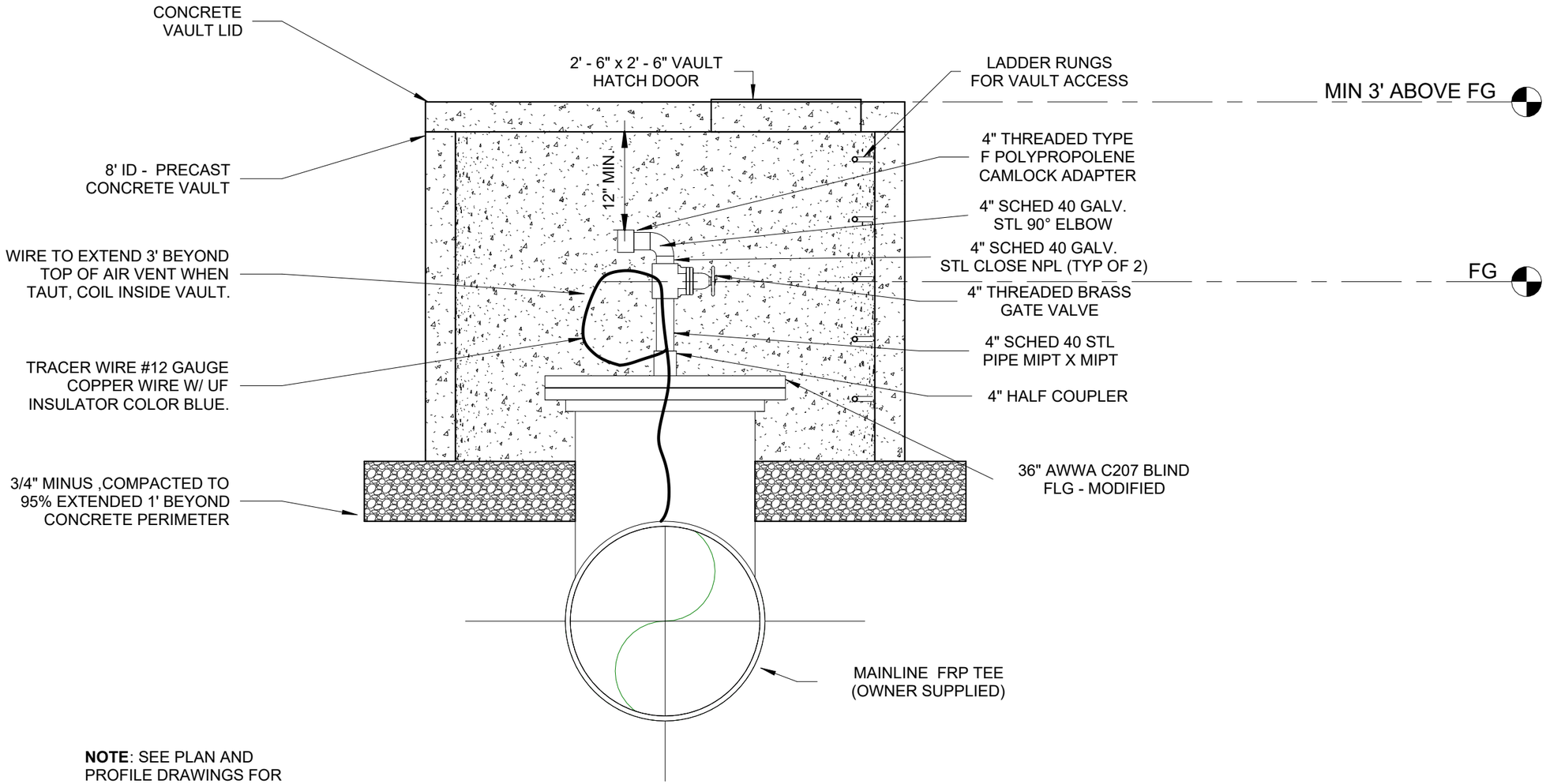

NOTE: SEE PLAN AND PROFILE DRAWINGS FOR STATIONING.

NOTE: LINE AND COAT PER SPECIFICATION 33-05-24. GALVANIZED PIPE IS ALSO AN APPROVED EQUAL.

(2) DRAIN STATION 149+00 SECTION VIEW
1/2" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING™
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Engineer of Record:

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Sheet Name: DRAIN DETAILS

Drawing Number: C4003

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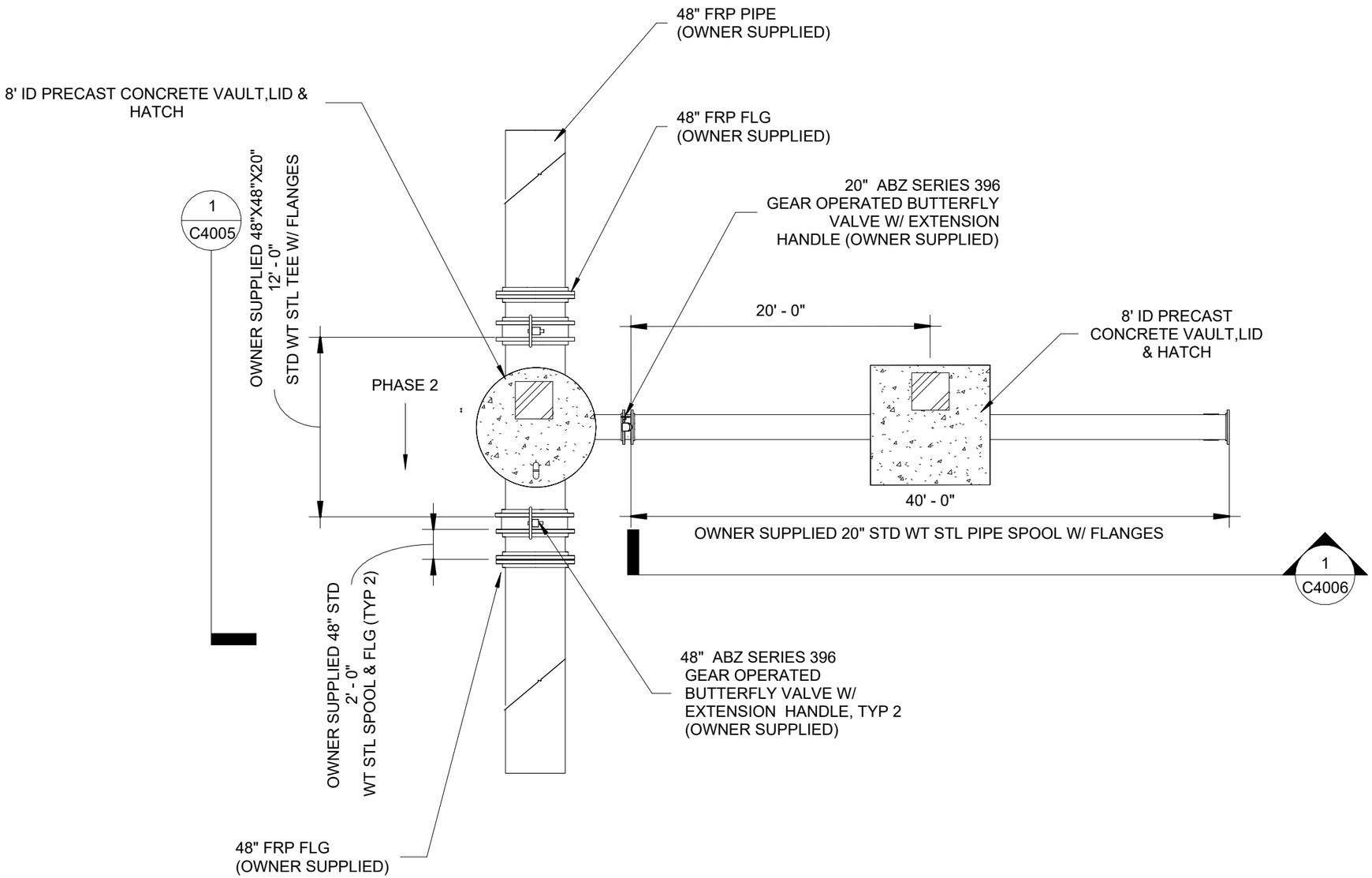

1 COU DELIVERY POINT PLAN VIEW
1/8" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/8" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

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Engineer of Record:

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Sheet Name
COU DELIVERY POINT PLAN VIEW

Drawing Number
C4004

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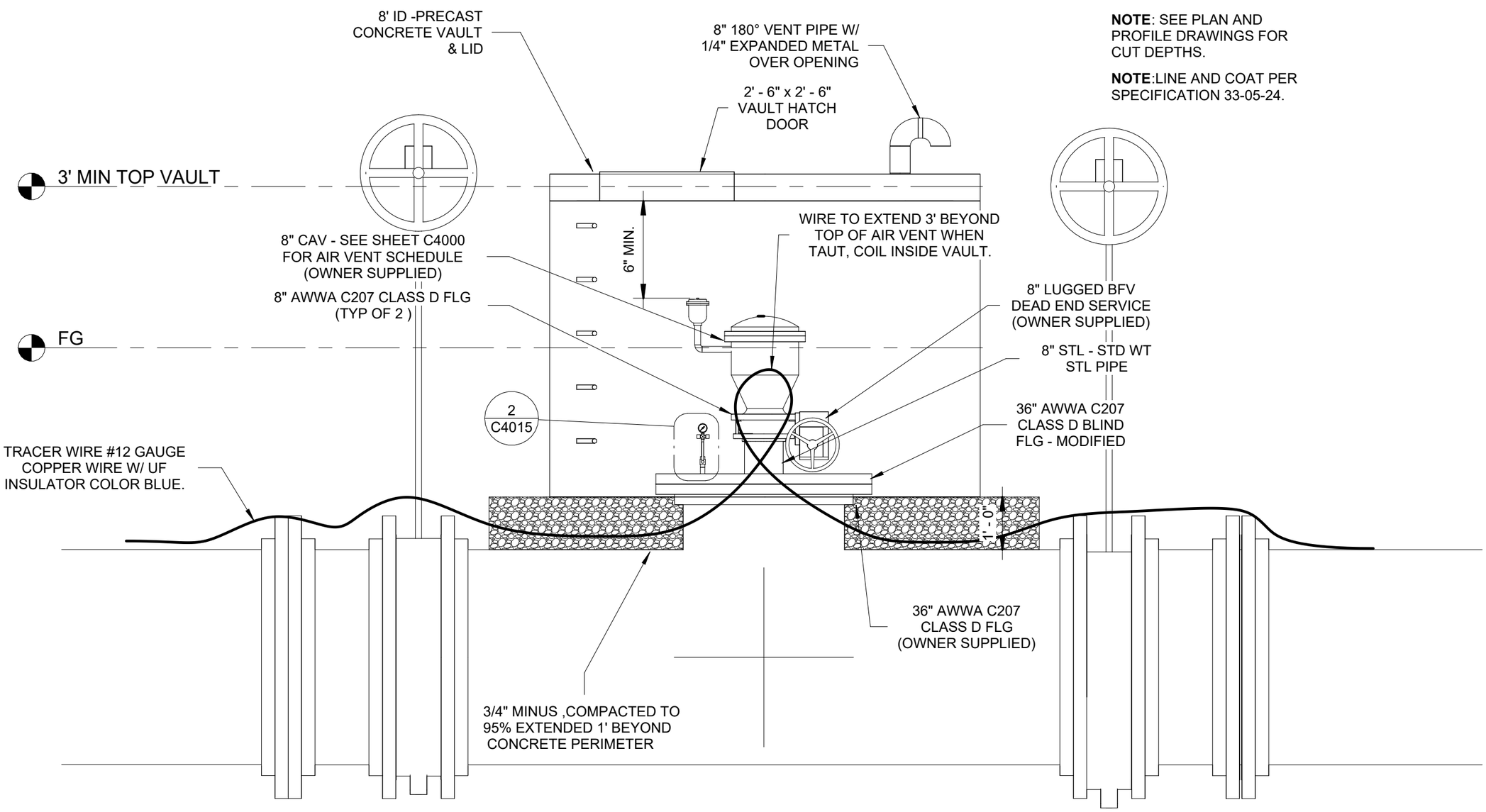

NOTE: SEE PLAN AND PROFILE DRAWINGS FOR CUT DEPTHS.

NOTE:LINE AND COAT PER SPECIFICATION 33-05-24.

1 COU DELIVERY POINT SECTION VIEW
1/2" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

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Engineer of Record:

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Sheet Name
COU DELIVERY POINT SECTIONVIEW

Drawing Number
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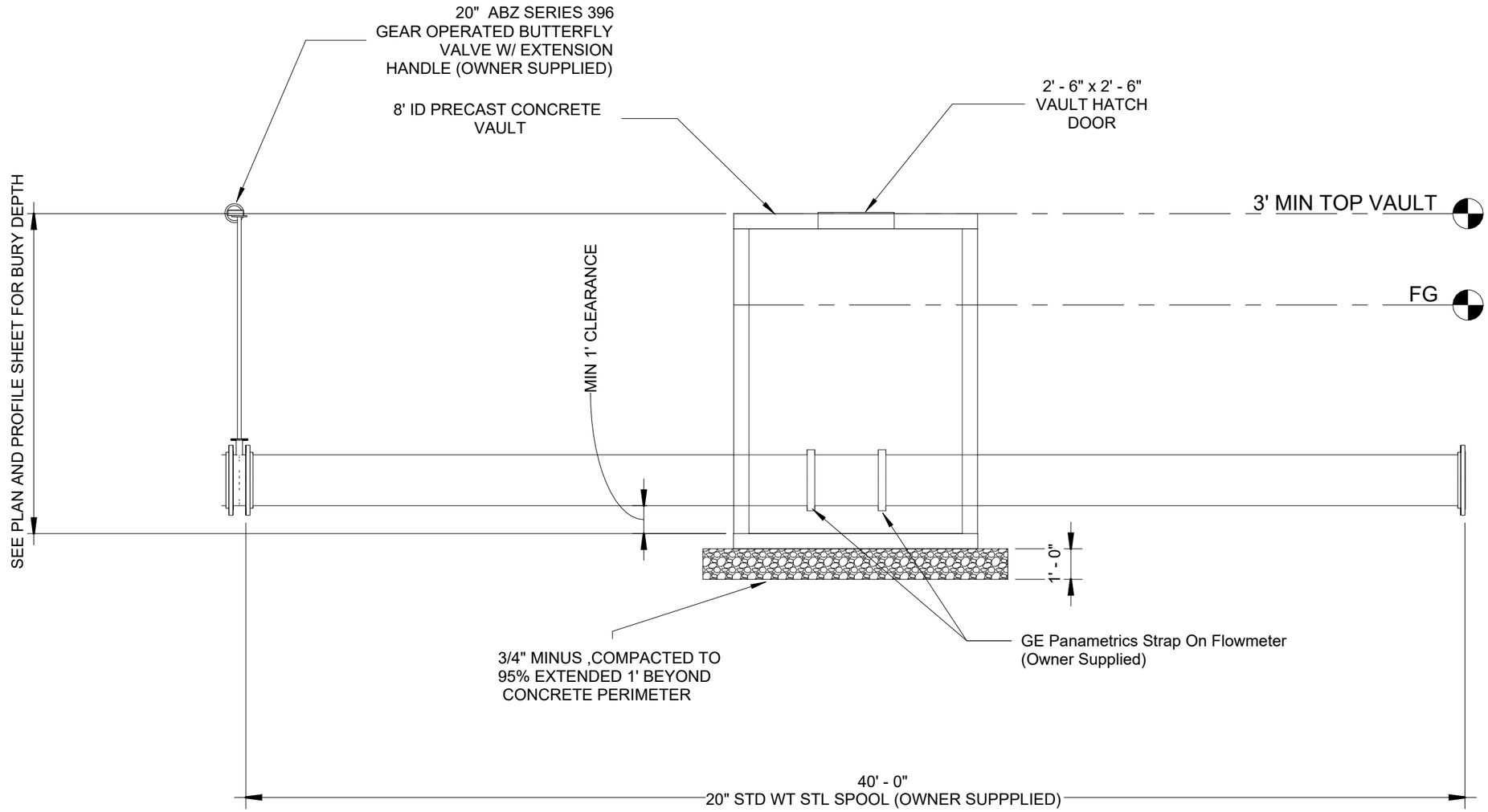

1 COU DELIVERY POINT FLOWMETER
1/4" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
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OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
COU DELIVERY POINT FLOWMETER

Drawing Number
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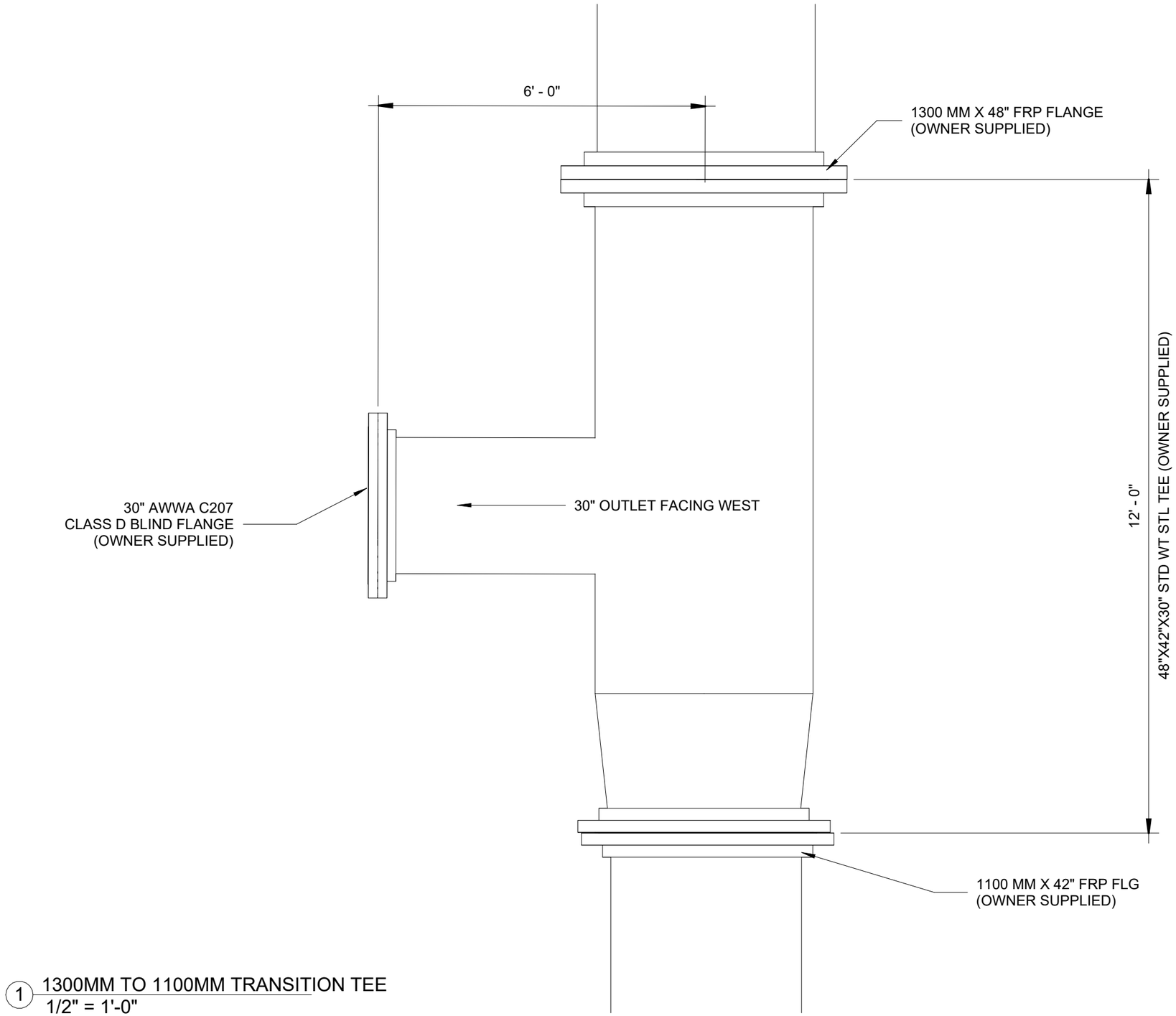

1 1300MM TO 1100MM TRANSITION TEE
1/2" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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Engineer of Record:

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Sheet Name
1300MM TO 1100MM TRANSITION TEE

Drawing Number
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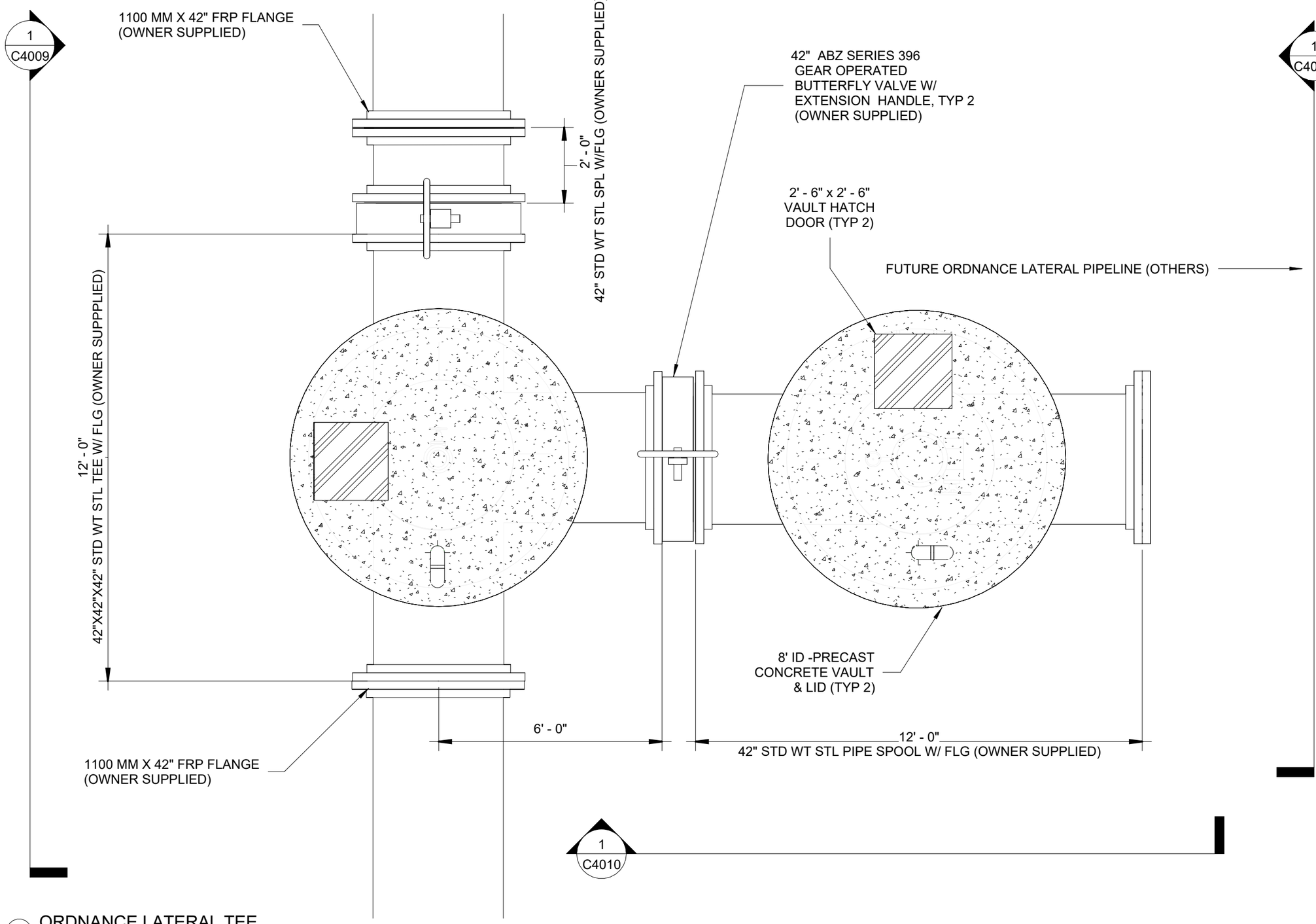

1 ORDNANCE LATERAL TEE
3/8" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/8" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING™
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
ORDANCE LATERAL TEE

Drawing Number
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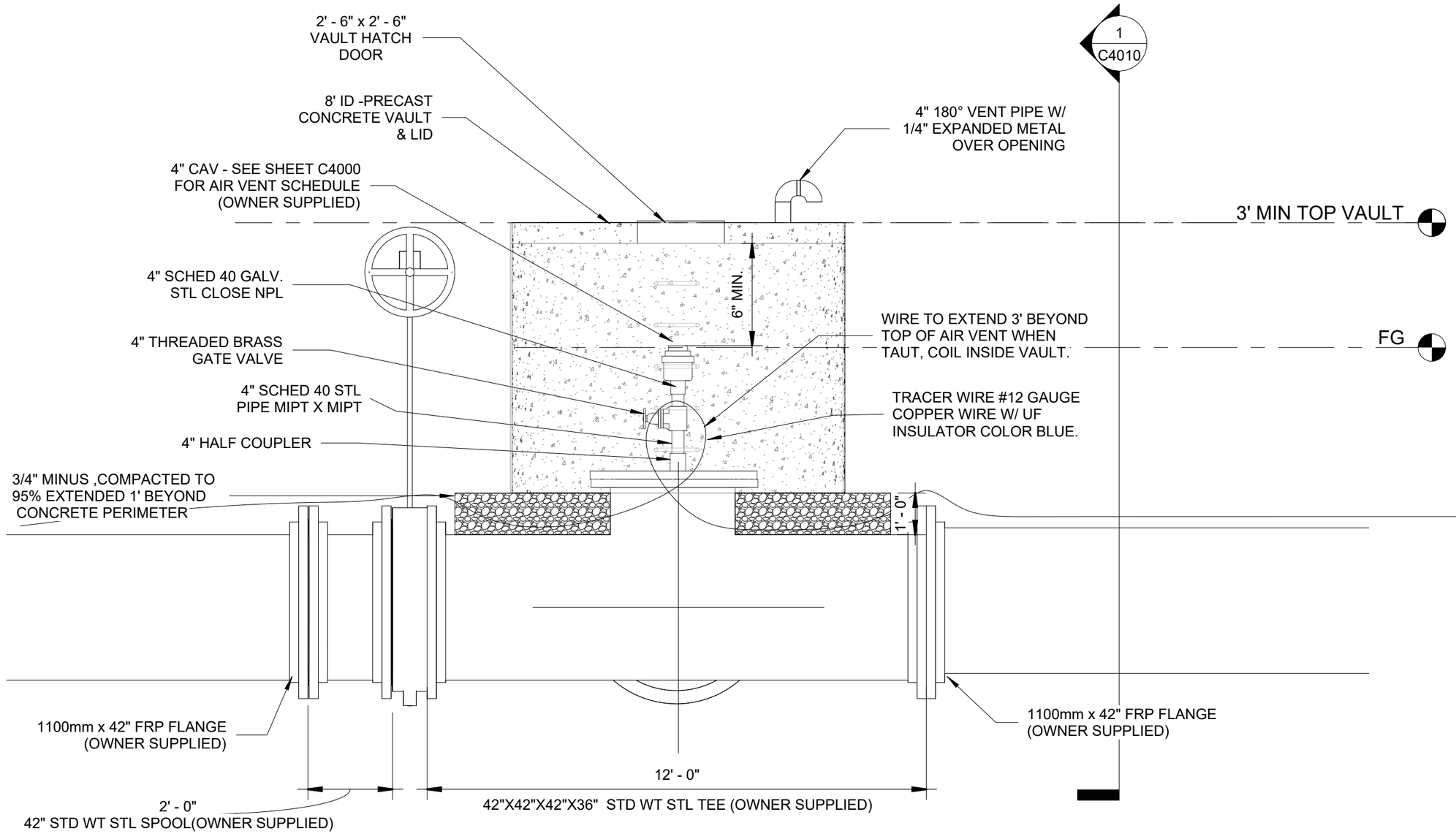

1 ORDNANCE LATERAL TEE SIDE VIEW #1
3/8" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/8" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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4		

0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
ORDANCE LATERAL TEE #1

Drawing Number
C4009

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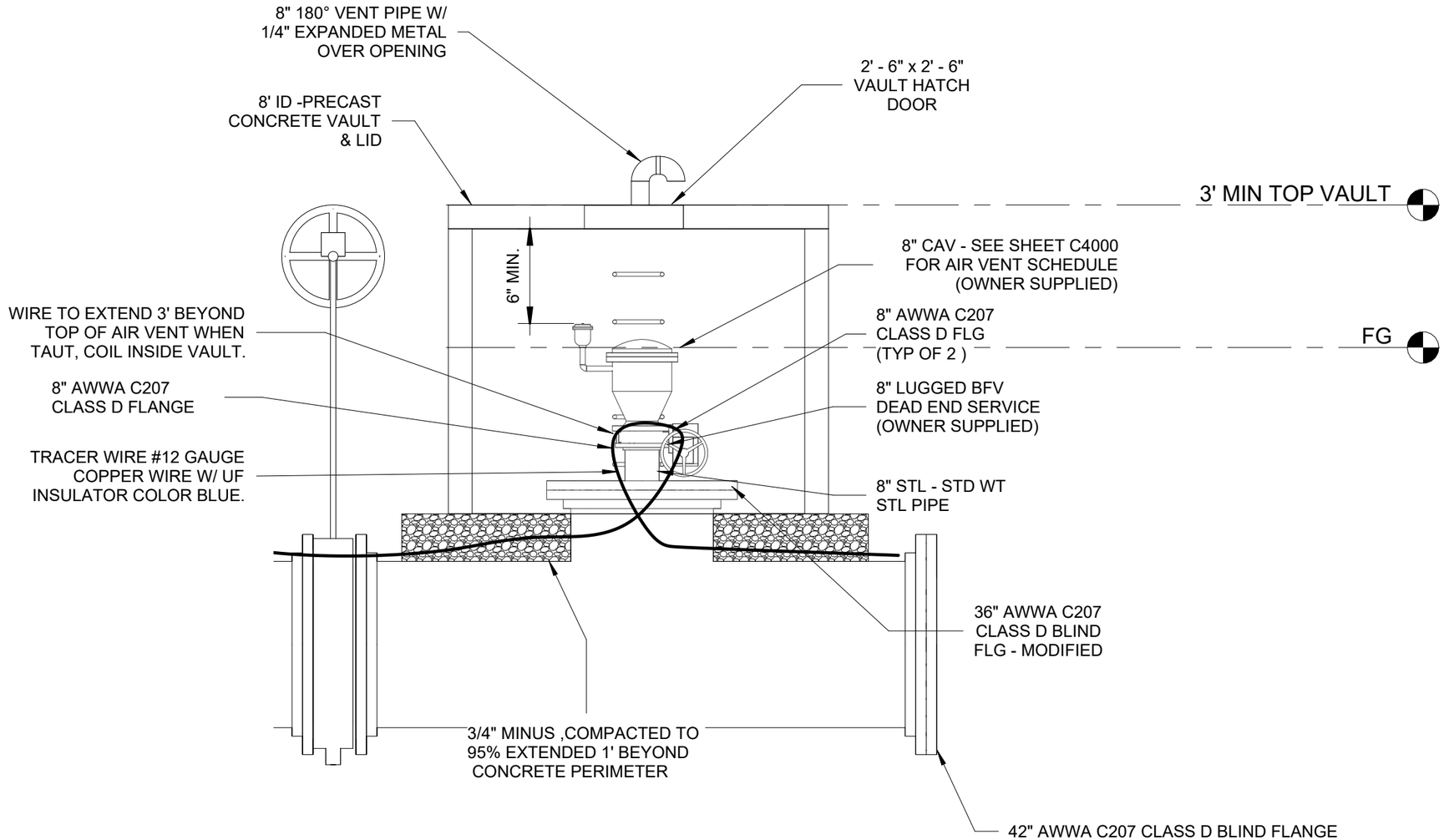

1 ORDANCE LATERAL TEE SIDEVIEW #2
3/8" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/8" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
ORDNACE LATERAL TEE #2

Drawing Number
C4010

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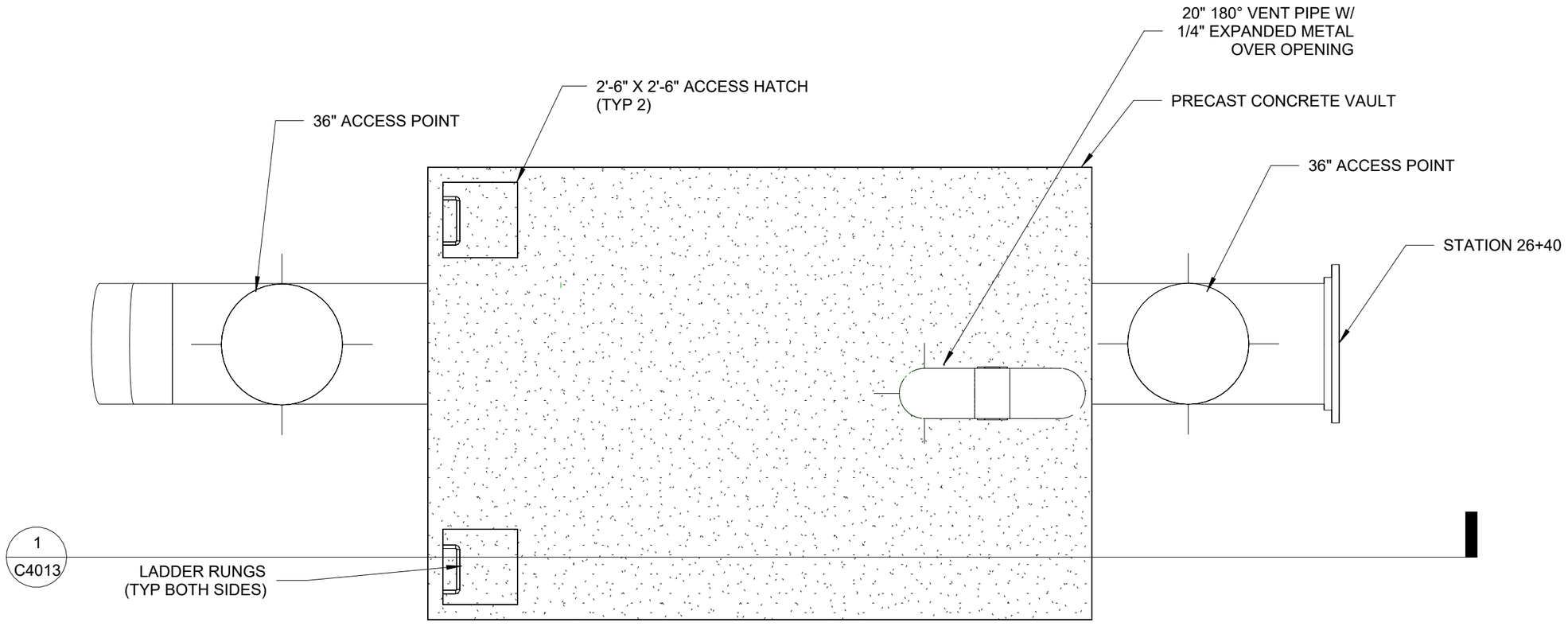

1 CHECK VALVE ASSEMBLY PLAN VIEW
1/4" = 1'-0"

DRAWN	Josh Obendorf
DESIGNED	Ty Lord
APPROVED	-
DATE	03/03/23
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
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Sheet Name
CHECK VALVE ASSEMBLY
AND VAULT PLAN VIEW

Drawing Number
C4011

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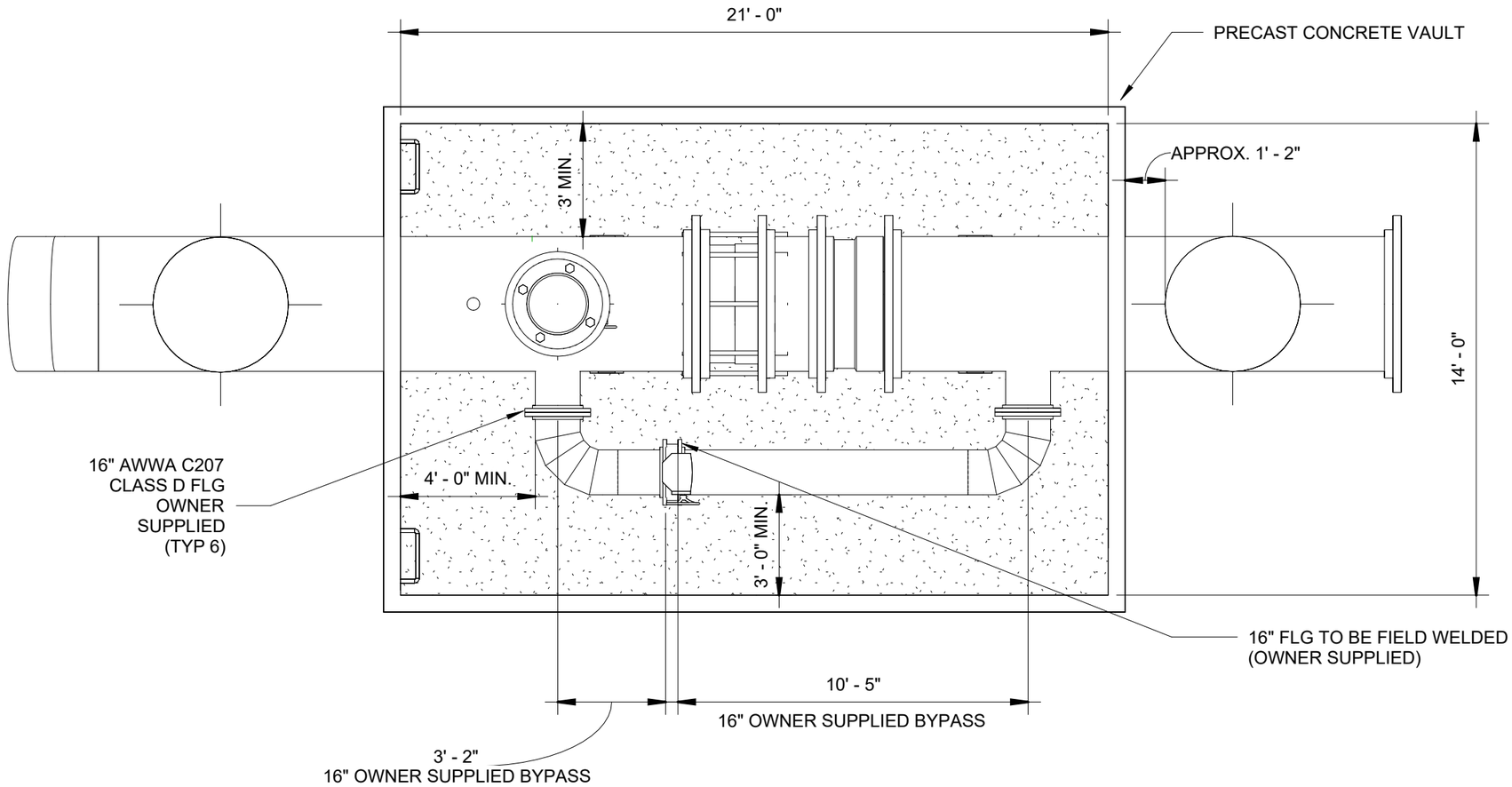

