# A d d e n d u m

Iowa Department of Transportation
Office of Contracts

Date of Letting: June 20, 2017
Date of Addendum: June 13, 2017

| B.O. | Proposal ID | Proposal Work Type | County | Project Number | Addendum |
|---|---|---|---|---|---|
| 001 | 07-0636-075 | BRIDGE NEW - PPCB | Black Hawk | NHSX-063-6(75)--3H-07<br>NHSX-063-6(87)--3H-07<br>NHSX-063-6(90)--3H-07<br>NHSX-063-6(92)--3H-07<br>NHSN-063-6(94)--2R-07<br>NHSX-063-6(96)--3H-07<br>NHSN-063-6(97)--2R-07 | 20JUN001A07 |

NHSX-063-6(75)--3H-07

Add Proposal Line No. 0885 2590-0000020 PROJECT MANAGEMENT, 1.000 LS

Make the following changes to the PROPOSAL SPECIAL PROVISIONS LIST & TEXT:

Add SS-15002 SUPPLEMENTAL SPECIFICATIONS FOR PROJECT MANAGEMENT
Effective Date: October 20, 2015

Replace SP-150237 with the attached SP-150237a

Replace SP-150243 with the attached SP-150243a

**SP-150237a**
**(Replaces SP-150237)**

**SPECIAL PROVISIONS**
**FOR**
**DRILLED-IN PILES**

**Black Hawk County**
**NHSX-063-6(90)--3H-07**

**Effective Date**
**March 21, 2017**

**THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

## 150237a.01 DESCRIPTION.

**A.** A concrete drilled-in pile foundation consists of a drilled shaft with a steel H-pile core installed in bedrock then filled with concrete.

**B.** As shown in the contract documents, the drilled-in piles are encased in concrete up to the bottom of the MSE wall, then encased with sand or bentonite fill between the bottom of the MSE wall and the bottom of the abutment footing. The sand shall be per Section 4133 of the Standard Specifications and the bentonite shall be per Article 2501.03, Q of the Standard Specifications.

**C.** Elevations, dimensions, and depth of the soil shafts and rock sockets shall be as specified in the contract documents. If bearing strata are encountered at different elevations or are judged to be of a different quality, the Engineer will adjust the permanent casing length and the socket elevation.

**D. Site Conditions.**

**1.** Artesian conditions have been encountered during drilling of borings BR-01 through BR-09. For example, boring BR-01, drilled from existing grade at elevation 828.4 feet, encountered an artesian water condition with water head at approximate elevation 835 feet. It is anticipated that similar artesian conditions will be encountered during probe testing and installation of the drilled-in piles. To minimize the impacts of artesian conditions, the planned sequence of construction requires the Contractor to fill between the existing grade and the bottom of the proposed MSE wall near the bridge (approximate elevation 847 feet) prior to installation of the drilled-in piles. The Contractor shall be prepared to handle the artesian condition during probe testing and pile installation.

**2.** Karst features, voids and cavities have been encountered during coring of borings BR-01 through BR-09. It is anticipated that similar conditions will be encountered during installation

of the drilled-in piles. If the Contractor is planning to use drilling fluid, he shall be prepared for drilling fluid loss. The Contractor shall be prepared to handle potential concrete quantity overruns during installation of the drilled-in piles.

## 150237a.02 MATERIALS.

**A. Drilling Fluid.**
Drilling fluid shall comply with Article 2433.02, A of the Standard Specifications except that only bentonite slurry or clean water shall be used.

**B. Concrete.**

**1.** All materials, proportioning, air entraining, mixing, slump, and transporting of Portland Cement Concrete (PCC) shall be according to Section 2403 of the Standard Specifications, except as modified herein.

**2.** Water/cement ratio: not to exceed 0.45.

**3.** Drilled-in pile construction: use Class D PCC mixture with a slump of 8 inches +/- 1.5 inches.

**4.** Portland cement: meet the requirements of ASTM C 150 Type I / II.

**5.** Air entrainment: apply Section 2403 of the Standard Specifications.

**6.** Retarder is required according to Materials I.M. 403 to maintain workable concrete.

**7.** ~~SIKA Intraplast-N, Intrusion-Aid MAX, or Eucon AWA is required. Use in accordance with the manufacturer's recommendations.~~ The use of fluidifier and anti-shrinkage admixture are required for the drilled-in pile concrete. The contractor shall determine the proper fluidifier and anti-shrinkage admixture product and dosage to be used in the concrete mix design.

**8.** Do not use Ground Granulated Blast Furnace Slag (GGBFS).

**C. Grout.**
Apply Materials I.M. 388.

**D. Steel H-Pile Core.**

**1.** Conform to Section 4167 of the Standard Specifications.

**2.** Storing, transporting, and handling shall be performed in a manner to prevent bending stresses or other damage.

**3. Pile Order Lengths.**
- **a.** The Contractor shall develop his schedule such that all the probes or test borings can be performed as early as possible. The record of the air-track probes or test borings shall be provided to the Engineer for evaluations and issuance of the final drilled-in piles. The Contractor shall allow the Engineer 15 working days to evaluate and issue the final tip elevations.
- **b.** The Contractor assumes all risk involved with ordering production piles in advance of the Engineer issuing the final drilled-in pile tip elevations.

**E. Corrugated Metal Pipe (CMP).**
Conform to Article 4141.01 of the Standard Specifications.

**F. Permanent Steel Casing.**

1. Conform to ASTM A252, Grade 3.

2. The minimum casing thickness shall be 1/2 inch.

3. Conform to the diameter specified in the plans.

**150237a.03 CONSTRUCTION.**

**A. Construction Sequence.**

1. Drill one 2 inch minimum air-track test probe or one test boring with NQ-size rock coring