1 CHECK VALVE AND VAULT ASSEMBLY
1/4" = 1'-0"

DRAWN	Josh Obendorf
DESIGNED	Ty Lord
APPROVED	-
DATE	03/03/23
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
CHECK VALVE ASSEMBLY AND VAULT ASSEMBLY

Drawing Number
C4012

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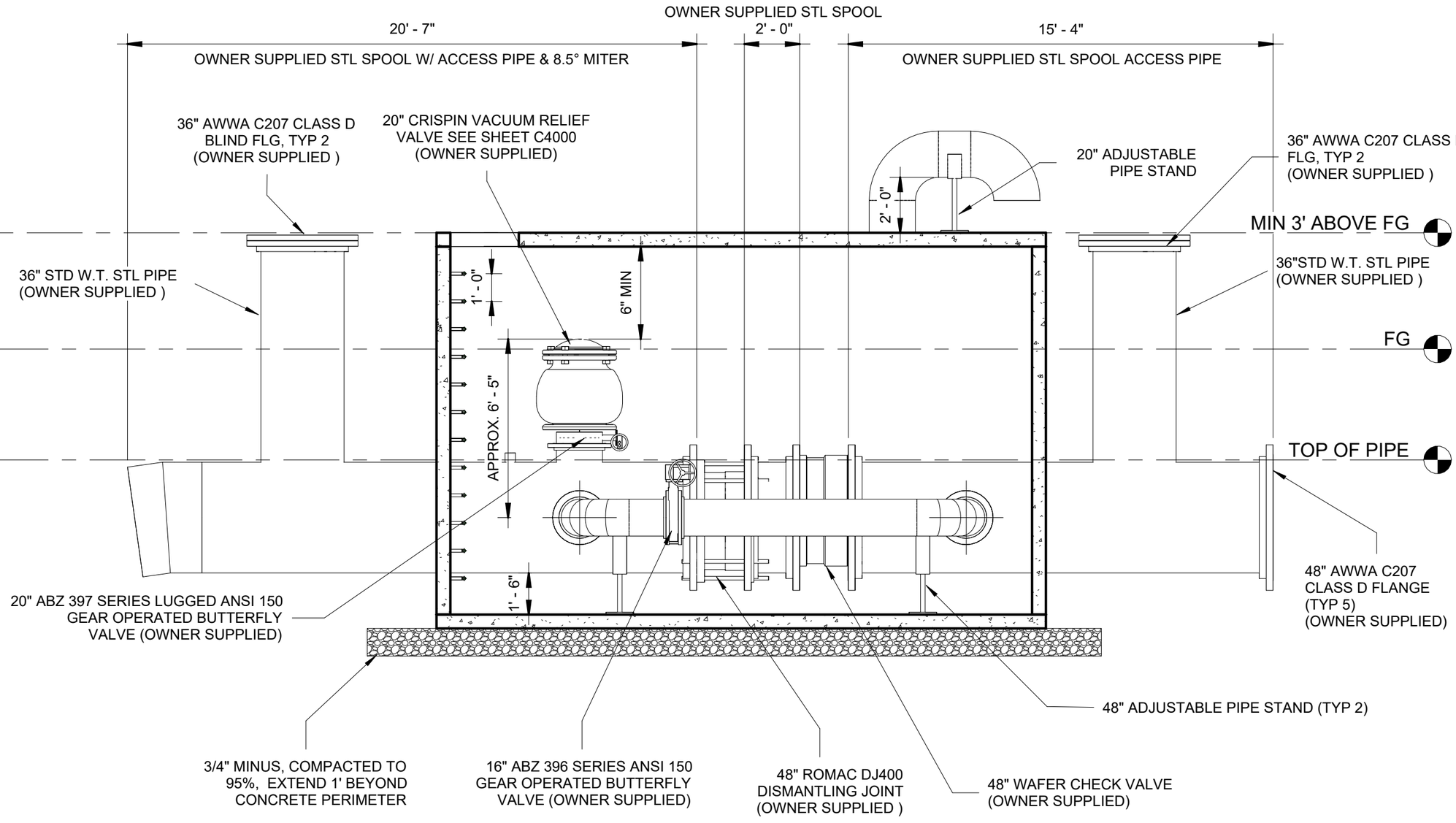

1 CHECK VALVE ASSEMBLY SIDE VIEW
1/4" = 1'-0"

DRAWN	Josh Obendorf
DESIGNED	Ty Lord
APPROVED	-
DATE	03/03/23
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
CHECK VALVE ASSEMBLY AND VAULT SIDE VIEW

Drawing Number
C4013

3/9/2023 4:53:37 PM

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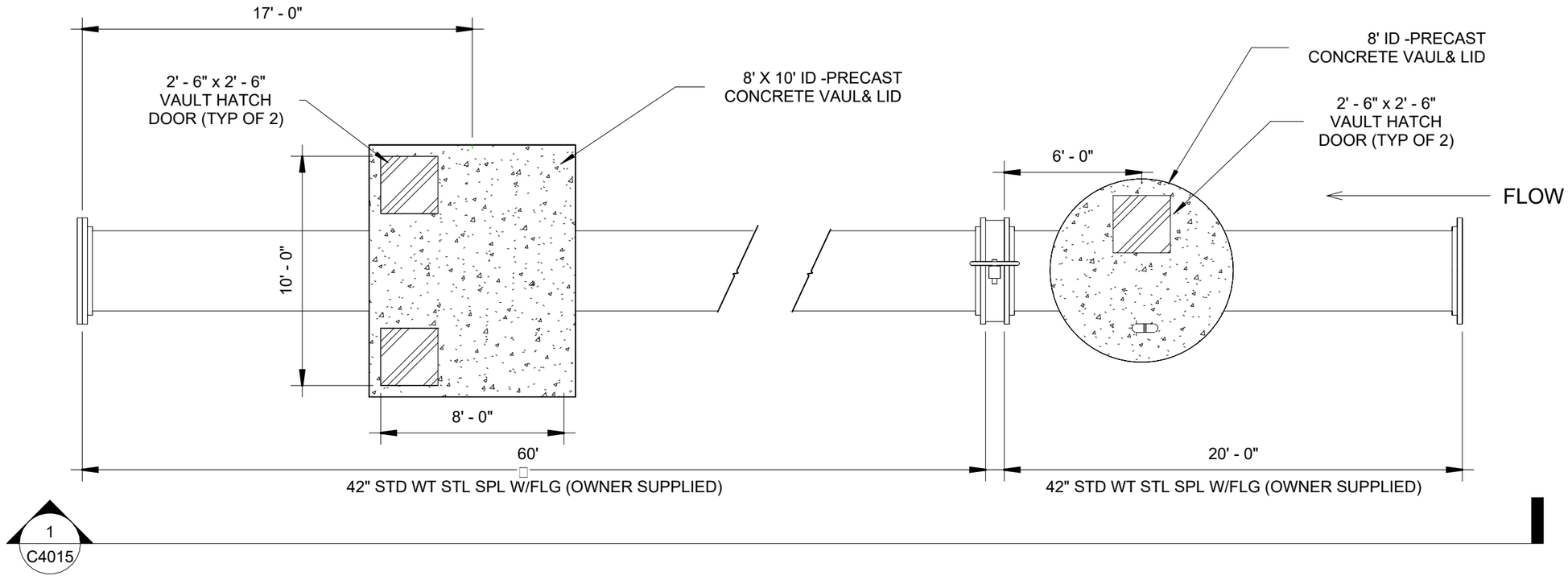

1 FLOWMETER 336+00
3/16" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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ONLY, NOT FOR CONSTRUCTION

Sheet Name
RECHARGE BASIN
DELIVERY POINT PLAN VIEW

Drawing Number
C4014

3/9/2023 3:42:39 PM

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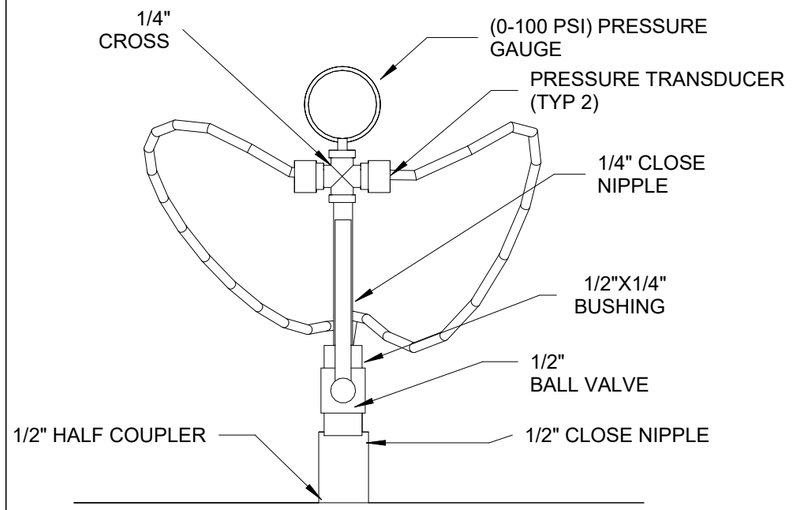
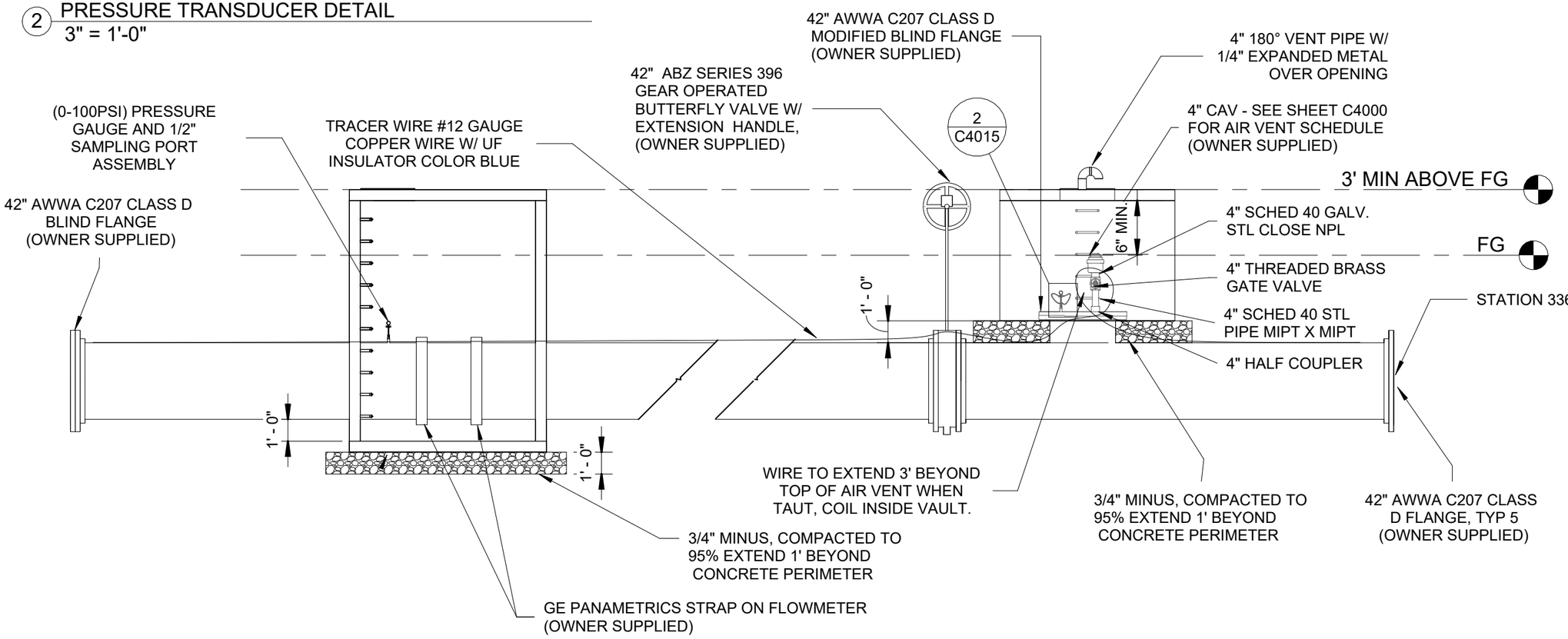


2 PRESSURE TRANSDUCER DETAIL
3" = 1'-0"



1 RECHARGE BASIN SIDE VIEW
3/16" = 1'-0"

DRAWN	JOSH OBENDORF
DESIGNED	TY LORD
APPROVED	-
DATE	03/03/23
SCALE	As indicated
PROJECT	675-20-001

UMATILLA COUNTY

ORDNANCE PROJECT

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OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
RECHARGE BASIN DELIVERY POINT SIDEVIEW

Drawing Number
C4015

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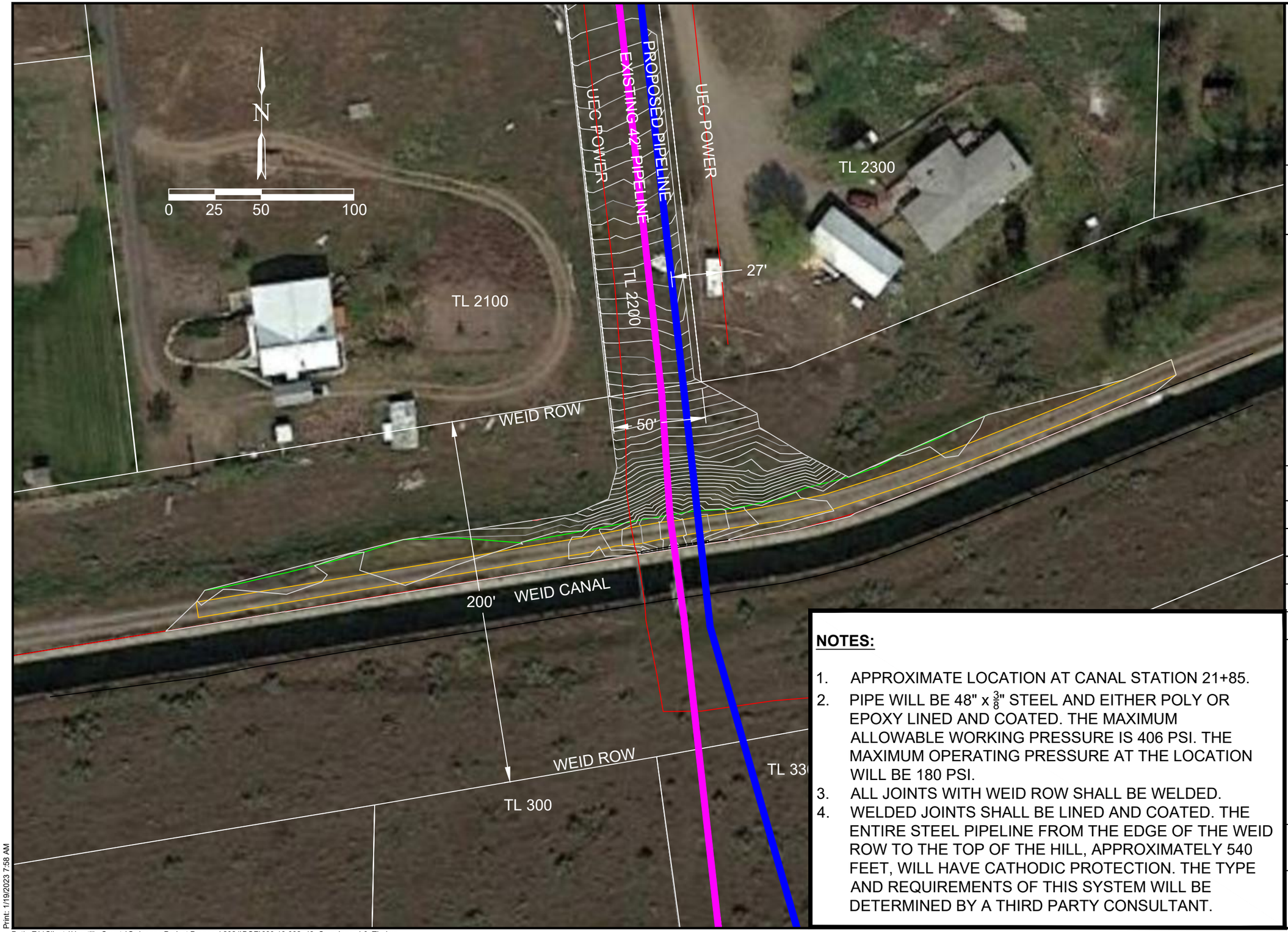


NOTES:

1. APPROXIMATE LOCATION AT CANAL STATION 21+85.
2. PIPE WILL BE 48" x $\frac{3}{8}$" STEEL AND EITHER POLY OR EPOXY LINED AND COATED. THE MAXIMUM ALLOWABLE WORKING PRESSURE IS 406 PSI. THE MAXIMUM OPERATING PRESSURE AT THE LOCATION WILL BE 180 PSI.
3. ALL JOINTS WITH WEID ROW SHALL BE WELDED.
4. WELDED JOINTS SHALL BE LINED AND COATED. THE ENTIRE STEEL PIPELINE FROM THE EDGE OF THE WEID ROW TO THE TOP OF THE HILL, APPROXIMATELY 540 FEET, WILL HAVE CATHODIC PROTECTION. THE TYPE AND REQUIREMENTS OF THIS SYSTEM WILL BE DETERMINED BY A THIRD PARTY CONSULTANT.

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	JANUARY 2023
SCALE	
PROJECT	675-20-001

IRZ ENGINEERING™ & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

UMATILLA COUNTY

PHASE 1 ORDANCE PROJECT

Revisions

N0.	Description	Date
1		
2		
3		
4		

0 SCALE CHECK 1"

Stamp:

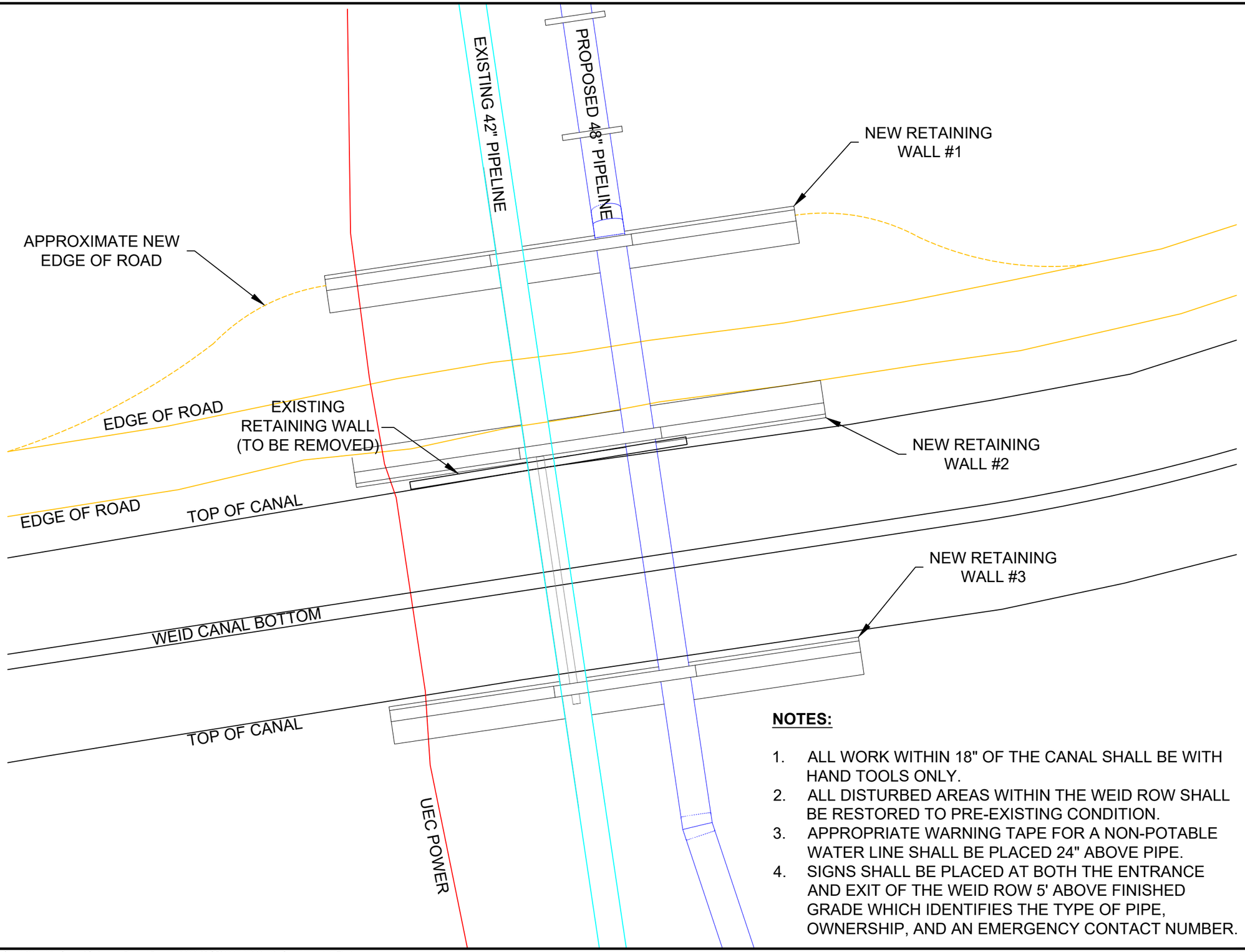
REGISTERED PROFESSIONAL ENGINEER
96512PE
OREGON
SEPT. 08, 2020
TY JAMES LORD
EXPIRES: 12/31/24

Sheet Name:
WEID CANAL CROSSING

Drawing Number:
C4020

Print: 1/19/2023 7:58 AM

Path: Z:\1Clients\Umatilla County\Ordnance Project Proposal 2021\BOR\609-16-002_42_Crossings_4.0_TL.dwg



NOTES:

1. ALL WORK WITHIN 18" OF THE CANAL SHALL BE WITH HAND TOOLS ONLY.
2. ALL DISTURBED AREAS WITHIN THE WEID ROW SHALL BE RESTORED TO PRE-EXISTING CONDITION.
3. APPROPRIATE WARNING TAPE FOR A NON-POTABLE WATER LINE SHALL BE PLACED 24" ABOVE PIPE.
4. SIGNS SHALL BE PLACED AT BOTH THE ENTRANCE AND EXIT OF THE WEID ROW 5' ABOVE FINISHED GRADE WHICH IDENTIFIES THE TYPE OF PIPE, OWNERSHIP, AND AN EMERGENCY CONTACT NUMBER.

DRAWN	MIKE CARSON
DESIGNED	TY LORD
APPROVED	-
DATE	JANUARY 2023
SCALE	
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDANCE PROJECT

IRZ ENGINEERING & CONSULTING™
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239

Revisions

N0.	Description	Date
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3		
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0 SCALE CHECK 1"

Stamp:

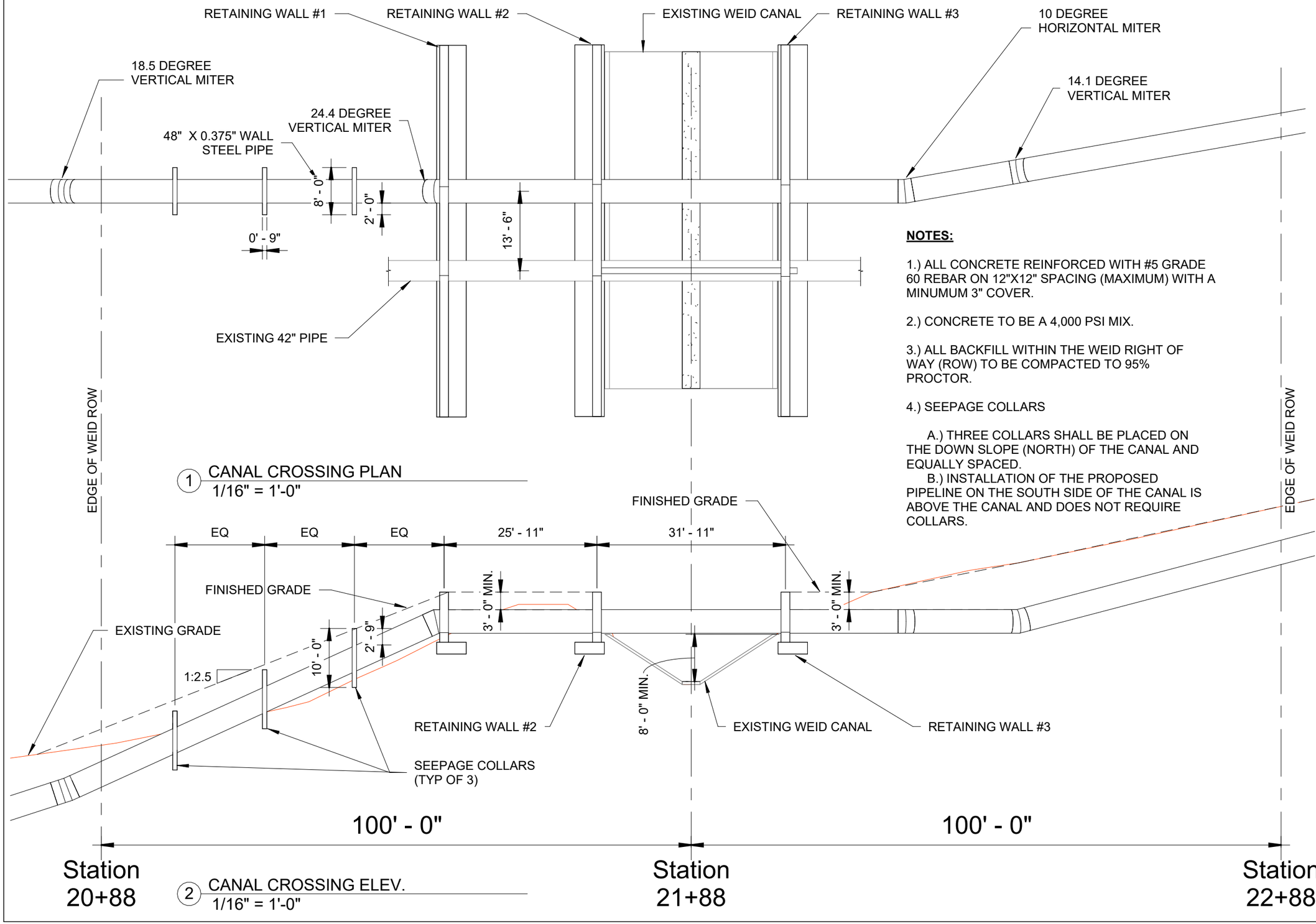
REGISTERED PROFESSIONAL ENGINEER
96512PE
OREGON
SEPT. 08, 2020
TY JAMES LORD
EXPIRES: 12/31/24

Sheet Name:
WEID CANAL CROSSING

Drawing Number:
C4021

Print: 1/19/2023 7:58 AM

Path: Z:\1Clients\Umatilla County\Ordnance Project Proposal 2021\BOR\609-16-002_42_Crossings_4.0_TL.dwg



1 CANAL CROSSING PLAN
1/16" = 1'-0"

2 CANAL CROSSING ELEV.
1/16" = 1'-0"

NOTES:

1.) ALL CONCRETE REINFORCED WITH #5 GRADE 60 REBAR ON 12"X12" SPACING (MAXIMUM) WITH A MINUMUM 3" COVER.

2.) CONCRETE TO BE A 4,000 PSI MIX.

3.) ALL BACKFILL WITHIN THE WEID RIGHT OF WAY (ROW) TO BE COMPACTED TO 95% PROCTOR.

4.) SEEPAGE COLLARS

A.) THREE COLLARS SHALL BE PLACED ON THE DOWN SLOPE (NORTH) OF THE CANAL AND EQUALLY SPACED.

B.) INSTALLATION OF THE PROPOSED PIPELINE ON THE SOUTH SIDE OF THE CANAL IS ABOVE THE CANAL AND DOES NOT REQUIRE COLLARS.

DRAWN	Mike Carson
DESIGNED	Ty Lord
APPROVED	-
DATE	08/10/2022
SCALE	1/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING™
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OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

REGISTERED PROFESSIONAL ENGINEER
96512PE
OREGON
SEPT. 08, 2020
TY JAMES LORD
EXPIRES: 12/31/24

Sheet Name
WEID Canal Crossing Details

Drawing Number
C4030

3/9/2023 3:18:41 PM

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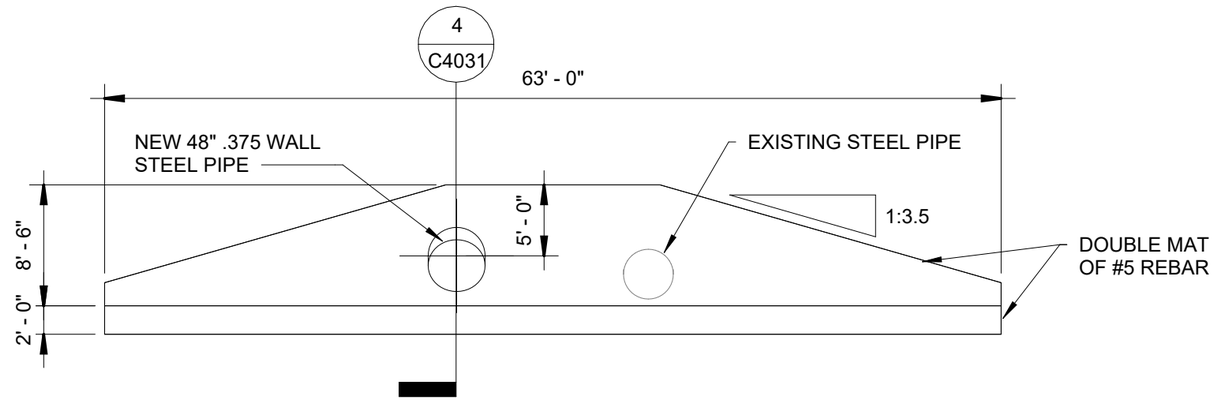
NOTES:

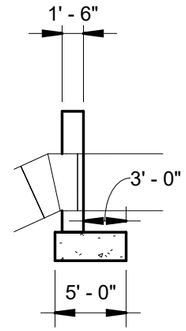
1.) ALL CONCRETE REINFORCED WITH #5 GRADE 60 REBAR ON 12"X12" SPACING (MAXIMUM) WITH A MINUMUM 3" COVER.

2.) CONCRETE TO BE A 4,000 PSI MIX.

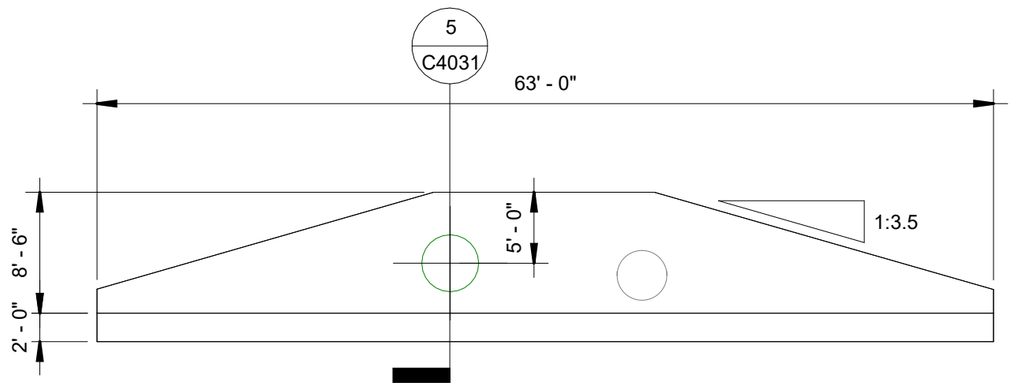
3.) 12" OF 3/4" MINUS COMPACTED TO 95% SHALL BE INSTALLED UNDER ALL RETAINING WALL FOOTINGS.



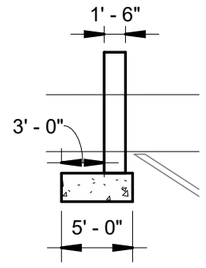
1 RETAINING WALL 1 SIDE VIEW
3/32" = 1'-0"



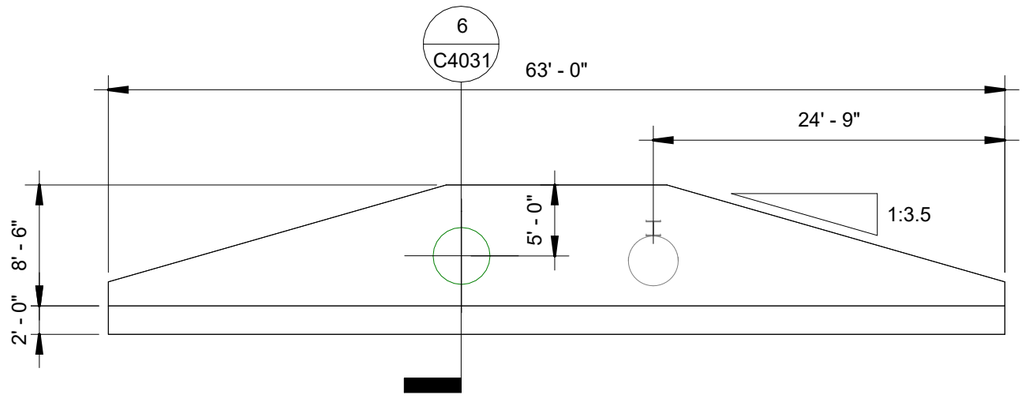
4 RETAINING WALL 1 SECTION VIEW
3/32" = 1'-0"



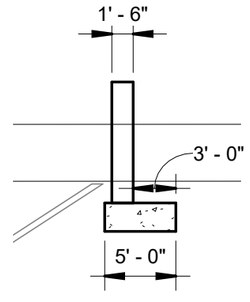
2 RETAINING WALL 2 SIDE VIEW
3/32" = 1'-0"



5 RETAINING WALL 2 SECTION VIEW
3/32" = 1'-0"



3 RETAINING WALL 3 SIDE VIEW
3/32" = 1'-0"



6 RETAINING WALL 3 SECTION VIEW
3/32" = 1'-0"

DRAWN	Mike Carson
DESIGNED	Ty Lord
APPROVED	-
DATE	08/10/2022
SCALE	3/32" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING™
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OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

REGISTERED PROFESSIONAL ENGINEER
96512PE
OREGON
SEPT. 08, 2020
TY JAMES LORD
EXPIRES: 12/31/24

Sheet Name
WEID Retaining Wall Details

Drawing Number
C4031

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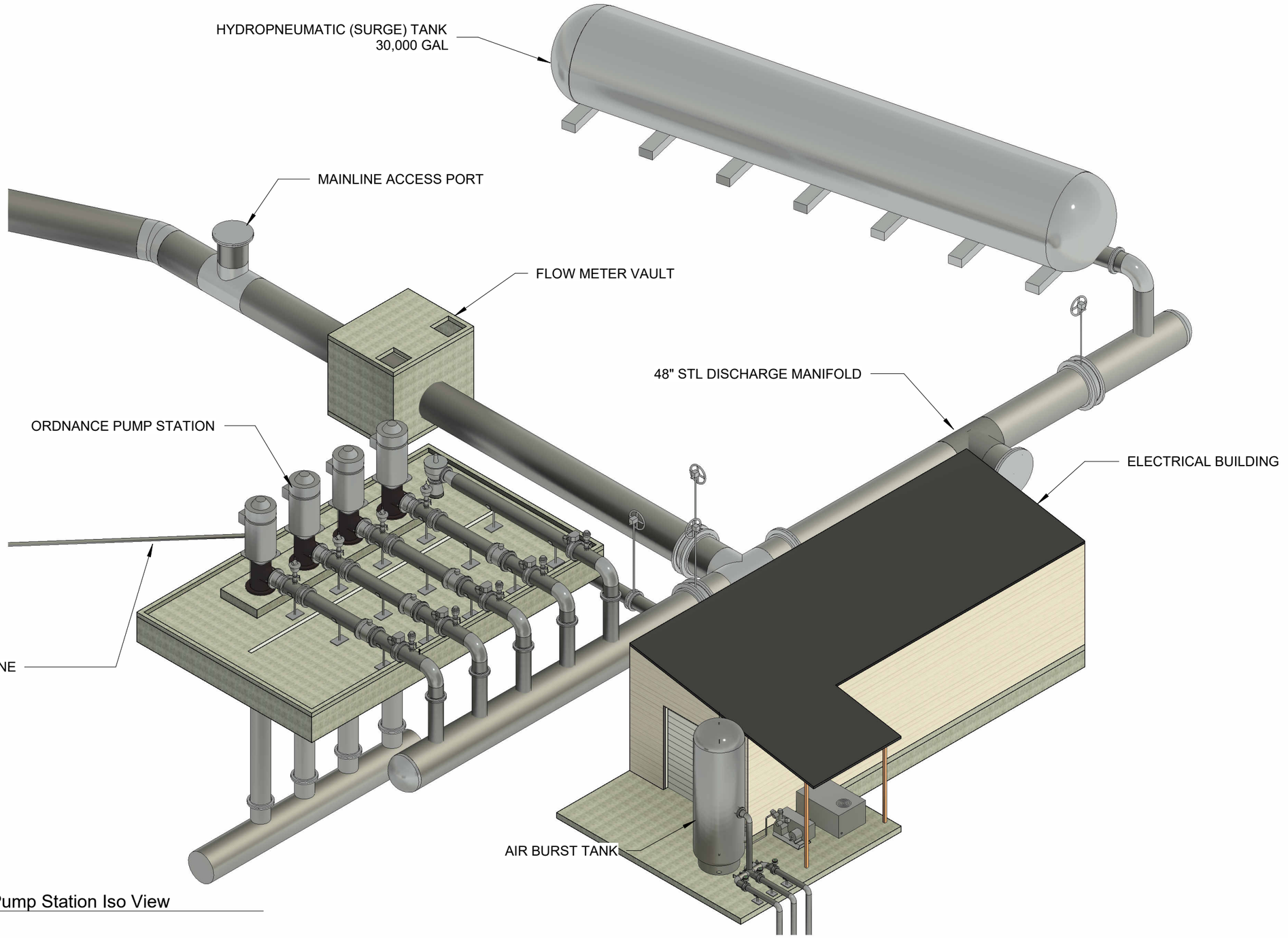

1 Pump Station Iso View

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DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	
PROJECT	675-20-001

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OFFICE (541) 567- 0252 FAX (541) 567- 4239

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

NO.	DESCRIPTION	DATE
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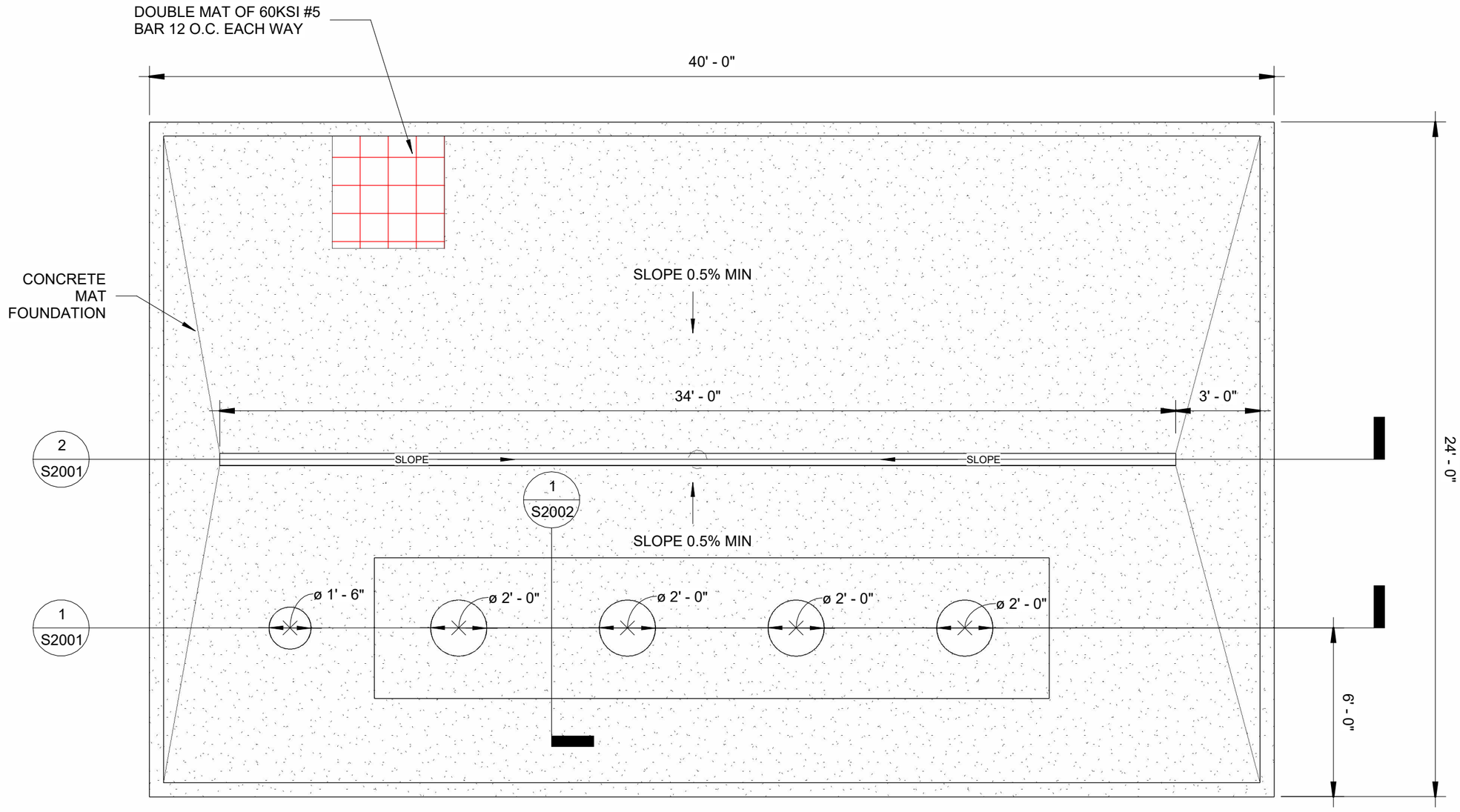
Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Pump Facility Iso View

Drawing Number
S1000



1 Pump Station Concrete Mat Plan View
1/4" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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Engineer of Record:

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Sheet Name
Concrete Mat Plan

Drawing Number
S2000

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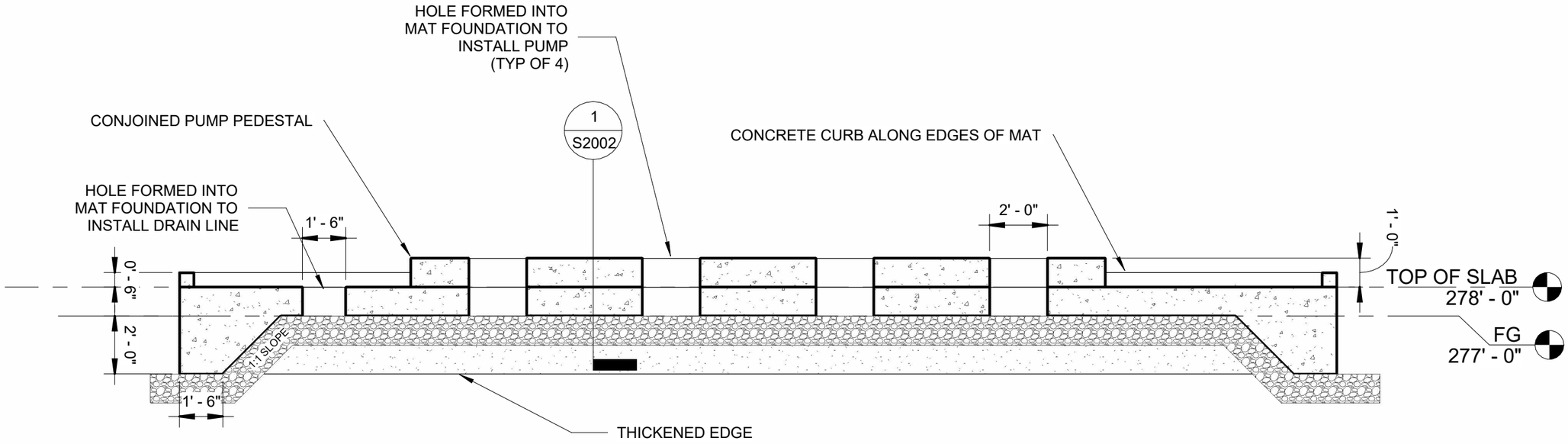
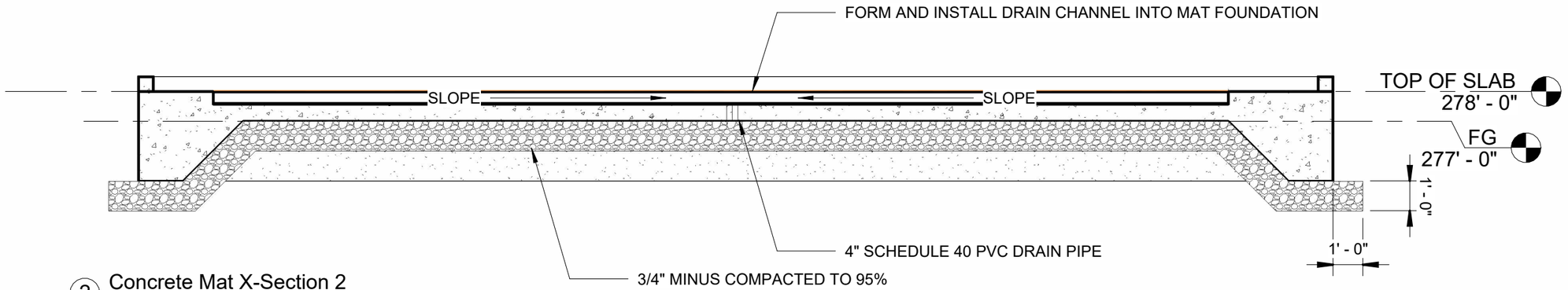


1 Concrete Mat X-Section 1
1/4" = 1'-0"



2 Concrete Mat X-Section 2
1/4" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
PS Conc Mat South Elevation

Drawing Number
S2001

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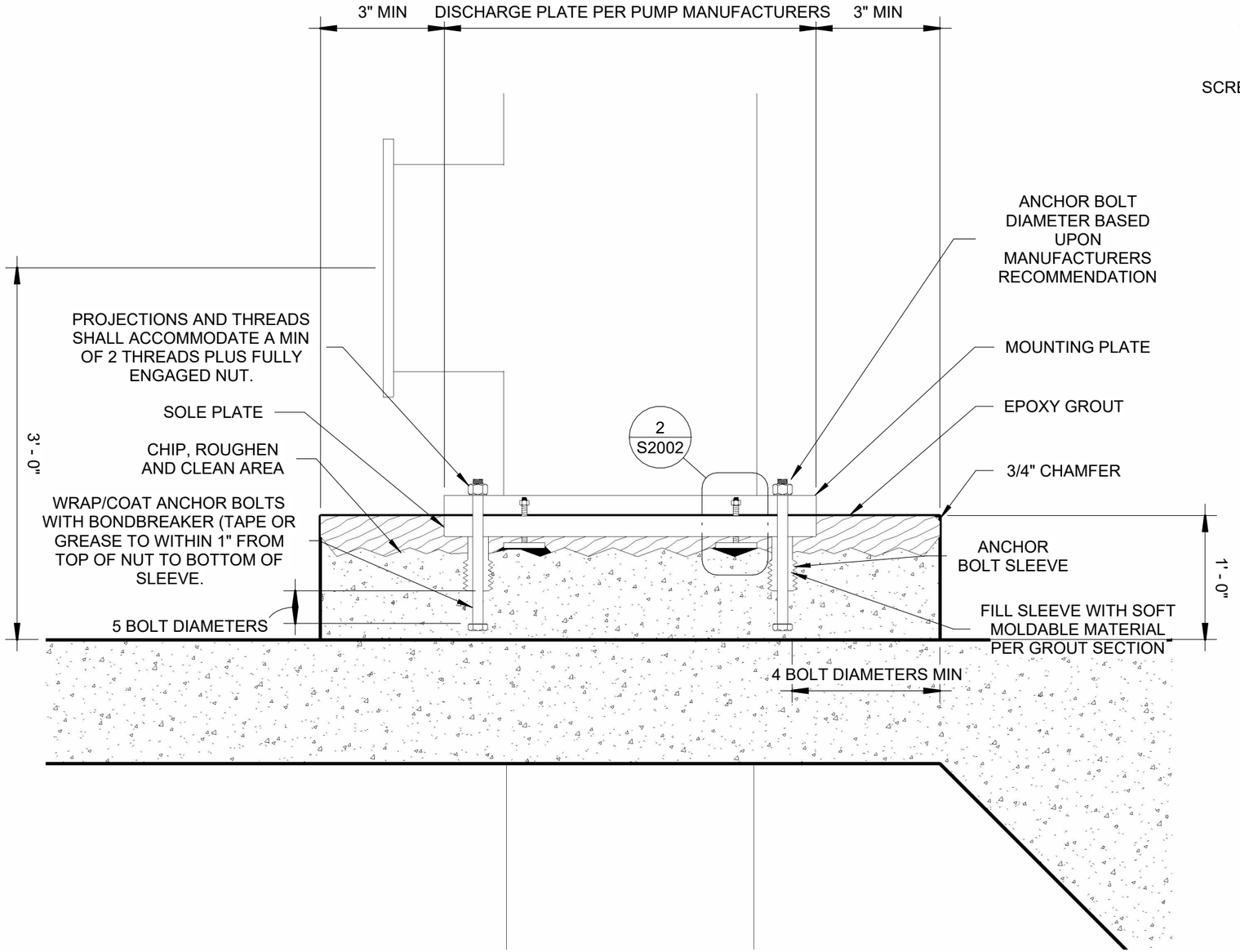
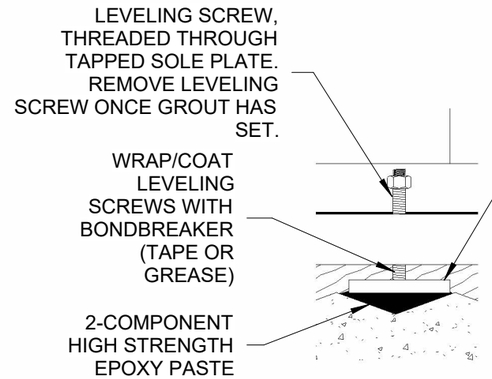


1 Pump Pedestal Connection Detail
1" = 1'-0"



2 Leveling Screw Section View
1 : 6

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	As indicated
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Pedestal Connection Detail

Drawing Number
S2002

3/8/2023 1:06:30 PM

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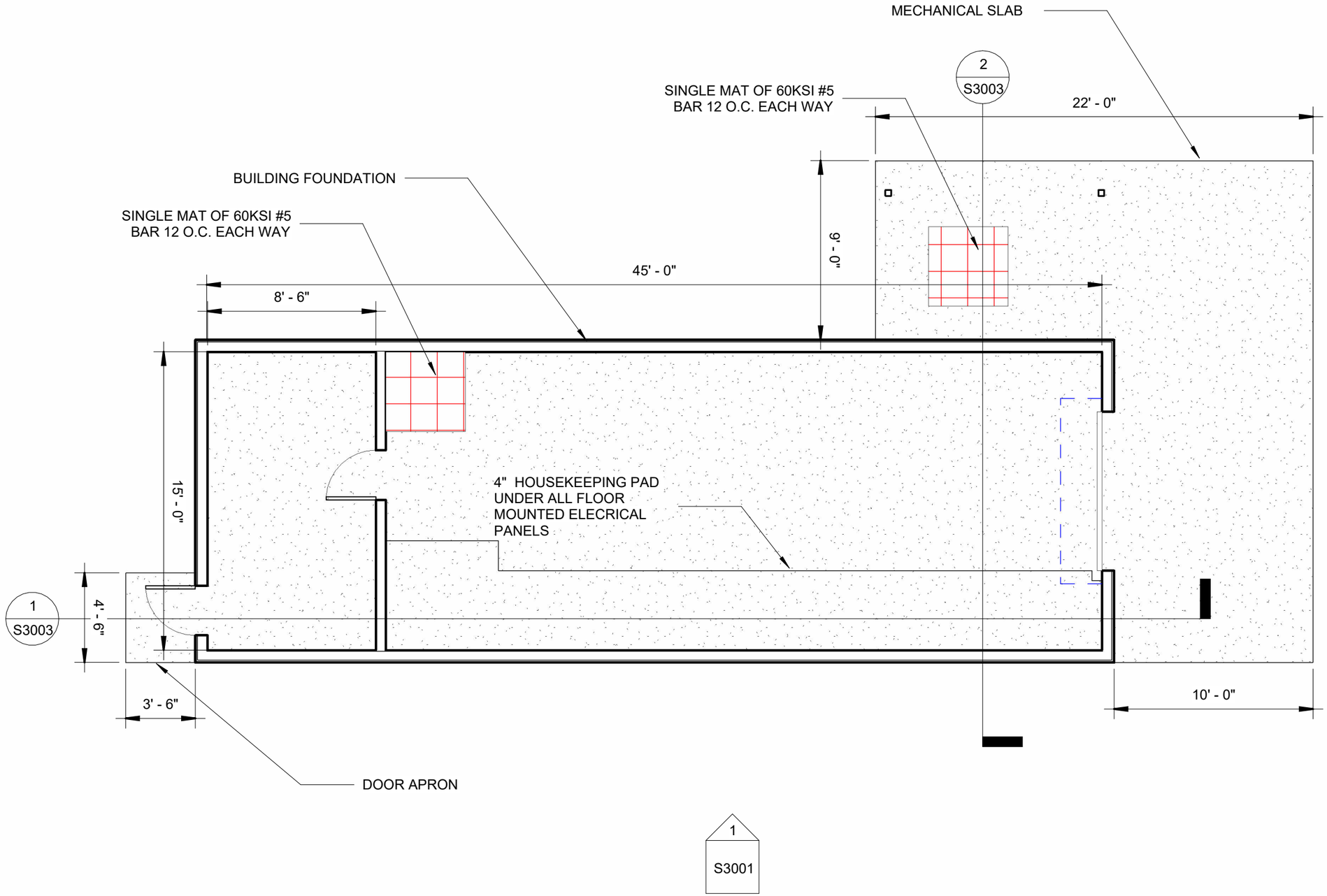

1 Electrical Building Plan View
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING™ & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
Electrical Building Plan View

Drawing Number
S3000

3/8/2023 1:06:31 PM

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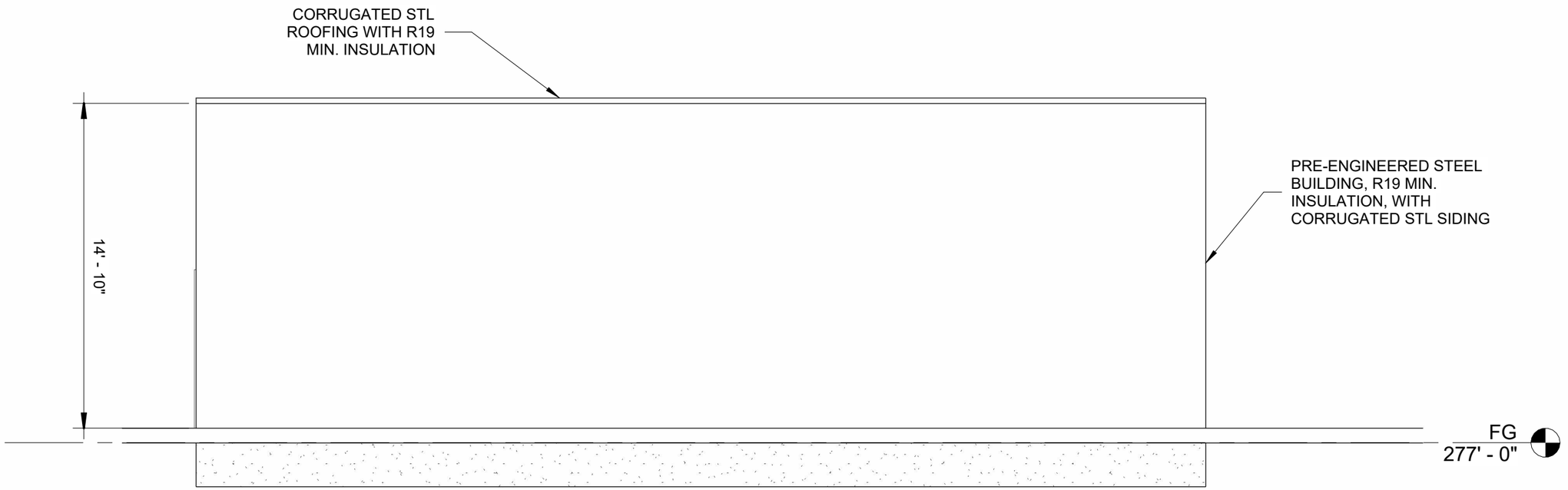
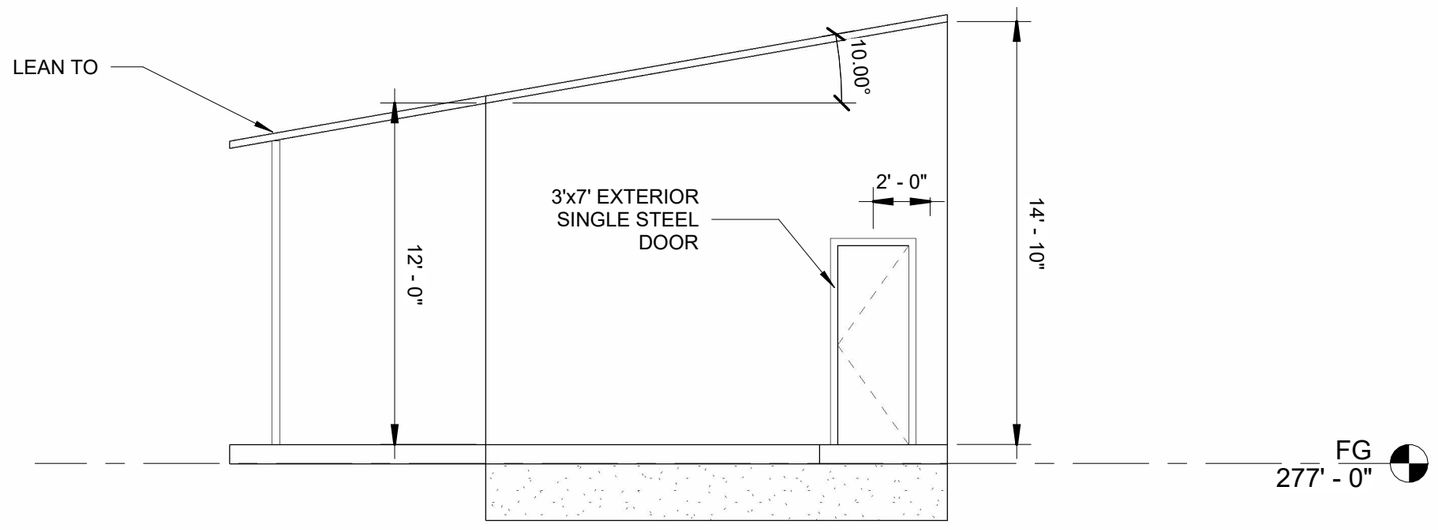


1 Electrical South Elevation
3/16" = 1'-0"



2 Electrical West Elevation
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
Electrical Building S/W Elevation

Drawing Number
S3001

3/8/2023 1:06:32 PM

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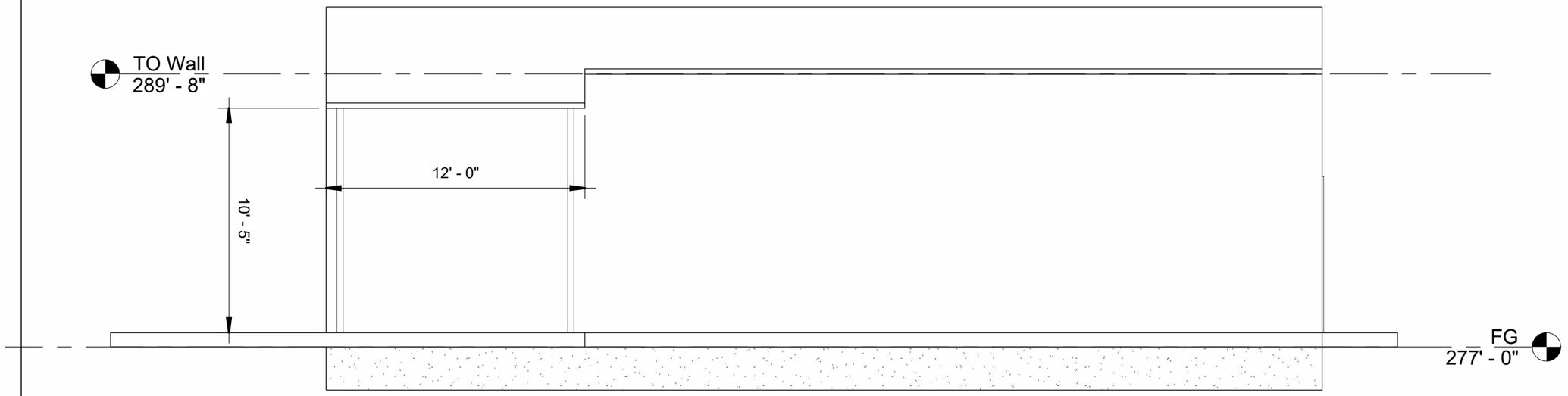
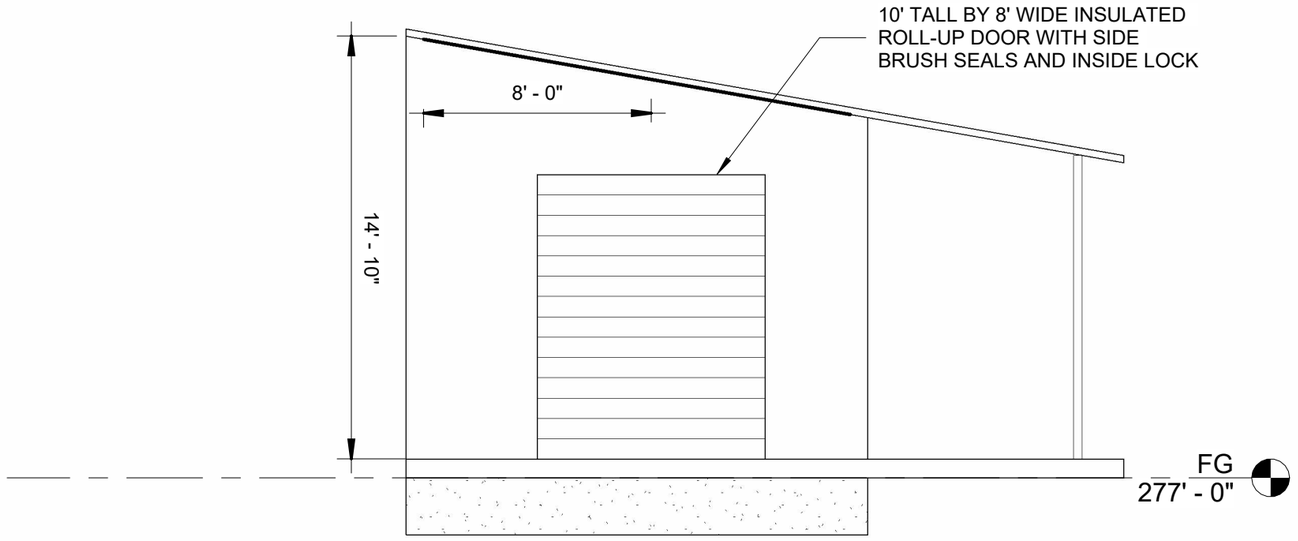


1 Electrical North Elevation
3/16" = 1'-0"



2 Electrical East Elevation
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Electrical Building N/E Elevation

Drawing Number
S3002

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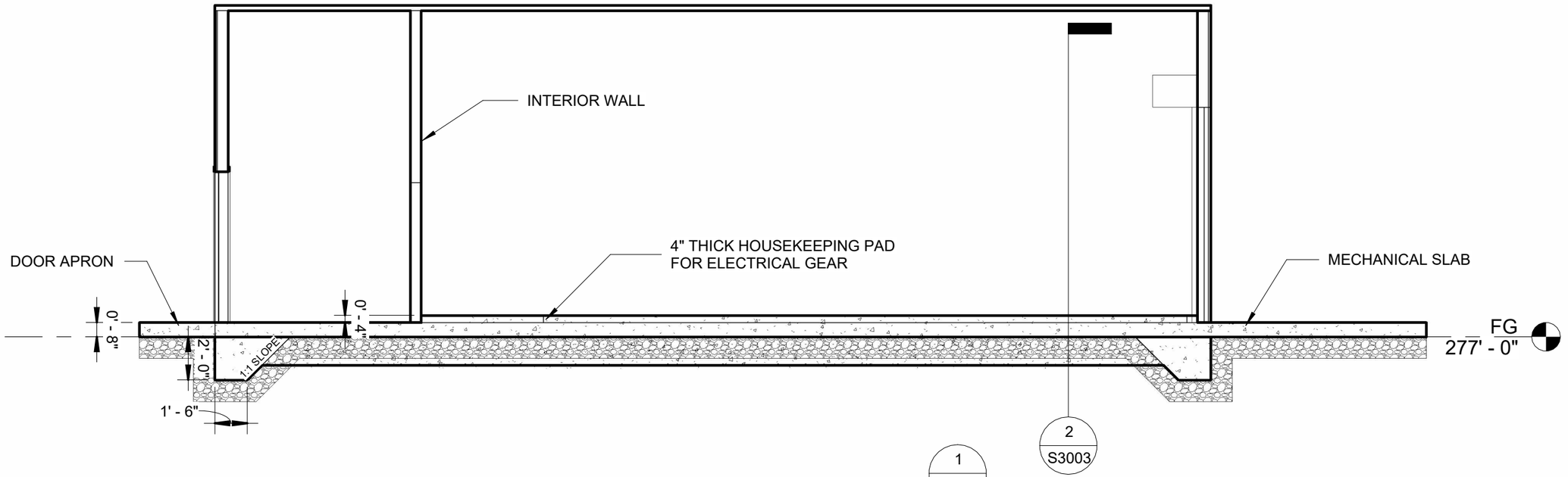
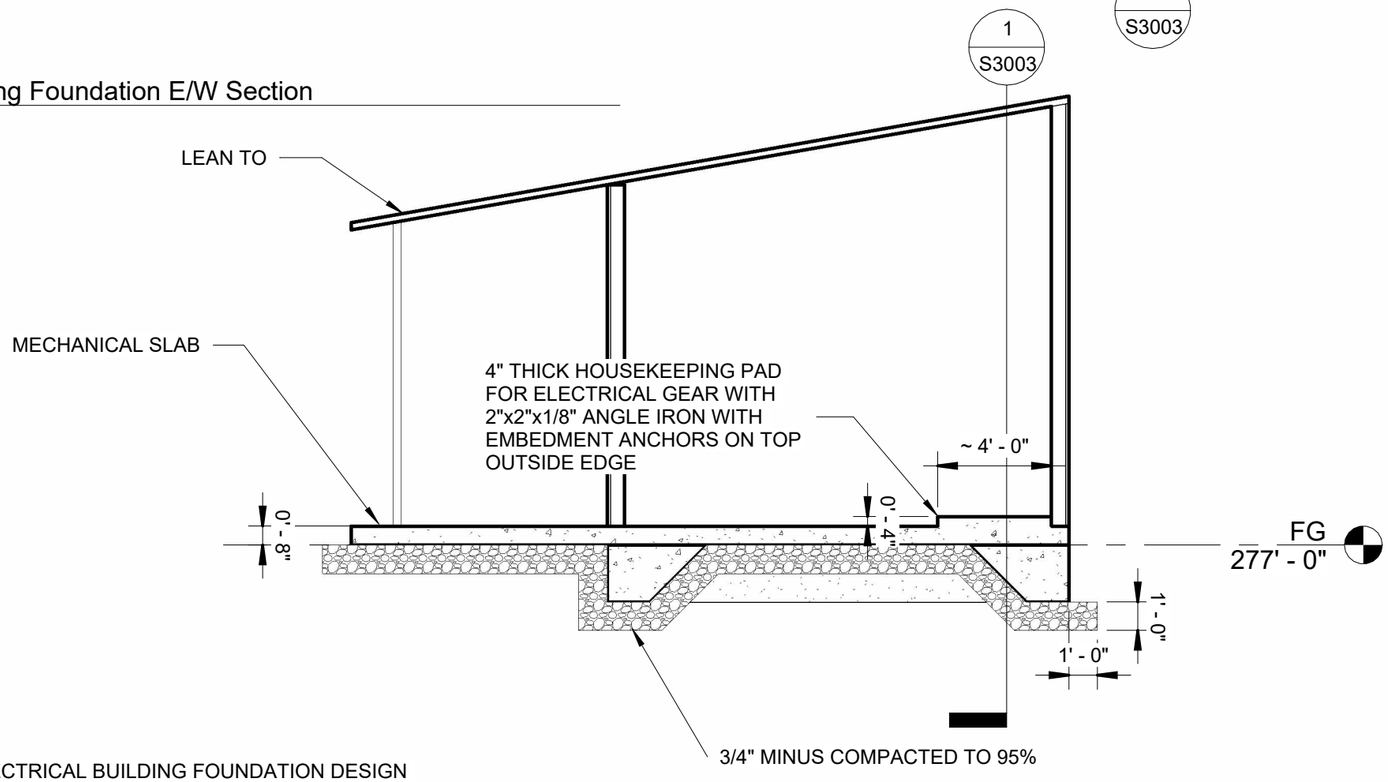


1 Electrical Building Foundation E/W Section
3/16" = 1'-0"



NOTE: FINAL ELECTRICAL BUILDING FOUNDATION DESIGN WILL BE UPDATED BASED ON STEEL BUILDING MANUFACTURERS REQUIREMENTS.

2 Electrical Building Foundation N/S Section
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Electrical Building Foundation

Drawing Number
S3003

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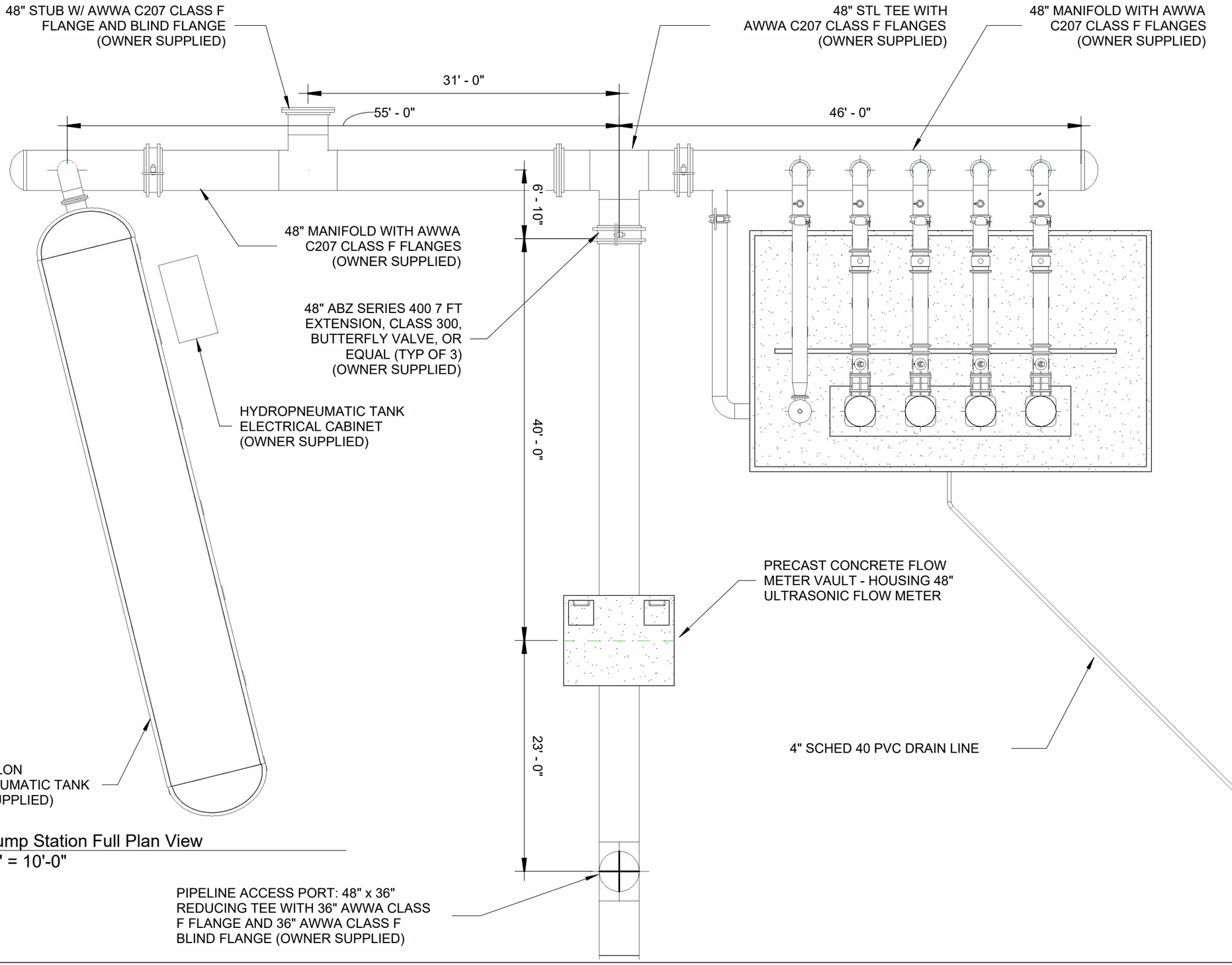

1 Pump Station Full Plan View
1" = 10'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1" = 10'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Full Plan View

Drawing Number
M1000

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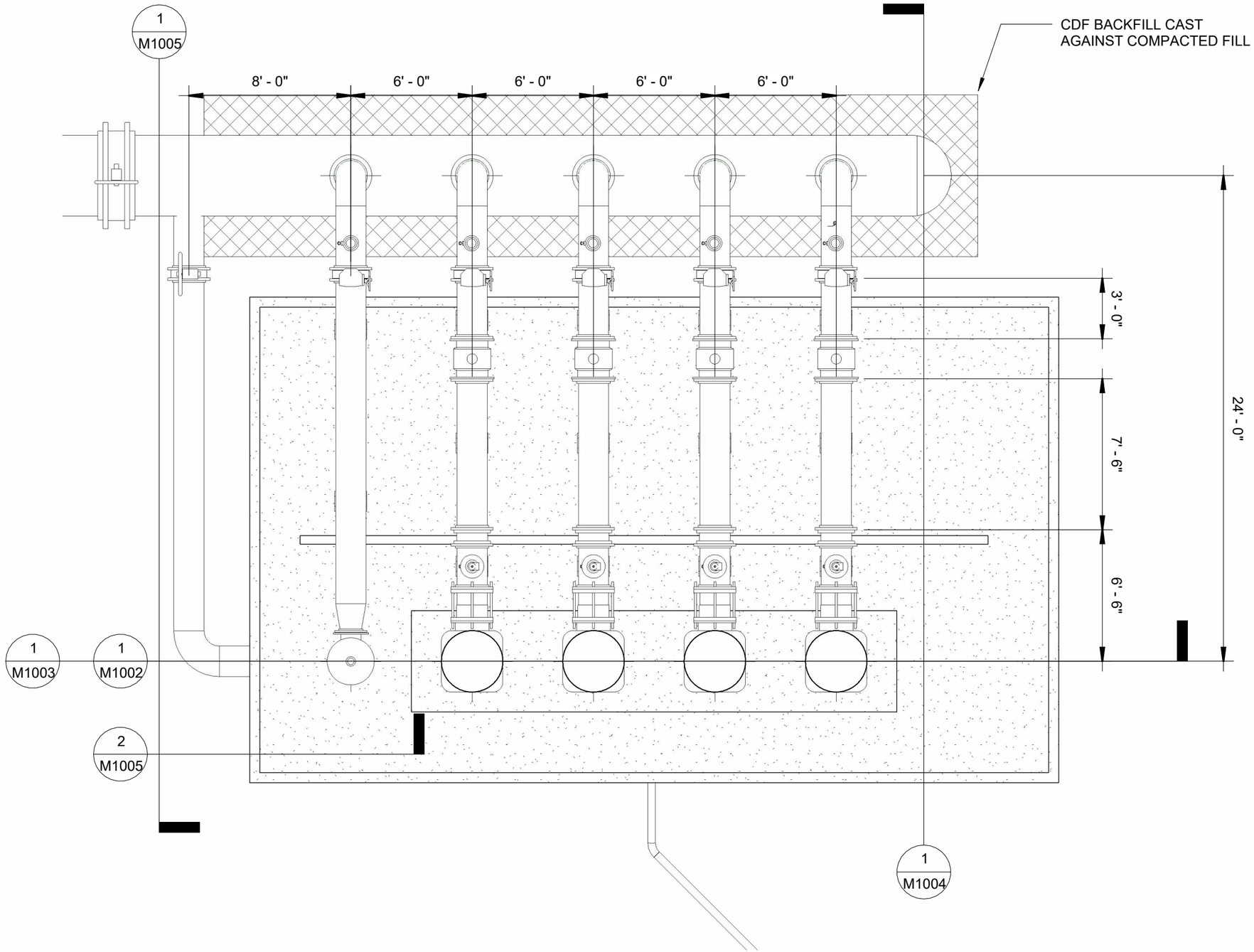

1 Discharge Piping Plan View
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
Discharge Piping Plan View

Drawing Number
M1001

3/8/2023 1:06:00 PM

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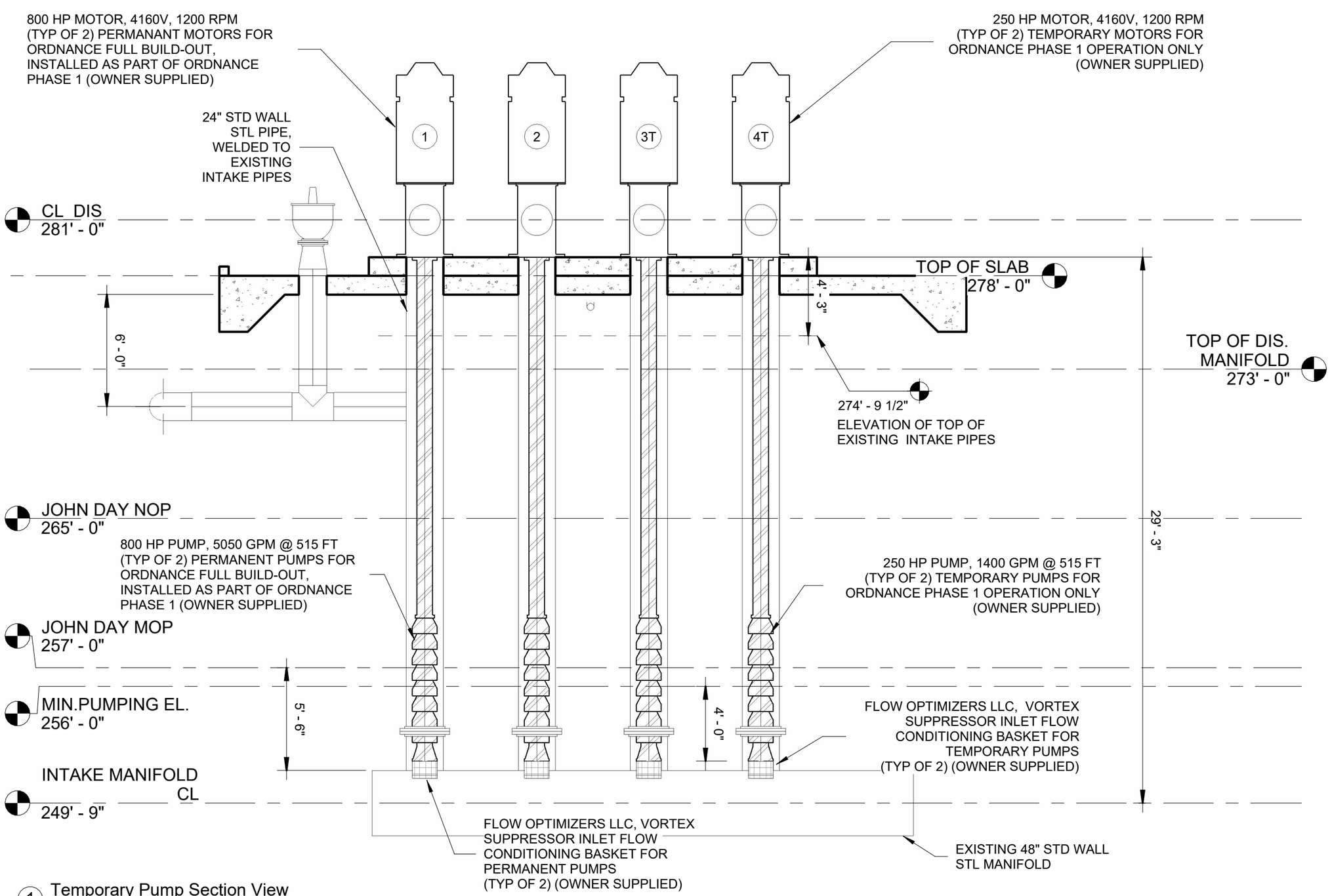

1 Temporary Pump Section View
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
Temporary Pump Section View

Drawing Number
M1002

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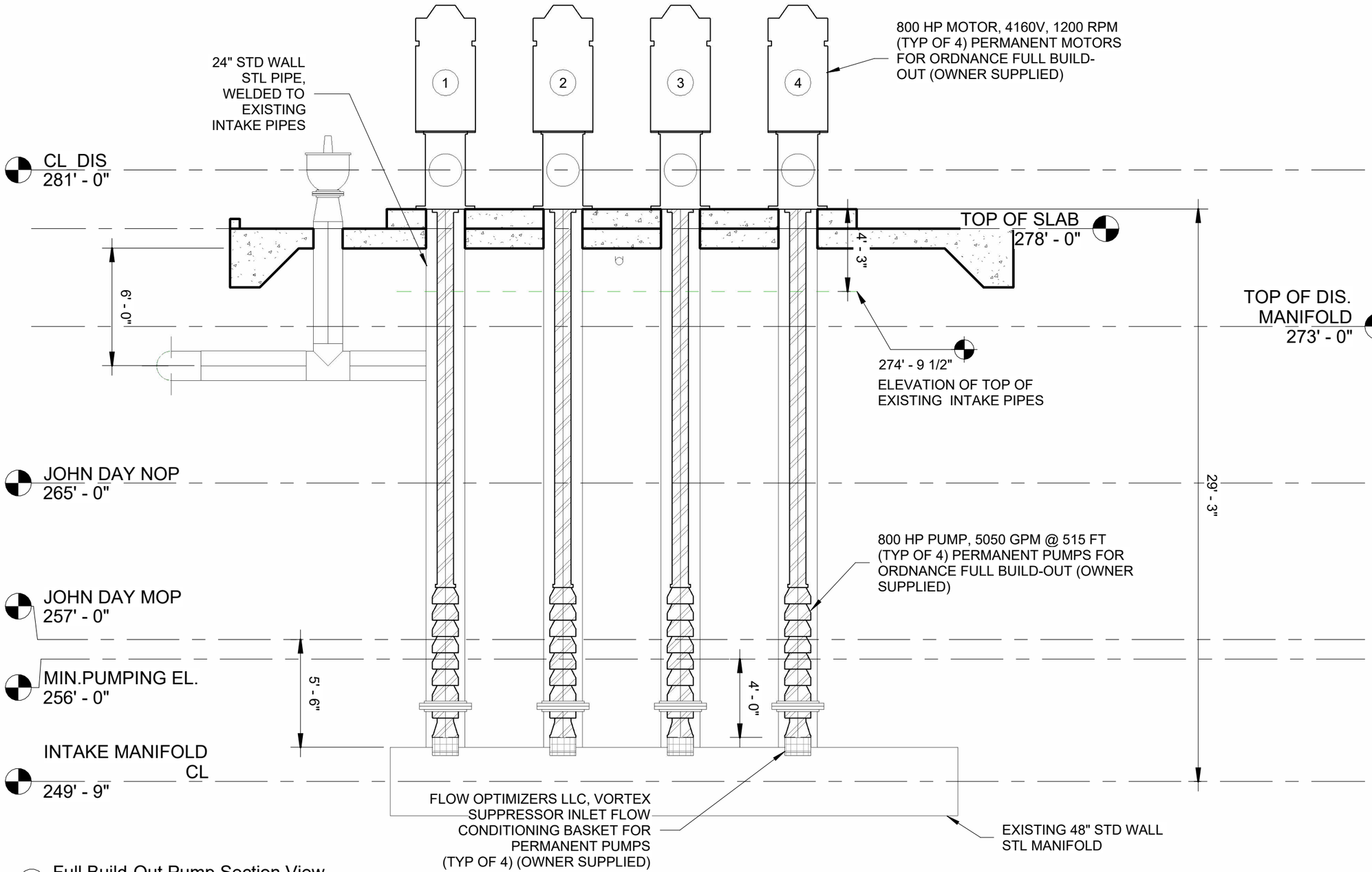

1 Full Build-Out Pump Section View
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Full Build-Out Pump Section View

Drawing Number
M1003

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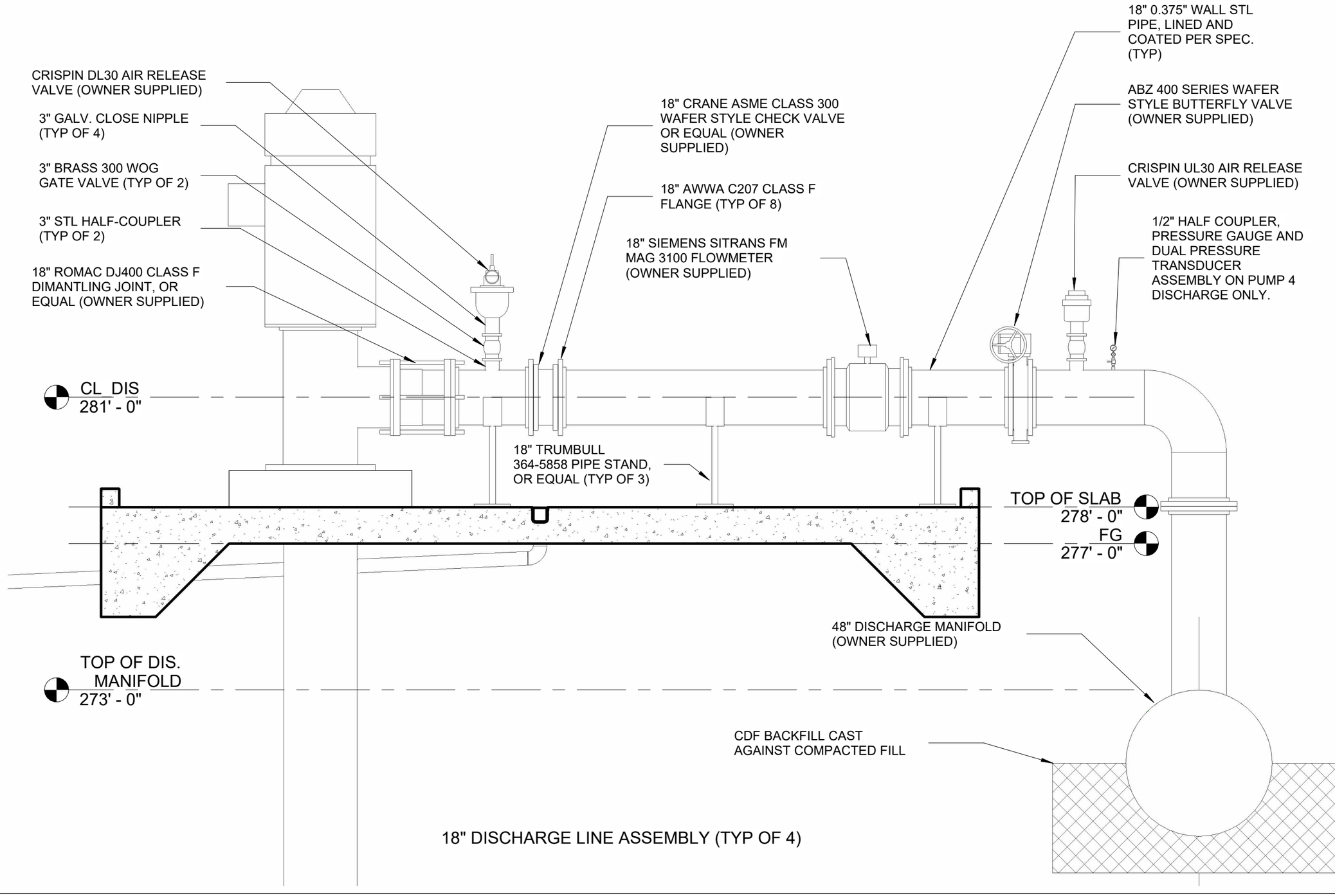

18" DISCHARGE LINE ASSEMBLY (TYP OF 4)

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/8" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
18" Line X-Section

Drawing Number
M1004

3/8/2023 1:06:04 PM

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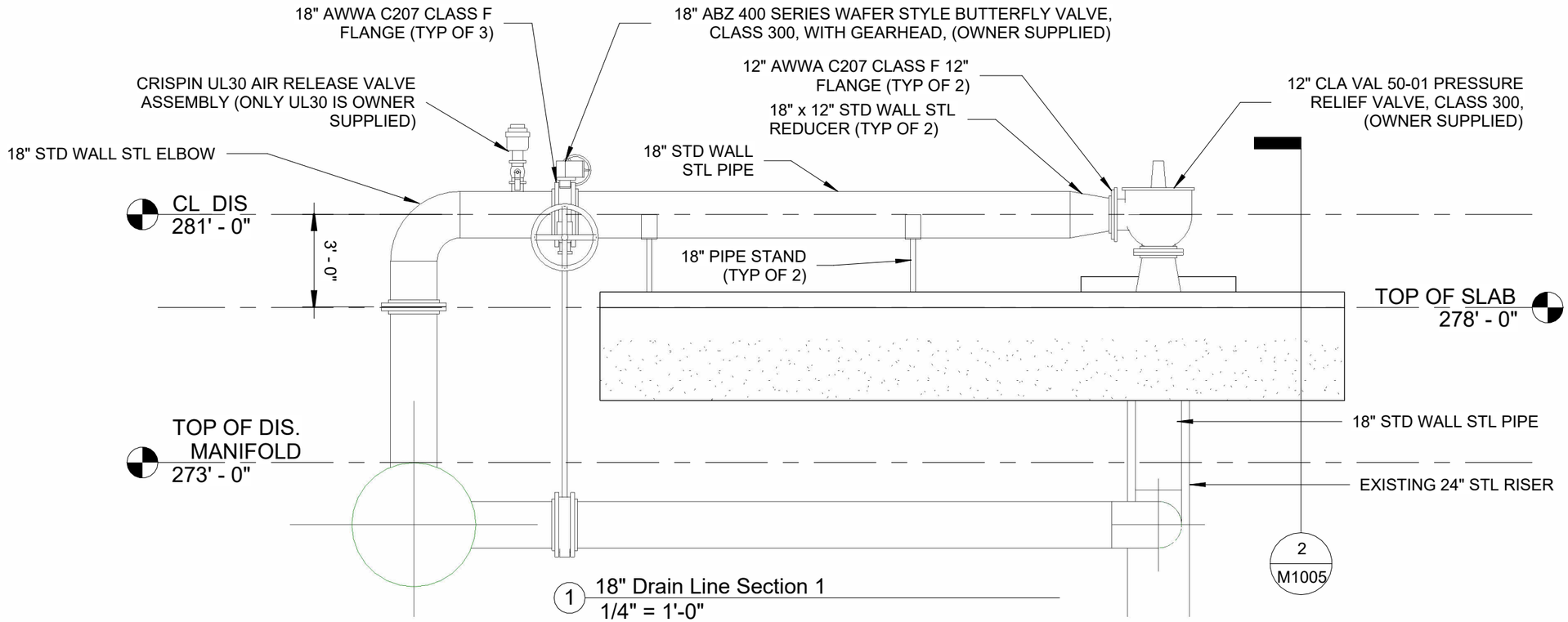

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
18" Drain and PRV Line

Drawing Number
M1005

3/15/2023 8:07:59 AM

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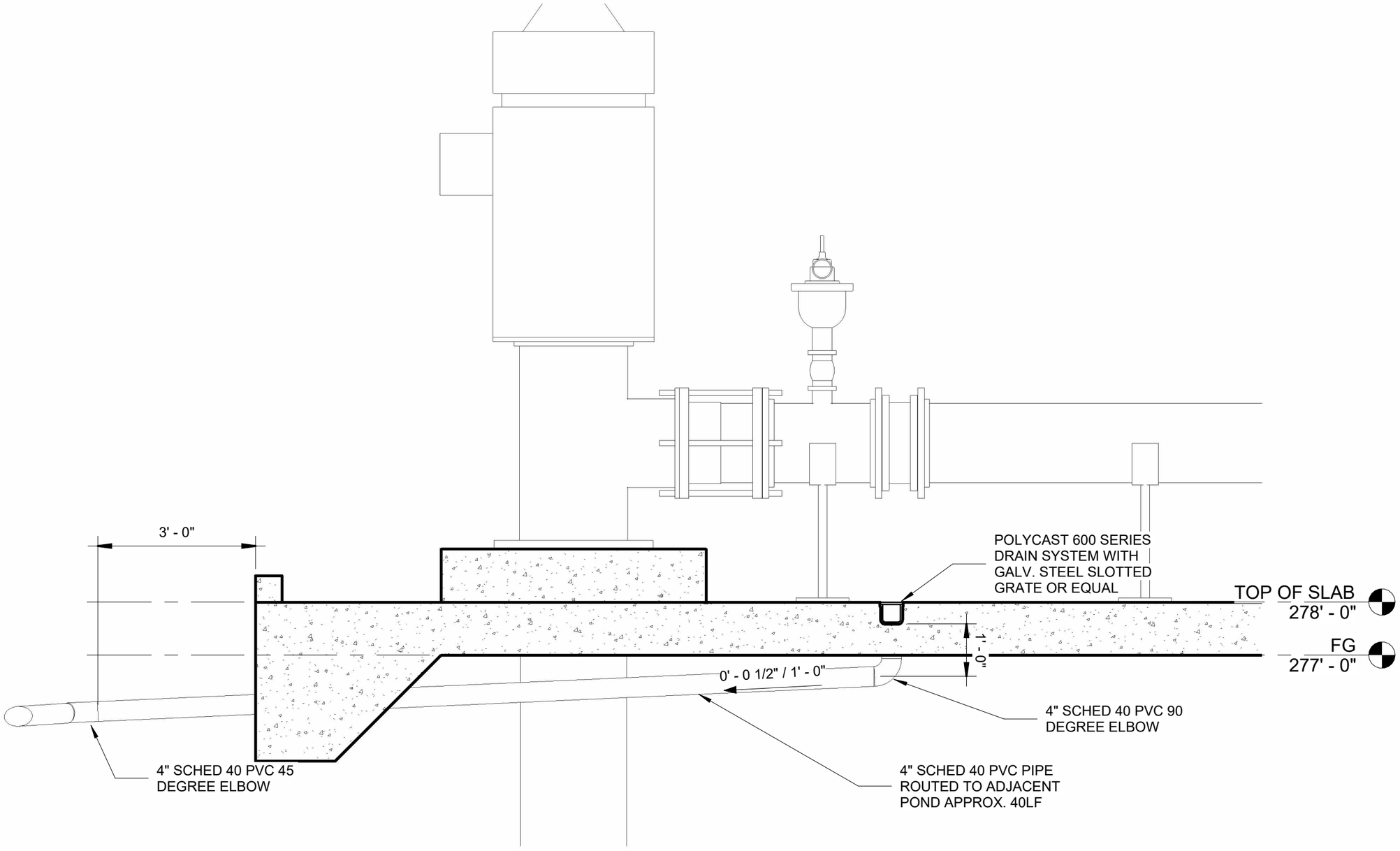

3 Pump Pad Drain Section View
1/2" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Pump Pad Drain

Drawing Number
M1006

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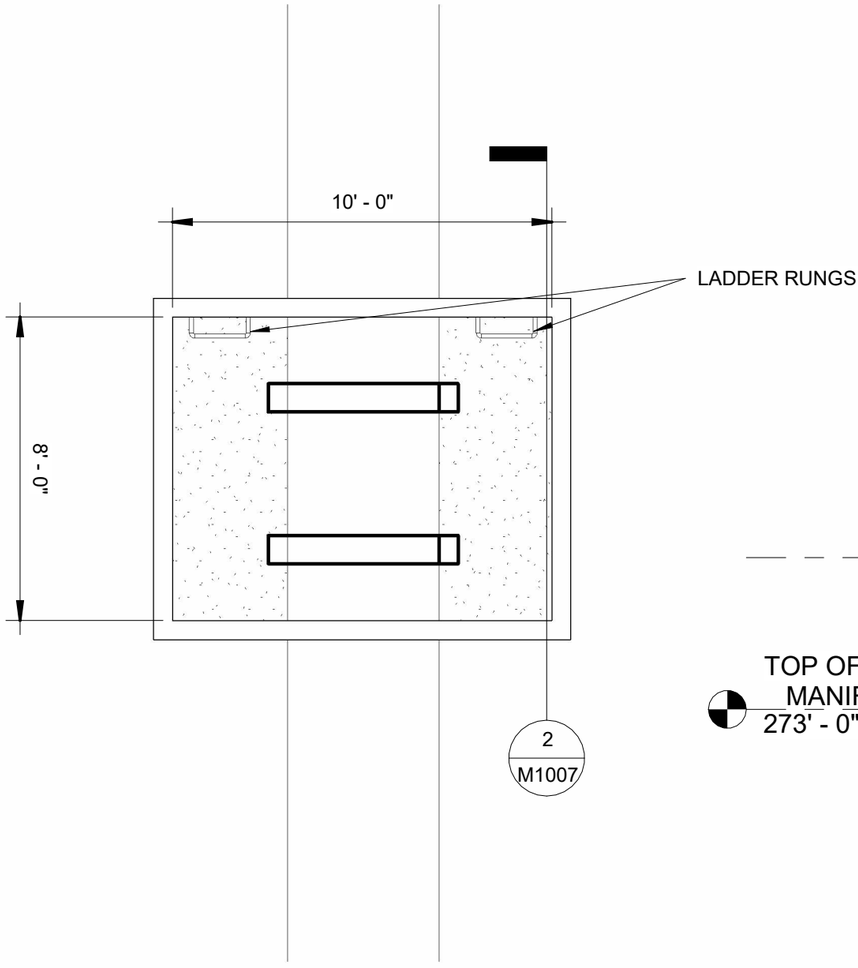
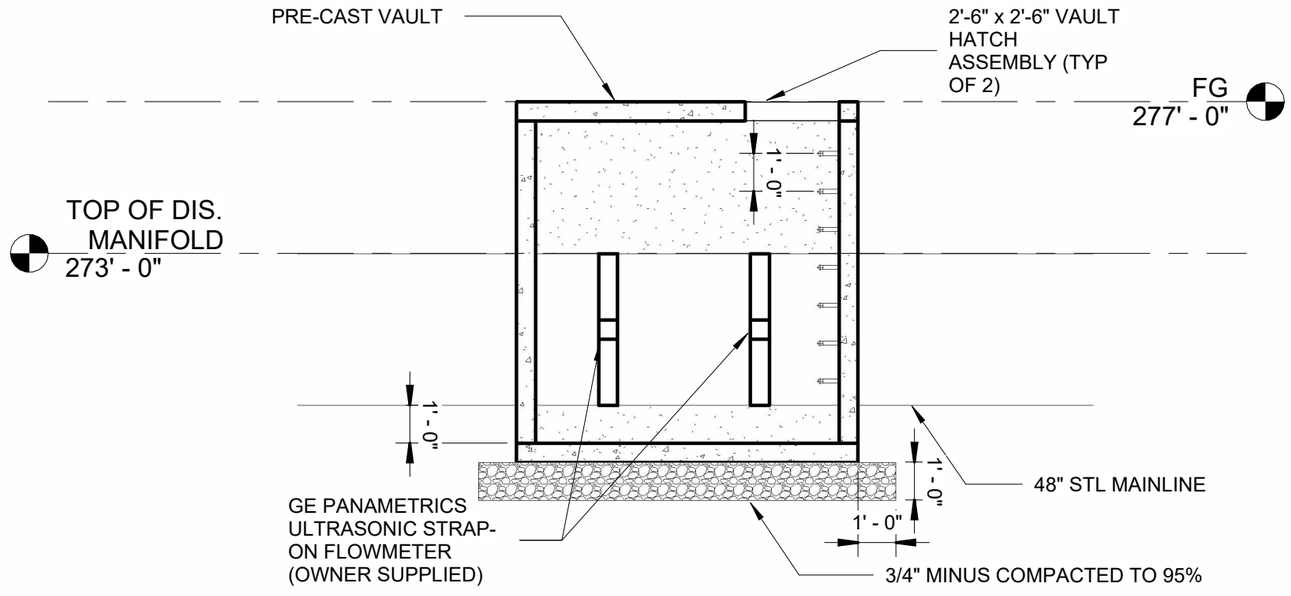


1 Flowmeter Vault Plan View
1/4" = 1'-0"



2 Flowmeter Vault Section View
1/4" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/4" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Flowmeter and Pre-Cast Vault Details

Drawing Number
M1007

3/10/2023 2:12:36 PM

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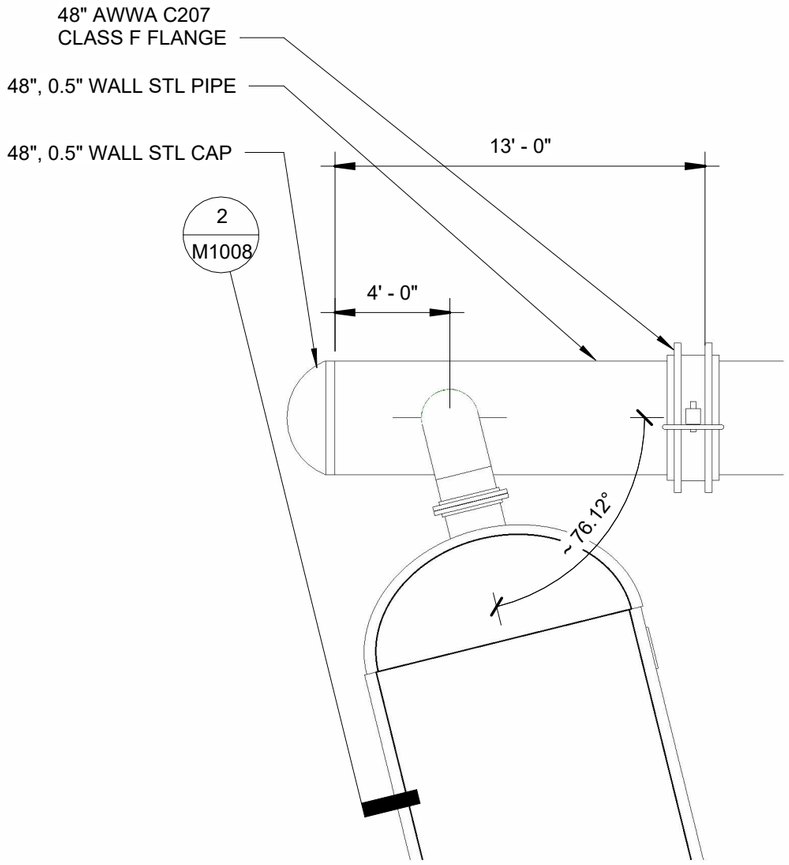
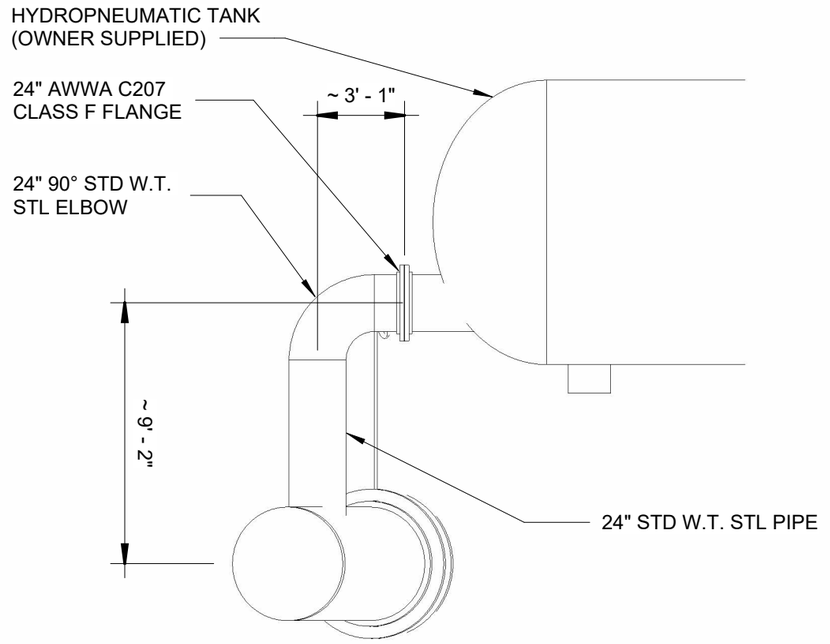


1 Hydropneumatic Tank Plan View
3/16" = 1'-0"



2 Hydropneumatic Tank Section View
3/16" = 1'-0"

NOTE: DIMENSIONS SHOWN AS APPROXIMATE. ALL DIMISIONS WILL BE FINALIZED BASED ON HYDROPNEUMATIC TANK MANUFACTURER'S DIMENSIONS.

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
HYDROPNEUMATIC TANK CONNECTION

Drawing Number
M1008

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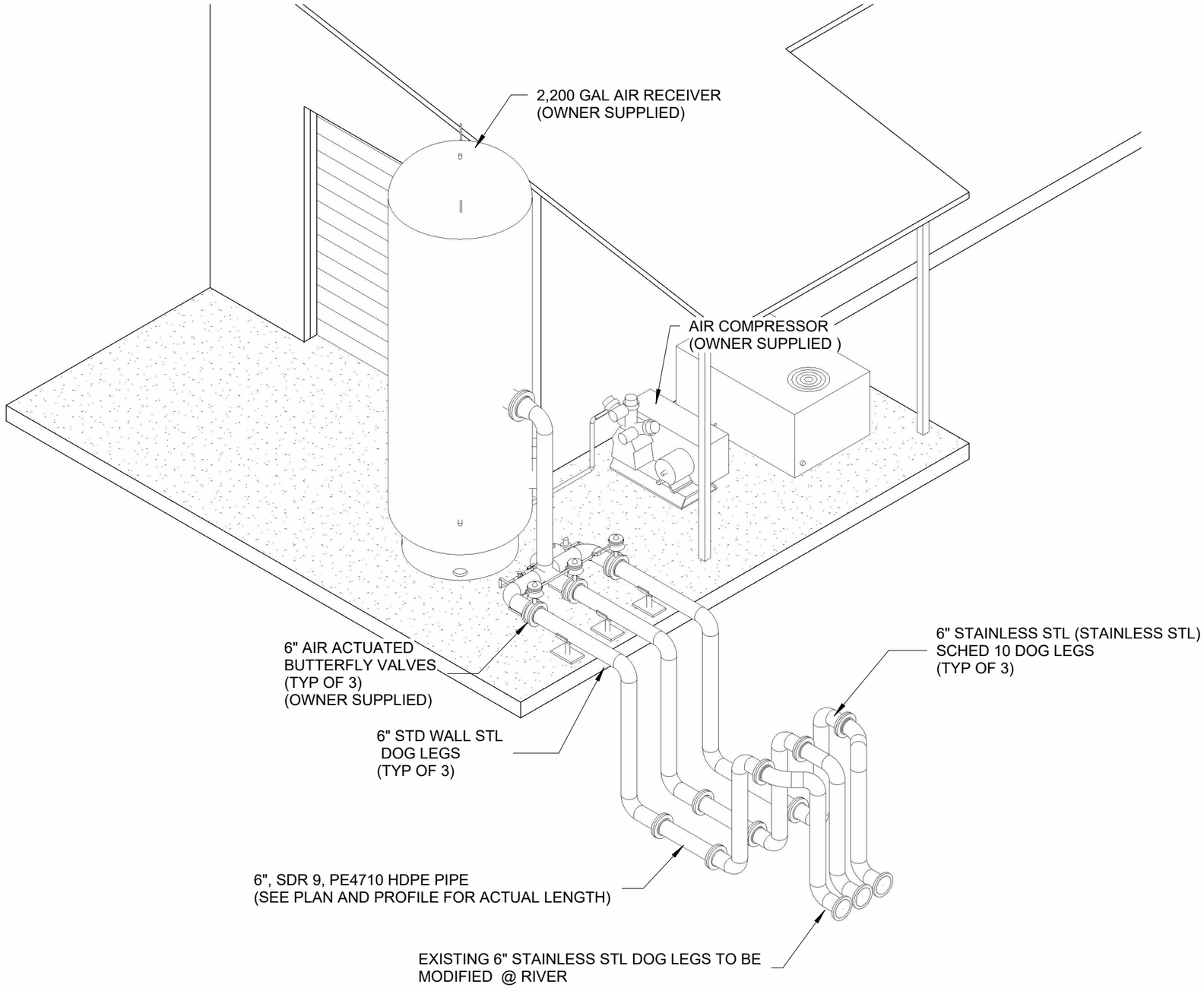

1 3D-ISO AIR BURST

3/8/2023 1:06:10 PM

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DRAWN	DH,TL
DESIGNED	TY LORD
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DATE	MARCH 2023
SCALE	
PROJECT	675-20-001

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NO.	DESCRIPTION	DATE
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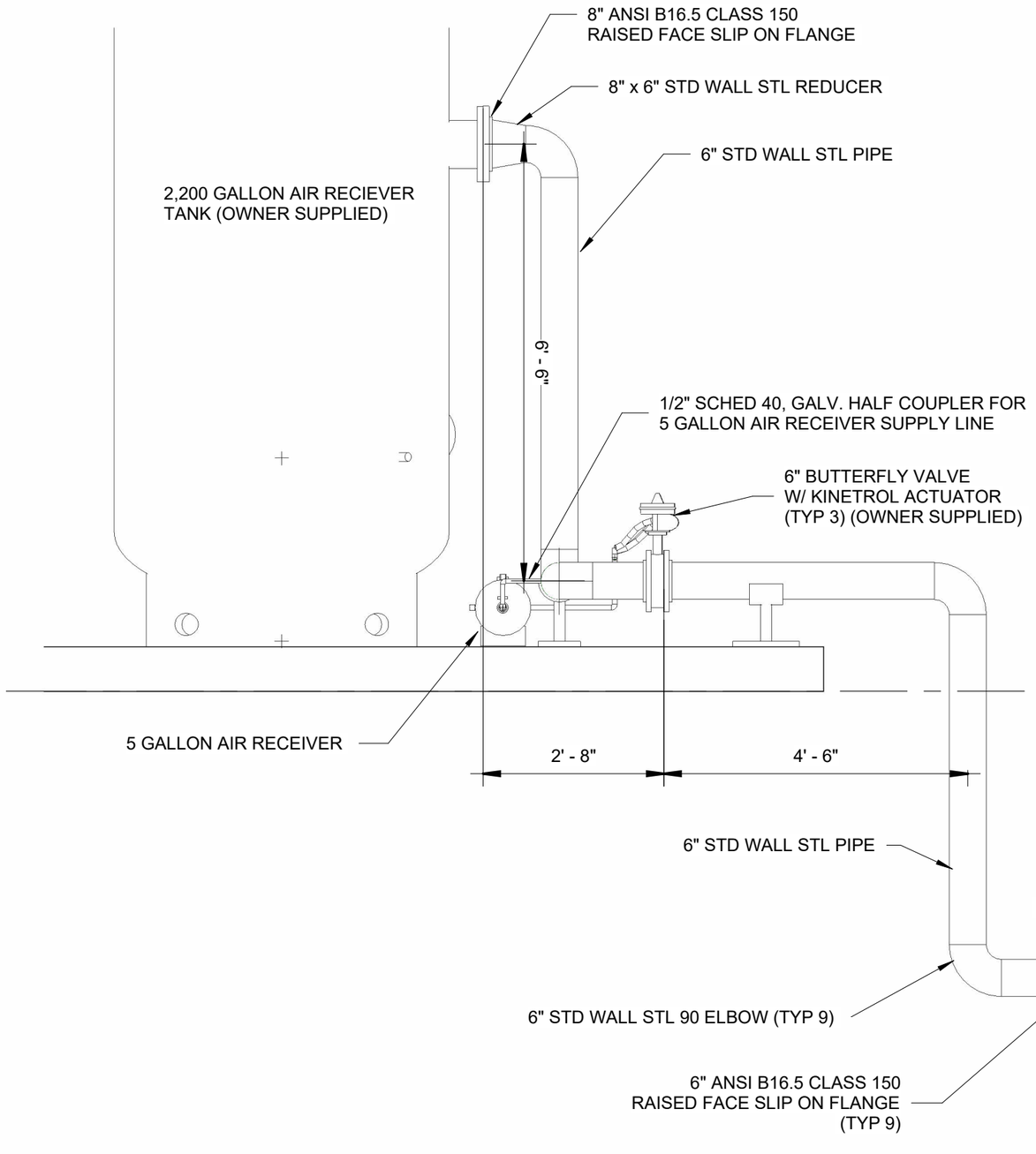
0 SCALE CHECK 1"

Engineer of Record:

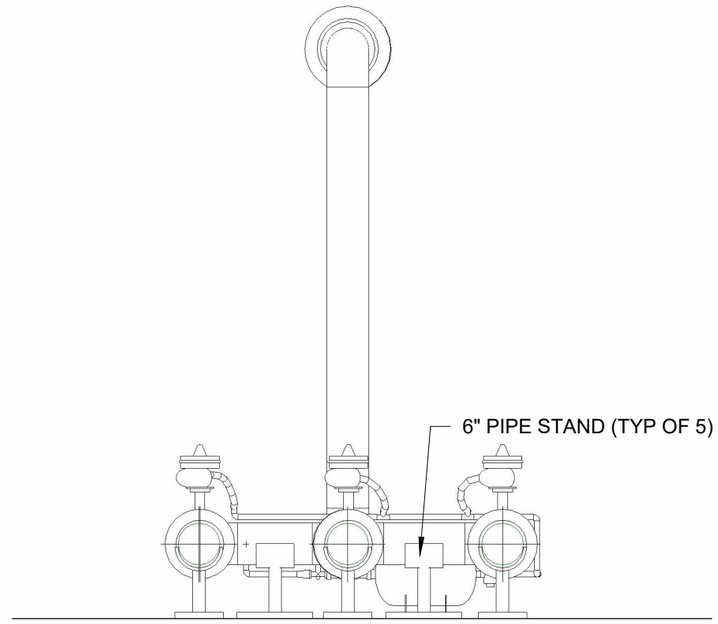
DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Airburst ISO View

Drawing Number
M1200



1 Airburst Section View
1/2" = 1'-0"



2 Airburst Front View
1/2" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
Air Burst Detail 1

Drawing Number
M1201

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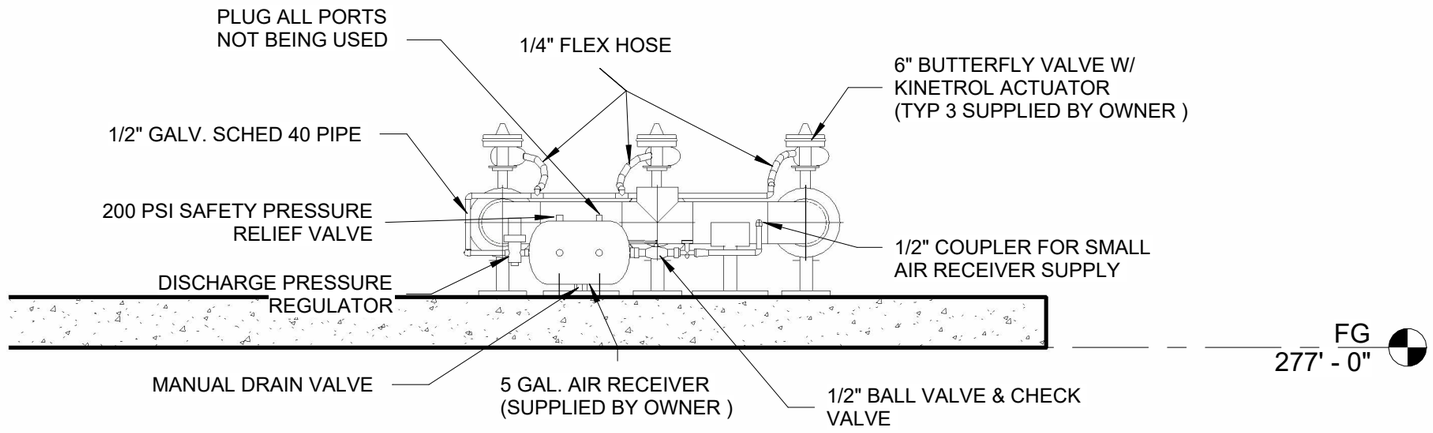
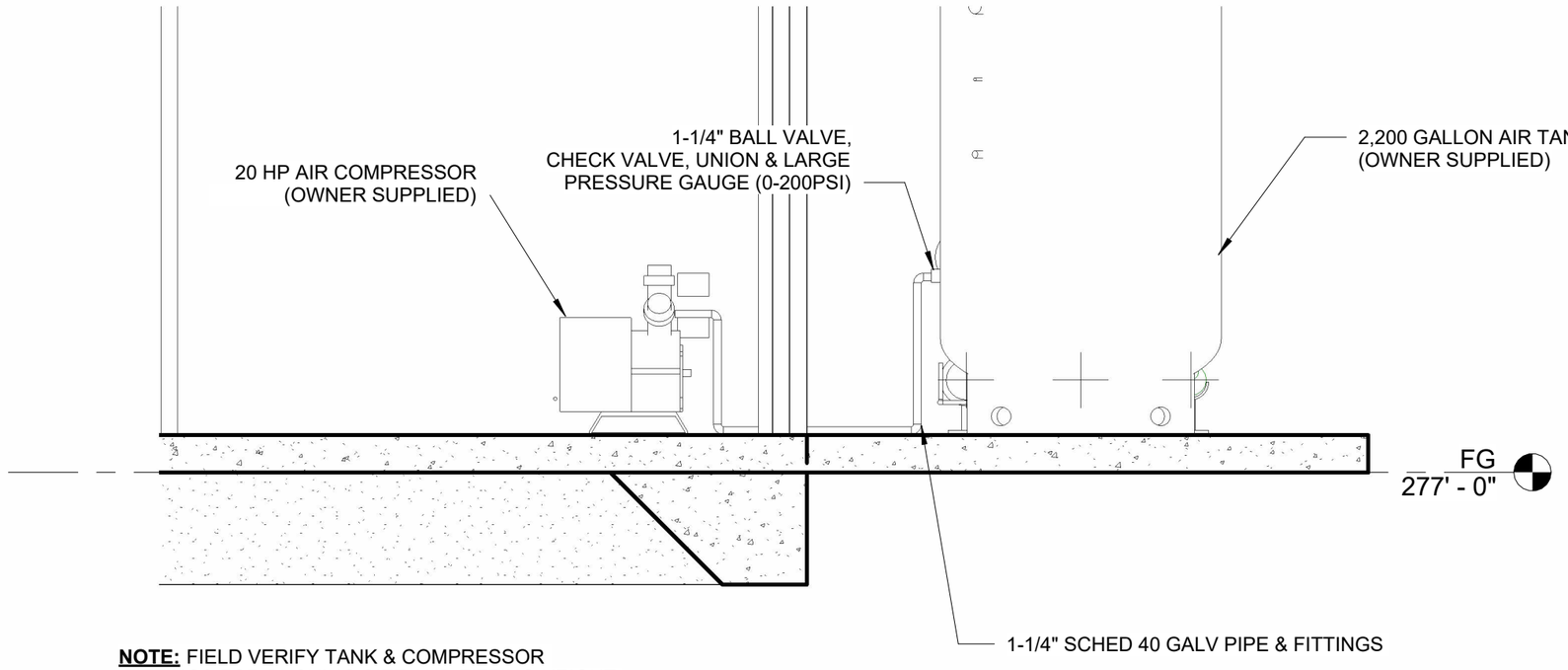


1 Air Reciever Section View
1/2" = 1'-0"



NOTE: FIELD VERIFY TANK & COMPRESSOR
FITTINGS FOR BUSHING SIZE AND FITTING HEIGHT

2 Air Compressor Section View
3/8" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	As indicated
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

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NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION
ONLY, NOT FOR CONSTRUCTION

Sheet Name
Air Burst Detail 2

Drawing Number
M1202

3/8/2023 1:06:13 PM

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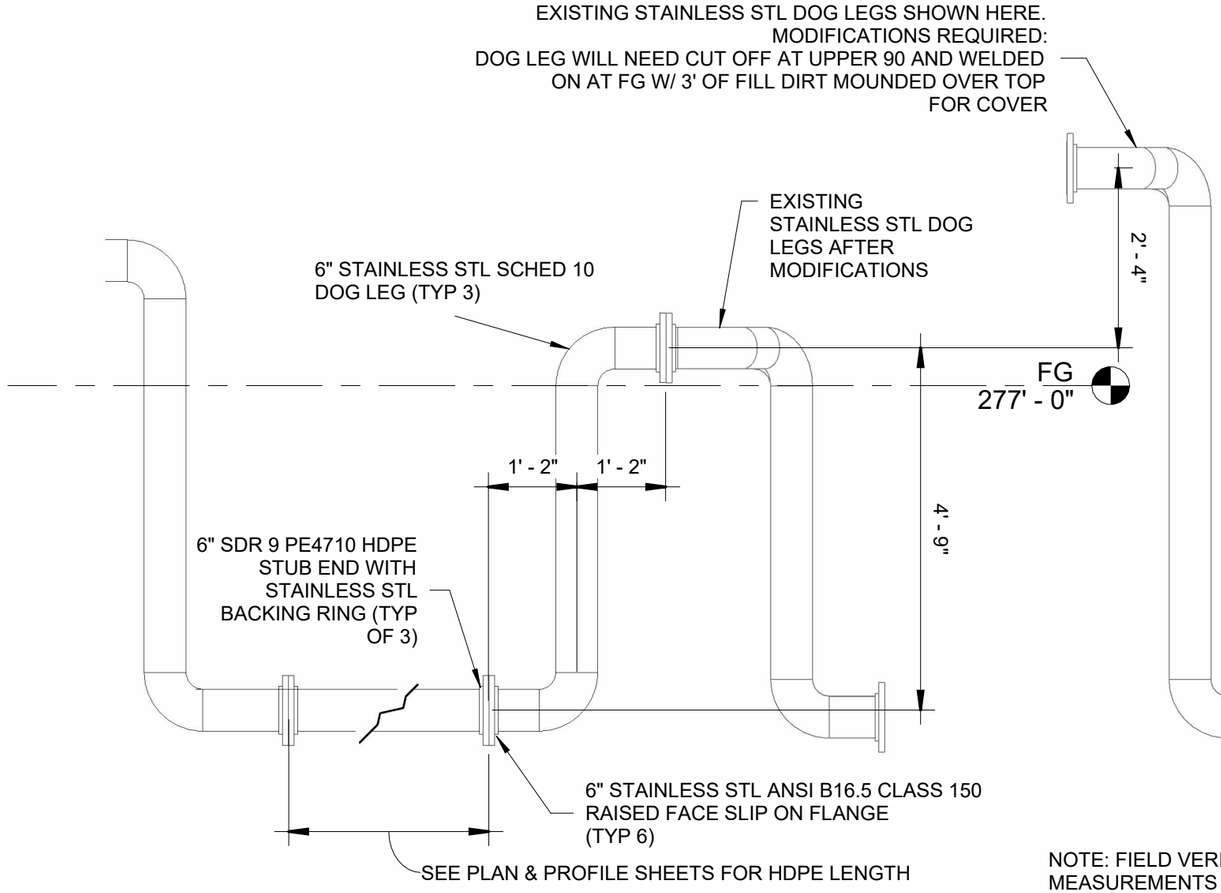
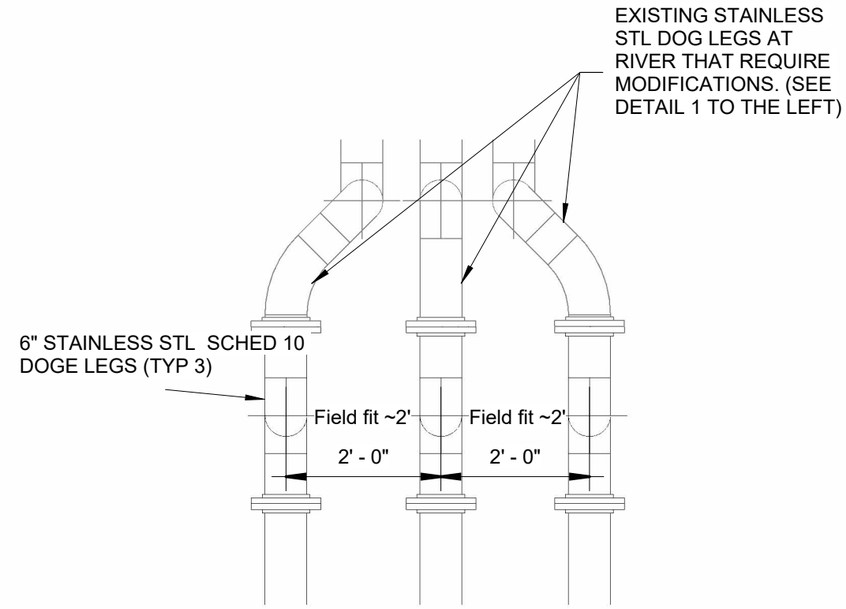


NOTE: FIELD VERIFY ALL MEASUREMENTS

1 Air Burst Connection at River Section View
1/2" = 1'-0"



2 Air Burst Connection at River Plan View
1/2" = 1'-0"

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DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	1/2" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

DRAWING FOR INFORMATION ONLY, NOT FOR CONSTRUCTION

Sheet Name
Air Burst River Connection

Drawing Number
M1203

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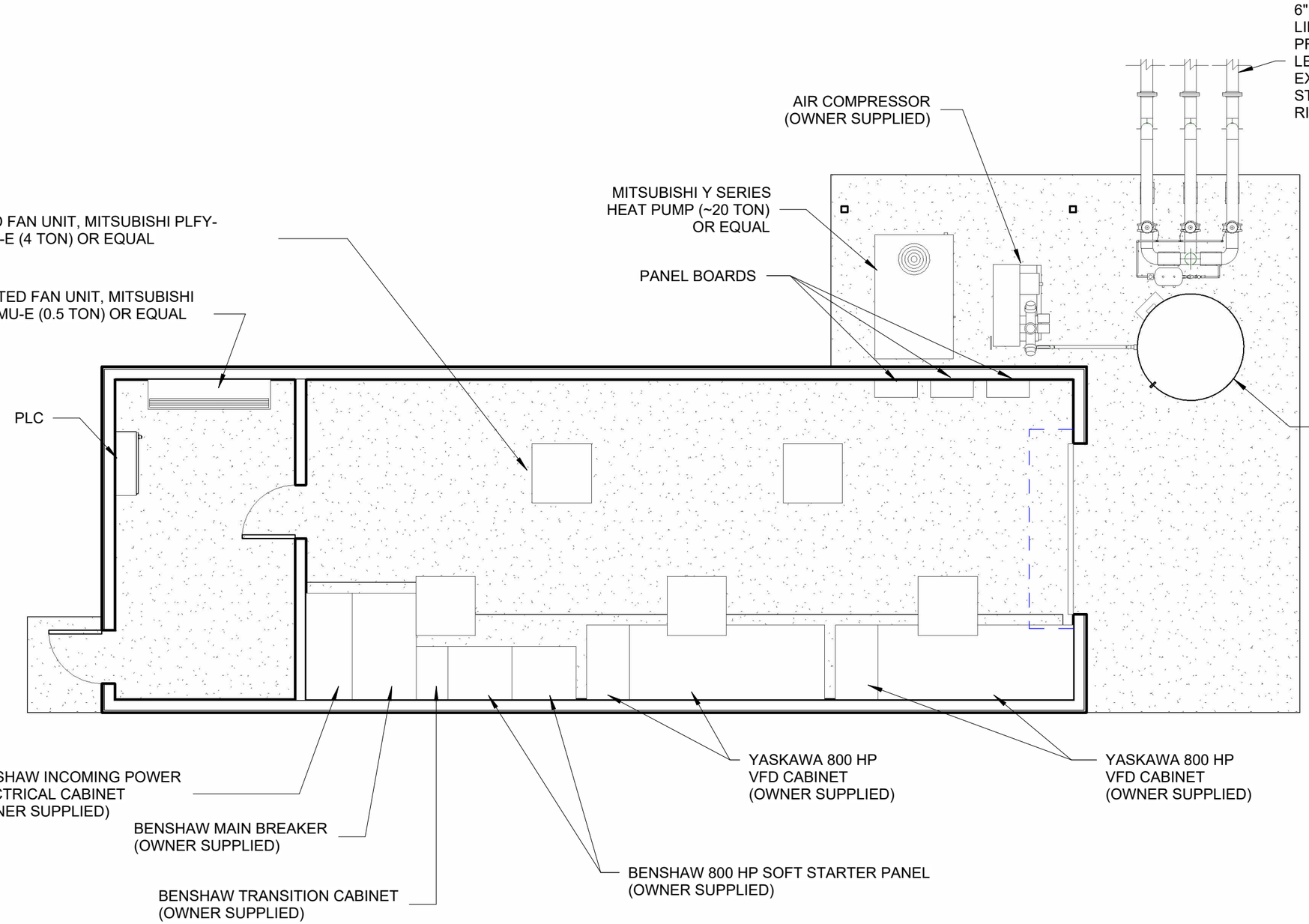

1 Electrical Building Mechanical Components
3/16" = 1'-0"

DRAWN	DH,TL
DESIGNED	TY LORD
APPROVED	-
DATE	MARCH 2023
SCALE	3/16" = 1'-0"
PROJECT	675-20-001

UMATILLA COUNTY

PHASE 1 ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N. 1st. ST. HERMISTON, OREGON 97838
OFFICE (541) 567- 0252 FAX (541) 567- 4239

NO.	DESCRIPTION	DATE
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0 SCALE CHECK 1"

Engineer of Record:

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Sheet Name
Electrical Building Mechanical Components

Drawing Number
M3000

3/8/2023 1:06:16 PM

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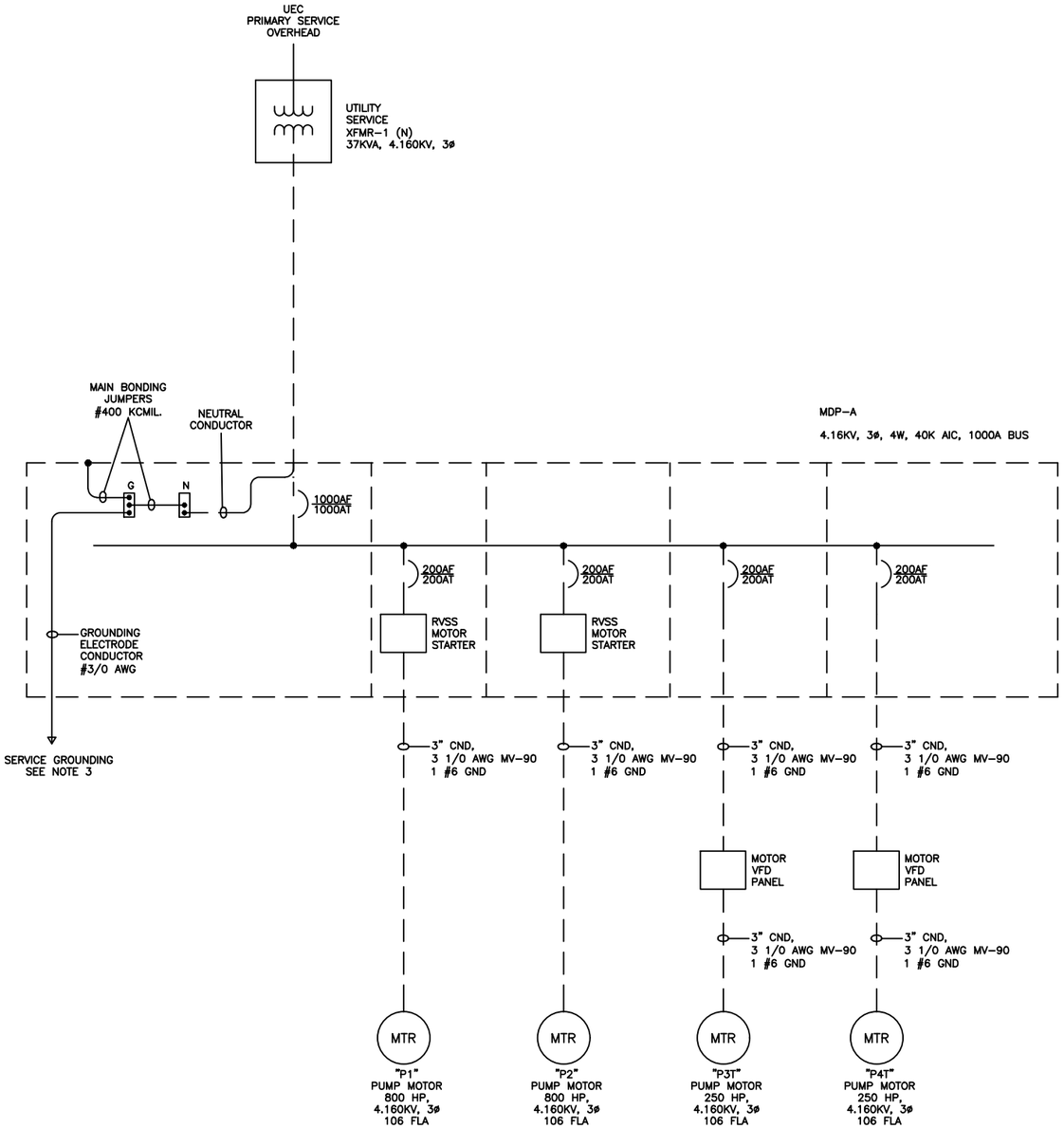

1 4,160V SINGLE LINE DIAGRAM

Scale: NTS

NOTES:

1. INSTALLATION SHALL BE IN ACCORDANCE WITH NEC AND LOCAL CODES.
2. ALL CONDUCTORS SHALL BE COPPER "CU".
3. CONTRACTOR SHALL SIZE CONDUIT PER NEC CODE REQUIREMENTS USING 40% FILL.
4. COORDINATE SERVICE WITH UEC.

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING
UMATILLA COUNTY
ORDANANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
OFFICE (541) 567-0252 FAX (541) 567-4239
G6 | ENGINEERING LLC
Kennewick, WA 99336
509-581-2229

Revisions

N0.	Description	Date
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4		

0 SCALE CHECK 1"

Stamp:

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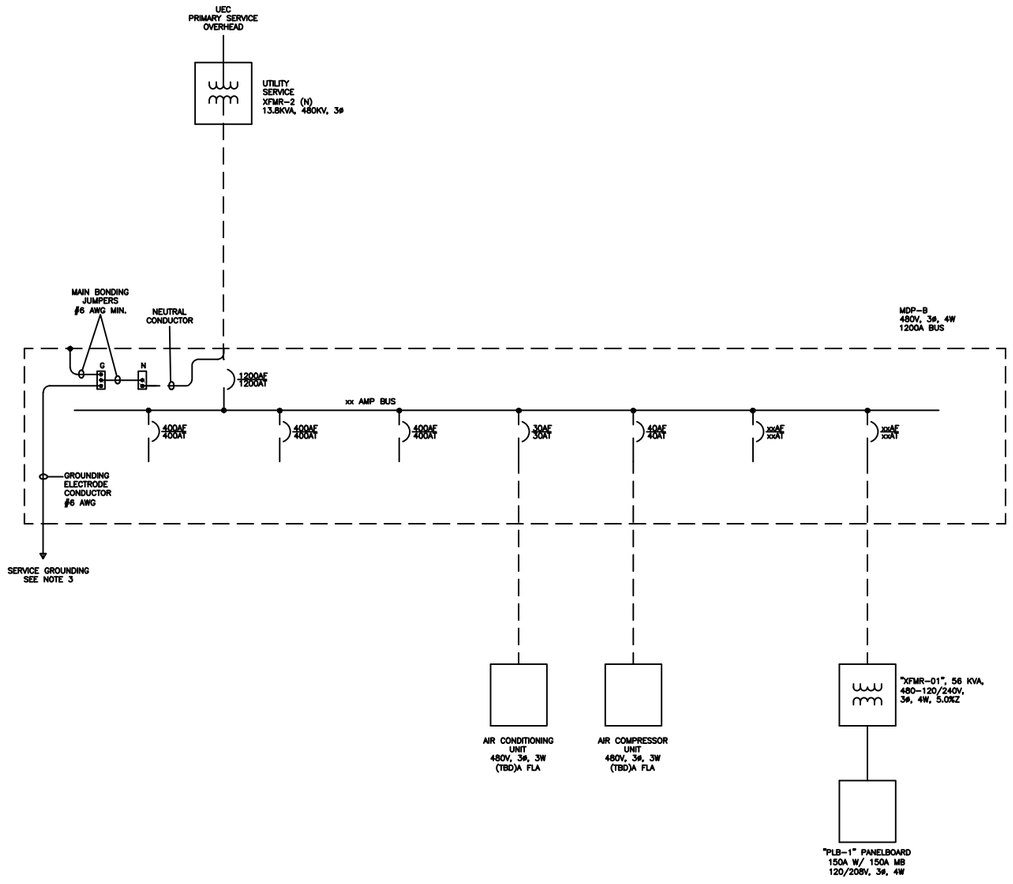
Sheet Name and Description:
60% Design Review
SINGLE LINE DIAGRAM
4,160V

Drawing Number:
E1000



1 480V SINGLE LINE DIAGRAM

Scale: NTS

NOTES:

1. INSTALLATION SHALL BE IN ACCORDANCE WITH NEC AND LOCAL CODES.
2. ALL CONDUCTORS SHALL BE COPPER "CU".
3. CONTRACTOR SHALL SIZE CONDUIT PER NEC CODE REQUIREMENTS USING 40% FILL.
4. COORDINATE SERVICE WITH UEC.

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING

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IRZ ENGINEERING & CONSULTING
UMATILLA COUNTY
ORDNANCE PROJECT

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Sheet Name and Description:
60% Design Review
SINGLE LINE DIAGRAM
480V

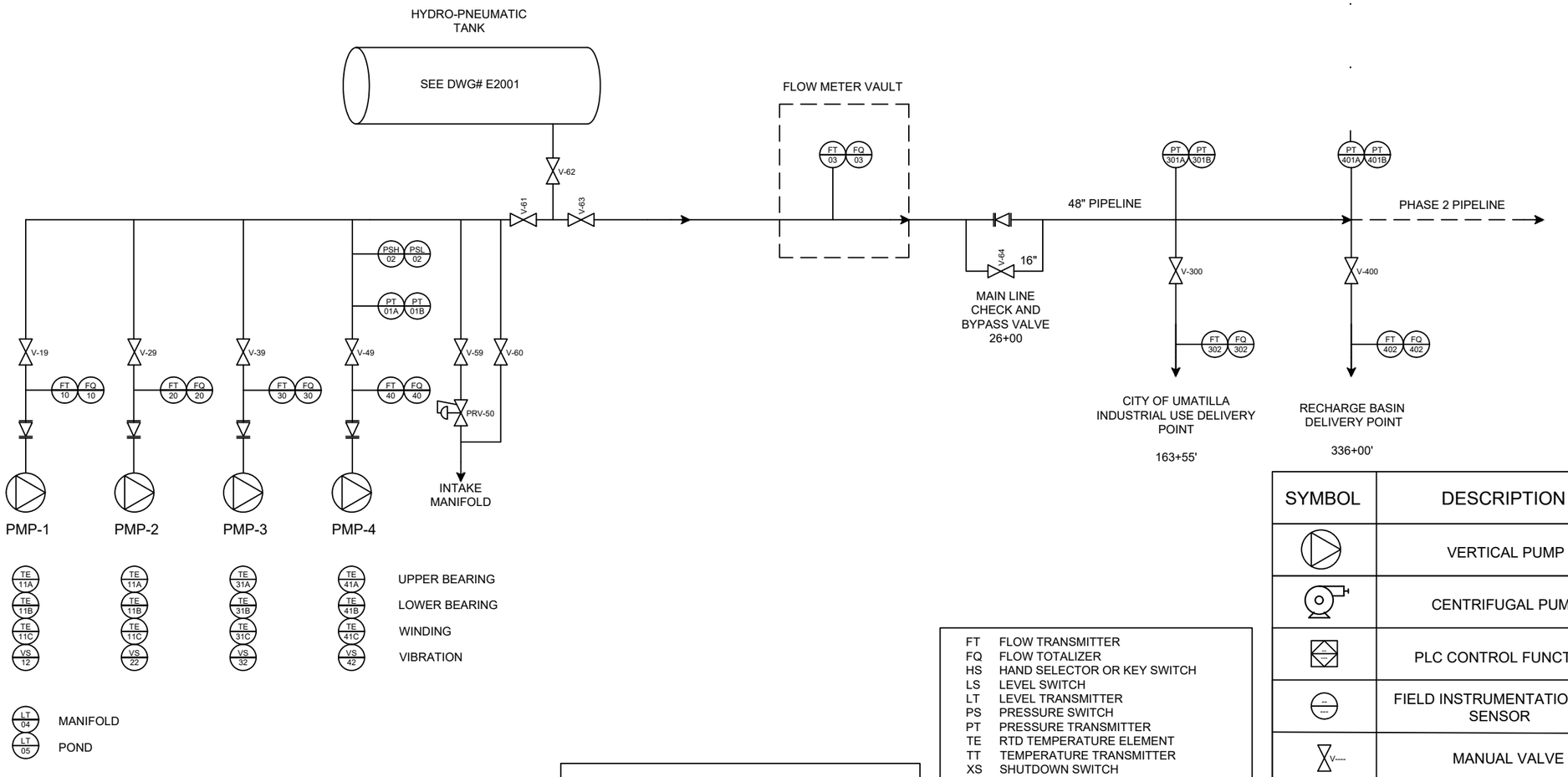
Drawing Number:
E1001

NOTES:
1. VFD MOTOR CONTROLLERS WILL PROVIDE SIGNALS/DATA TO THE PLC, SEE INTEGRATION SPECIFICATION OF LIST OF SIGNALS.
2. RVSS MOTOR CONTROLLERS WILL PROVIDE SIGNALS/DATA TO THE PLC, SEE INTEGRATION SPECIFICATION OF LIST OF SIGNALS.
3. PUMP 3 AND PUMP 4 WILL BE INITIALLY INSTALLED WITH 250 HP, 4160VAC TEMPORARY PUMPS FOR PHASE 1. FUTURE PHASE 2 PUMP SIZES ARE SHOWN.

PUMPS 3 & 4: 800 HP 4160 VAC, 3PH VFD NOTE 1,3

PUMPS 1 & 2: 800 HP 4160 VAC, 3PH RVSS NOTE 2

PLC PRESSURE CONTROLLER (PC 00)



— . — ELECTRICAL SIGNAL

——————— PIPING

FT	FLOW TRANSMITTER
FQ	FLOW TOTALIZER
HS	HAND SELECTOR OR KEY SWITCH
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
PS	PRESSURE SWITCH
PT	PRESSURE TRANSMITTER
TE	RTD TEMPERATURE ELEMENT
TT	TEMPERATURE TRANSMITTER
XS	SHUTDOWN SWITCH
YY	SHUNT TRIP OUTPUT
VS	VIBRATION SWITCH
ZS	POSITION SWITCH
ZSO	POSITION SWITCH OPEN

SYMBOL	DESCRIPTION
	VERTICAL PUMP
	CENTRIFUGAL PUMP
	PLC CONTROL FUNCTION
	FIELD INSTRUMENTATION OR SENSOR
V----	MANUAL VALVE
PRV-1	PRESSURE RELIEF VALVE
	CHECK VALVE

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING
UMATILLA COUNTY
ORDANANCE PROJECT

IRZ ENGINEERING & CONSULTING
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Sheet Name and Description:
60% Design Review
PIPING AND INSTRUMENTATION DIAGRAM - SHEET 1

Drawing Number:
E2000

Print: 3/3/2023 10:16 AM

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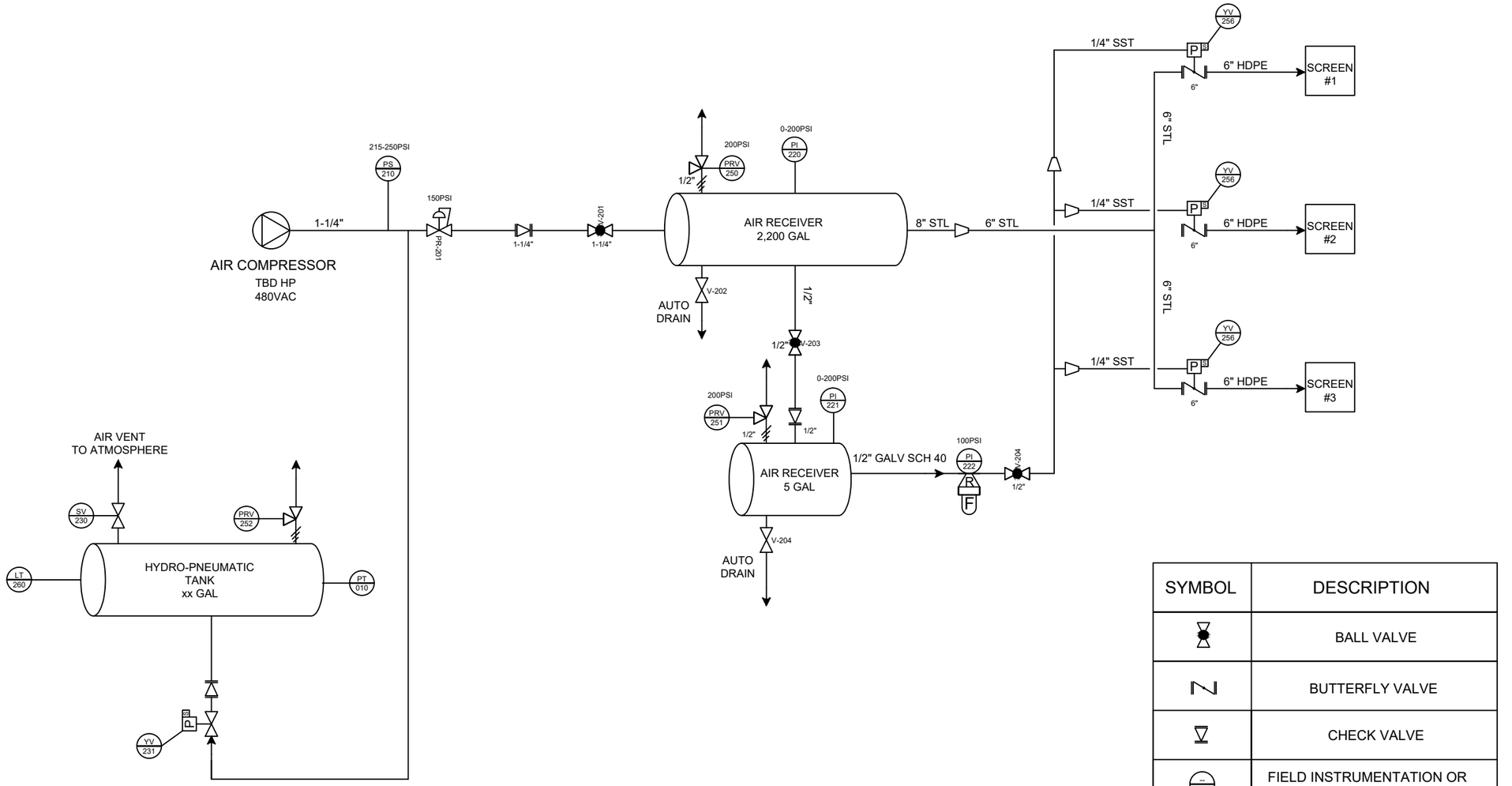

— · —	ELECTRICAL SIGNAL
———	PIPING

F	FILTER
FT	FLOW TRANSMITTER
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
PG	PRESSURE GAUGE
PI	PRESSURE INDICATOR
PR	PRESSURE REGULATOR
PRV	PRESSURE RELIEF VALVE
PS	PNEUMATIC SOLENOID
PT	PRESSURE TRANSMITTER
R	REGULATOR
SST	STAINLESS STEEL TUBING
STL	STEEL PIPE
SV	SOLENOID VALVE
TT	TEMPERATURE TRANSMITTER
V	VALVE
XS	SHUTDOWN SWITCH
ZS	POSITION SWITCH
ZSO	POSITION SWITCH OPEN

SYMBOL	DESCRIPTION
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	FIELD INSTRUMENTATION OR SENSOR
V----	MANUAL VALVE
PS	PNEUMATIC SOLENOID
PR--	PRESSURE REGULATOR VALVE
	PRESSURE RELIEF VALVE
R F	RUGULATOR / FILTER
	VERTICAL PUMP

DRAWN	TOM GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING
UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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509-581-2229

Revisions

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Sheet Name and Description:
60% Design Review
PIPING AND INSTRUMENTATION DIAGRAM - AIR SYSTEMS

Drawing Number:
E2001

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REMOTE STATION PLANS

SCOPE OF WORK (CONTRACTOR):

1. INSTALL AND FURNISH ALL ELECTRICAL PANELS AND ENCLOSURES AS SHOWN ON THE PLANS.
2. INSTALL AND FURNISH ALL ABOVE AND BELOW GROUND CONDUIT AS SHOWN ON THE PLANS.
3. PERFORM A SITE SURVEY TO VERIFY THE ANTENNA TYPE AND HEIGHT TO BE INSTALL TO COMMUNICATE WITH THE INTERTIE LOCATION.
4. INSTALL AND FURNISH RADIO COMPONENTS AND ANTENNA AS SHOWN ON THE PLANS.

ABBRREVIATION LIST

ATL	–	ACCROSS THE LINE
FT	–	FLOW TRANSMITTER
HMI	–	HUMAN MACHINE INTERFACE
HOA	–	HAND, OFF, AUTO
HS	–	HAND SWITCH
LSH	–	LEVEL SWITCH HIGH
LSL	–	LEVEL SWITCH LOW
LT	–	LEVEL TRANSMITTER
MCC	–	MOTOR CONTROL CENTER
MCP	–	MOTOR CONTROL PANEL
MDP	–	MAIN DISTRIBUTION PANEL
MS	–	MOTOR STARTER
PLB	–	PANELBOARD
PLC	–	PROGRAMMABLE LOGIC CONTROLLER
PNL	–	ELECTRICAL PANEL
PMP	–	PUMP
PSH	–	PRESSURE SWITCH HIGH
PSL	–	PRESSURE SWITCH LOW
PSI	–	POUND–FORCE PER SQUARE INCH
PT	–	PRESSURE TRANSMITTER
MTR	–	MOTOR
VFD	–	VARIABLE FREQUENCY DRIVE
XFMR	–	TRANSFORMER
PSH	–	PRESSURE SWITCH HIGH

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING

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ORDANANCE PROJECT

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REMOTE STATION PLAN COVERSHEET

Drawing Number:
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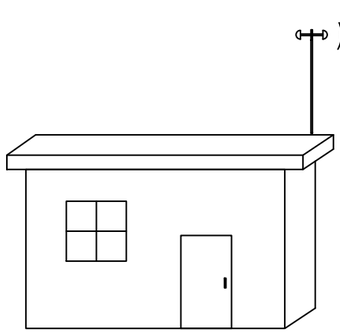

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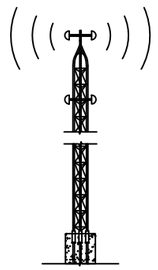

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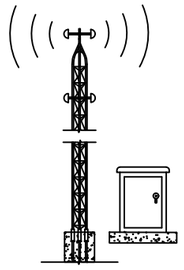

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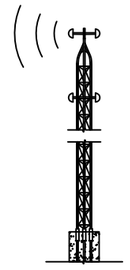

PUMP STATION
STA 0+00

TOWER 1

26+00

TOWER 2
CITY OF UMATILLA
INDUSTRIAL USE PIPELINE
DELIVERY POINT

163+55'

TOWER 3
RECHARGE BASIN
DELIVERY POINT

336+00'

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING

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509-581-2229

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UMATILLA COUNTY
ORDANANCE PROJECT

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Sheet Name and Description:
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Remote Station Plan
RADIO COMMUNICATIONS PLAN

Drawing Number:
E2101

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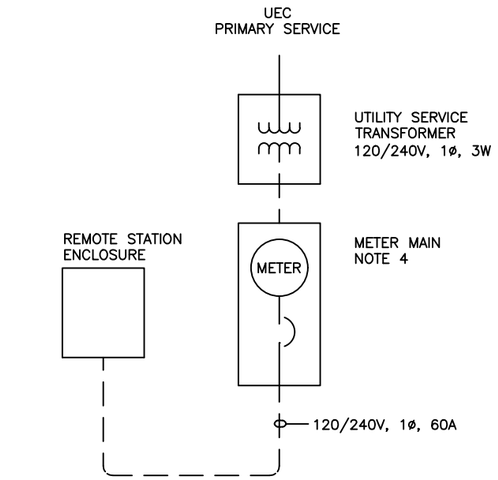

2 REMOTE STATION SINGLE LINE

NTS

NOTES:

1. INSTALLATION SHALL BE IN ACCORDANCE WITH NEC AND LOCAL CODES.
2. ALL POWER CONDUCTORS SHALL BE COPPER "CU".
3. CONTRACTOR SHALL SIZE CONDUIT PER NEC CODE REQUIREMENTS USING 40% FILL. CONDUIT ROUTES SHALL BE COMPLETE FROM DEVICE TO DEVICE, THIS DRAWING IS INTENDED TO ONLY BE A SCHEMATIC OF CONNECTION POINTS. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS IN THE FIELD.
4. INSTALL SERVICE GROUNDING IN ACCORDANCE WITH NEC AND LOCAL CODES.
5. CONTRACTOR SHALL PROVIDE A ROBUST STEEL MOUNTING SUPPORT STAND FOR THE ELECTRICAL PANELS AND JUNCTION BOXES.

1 TYPICAL REMOTE STATION CONNECTION DETAIL

NTS

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING
UMATILLA COUNTY
ORDNANCE PROJECT

IRZ ENGINEERING & CONSULTING
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REMOTE STATION PLANS
TYPICAL REMOTE STATION

Drawing Number:
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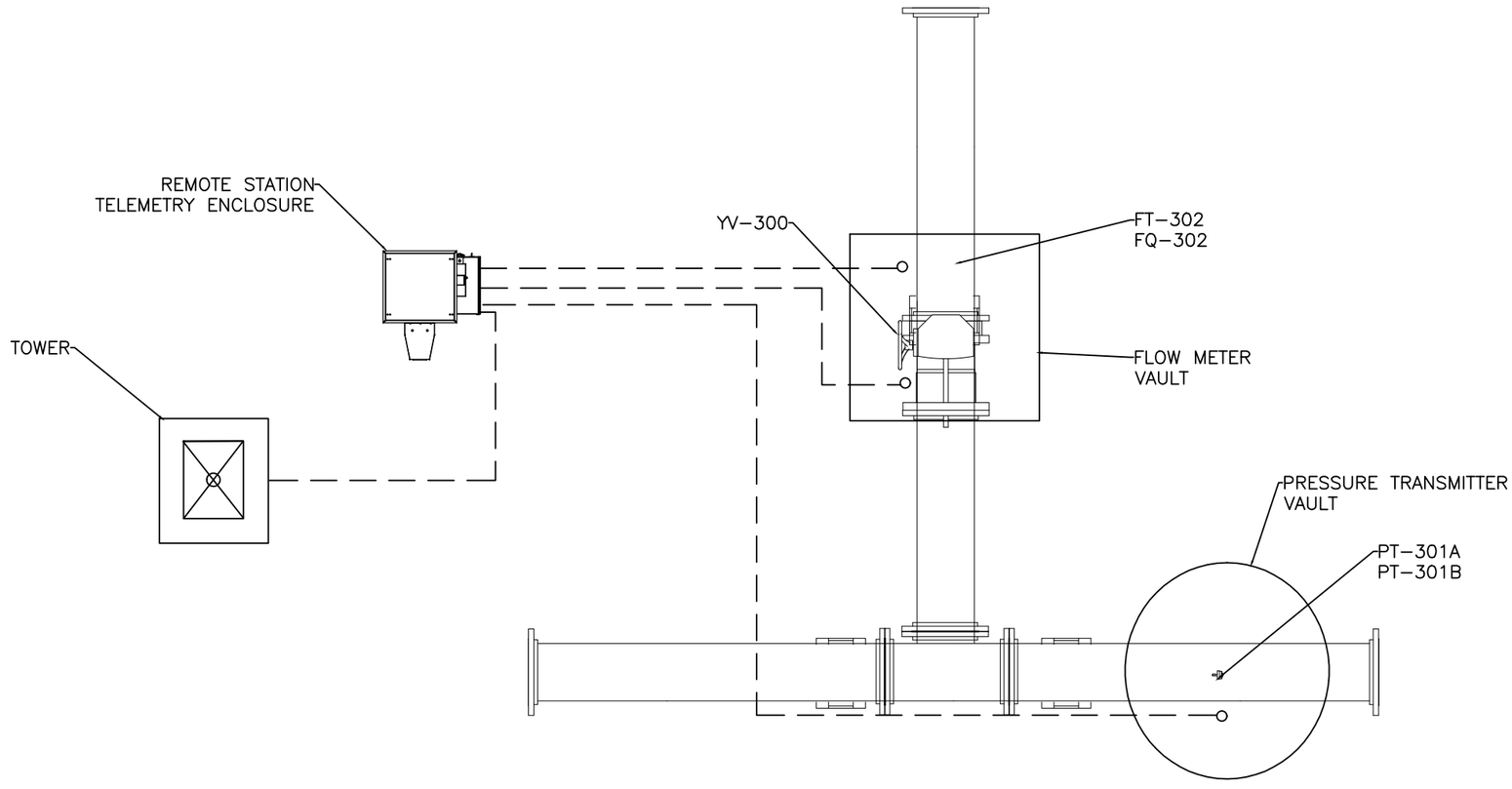

3 CITY OF UMATILLA INDUSTRIAL USE DELIVERY POINT – ELECTRICAL PLAN

SCALE: 1"=3'

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING
ASSOCIATION
UMATILLA COUNTY
ORDANANCE PROJECT

IRZ ENGINEERING & CONSULTING
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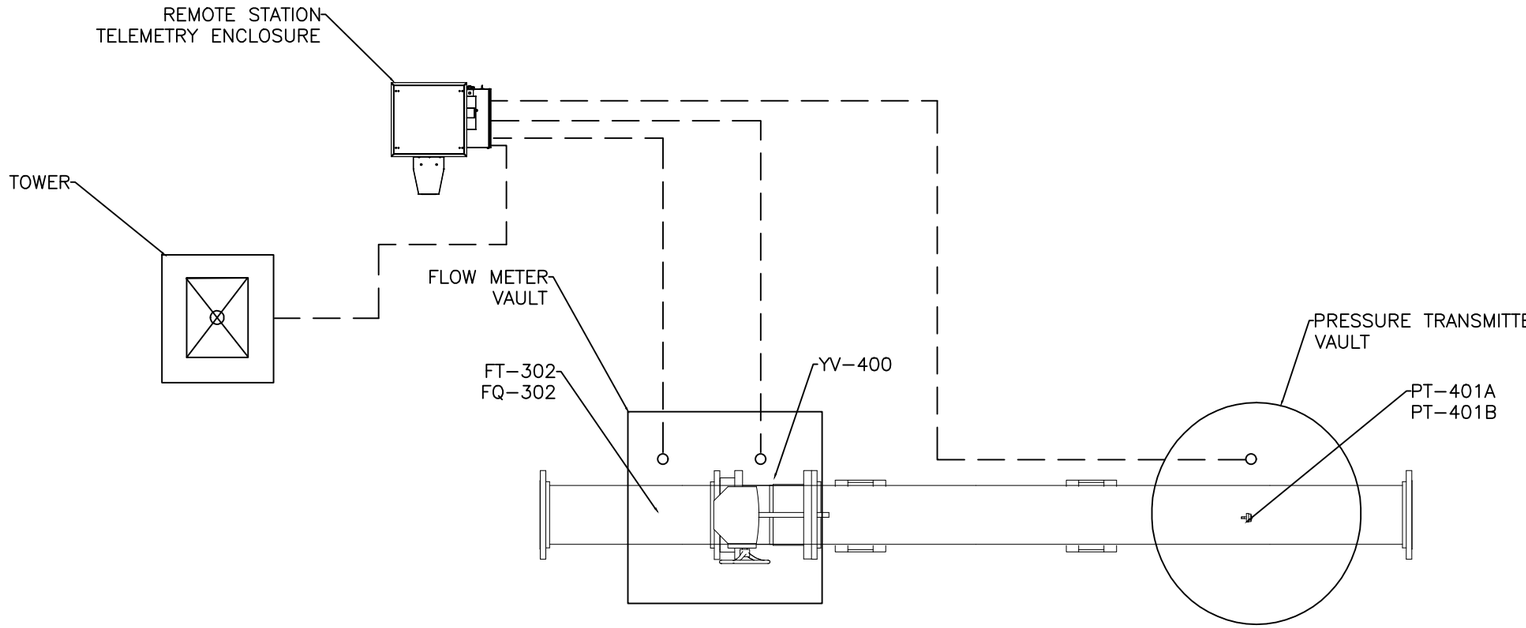
REMOTE STATION PLANS
CITY OF UMATILLA IND. D.P.

Drawing Number:
E2103



4 RECHARGE BASIN DELIVERY POINT – ELECTRICAL PLAN
SCALE: 1"=3'

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING ASSOCIATION
UMATILLA COUNTY
ORDANANCE PROJECT

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SCALE CHECK 0 1"

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Sheet Name and Description:
60% DESIGN REVIEW
REMOTE STATION PLANS
RECHARGE BASIN D.P.

Drawing Number:
E2104

REMOTE STATION CABINET ASSEMBLY DRAWINGS (RSC)

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DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ CONSULTING
& CONSULTING
UMATILLA COUNTY
ORDANANCE PROJECT

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REMOTE STATION CABINET COVERSHEET

Drawing Number:
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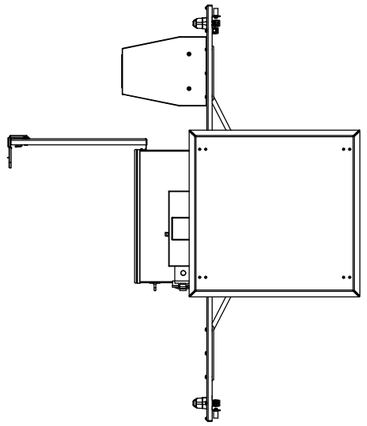

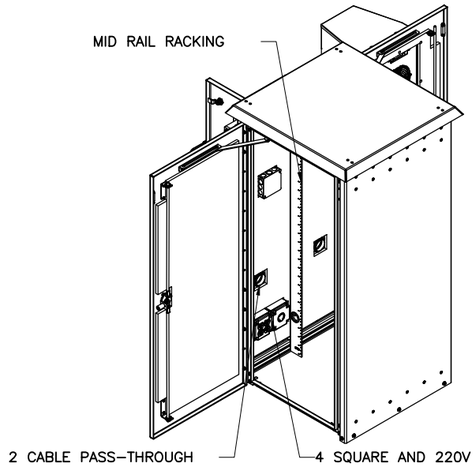

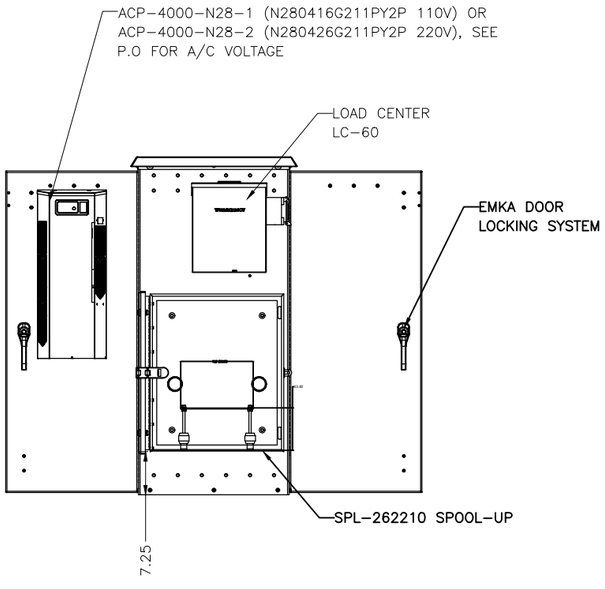

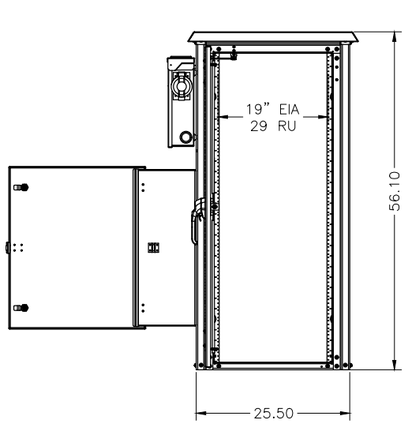

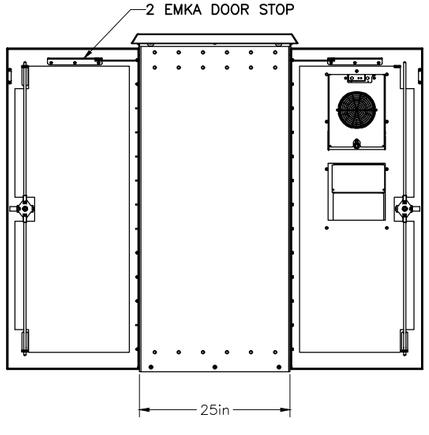

1 REMOTE STATION CABINET – DETAILS

NTS

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING

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OFFICE (541) 567-0252 FAX (541) 567-4239

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Kennewick, WA 99336
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UMATILLA COUNTY
ORDANANCE PROJECT

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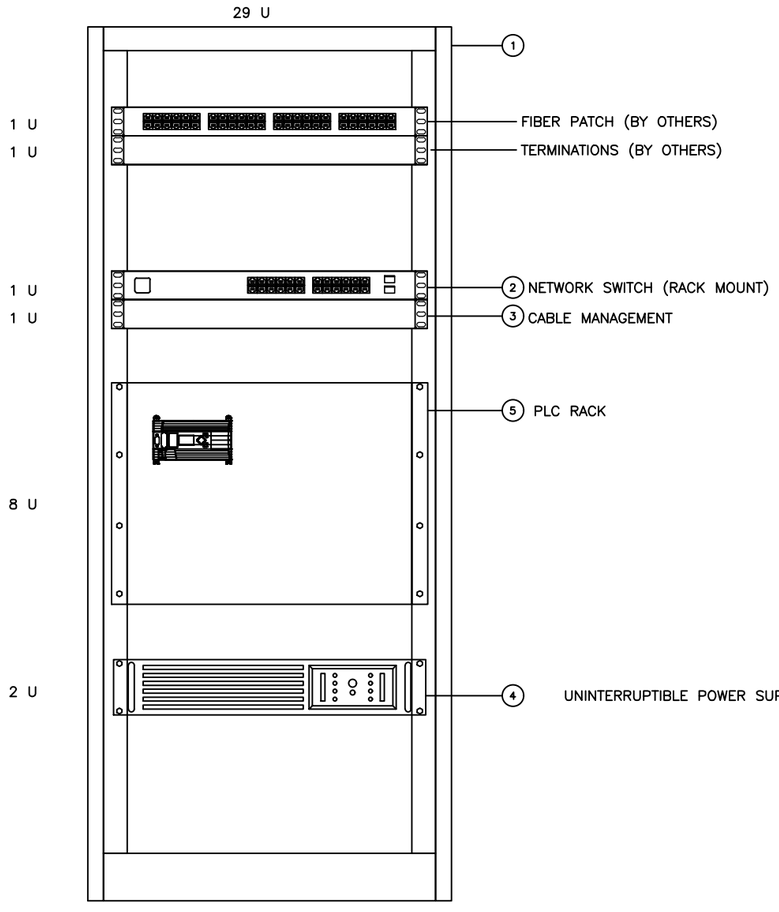
Sheet Name and Description:
60% DESIGN REVIEW
REMOTE STATION CABINET DETAILS

Drawing Number:
E2201



BILL OF MATERIAL

ITEM	PART NUMBER	PART DESCRIPTION	MANUFACTURER	QTY EA.	QTY TOTAL
1	R7-54DXW	NETWORK ENCLOSURE, OUTDOOR RATED, W/ A/C AND HEATER, WITH GENERATOR PLUG AND POWER LOAD CENTER PANEL	DDB UNLIMITED	1	TBD
2	US-24	NETWORK SWITCH, RACK MOUNT, 1U, 24 PORT	UBIQUITY	1	TBD
3	CMH-SFD1U	CABLE MANAGEMENT, RACK MOUNT, 1U	FS	1	TBD
4	SMT1000RM2UC	UNINTERRUPTIBLE POWER SUPPLY, 120VAC, 1000VA	APC	1	TBD
5	TBD	MICORLOGIX PLC RACK AND DC POWER SUPPLY, RACK MOUNTED, 120VAC, ETHERNET COMMS	G6	1	TBD

2 REMOTE STATION CABINET – RACK LAYOUT

NTS

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING

UMATILLA COUNTY ORDANANCE PROJECT

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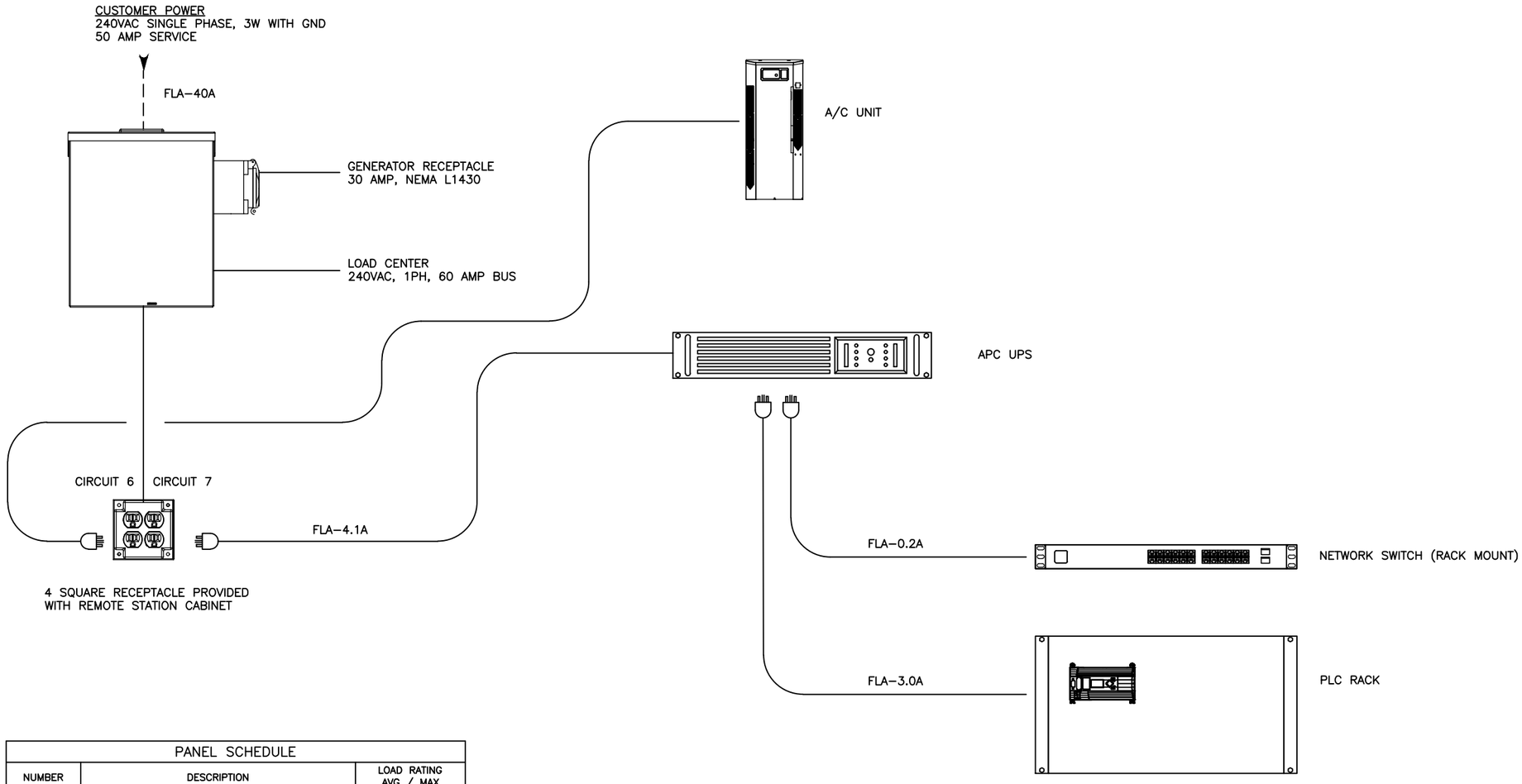
Sheet Name and Description:
60% DESIGN REVIEW
REMOTE STATION CABINET
RACK LAYOUT

Drawing Number:
E2202



PANEL SCHEDULE		
NUMBER	DESCRIPTION	LOAD RATING AVG / MAX
1	A/C AND HEATER UNIT	24 / 40 AMPS
2	110V GENERAL RECEPTACLE CIRCUIT	4.1 / 10 AMPS
3	SPARE	0 / 0 AMPS
TOTAL		28.1 / 44 AMPS

3 REMOTE STATION CABINET – POWER DIAGRAM

NTS

DRAWN	JACK GOURLEY
DESIGNED	JACK GOURLEY
APPROVED	JACK GOURLEY
DATE	MARCH 2023
SCALE	NTS
PROJECT	675-20-01

IRZ ENGINEERING & CONSULTING
UMATILLA COUNTY
ORDANANCE PROJECT

IRZ ENGINEERING & CONSULTING
500 N 1ST, HERMISTON, OREGON 97838
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G6 | ENGINEERING LLC
Kennewick, WA 99336
509-581-2229

Revisions

N0.	Description	Date
1		
2		
3		
4		

0 SCALE CHECK 1"

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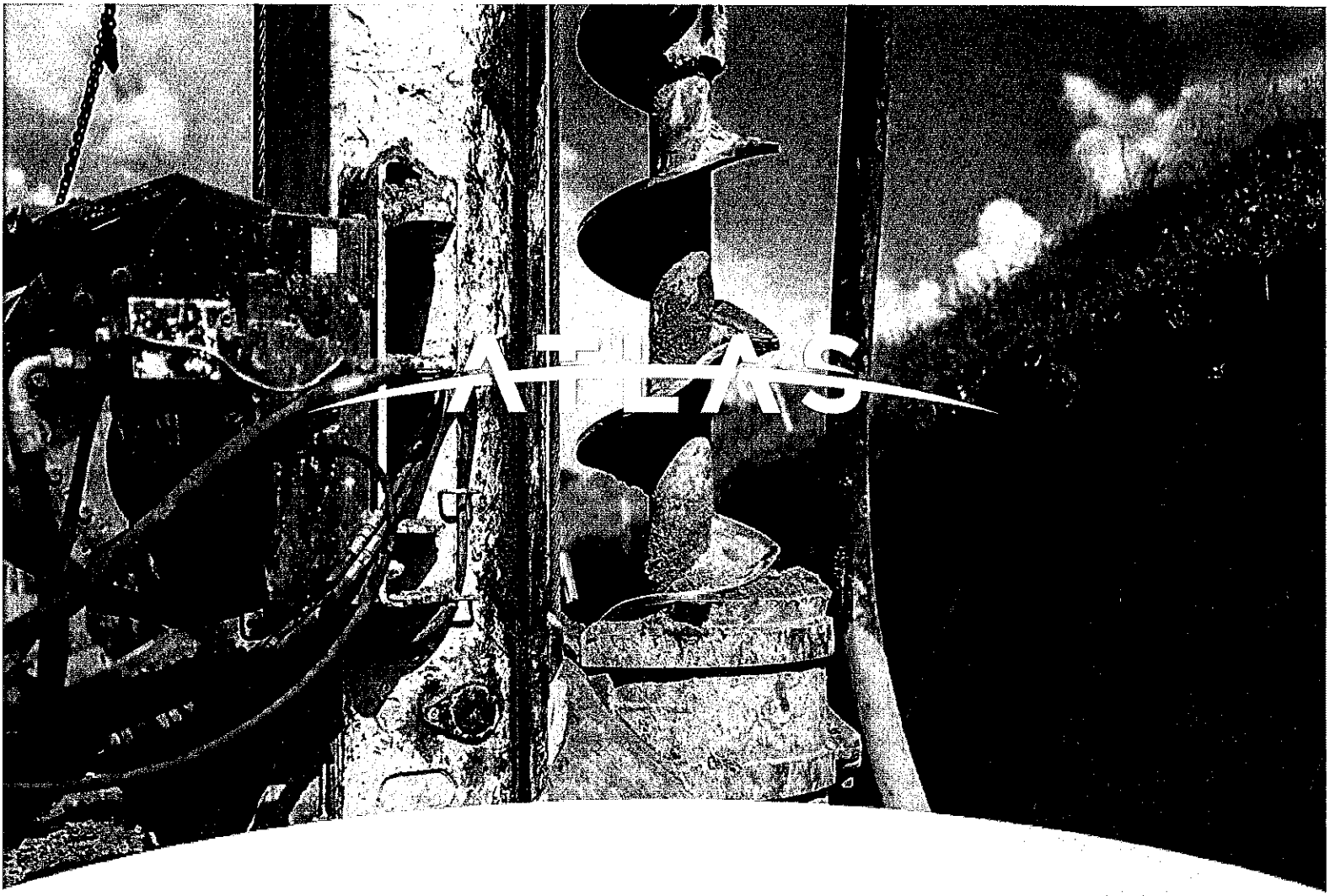
Sheet Name and Description:
60% DESIGN REVIEW
REMOTE STATION CABINET
POWER DIAGRAM

Drawing Number:
E2203

APPENDIX B – Phase 1 Geotechnical Investigation Report



GEOTECHNICAL INVESTIGATION

UMATILLA PIPELINE

Umatilla, OR

PREPARED FOR:

Mr. Dylan Hatch
IRZ Construction Division
500 North 1st Street
Hermiston, OR 97838

PREPARED BY:

Atlas Technical Consultants, LLC
2791 South Victory View Way
Boise, ID 83709

August 16, 2022
B221100g

ATLAS

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Boise, ID 83709
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August 16, 2022

Atlas No. B221100g

Mr. Dylan Hatch
IRZ Construction Division
500 North 1st Street
Hermiston, OR 97838

Subject: Geotechnical Investigation
Umatilla Pipeline
Umatilla, OR

Dear Mr. Hatch:

In compliance with your instructions, Atlas has conducted a soils exploration and foundation evaluation for the above referenced development. Fieldwork for this investigation was conducted on June 15, 2022. Data have been analyzed to evaluate pertinent geotechnical conditions. Results of this investigation, together with our recommendations, are to be found in the following report. We have provided a PDF copy for your review and distribution.

Often, questions arise concerning soil conditions because of design and construction details that occur on a project. Atlas would be pleased to continue our role as geotechnical engineers during project implementation.

If you have any questions, please call us at (208) 376-4748.

Respectfully submitted,

Max Kasberger
Staff Engineer

Jacob Schlador, PE (ID)
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
19053PE
OREGON
MAY 15, 1991
DAVID O. CRAM
Exp. 12-31-22

David O. Cram, PE, GE 8-16-22
Senior Vice President

ATLAS

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ATLAS

1. INTRODUCTION

This report presents results of a geotechnical investigation and analysis in support of data utilized in design of structures as defined in the 2019 Oregon Structural Specialty Code (OSSC). Information in support of groundwater and stormwater issues pertinent to the practice of Civil Engineering is included. Observations and recommendations relevant to the earthwork phase of the project are also presented. Revisions in plans or drawings for the proposed development from those enumerated in this report should be brought to the attention of the soils engineer to determine whether changes in the provided recommendations are required. Deviations from noted subsurface conditions, if encountered during construction, should also be brought to the attention of the soils engineer.

1.1 Project Description

The proposed pipeline is west and southwest of the City of Umatilla, Umatilla County, OR, and occupies portions of Township 5 North, Range 27 East, Willamette Meridian. This project will consist of constructing an approximately 3.1-mile long stretch of 42-inch irrigation pipeline along with a pump station on the northern end of the pipeline. It is also anticipated that pipeline crossing Highway 730 will be constructed using a bore and jack method. Atlas was informed that the canal crossings have already been design and that recommendations for roadway and canal crossings were not required with the exception of the Highway 730 crossing. Atlas has not been informed of the pipe material or the proposed depth of the pipeline. Atlas was informed by Ty Lord with IRZ Construction, that it is anticipated that pump station will reside on a raft/mat slab foundation system with thickened edges for frost embedment. Additionally, the site for the pump station is anticipated to be raised approximately 7 feet above existing grade. Ty Lord informed Atlas that point loads of 30,000 pounds for the pump and three separate loads of 2,000 pounds for support of the pipe are anticipated on the slab. Retaining walls are anticipated as temporary shoring measures. Atlas has not been informed of the proposed grading plan.

1.2 Authorization

Authorization to perform this exploration and analysis was given in the form of a written authorization to proceed from Mr. Ty Lord of IRZ Construction Division to Jacob Schlador of Atlas Technical Consultants (Atlas), on May 5, 2022. Said authorization is subject to terms, conditions, and limitations described in the Professional Services Contract entered into between IRZ Construction Division and Atlas. Our scope of services for the proposed development has been provided in our proposal dated April 28, 2022 and repeated below.

1.3 Scope of Investigation

The scope of this investigation included review of geologic literature and existing available geotechnical studies of the area, review of available environmental reports, visual site reconnaissance of the immediate site, subsurface exploration of the site, field and laboratory testing of materials collected, and engineering analysis and evaluation of foundation materials. The scope of work did not include pavement design recommendations, canal crossing recommendations, and roadway crossings recommendations with the exception of Highway 730.

2. SITE DESCRIPTION

2.1 Site Access

Access to the site may be gained via Interstate 82 to the Highway 730 exit. Proceed west and southwest on Highway 730 approximately 2.4 miles to Southshore Drive. Head north on Southshore Drive 150 feet north to where the road turns to the northwest. Travel 0.83 mile northwest. The proposed pipeline corridor is anticipated to start 0.13 mile north and finish 2.9 miles south of this location. The location is depicted on site maps included in the **Appendix**.

2.2 Regional Geology

The site lies within the Umatilla Basin of the Columbia Plateau, a broad area underlain by volcanic flood basalts, and covered with a veneer of sediments ranging in grain size from windblown clay and silt to water lain sand and gravel. The volcanic flood basalts are part of the Columbia River Basalt Group (CRBG) which consists of a series of Miocene age (17-6 million years) basalt flows that covers northern and eastern Oregon, central and eastern Washington, and western Idaho. The CRBG forms the rolling hills of the Umatilla Basin, as well as the scablands of eastern Washington. Over 300 individual flows have been identified as part of the CRBG with flows ranging in thickness from 5 to over 100 feet. Total thickness of the series of flows may be as great as 10,000 ft. The vesicular and brecciated flow tops and bottoms of individual flows within the Columbia River Basalt Group are permeable and an important source of water supply in the Umatilla Basin. The alluvial sand and gravel deposits are limited to the lower basin between Boardman and Cold Springs Reservoir and in the flood plain of major streams. The project site is underlain by sediments that reflect deposition by wind and stream activity including fine-grained clays and silts deposited by wind and coarse-grained sands and gravels that resulted from stream deposition. Locally gravels are strongly cemented suggesting a relatively long time since their deposition.

2.3 General Site Characteristics

The pipeline to be developed is approximately 3.1 miles in length. The pipeline corridor is planned to start on the south side of the Columbia River at the Irrigon Wildlife Area. The pipeline will extend south and crosses Southshore Drive, Highway 730, and the West Extension Canal. After crossing the West Extension Canal it continues south through agricultural fields. Vegetation consist of native weeds and grasses in the wild life area, landscape grasses and trees near the highway. South of West Extension Canal, vegetation consists of agricultural crops.

The site slope upwards from north to south approximately 363 feet in elevation across the entire site. However, 231 feet of the elevation gain takes place from the Columbia River to West Extension Canal. The remainder of the site is relatively flat and level with localized elevation changes of less than 5 feet. The pipeline corridor crosses an approximately 50-foot-tall ridgeline approximately 3-miles southeast of the start location of the pipeline.

Regional drainage is north and west toward the Columbia River. Runoff predominates for the steeper slopes while percolation prevails across the gently sloping and near level areas. From the south and east, intermittent off-site stormwater may drain onto the project site. Stormwater drainage collection and retention systems are not in place on the project site and were not noted within the vicinity of the project site.

2.4 Regional Site Climatology and Geochemistry

According to the Soil Survey of Umatilla County Area, Oregon the average precipitation for the project area is on the order of 8 to 12 inches per year, with an annual snowfall of approximately 11 inches. The monthly mean daily temperatures range from 27° F to 85° F with daily extremes ranging from -31° F to 113° F. Winds are generally from the southwest with an annual average wind speed of approximately 11 mph. Soils and sediments in the area are primarily derived from siliceous materials and exhibit low electro-chemical potential for corrosion of metals or concretes, and local aggregates are generally appropriate for Portland cement and lime cement mixtures. No indication of abnormal geochemical conditions were noted on site.

3. SEISMIC SITE EVALUATION

3.1 Geoseismic Setting

Soils on site are classed as Site Class D in accordance with Chapter 20 of the American Society of Civil Engineers (ASCE) publication ASCE/SEI 7-16. Structures constructed on this site should be designed per IBC requirements for such a seismic classification. Our investigation did not reveal hazards resulting from potential earthquake motions including: slope instability, liquefaction, and surface rupture caused by faulting or lateral spreading. Incidence and anticipated acceleration of seismic activity in the area is low.

3.2 Seismic Design Parameter Values

The United States Geological Survey National Seismic Hazard Maps (2008), includes a peak ground acceleration map. The map for 2% probability of exceedance in 50 years in the Western United States in standard gravity (g) indicates that a peak ground acceleration of 0.260 is appropriate for the project site based on a Site Class D.

The following section provides an assessment of the earthquake-induced earthquake loads for the site based on the Risk-Targeted Maximum Considered Earthquake (MCE_R). The MCE_R spectral response acceleration for short periods, S_{MS}, and at 1-second period, S_{M1}, are adjusted for site class effects as required by the 2018 IBC. Design spectral response acceleration parameters as presented in the 2018 IBC are defined as a 5% damped design spectral response acceleration at short periods, S_{DS}, and at 1-second period, S_{D1}.

The USGS National Seismic Hazards Mapping Project includes a program that provides values for ground motion at a selected site based on the same data that were used to prepare the USGS ground motion maps. The maps were developed using attenuation relationships for soft rock sites; the source model, assumptions, and empirical relationships used in preparation of the maps are described in Petersen and others (1996).

Table 1 – Seismic Design Values

Seismic Design Parameter	Design Value
Site Class	D "Default"
S_s	0.401 (g)
S_1	0.154 (g)
F_a	1.479
F_v	2.292
S_{MS}	0.594
S_{M1}	0.353
S_{DS}	0.396
S_{D1}	0.235

4. SOILS EXPLORATION

4.1 Exploration and Sampling Procedures

Field exploration conducted to determine engineering characteristics of subsurface materials included a reconnaissance of the project site and investigation by soil boring. The boring locations and depths were provided by IRZ Construction to Atlas via a map. Borings were located in the field by means of a Global Positioning System (GPS) device and are reportedly accurate to within fifteen feet. Borings were advanced by means of a truck-mounted drilling rig equipped with continuous flight hollow-stem augers. At specified depths, samples were obtained using a standard split-spoon sampler and Standard Penetration Test (SPT) blow counts were recorded. Uncorrected SPT blow counts are provided on logs, which can be found in the **Appendix.** Delayed water level observations were made in open borings to evaluate groundwater levels. At completion of exploration, borings were backfilled with bentonite holeplug,

Samples have been visually classified in the field by professional staff, identified according to boring number and depth, placed in sealed containers, and transported to our laboratory for additional testing. Subsurface materials have been described in detail on logs provided in the **Appendix**. Results of field and laboratory tests are also presented in the **Appendix**. Atlas recommends that these logs **not** be used to estimate fill material quantities.

4.2 Laboratory Testing Program

Along with our field investigation, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of subsurface materials necessary in an analysis of anticipated behavior of the proposed structures. Laboratory tests were conducted in accordance with current applicable American Society for Testing and Materials (ASTM) specifications, and results of these tests are to be found in the **Appendix**. The laboratory testing program for this report included: Atterberg Limits Testing – ASTM D4318, Grain Size Analysis – ASTM C117/C136, Direct Shear – ASTM D3080, and Compaction Characteristics of Soil Using Modified Effort - ASTM D1557.

The soils encountered within this investigation consisted of very granular material and dry silty soils. Due to the granular sediments and dry silty soils encountered during the investigation, Atlas was unable to obtain in-situ samples that were able to be extruded without disturbance. Therefore, Atlas was unable to conduct Direct Shear testing as originally requested. Additionally, the materials obtained for Compaction Characteristics of Soil Using Modified Effort typically consisted of very granular material. The material encountered was found to generally contain greater than 40 percent over-sized material; and therefore, was considered to granular to test per ASTM D1557.

4.3 Soil and Sediment Profile

The profile below represents a generalized interpretation for the project site. Note that on site soils strata, encountered between boring locations, may vary from the individual soil profiles presented in the logs, which can be found in the **Appendix**.

Silty sand and sandy silts were observed at ground surface in the all of the borings, with the exception of borings 2 and 3. Silty sands and sandy silts were brown to dark brown, dry to saturated, and very loose to medium dense/medium stiff to stiff, with fine to medium-grained sand and trace fine to coarse gravel. Silty gravel with sand sediments and poorly graded gravel with silt and sand sediments were noted at throughout borings 2 and 3, respectively. Poorly graded gravels with silt and sand were light, brown, and dark brown, dry to moist, and medium dense to very dense, with fine to coarse-grained sand and fine to coarse gravel. Silt-sand-gravel sediments were encountered below the surficial sediments in all borings except 2 and 3. These sediments were brown to light brown, dry to saturated, and loose to very dense with fine to coarse-grained sand and fine to coarse gravel.

During excavation, boring sidewalls were generally stable. However, moisture contents will affect wall competency with saturated soils having a tendency to readily slough when under load and unsupported.

4.4 Volatile Organic Scan

No environmental concerns were identified prior to commencement of the investigation. Therefore, soils obtained during on-site activities were not assessed for volatile organic compounds by portable photoionization detector. Samples obtained during our exploration activities exhibited no odors or discoloration typically associated with this type of contamination. Groundwater encountered did not exhibit obvious signs of contamination.

5. SITE HYDROLOGY

Existing surface drainage conditions are defined in the **General Site Characteristics** section. Information provided in this section is limited to observations made at the time of the investigation. Either regional or local ordinances may require information beyond the scope of this report.

5.1 Groundwater

During this field investigation, groundwater was encountered in boring 1 at a depth of 9.0 feet bgs and was not encountered in the remaining borings advanced to a maximum depth of 21.5 feet bgs. It should be noted that boring 1 was directly adjacent to the Columbia River and the remaining borings were approximately 200 to 300 feet higher in elevation. With the exception of boring 1, soil moistures in the test pits were generally dry to moist throughout.

For construction purposes, throughout the majority of the site, groundwater depth can be assumed to remain greater than 20 feet bgs throughout the year. However, in the vicinity of boring 1, groundwater should be anticipated to be as shallow as 5 feet bgs. However, as the site is heavily influenced by the Columbia River, flooding or near flooding conditions will result in temporarily higher groundwater elevations.

6. LATERAL EARTH PRESSURES

For lateral earth pressure analysis, Atlas anticipates that the soils of interest will be the onsite native sandy silt soils, silty sand sediments, poorly graded sands with silt, and silty gravel with sand sediments. Seismic lateral earth pressures have also been provided in the following tables, and were calculated per the Whitman method. For sandy silt and silty sand soils, the following values are applicable under non-surcharged, drained conditions.

Table 2 – Lateral Earth Pressure Values for Native Soil

Soil Type: Sandy Silt/Silty Sand			
Internal Friction Angle:	28 °	Dry Unit Weight:	110 pcf
Cohesion:	100 psf	Bouyant Unit Weight:	71 pcf
Natural Void Ratio:	0.6	Natural Moisture:	17 %
Ground Acceleration[2]:	0.26	Backfill Slope:	0 °
At rest lateral earth pressure:	68 pcf[1]		K_0= 0.53
Active lateral earth pressure:	46 pcf[1]		K_a= 0.36
Passive lateral earth pressure:	356 pcf[1]		K_p= 2.77
Seismic active lateral earth pressure:	72 pcf[1]		K_{ae}= 0.56
Seismic passive lateral earth pressure:	264 pcf[1]		K_{pe}= 2.05

[1]Lateral earth pressure values are in pounds per square foot, per foot of wall (psf/ft). Alternately, the values presented may also be considered as equivalent fluid with units of pounds per cubic foot (pcf).
[2]Ground acceleration obtained from the USGS Seismic Design Maps.

For poorly graded sand with silt sediments, the following values are applicable under non-surcharged, drained conditions.

Table 3 – Lateral Earth Pressure Values for Native Soil

Soil Type: Poorly Graded Sand with Silt			
Internal Friction Angle:	30 °	Dry Unit Weight:	120 pcf
Cohesion:	25 psf	Bouyant Unit Weight:	78 pcf
Natural Void Ratio:	0.5	Natural Moisture:	10 %
Ground Acceleration[2]:	0.26	Backfill Slope:	0 °
At rest lateral earth pressure:	66 pcf[1]		K_o= 0.50
Active lateral earth pressure:	44 pcf[1]		K_a= 0.33
Passive lateral earth pressure:	396 pcf[1]		K_p= 3.00
Seismic active lateral earth pressure:	70 pcf[1]		K_{ae}= 0.53
Seismic passive lateral earth pressure:	293 pcf[1]		K_{pe}= 2.22

[1]Lateral earth pressure values are in pounds per square foot, per foot of wall (psf/ft). Alternately, the values presented may also be considered as equivalent fluid with units of pounds per cubic foot (pcf).
[2]Ground acceleration obtained from the USGS Seismic Design Maps.

For silty gravel with sand sediments, the following values are applicable under non-surcharged, drained conditions.

Table 4 – Lateral Earth Pressure Values for Native Soil

Soil Type: Silty Gravel with Sand			
Internal Friction Angle:	32 °	Dry Unit Weight:	125 pcf
Cohesion:	25 psf	Bouyant Unit Weight:	83 pcf
Natural Void Ratio:	0.5	Natural Moisture:	10 %
Ground Acceleration[2]:	0.26	Backfill Slope:	0 °
At rest lateral earth pressure:	65 pcf[1]		K_o= 0.47
Active lateral earth pressure:	42 pcf[1]		K_a= 0.31
Passive lateral earth pressure:	448 pcf[1]		K_p= 3.25
Seismic active lateral earth pressure:	69 pcf[1]		K_{ae}= 0.50
Seismic passive lateral earth pressure:	331 pcf[1]		K_{pe}= 2.41

[1]Lateral earth pressure values are in pounds per square foot, per foot of wall (psf/ft). Alternately, the values presented may also be considered as equivalent fluid with units of pounds per cubic foot (pcf).
[2]Ground acceleration obtained from the USGS Seismic Design Maps.

Imported, compacted, structural material, which is used to backfill the soil side of walls, must demonstrate the following characteristics:

Table 5 – Lateral Earth Pressure Values for Fill Materials

Soil Type: Compacted Sandy Gravel Fill			
Internal Friction Angle:	35 °	Dry Unit Weight:	128 pcf
Cohesion:	N/A	Bouyant Unit Weight:	83 pcf
Natural Void Ratio:	0.4	Natural Moisture:	5 %
Ground Acceleration[2]:	0.26	Backfill Slope:	0 °
At rest lateral earth pressure:	57 pcf[1]		K_0= 0.43
Active lateral earth pressure:	36 pcf[1]		K_a= 0.27
Passive lateral earth pressure:	496 pcf[1]		K_p= 3.69
Seismic active lateral earth pressure:	63 pcf[1]		K_{ae}= 0.47
Seismic passive lateral earth pressure:	367 pcf[1]		K_{pe}= 2.73

[1]Lateral earth pressure values are in pounds per square foot, per foot of wall (psf/ft). Alternately, the values presented may also be considered as equivalent fluid with units of pounds per cubic foot (pcf).
[2]Ground acceleration obtained from the USGS Seismic Design Maps.

Please note that the values for seismic lateral earth pressures are calculated using both the static and seismic coefficients. The effect of seismic conditions alone is the difference between the static and seismic lateral earth pressures presented above. Also, the expected pressure diagram is considered to be an inverted triangular force, with the maximum force at the ground surface.

Lateral earth pressure values do not incorporate specific factors of safety, and are only applicable for non-surcharged, drained conditions. Factors of safety, if applicable, should be integrated into the structural design of the wall. The preceding values are presented for idealized conditions relating to simple shallow structures. For complex structures, deep structures, or structures with significant perimeter landscaping, a soils engineer should be retained as part of the design team in developing appropriate project design parameters and construction specifications.

7. FOUNDATION AND SLAB DISCUSSION AND RECOMMENDATIONS

Various foundation types have been considered for support of the proposed pump station. Two requirements must be met in the design of foundations. First, the applied bearing stress must be less than the ultimate bearing capacity of foundation soils to maintain stability. Second, total and differential settlement must not exceed an amount that will produce an adverse behavior of the superstructure. Allowable settlement is usually exceeded before bearing capacity considerations become important; thus, allowable bearing pressure is normally controlled by settlement considerations.

Atlas was informed by Ty Lord with IRZ Construction, that is anticipated that pump station will reside on a raft/mat slab foundation system with thickened edges for frost embedment. Additionally, the site for the pump station is anticipated to be raised approximately 7 feet above existing grade. Ty Lord informed Atlas that point loads of 30,000 pounds for the pump and three separate loads of 2,000 pounds for support of the pipe are anticipated on the slab.

7.1 Preliminary Raft/Mat Slab Design Recommendations

Very loose to loose silty sand sediments were encountered within the upper 5 feet of the pump station. In order to raise the pump station site 7 feet without incurring unacceptable levels of vertical consolidation or settlement, Atlas recommends two options. These options include a partial over-excavation and re-compaction OR placing a surcharge load on the building area and monitoring the settlement for a period of approximately 6 to 12 months or until negligible settlement is observed.

7.1.1 Option 1: Over-Excavation and Re-compaction

This option will limit settlement and allow for the immediate construction of the proposed project. This option will require the following:

1. At least 5 feet of existing very loose to loose silty sand sediments must be removed from building pad.
2. Scarify and moisture condition the upper 12 inches to within 4 percent of optimum moisture content.
3. The moisture conditioned subgrade should then be compacted to at least 95% of the maximum dry density, as determined by ASTM D1557.
4. Excavated native soils shall be replaced above the compacted subgrade. The native soils should be placed in maximum 6-inch thick loose lifts and be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557.
5. It is anticipated that the fill material to be used to elevate the pump station building pad 7 feet will consist of existing onsite soils near the project site. This material will consist of silty sand sediments and should be placed in maximum 6-inch thick loose lifts and be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557.
6. A net allowable soil bearing capacity of 2,000 pounds per square foot (psf) may be used in design of the raft/mat slab with thickened edge.

7.1.2 Option 2: Surcharging the Building Pad

This option will limit settlement and will reduce the cost of excavation. However, it will increase the total length of the earthwork portion of the project. This option will require the following:

1. Strip the proposed building pad area of all organic materials.
2. Scarify and moisture condition the upper 12 inches to within 4 percent of optimum moisture content.
3. The moisture conditioned subgrade should then be compacted to at least 95% of the maximum dry density, as determined by ASTM D1557.
4. It is anticipated that the fill material used elevate the pump station building pad 7 feet will consist of existing onsite soils near the project site. This material will consist of silty sand sediments and should be placed in maximum 6-inch thick loose lifts and be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557.
5. Settlement markers will then need to be placed in the building pad to monitor the settlement. At least 8 settlement markers shall be installed.
6. Settlement markers will then need to be monitored for the next 6 to 12 months, or until negligible settlement is noted. For planning purposes, markers shall be measured initially upon installation and every 2 months afterwards.

7. Once Atlas has reviewed and approved measurements and settlements, construction of the pump station may proceed.
8. A net allowable soil bearing capacity of 2,000 psf may be used in design of the raft/mat slab with thickened edge footings.

7.2 General Raft/Mat Slab Recommendations

The following sliding frictional coefficient values should be used: 1) 0.35 for footings bearing on native silty sand sediments and silty sand with gravel sediments and 2) 0.45 for footings bearing on granular structural fill. A passive lateral earth pressure of 356 pounds per square foot per foot (psf/ft) should be used for silty sand sediments. For compacted sandy gravel fill, a passive lateral earth pressure of 496 psf/ft should be used.

For raft or mat slabs bearing on native silty sand soils, a modulus of subgrade reaction, *k* value, of 130 pounds per cubic inch (pci) may be used for the slab design based on correlation to values typically resulting from a 1 foot by 1 foot plate load test. Additionally, for raft or mat slabs bearing on at least 12 inches of compacted structural fill material, a *k* value of 200 pci may be used. However, depending on how the slab load is applied, the value will need to be geometrically modified. The values should be adjusted for larger areas using the following expression:

Modulus of Subgrade Reaction for Square Mat Slabs: $k_s = k\left(\frac{B+1}{2B}\right)^2$

where: k_s = coefficient of vertical subgrade reaction for loaded area,

k = coefficient of vertical subgrade reaction for a 1 square foot area, and

B = effective width of area loaded, in feet.

Modulus of Subgrade Reaction for Rectangular Mat Slabs: $k' = \frac{k_s(1+0.5\left(\frac{B}{L}\right))}{1.5}$

where: k' = coefficient of vertical subgrade reaction for the loaded rectangular area,

k_s = coefficient of vertical subgrade reaction for loaded square area,

B = effective width of area loaded, in feet,

L = effective length of area loaded, in feet.

A free-draining granular mat should be provided below slabs-on-grade to provide drainage and a uniform and stable bearing surface. This should be a minimum of 4 inches in thickness and properly compacted. The mat should consist of a sand and gravel mixture, complying with Oregon Department of Transportation (ODOT) specifications for ¾-inch (Type 1) crushed aggregate. The granular mat should be compacted to no less than 95 percent of the maximum dry density as determined by ASTM D1557.

A moisture-retarder should be placed beneath floor slabs to minimize potential ground moisture effects on moisture-sensitive floor coverings. The moisture-retarder should be at least 15-mil in thickness and have a permeance of less than 0.01 US perms as determined by ASTM E96. Placement of the moisture-retarder will require special consideration with regard to effects on the slab-on-grade and should adhere to recommendations outlined in the ACI 302.1R and ASTM E1745 publications. Upon request, Atlas can provide further consultation regarding installation.

8. WATER LINE CROSSING DISCUSSION AND GENERAL RECOMMENDATIONS

Construction of the crossing is expected to consist of boring and jacking for installation of a 42-inch diameter irrigation pipeline under Highway 730. At this time, details regarding pipe wall thickness, advancement edge, and expected advancement depth are unknown. Further, tolerances or maximum allowable limits of surface movement are also unknown. Once this information is available, Atlas should be contacted to review the information with regarding to existing conditions. At that time, further and/or alternate recommendations may be required.

The boring will be advanced through medium dense to very dense poorly graded gravel with silt and sand. An irregular bore hole shape should be expected as the gravels may not remain in position and voids may develop if cobbles/boulders are encountered. Depending on criteria regarding depth of advancement and allowable tolerances, stabilization of the soil formation may be required prior to advancement. This could consist of pressure grouting or other similar forms of stabilization. If stabilization is required, Atlas is available to provide further design assistance.

9. PRELIMINARY TEMPORARY SHORING AND EXCAVATION RECOMMENDAITONS

Shallow excavations that do not exceed 4 feet in depth may be constructed with side slopes approaching vertical. Below this depth it is recommended that slopes be constructed in accordance with Occupational Safety and Health Administration (OSHA) regulations, section 1926, Subpart P. Based on these regulations, on site soils are classified as Type "C", and as such, excavations within these soils should be constructed at a maximum slope of 1½ feet horizontal to 1 foot vertical (1½:1) for excavations up to 20 feet in height. Excavations in excess of 20 feet will require additional analysis. Noted that these slope angles are considered stable for short-term conditions only and will not be stable for long-term conditions.

All excavations must be monitored/inspected as follows:

- Daily and before the start of each shift.
- As dictated by the work being performed in the excavation.
- After every precipitation event or other events that could increase hazards (e.g. windstorm, earthquake, etc.).
- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom of the excavation, or other similar conditions occur.

- When there is a change in the size, location, or placement of the spoil pile.

Additional stabilization measures may be required if fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom of the excavation, or other similar conditions occur. No loads can be placed within 10 feet from the edge of the excavation, measured from the nearest load to the top of the cut.

10. CONSTRUCTION CONSIDERATIONS

Recommendations in this report are based upon structural elements of the project being founded on competent, native silty sand sediments, silty sand with gravel sediments, or compacted structural fill. Structural areas should be stripped to an elevation that exposes these soil types.

10.1 Earthwork

Excessively organic soils, deleterious materials, or disturbed soils generally undergo high volume changes when subjected to loads, which is detrimental to subgrade behavior in the area of pavements, floor slabs, structural fills, and foundations. Mature trees, brush, agricultural crops, and thick grasses, and agricultural crops with associated root systems were noted at the time of our investigation. It is recommended that organic or disturbed soils, if encountered, be removed to depths of 1 foot (minimum), and wasted or stockpiled for later use. However, in areas where trees are/were present, deeper excavation depths should be anticipated. Stripping depths should be adjusted in the field to assure that the entire root zone or disturbed zone or topsoil are removed prior to placement and compaction of structural fill materials. Exact removal depths should be determined during grading operations by Atlas personnel, and should be based upon subgrade soil type, composition, and firmness or soil stability. If underground storage tanks, underground utilities, wells, or septic systems are discovered during construction activities, they must be decommissioned then removed or abandoned in accordance with governing Federal, State, and local agencies. Excavations developed as the result of such removal must be backfilled with structural fill materials as defined in the **Structural Fill** section.

Atlas should oversee subgrade conditions (i.e., moisture content) as well as placement and compaction of new fill (if required) after native soils are excavated to design grade. Recommendations for structural fill presented in this report can be used to minimize volume changes and differential settlements that are detrimental to the behavior of footings, pavements, and floor slabs. Sufficient density tests should be performed to properly monitor compaction. . For structural fill beneath building structures, one in-place density test per lift for every 5,000 square feet is recommended. In parking and driveway areas, this can be decreased to one test per lift for every 10,000 square feet. For trench lines, one in-place density test per lift for every 300 lineal feet of trench.

10.2 Dry Weather

If construction is to be conducted during dry seasonal conditions, many problems associated with soft soils may be avoided. However, some rutting of subgrade soils may be induced by shallow groundwater conditions related to springtime runoff or irrigation activities during late summer through early fall. Solutions to problems associated with soft subgrade soils are outlined in the **Soft Subgrade Soils** section. Problems may also arise because of lack of moisture in native and fill soils at time of placement. This will require the addition of water to achieve near-optimum moisture levels. Low-cohesion soils exposed in excavations may become friable, increasing chances of sloughing or caving. Measures to control excessive dust should be considered as part of the overall health and safety management plan.

10.3 Wet Weather

If construction is to be conducted during wet seasonal conditions (commonly from mid-November through May), problems associated with soft soils must be considered as part of the construction plan. During this time of year, fine-grained soils such as silts and clays will become unstable with increased moisture content, and eventually deform or rut. Additionally, constant low temperatures reduce the possibility of drying soils to near optimum conditions.

10.4 Soft Subgrade Soils

Shallow fine-grained subgrade soils that are high in moisture content should be expected to pump and rut under construction traffic. During periods of wet weather, construction may become very difficult if not impossible. The following recommendations and options have been included for dealing with soft subgrade conditions:

- Track-mounted vehicles should be used to strip the subgrade of root matter and other deleterious debris. Heavy rubber-tired equipment should be prohibited from operating directly on the native subgrade and areas in which structural fill materials have been placed. Construction traffic should be restricted to designated roadways that do not cross, or cross on a limited basis, proposed roadway or parking areas.
- Soft areas can be over-excavated and replaced with granular structural fill.
- Construction roadways on soft subgrade soils should consist of a minimum 2-foot thickness of large cobbles of 4 to 6 inches in diameter with sufficient sand and fines to fill voids. Construction entrances should consist of a 6-inch thickness of clean, 2-inch minimum, angular drain-rock and must be a minimum of 10 feet wide and 30 to 50 feet long. During the construction process, top dressing of the entrance may be required for maintenance.
- Scarification and aeration of subgrade soils can be employed to reduce the moisture content of wet subgrade soils. After stripping is complete, the exposed subgrade should be ripped or disked to a depth of 1½ feet and allowed to air dry for 2 to 4 weeks. Further disking should be performed on a weekly basis to aid the aeration process.
- Alternative soil stabilization methods include use of geotextiles, lime, and cement stabilization. Atlas is available to provide recommendations and guidelines at your request.

10.5 Frozen Subgrade Soils

Prior to placement of structural fill materials or foundation elements, frozen subgrade soils must either be allowed to thaw or be stripped to depths that expose non-frozen soils and wasted or stockpiled for later use. Stockpiled materials must be allowed to thaw and return to near-optimal conditions prior to use as structural fill.

The onsite, shallow silty soils are susceptible to frost heave during freezing temperatures. For exterior flatwork and other structural elements, adequate drainage away from subgrades is critical. Compaction and use of structural fill will also help to mitigate the potential for frost heave. Complete removal of frost susceptible soils for the full frost depth, followed by replacement with a non-frost susceptible structural fill, can also be used to mitigate the potential for frost heave. Atlas is available to provide further guidance/assistance upon request.

10.6 Structural Fill

Soils recommended for use as structural fill are those classified as GW, GP, SW, and SP in accordance with the Unified Soil Classification System (USCS) (ASTM D2487). Use of silty soils (USCS designation of GM, SM, and ML) as structural fill may be acceptable. These materials require very high moisture contents for compaction and require a long time to dry out if natural moisture contents are too high and may also be susceptible to frost heave under certain conditions. Therefore, these materials can be quite difficult to work with as moisture content, lift thickness, and compactive effort becomes difficult to control. If silty soil is used for structural fill, lift thicknesses should not exceed 6 inches (loose), and fill material moisture must be closely monitored at both the working elevation and the elevations of materials already placed. Following placement, silty soils must be protected from degradation resulting from construction traffic or subsequent construction.

Recommended granular structural fill materials, those classified as GW, GP, SW, and SP, should consist of a 6-inch minus select, clean, granular soil with no more than 50 percent oversize (greater than ¾-inch) material and no more than 12 percent fines (passing No. 200 sieve). These fill materials should be placed in layers not to exceed 12 inches in loose thickness. Prior to placement of structural fill materials, surfaces must be prepared as outlined in the **Construction Considerations** section. Structural fill material should be moisture-conditioned to achieve optimum moisture content prior to compaction. For structural fill below footings, areas of compacted backfill must extend outside the perimeter of the footings for a distance equal to the thickness of fill between the bottom of foundation and underlying soils, or 5 feet, whichever is less. All fill materials must be monitored during placement and tested to confirm compaction requirements, outlined below, have been achieved.

Each layer of structural fill must be compacted, as outlined below:

- Below Structures and Rigid Pavements: A minimum of 95 percent of the maximum dry density as determined by ASTM D1557.

- Trench Lines Below Flexible Pavements: A minimum of 92 percent of the maximum dry density as determined by ASTM D1557 or 95 percent of the maximum dry density as determined by ASTM D698.
- Trench Lines Below Non-Structural Areas: A minimum of 90 percent of the maximum dry density as determined by ASTM D698.

The ASTM D1557 test method must be used for samples containing up to 40 percent oversize (greater than ¾-inch) particles. If material contains more than 40 percent but less than 50 percent oversize particles, compaction of fill must be confirmed by proof rolling each lift with a 10-ton vibratory roller (or equivalent) until the maximum density has been achieved. Density testing must be performed after each proof rolling pass until the in-place density test results indicate a drop (or no increase) in the dry density, defined as maximum density or "break over" point. The number of required passes should be used as the requirements on the remainder of fill placement. Material should contain sufficient fines to fill void spaces, and must not contain more than 50 percent oversize particles.

10.7 Backfill of Walls

Backfill materials must conform to the requirements of structural fill, as defined in this report. For wall heights greater than 2.5 feet, the maximum material size should not exceed 4 inches in diameter. Placing oversized material against rigid surfaces interferes with proper compaction, and can induce excessive point loads on walls. Backfill shall not commence until the wall has gained sufficient strength to resist placement and compaction forces. Further, retaining walls above 2.5 feet in height shall be backfilled in a manner that will limit the potential for damage from compaction methods and/or equipment. It is recommended that only small hand-operated compaction equipment be used for compaction of backfill within a horizontal distance equal to the height of the wall, measured from the back face of the wall.

Backfill should be compacted in accordance with the specifications for structural fill, except in those areas where it is determined that future settlement is not a concern, such as planter areas. In nonstructural areas, backfill must be compacted to a firm and unyielding condition.

10.8 Groundwater Control

Groundwater was encountered during the investigation but is anticipated to be below the depth of most construction. Excavations below the water table will require a dewatering program. Dewatering will be required prior to placement of fill materials. Placement of concrete can be accomplished through water by the use of a treme. It may be possible to discharge dewatering effluent to remote portions of the site, to a sump, or to a pit. This will essentially recycle effluent, thus eliminating the need to enter into agreements with local drainage authorities. Should the scope of the proposed project change, Atlas should be contacted to provide more detailed groundwater control measures.

Special precautions may be required for control of surface runoff and subsurface seepage. It is recommended that runoff be directed away from open excavations. Silty soils may become soft and pump if subjected to excessive traffic during time of surface runoff. Ponded water in construction areas should be drained through methods such as trenching, sloping, crowning grades, nightly smooth drum rolling, or installing a French drain system. Additionally, temporary or permanent driveway sections should be constructed if extended wet weather is forecasted.

11. GENERAL COMMENTS

Based on the subsurface conditions encountered during this investigation and available information regarding the proposed pipeline and pump station, the site is adequate for the planned construction. When plans and specifications are complete, and if significant changes are made in the character or location of the proposed structure, consultation with Atlas must be arranged as supplementary recommendations may be required. Suitability of subgrade soils and compaction of structural fill materials must be verified by Atlas personnel prior to placement of structural elements. Additionally, monitoring and testing should be performed to verify that suitable materials are used for structural fill and that proper placement and compaction techniques are utilized.

12. REFERENCES

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Appendix I WARRANTY AND LIMITING CONDITIONS

Atlas warrants that findings and conclusions contained herein have been formulated in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology only for the site and project described in this report. These engineering methods have been developed to provide the client with information regarding apparent or potential engineering conditions relating to the site within the scope cited above and are necessarily limited to conditions observed at the time of the site visit and research. Field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for the purposes cited above.

Exclusive Use

This report was prepared for exclusive use of the property owner(s), at the time of the report, and their retained design consultants ("Client"). Conclusions and recommendations presented in this report are based on the agreed-upon scope of work outlined in this report together with the Contract for Professional Services between the Client and Atlas Technical Consultants ("Consultant"). Use or misuse of this report, or reliance upon findings hereof, by parties other than the Client is at their own risk. Neither Client nor Consultant make representation of warranty to such other parties as to accuracy or completeness of this report or suitability of its use by such other parties for purposes whatsoever, known or unknown, to Client or Consultant. Neither Client nor Consultant shall have liability to indemnify or hold harmless third parties for losses incurred by actual or purported use or misuse of this report. No other warranties are implied or expressed.

Report Recommendations are Limited and Subject to Misinterpretation

There is a distinct possibility that conditions may exist that could not be identified within the scope of the investigation or that were not apparent during our site investigation. Findings of this report are limited to data collected from noted explorations advanced and do not account for unidentified fill zones, unsuitable soil types or conditions, and variability in soil moisture and groundwater conditions. To avoid possible misinterpretations of findings, conclusions, and implications of this report, Atlas should be retained to explain the report contents to other design professionals as well as construction professionals.

Since actual subsurface conditions on the site can only be verified by earthwork, note that construction recommendations are based on general assumptions from selective observations and selective field exploratory sampling. Upon commencement of construction, such conditions may be identified that require corrective actions, and these required corrective actions may impact the project budget. Therefore, construction recommendations in this report should be considered preliminary, and Atlas should be retained to observe actual subsurface conditions during earthwork construction activities to provide additional construction recommendations as needed.

Since geotechnical reports are subject to misinterpretation, **do not** separate the soil logs from the report. Rather, provide a copy of, or authorize for their use, the complete report to other design

professionals or contractors. Locations of exploratory sites referenced within this report should be considered approximate locations only. For more accurate locations, services of a professional land surveyor are recommended.

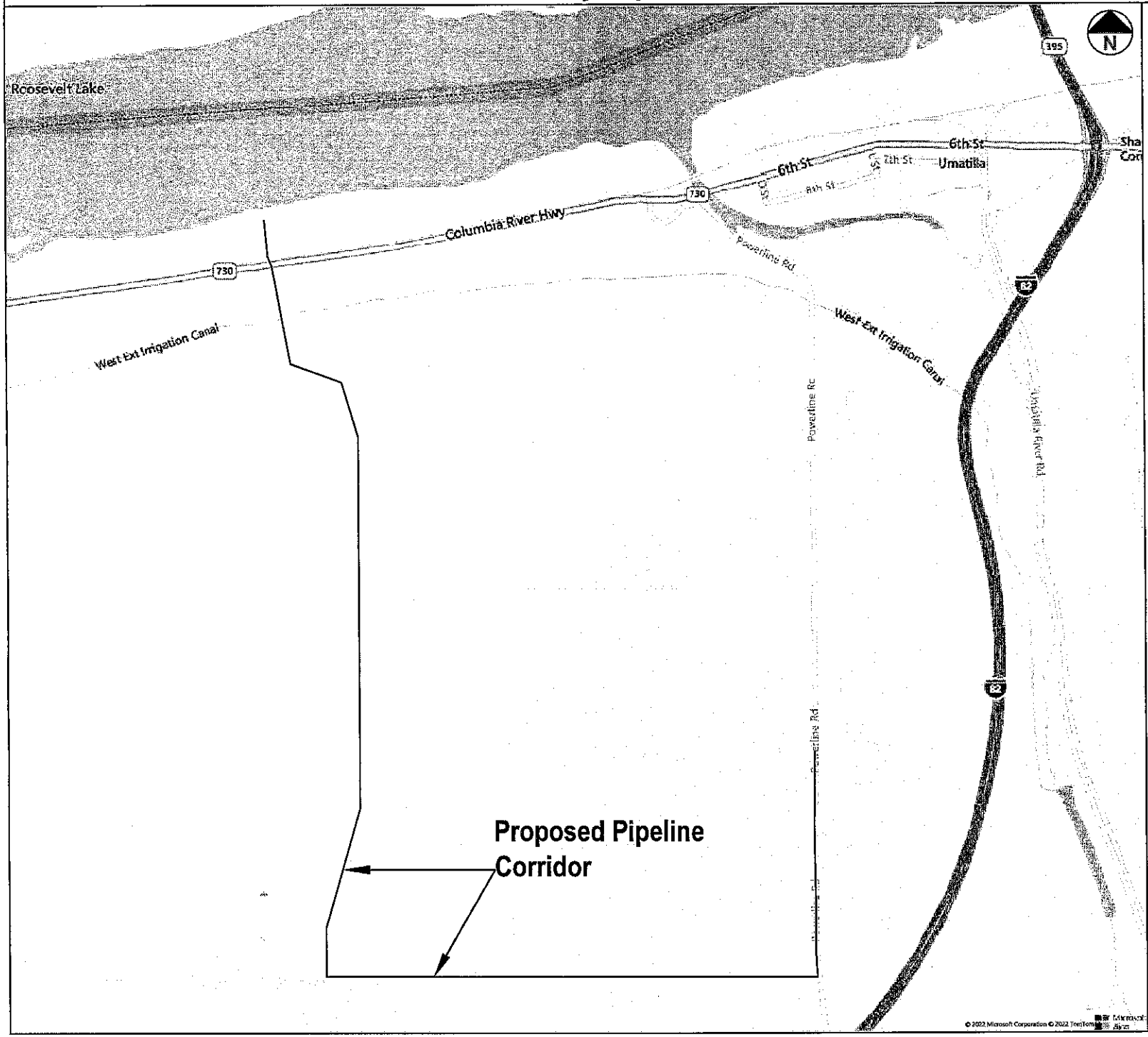
This report is also limited to information available at the time it was prepared. In the event additional information is provided to Atlas following publication of our report, it will be forwarded to the client for evaluation in the form received.

Environmental Concerns

Comments in this report concerning either onsite conditions or observations, including soil appearances and odors, are provided as general information. These comments are not intended to describe, quantify, or evaluate environmental concerns or situations. Since personnel, skills, procedures, standards, and equipment differ, a geotechnical investigation report is not intended to substitute for a geoenvironmental investigation or a Phase II/III Environmental Site Assessment. If environmental services are needed, Atlas can provide, via a separate contract, those personnel who are trained to investigate and delineate soil and water contamination.

Vicinity Map

Figure 1



MAP NOTES:

- Not to Scale

LEGEND

Approximate Ordinace Pipeline Corridor

Approximate Industrial Pipeline Corridor

Ordinace Pieline

Umatilla, OR

Modified by: MPK
July 28, 2022
Drawing: B221100g

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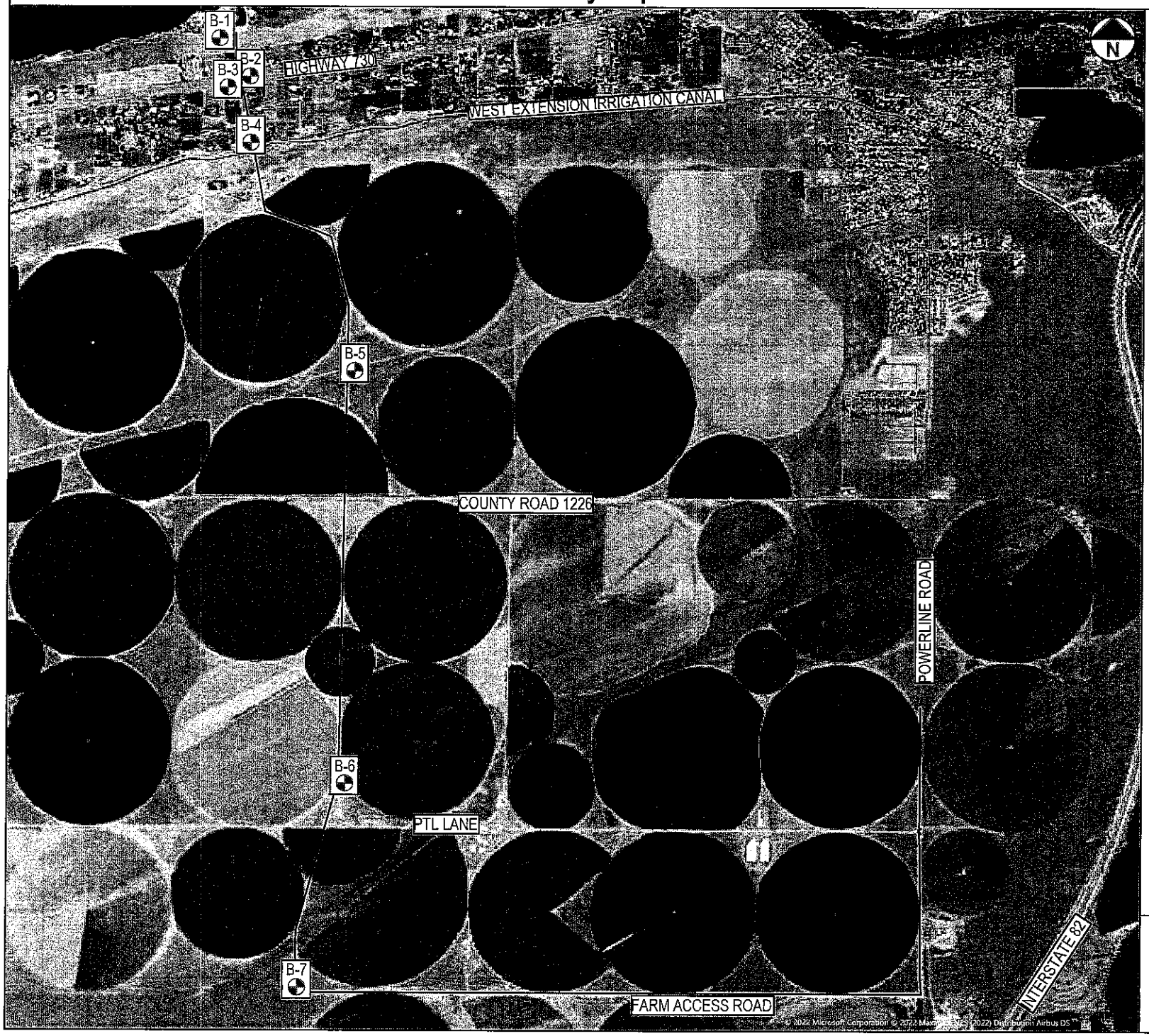
Vicinity Map

Figure 2



MAP NOTES:

- Not to Scale

LEGEND

Approximate Ordinace Pipeline Corridor

Approximate Industrial Pipeline Corridor

Approximate Atlas Boring Location

Ordinace Pieline

Umatilla, OR

Modified by: MPK
July 28, 2022
Drawing: B221100g

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FIELD BORING LOG

BORING NO.: B-1
TOTAL DEPTH: 16.5'
GROUNDWATER DEPTH: 9.0'

PROJECT INFORMATION

PROJECT:	Ordnance Pipeline
LOCATION:	Southshore Drive
	Umatilla, OR
JOB NO.:	B221100G
LOGGED BY:	Cody Ellis

DRILLING INFORMATION

DRILLING CO.:	Haztech Drilling, Inc.
METHOD OF DRILLING:	6" Hollow Stem Auger
SAMPLING METHODS:	Split Spoon
DATES DRILLED:	June 15, 2022
LATITUDE/LONGITUDE:	45.914909, -116.387691

▼ Water level during drilling | Standard Split Spoon | Auger Sample | Shelby Tube

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		SILTY SAND (SM): Brown to dark brown, dry to slightly moist, very loose to medium dense, with fine-grained sand and trace coarse gravel.						3,5,3	
								3,4,5	
5								1,1,2	0 30 60
								3,6,5	
▼ 10		SILTY SAND WITH GRAVEL (SM): Brown, saturated, medium dense, with fine to medium-grained sand and fine to coarse gravel.	13.0	NP	84	22.7		3,6,8	0 30 60
15								0,8,14	0 30 60

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FIELD BORING LOG

BORING NO.: B-2
TOTAL DEPTH: 21.5'
GROUNDWATER DEPTH: None

PROJECT INFORMATION

PROJECT: Ordnance Pipeline
LOCATION: Southshore Drive
Umatilla, OR
JOB NO.: B221100G
LOGGED BY: Cody Ellis

DRILLING INFORMATION

DRILLING CO.: Haztech Drilling, Inc.
METHOD OF DRILLING: 6" Hollow Stem Auger
SAMPLING METHODS: Split Spoon
DATES DRILLED: June 15, 2022
LATITUDE/LONGITUDE: 45.911999, -119.386900

Water level during drilling | Standard Split Spoon | Auger Sample | Shelby Tube

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		SILTY GRAVEL WITH SAND (GM): Light brown to dark brown, dry to moist, medium dense to very dense, with fine to coarse-grained sand and fine to coarse gravel.						4,5,12	
			2.8	NP	46	13.7		13,31, 50 for 5"	
5								22,43,45	0 30 60
								23,43,50 for 6"	
10								36,50 for 4"	0 30 60
15								5,14,13	0 30 60
20								10,24,44	0 30 60

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FIELD BORING LOG

BORING NO.: B-3
TOTAL DEPTH: 21.5'
GROUNDWATER DEPTH: None

PROJECT INFORMATION

PROJECT:	Ordnance Pipeline
LOCATION:	Southshore Drive
	Umatilla, OR
JOB NO.:	B221100G
LOGGED BY:	Cody Ellis

DRILLING INFORMATION

DRILLING CO.:	Haztech Drilling, Inc.
METHOD OF DRILLING:	6" Hollow Stem Auger
SAMPLING METHODS:	Split Spoon
DATES DRILLED:	June 15, 2022
LATITUDE/LONGITUDE:	45.911424, -119.386917

Water level during drilling | Standard Split Spoon | Auger Sample | California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM): Brown, dry to slightly moist, dense to very dense, with fine to coarse-grained sand and fine to coarse gravel.						2, 50 for 4"	
								11,22,23	
5								9,20,21	0 30 60
			2.1	NP	36	7.1		9,20,19	
10								9,20,31	0 30 60
15								15,36,50 for 5"	0 30 60
20								16,30,34	0 30 60

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FIELD BORING LOG

BORING NO.: B-4
TOTAL DEPTH: 16.5'
GROUNDWATER DEPTH: None

PROJECT INFORMATION

PROJECT:	Ordnance Pipeline
LOCATION:	Southshore Drive Umatilla, OR
JOB NO.:	B221100G
LOGGED BY:	Cody Ellis

DRILLING INFORMATION

DRILLING CO.:	Haztech Drilling, Inc.
METHOD OF DRILLING:	6" Hollow Stem Auger
SAMPLING METHODS:	Split Spoon
DATES DRILLED:	June 15, 2022
LATITUDE/LONGITUDE:	45.908983, -119.386376

▼ Water level during drilling | Standard Split Spoon | Auger Sample | Shelby Tube

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		SANDY SILT (ML): Brown to light brown, dry to slightly moist, medium stiff to stiff, with fine-grained sand. --Organics encountered to 0.2 foot bgs.	7.8	NP	100	60.7		0,3,4	
								5,5,4	
5								4,5,6	0 30 60
		SILTY SAND WITH GRAVEL (SM): Brown to light brown, dry to slightly moist, medium dense to very dense, with fine to medium-grained sand and fine to coarse gravel.						5,8,9	
10								22,23,41	0 30 60
		POORLY GRADED SAND WITH SILT (SP-SM): Brown, slightly moist, medium dense, with fine to medium-grained sand.							
15								8,12,17	0 30 60

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FIELD BORING LOG

BORING NO.: B-5
TOTAL DEPTH: 16.5'
GROUNDWATER DEPTH: None

PROJECT INFORMATION

PROJECT:	Ordnance Pipeline
LOCATION:	Southshore Drive
	Umatilla, OR
JOB NO.:	B221100G
LOGGED BY:	Cody Ellis

DRILLING INFORMATION

DRILLING CO.:	Haztech Drilling, Inc.
METHOD OF DRILLING:	6" Hollow Stem Auger
SAMPLING METHODS:	Split Spoon
DATES DRILLED:	June 15, 2022
LATITUDE/LONGITUDE:	45.899761, -119.980455

Water level during drilling | Standard Split Spoon | Auger Sample | California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		SILTY SAND (SM): Brown to dark brown, dry to slightly moist, loose to medium dense, with fine to medium-grained sand.						1,3,5	
								3,3,4	
5								3,4,5	0 30 60
								6,10,14	
10			3.4	NP	100	16.9		8,12,16	0 30 60
15		POORLY GRADED SAND WITH SILT (SP-SM): Brown to light brown, dry to slightly moist, medium dense, with fine to coarse-grained sand.						11,13,15	0 30 60

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FIELD BORING LOG

BORING NO.: B-6
TOTAL DEPTH: 16.5'
GROUNDWATER DEPTH: None

PROJECT INFORMATION

PROJECT:	Ordnance Pipeline
LOCATION:	Southshore Drive
	Umatilla, OR
JOB NO.:	B221100G
LOGGED BY:	Cody Ellis

DRILLING INFORMATION

DRILLING CO.:	Haztech Drilling, Inc.
METHOD OF DRILLING:	6" Hollow Stem Auger
SAMPLING METHODS:	Split Spoon
DATES DRILLED:	June 15, 2022
LATITUDE/LONGITUDE:	45.884500, -119.380442

Water level during drilling | Standard Split Spoon | Auger Sample | Shelby Tube

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		SILTY SAND (SM): Brown, dry to slightly moist, loose, with fine to medium-grained sand.						2,2,3	
								2,3,3	
5		POORLY GRADED SAND WITH SILT (SP-SM): Brown to light brown, dry to slightly moist, loose to medium dense, with fine to coarse-grained sand and fine to coarse gravel.						2,3,3	0 30 60
								8,12,13	
10			2.8	NP	100	7.6		7,16,12	0 30 60
15								7,13,14	0 30 60

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FIELD BORING LOG

BORING NO.: B-7
TOTAL DEPTH: 16.5'
GROUNDWATER DEPTH: None

PROJECT INFORMATION

PROJECT:	Ordnance Pipeline
LOCATION:	Powerline Road
	Umatilla, OR
JOB NO.:	B221100g
LOGGED BY:	Cody Ellis

DRILLING INFORMATION

DRILLING CO.:	Haztech Drilling, Inc.
METHOD OF DRILLING:	6" Hollow Stem Auger
SAMPLING METHODS:	Split Spoon
DATES DRILLED:	June 15, 2022
LATITUDE/LONGITUDE:	45.872456, -119.382425

Water level during drilling | Standard Split Spoon | Auger Sample | Shelby Tube

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		SILTY SAND (SM): Brown, dry to slightly moist, medium dense, with fine-grained sand and trace fine to coarse gravel.						1,5,9	
		SILTY SAND WITH GRAVEL (SM): Brown, dry to slightly moist, medium dense to very dense, with fine to coarse-grained sand and fine to coarse gravel.						5,10,10	
5								11,15,13	0 30 60
								9,6,19	
10								31, 50 for 6"	0 30 60
15			3.1	NP	58	12.1		21,34,41	0 30 60

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Appendix V GEOTECHNICAL GENERAL NOTES

Unified Soil Classification System			
Major Divisions		**Symbol**	**Soil Descriptions**
Coarse-Grained Soils < 50% passes No.200 sieve	Gravel & Gravelly Soils < 50% coarse	GW	Well-graded gravels; gravel/sand mixtures with little or no fines
		GP	Poorly-graded gravels; gravel/sand mixtures with little or no fines
		GM	Silty gravels; poorly-graded gravel/sand/silt mixtures
		GC	Clayey gravels; poorly-graded gravel/sand/clay mixtures
	Sand & Sandy Soils > 50% coarse fraction	SW	Well-graded sands; gravelly sands with little or no fines
		SP	Poorly-graded sands; gravelly sands with little or no fines
		SM	Silty sands; poorly-graded sand/gravel/silt mixtures
		SC	Clayey sands; poorly-graded sand/gravel/clay mixtures
Fine-Grained Soils > 50% passes No.200 sieve	Silts & Clays LL < 50	ML	Inorganic silts; sandy, gravelly or clayey silts
		CL	Lean clays; inorganic, gravelly, sandy, or silty, low to medium-plasticity clays
		OL	Organic, low-plasticity clays and silts
	Silts & Clays LL > 50	MH	Inorganic, elastic silts; sandy, gravelly or clayey elastic silts
		CH	Fat clays; high-plasticity, inorganic clays
		OH	Organic, medium to high-plasticity clays and silts
Highly Organic Soils		PT	Peat, humus, hydric soils with high organic content

Relative Density and Consistency Classification	
Coarse-Grained Soils	**SPT Blow Counts (N)**
Very Loose:	< 4
Loose:	4-10
Medium Dense:	10-30
Dense:	30-50
Very Dense:	> 50
Fine-Grained Soils	**SPT Blow Counts (N)**
Very Soft:	< 2
Soft:	2-4
Medium Stiff:	4-8
Stiff:	8-15
Very Stiff:	15-30
Hard:	> 30

Moisture Content and Cementation Classification	
Description	**Field Test**
Dry	Absence of moisture, dry to touch
Slightly Moist	Damp, but no visible moisture
Moist	Visible moisture
Wet	Visible free water
Saturated	Soil is usually below water table
Description	**Field Test**
Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

Particle Size	
Boulders:	> 12 in.
Cobbles:	12 to 3 in.
Gravel:	3 in. to 5 mm
Coarse-Grained Sand:	5 to 0.6 mm
Medium-Grained Sand:	0.6 to 0.2 mm
Fine-Grained Sand:	0.2 to 0.075 mm
Silts:	0.075 to 0.005 mm
Clays:	< 0.005 mm

Acronym List	
GS	grab sample
LL	Liquid Limit
M	moisture content
NP	non-plastic
PI	Plasticity Index
Q_p	penetrometer value, unconfined compressive strength, tsf
V	vane value, ultimate shearing strength, tsf

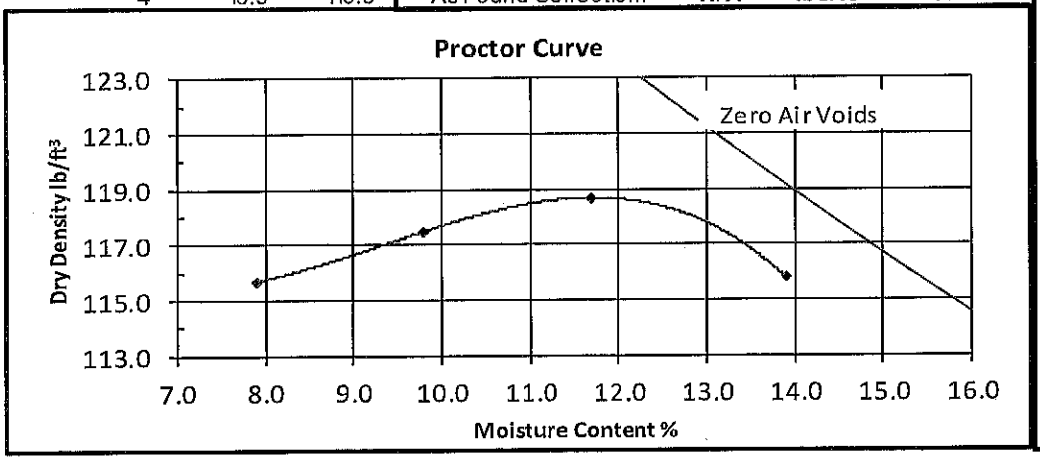
ATLAS

Appendix VI PROCTOR LABORATORY TEST DATA

Source and Description:	B-1: 5 to 7 feet bgs, Silty Sand				
Date Obtained:	July 5, 2022				
Sample ID:	22-0848 (B221100G)				
Sampling and Preparation:	ASTM D75: X	Moist: X	Manual: X	Mechanical :	
Test Standard:	AASHTO T99:	AASHTO T180:	Method	% Oversize	Rammer Face
	ASTM D698: X	ASTM D1557:	A	1.6	2" Circular

Assumed Sp. Gr.	Point Number	Percent Moisture	Dry Density
2.60	1	7.9	115.7
	2	9.8	117.5
	3	11.7	118.7
	4	13.9	115.8

	Maximum Dry Density		Optimum Moisture
Uncorrected:	118.7	lbs/ft^3	11.7 %
ASTM D 4718 Correction:	**122.2**	**lbs/ft^3**	**10.6%**
As Found Correction:	**N/A**	**lbs/ft^3**	**N/A**



Sieve Size	Percent Passing
6.0"	
5.0"	
4.0"	
3.0"	
2.0"	
1.5"	**100**
1.0"	**97**
3/4"	**95**
1/2"	**92**
3/8"	**91**
1/4"	
#4	**89.4**
#8	**89**
#10	**89**
#16	**88**
#30	**82**
#40	**71**
#50	**51**
#100	**26**
#200	**18.5**

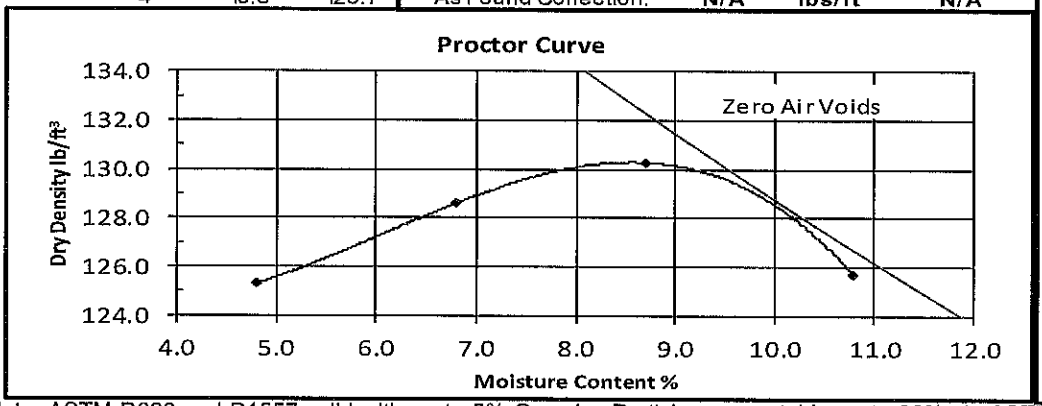
Note: ASTM D698 and D1557 valid with up to 5% Oversize Particles; correctable up to 30% via ASTM D 4718 and invalid for Oversized Particles greater than 30% retained on the ¾ inch screen.

PROCTOR LABORATORY TEST DATA

Source and Description:	B-4: 10-12 feet bgs, Silty Sand with Gravel				
Date Obtained:	July 5, 2022				
Sample ID:	22-0850 (B221100g)				
Sampling and Preparation:	ASTM D75: X	Moist: X	Manual: X	Mechanical:	
Test Standard:	AASHTO T99:	AASHTO T180:	Method	% Oversize	Rammer Face
	ASTM D698: X	ASTM D1557:	A	20.6	2" Circular

Assumed Sp. Gr.	Point Number	Percent Moisture	Dry Density
2.60	1	4.8	125.3
	2	6.8	128.6
	3	8.7	130.3
	4	10.8	125.7

	Maximum Dry Density		Optimum Moisture
Uncorrected:	130.3	lbs/ft^3	8.6 %
ASTM D 4718 Correction:	**135.9**	lbs/ft^3	**7.1%**
As Found Correction:	**N/A**	lbs/ft^3	**N/A**



Sieve Size	Percent Passing
6.0"	
5.0"	
4.0"	
3.0"	
2.0"	
1.5"	**100**
1.0"	**99**
3/4"	**98**
1/2"	**94**
3/8"	**90**
1/4"	
#4	**79.3**
#8	**69**
#10	**66**
#16	**57**
#30	**47**
#40	**44**
#50	**40**
#100	**33**
#200	**21.0**

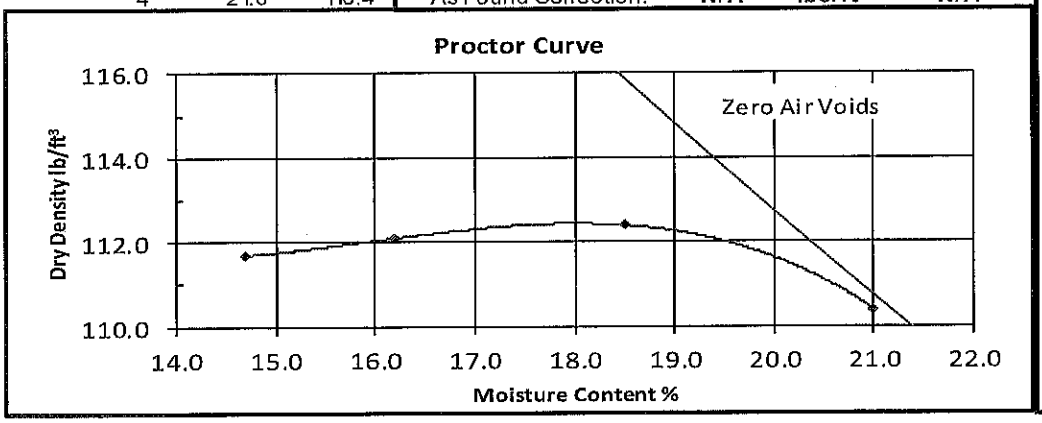
Note: ASTM D698 and D1557 valid with up to 5% Oversize Particles; correctable up to 30% via ASTM D 4718 and invalid for Oversized Particles greater than 30% retained on the ¾ inch screen.

PROCTOR LABORATORY TEST DATA

Source and Description:	B-5: 10 to 12 feet bgs, Silty Sand				
Date Obtained:	July 5, 2022				
Sample ID:	22-0847 (B221100G)				
Sampling and Preparation:	ASTM D75: X	Moist: X	Manual: X	Mechanical:	
Test Standard:	AASHTO T99:	AASHTO T180:	Method	% Oversize	Rammer Face
	ASTM D698: X	ASTM D1557:	A	0.0	2" Circular

Assumed Sp. Gr.	Point Number	Percent Moisture	Dry Density
2.83	1	14.7	111.7
	2	16.2	112.1
	3	18.5	112.4
	4	21.0	110.4

	Maximum Dry Density		Optimum Moisture
Uncorrected:	112.4	lbs/ft^3	18.0 %
ASTM D4718 Correction:	N/A	lbs/ft^3	N/A
As Found Correction:	N/A	lbs/ft^3	N/A



Sieve Size	Percent Passing
6.0"	
5.0"	
4.0"	
3.0"	
2.0"	
1.5"	
1.0"	
3/4"	
1/2"	
3/8"	
1/4"	
#4	100.0
#8	
#10	
#16	100
#30	95
#40	83
#50	58
#100	27
#200	15.9

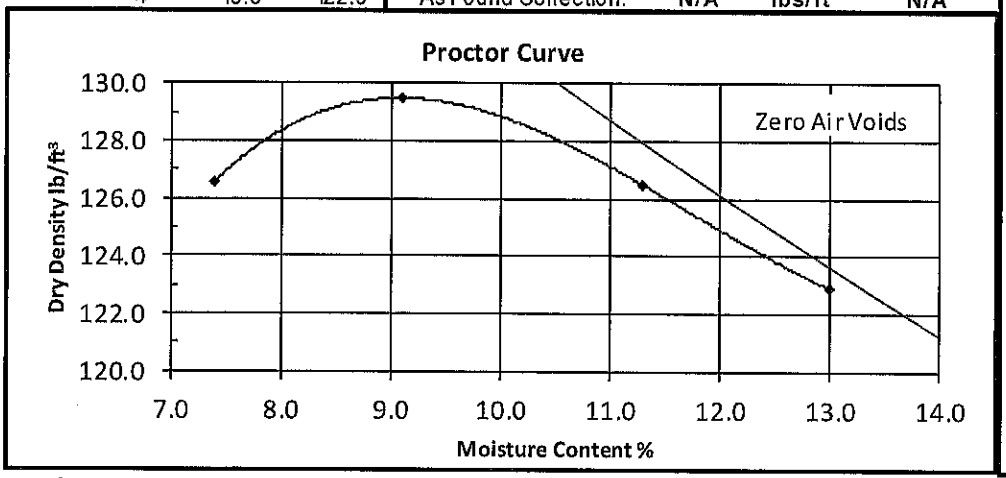
Note: ASTM D698 and D1557 valid with up to 5% Oversize Particles; correctable up to 30% via ASTM D 4718 and invalid for Oversized Particles greater than 30% retained on the ¾ inch screen.

PROCTOR LABORATORY TEST DATA

Source and Description:	B-6: 10-12 feet bgs, Silty Sand				
Date Obtained:	July 5, 2022				
Sample ID:	22-0849 (B221100G)				
Sampling and Preparation:	ASTM D75: X	Moist: X	Manual: X	Mechanical:	
Test Standard:	AASHTO T99:	AASHTO T180:	Method	% Oversize	Rammer Face
	ASTM D698: X	ASTM D1557:	A	3.9	2" Circular

Assumed Sp. Gr.	Point Number	Percent Moisture	Dry Density
2.67	1	7.4	126.6
	2	9.1	129.5
	3	11.3	126.5
	4	13.0	122.9

Maximum Dry Density			Optimum Moisture
Uncorrected:	129.5	lbs/ft^3	9.1%
ASTM D 4718 Correction:	N/A	lbs/ft^3	N/A
As Found Correction:	N/A	lbs/ft^3	N/A



Sieve Size	Percent Passing
6.0"	
5.0"	
4.0"	
3.0"	
2.0"	
1.5"	
1.0"	
3/4"	
1/2"	100
3/8"	99
1/4"	
#4	96.1
#8	87
#10	83
#16	71
#30	53
#40	42
#50	33
#100	24
#200	16.4

Note: ASTM D698 and D1557 valid with up to 5% Oversize Particles; correctable up to 30% via ASTM D 4718 and invalid for Oversized Particles greater than 30% retained on the ¾ inch screen.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX C – RFP Scoring Sheet

Ordnance Multi-Use Water Project General Contractor RFP Score Sheet

Proposal Evaulation Criteria	Weight
Project Understanding	15%
Qualifications/Experience/Future Support	25%
Approach/Project Work Plan/Project Schedule	40%
Project Cost	20%

	Available Points	Proposers Score	Weighted Score
Project Understanding (Section 5.2)	10		
Project Understanding Total	10	0	0%
Qualifications/Experience/Future Support			
Company Experience (Section 5.4.1)	10		
Personnel Experience (Section 5.4.2)	10		
Sub-Contractor Experience (Section 5.11)	10		
Future Support (Section 5.6)	10		
Qualifications/Experience/Future Support Total	40	0	0%
Approach/Project Work Plan/Project Schedule			
Project Approach (Section 5.5 & 5.10)	10		
Warranty Approach (Section 5.6)	10		
Project Work Plan (Section 5.5 & 5.7)	10		
Project Schedule (Section 5.7 & 5.10)	20		
Approach/Project Work Plan/Project Schedule Total	50	0	0%
Project Cost (Section 5.8)	10		
Project Cost Total	10	0	0%
Grand Total Weighted Score out of 100%			0%

APPENDIX D – Bid Sheet

PROPOSAL SHEET

ITB-009 General Contractor

Line Item	Project Phase	Category	Task Description	Quantity	Unit of Measurement	Unit Price (USD)	Extended Price (USD)
1	Phase 1	Civil	Mobilization	1	LS		
2	Phase 1	Civil	Electrical Building and Pump Station Foundation Excavation and Compaction	1	LS		
3	Phase 1	Civil	Pump Station Site Grading	3000	YD		
4	Phase 1	Civil	Pump Station Site Final Grading and 3/4" Gravel	250	YD		
5	Phase 1	Civil	Pump Station Security Fence, Man Gate and Double 12ft Gates	550	LF		
6	Phase 1	Structural	Pump Station Concrete Pad, Pedestals, 4" Drainage System	1	LS		
7	Phase 1	Structural	Electrical Building Foundation and Mechanical Pads	60	YD		
8	Phase 1	Structural	Pre-Engineered Steel Building (Furnish and Install)	1	LS		
9	Phase 1	Electrical	Electrical Building Electrical, provide panelboards and all 120/208 circuits as required. Provide and install LED Lighting (interior and exterior (full perimeter) etc.)	1	LS		
10	Phase 1	Mechanical	Electrical Building HVAC	1	LS		
11	Phase 1	Electrical	Compressed Air Instrumentation and Electrical	1	LS		
12	Phase 1	Mechanical	Airburst Compressor Installation, Piping and Appurtanances	1	LS		
13	Phase 1	Mechanical	Air Burst System, Air Reciever Tank and Steel Pipe, Manifold, Valves and Stainless Steel Piping	1	LS		
14	Phase 1	Civil	Airbust Pipelines, 6" SDR 9, PE4710, HDPE Pipe and Installation	1	LS		
15	Phase 1	Structural	Hydropneumatic Tank Foundation (Strip Footings)	35	YD		

16	**Phase 1**	**Mechanical**	Hydropneumatic Tank Installation and Furnish and Installing Piping to 48" Manifold	1	LS		
17	**Phase 1**	**Electrical**	4160V Electrical Gear Installation (gear supplied by Owner) and 4160V Motor Wiring, Conductors and Conduit	1	LS		
18	**Phase 1**	**Electrical**	Supply and install 480VAC MDP-B and all 480VAC Conduit and Wire.	1	LS		
19	**Phase 1**	**Electrical**	Pump Station Instrumentation and Electrical (18" Flowmeters, Pressure Transducers, Level Transmitters, Motor Instrumentation etc.)	1	LS		
20	**Phase 1**	**Mechanical**	Pump Discharge Manifold Installation	1	LS		
21	**Phase 1**	**Mechanical**	Pump Station Discharge Piping	1	LS		
22	**Phase 1**	**Mechanical**	Pump Station Pressure Relief Piping	1	LS		
23	**Phase 1**	**Mechanical**	Pump Station Drain Piping and Existing Intake Manifold Modifications	1	LS		
24	**Phase 1**	**Civil**	48" Flowmeter and Vault	1	LS		
25	**Phase 1**	**Civil**	Steel Mainline Installation, 48", Stations - 0+10 to 26+40	2650	LF		
26	**Phase 1**	**Civil**	Steel Mainline Bedding/Backfill (Requiring Processing), 48", Stations -0+10 to 26+40	8000	YD		
27	**Phase 1**	**Civil**	Mainline Thrust Blocking, Stations -0+10 to 26+40	40	YD		
28	**Phase 1**	**Civil**	Shoreline Road Paved Open Cut Crossing	1	LS		
29	**Phase 1**	**Civil**	HWY 730 Bore, 58", Stations 9+75 to 11+00	1	LS		
30	**Phase 1**	**Civil**	Remove Existing Concrete Structure on North side of WEID Canal	10	yd		
31	**Phase 1**	**Civil**	WEID Canal Crossing Structures	1	LS		
32	**Phase 1**	**Civil**	WEID Earthwork	230	YD		
33	**Phase 1**	**Civil**	Mainline Check Valve Assembly	1	LS		

34	**Phase 1**	**Civil**	Mainline Check Valve Assembly Vault	1	LS		
35	**Phase 1**	**Electrical**	65ft Radio Tower #1 and Foundation	1	LS		
36	**Phase 1**	**Electrical**	Radio Tower #1, Electrical install (County to Provide Transformer within 75ft, Owner to provide Remote Station Cabinet (RSC))	1	LS		
37	**Phase 1**	**Civil**	Security Fence and Man Gate	60	LF		
38	**Phase 1**	**Civil**	Radio Tower# 1/ Check Valve Vault Site Final Grading and 3/4" Gravel	10	YD		
39	**Phase 1**	**Civil**	FRP Mainline Installation, 1300mm, Stations 26+40 to 163+46	13706	LF		
40	**Phase 1**	**Civil**	FRP Mainline Bedding/Backfill Material (Requiring Processing), 1300mm, Stations 26+40 to 163+46	31000	YD		
41	**Phase 1**	**Civil**	FRP Mainline Top Soil Stripping, 1300mm, Stations 26+40 to 163+46	1	LS		
42	**Phase 1**	**Civil**	Install 64" Steel Casing, 1300mm Carrier, End Seals, and Casing Spacers, Under Williams Gas Lines (Open Cut) (68+40 to 69+40)	100	LF		
43	**Phase 1**	**Civil**	Mainline Airvent/Drain Assemblies and Vaults, 1300mm, Stations 26+40 to 163+46	7	EA		
44	**Phase 1**	**Civil**	Mainline Thrust Blocks 1300mm, Stations 26+40 to 163+55	46	YD		
45	**Phase 1**	**Civil**	COU Delivery Point, 48" Valves, Airvent and Vault Installation Station 163+55	1	LS		
46	**Phase 1**	**Electrical**	COU Delivery Point, Electrical install (County to Provide Transformer within 75ft, Owner to provide Remote Station Cabinet (RSC))	1	LS		
47	**Phase 1**	**Electrical**	COU Delivery Point Instrumentation and Electrical (20" Flowmeter and Pressure Transducers)	1	LS		
48	**Phase 1**	**Civil**	COU Delivery Point, Flowmeter and Vault	1	LS		
49	**Phase 1**	**Civil**	COU Delivery Point, Airvent Assembly and Vault	1	LS		
50	**Phase 1**	**Electrical**	65ft Radio Tower #2 and Foundation	1	LS		

51	**Phase 1**	**Civil**	COU Delivery Point Site Final Grading and 3/4" Gravel	100	YD		
52	**Phase 1**	**Civil**	COU Delivery Point Security Fence, Man Gate and Double 12ft Gates	350	LF		
53	**Phase 1**	**Civil**	Phase 1 Pressure Testing	1	LS		
54	**Phase 1**	**Civil**	Punch Lists, Cleanup and Alignment/Road/Laydown Yard Rehabilitation	1	LS		
55	**Phase 1**	**Civil**	Phase 1 Rock Excavation Rate	1	yd		
56	**Phase 1**	**Civil**	Phase 1 Contingency Allowance	1	LS	$250,000.00	$250,000.00
					Phase 1 Subtotal		
57	**Phase 2**	**Civil**	FRP Mainline Installation, 1300mm, Stations 163+64 to 196+16	3252	LF		
58	**Phase 2**	**Civil**	FRP Mainline Bedding/Backfill (Requiring Processing), 1300mm, Stations 163+64 to 196+16	8000	YD		
59	**Phase 2**	**Civil**	Mainline Airvent Assemblies and Vaults, 1300mm, Stations 163+64 to 196+16	1	EA		
60	**Phase 2**	**Civil**	FRP Mainline Installation, 1100mm, Stations 196+28 to 336+00	13972	LF		
61	**Phase 2**	**Civil**	FRP Mainline Bedding/Backfill (Requiring Processing), 1100mm, Stations 196+28 to 336+00	31000	YD		
62	**Phase 2**	**Civil**	Mainline Airvent/Drain Assemblies and Vaults, 1100mm, Stations 196+28 to 336+00	6	EA		
63	**Phase 2**	**Civil**	Mainline Thrust Blocks, 1100mm, Stations 163+55 to 336+00	50	YD		
64	**Phase 2**	**Civil**	1300mm x 1100mm Tee Station 196+22	1	LS		
65	**Phase 2**	**Civil**	Ordnance Lateral Tee's, Airvents, 42" Valves and Vaults Station 270+61	1	LS		
66	**Phase 2**	**Civil**	Depot Paved Road Open Cut Crossings	1	LS		
67	**Phase 2**	**Civil**	Recharge Basin Delivery Point Manifold, Flowmeter, Airvent, Vaults and 42" Valve Installation Station 336+00	1	LS		

68	**Phase 2**	**Electrical**	65ft Radio Tower #3 and Foundation	1	LS		
69	**Phase 2**	**Electrical**	Recharge Basin Delivery Point, Electrical install (County to Provide Transformer within 75ft, Owner to provide Remote Station Cabinet (RSC))	1	LS		
70	**Phase 2**	**Electrical**	Recharge Basin Delivery Point Instrumentation and Electrical (42" Flowmeter and Pressure Transducers)	1	LS		
71	**Phase 2**	**Civil**	Radio Tower# 3/ Recharge Basin Delivery Point Site Final Grading and 3/4" Gravel	25	YD		
72	**Phase 2**	**Civil**	Punch Lists, Cleanup and Alignment/Road/Laydown Yard Rehabilitation	1	LS		
73	**Phase 2**	**Civil**	Phase 2 Rock Excavation Rate	1	YD		
74	**Phase 2**	**Civil**	Contingency Allowance	1	LS	$125,000.00	$125,000.00
					Phase 2 subtotal		
					Total Amount		

_____ (Please Check or Initial) Proposer will comply with the provisions of ORS 279C.800 -.870, including the payment of the applicable prevailing rate of wage.

Proposer certifies this proposal is valid for _____ calendar days.

Proposer_____

Address_____

By (Print)_____

By (Signed)_____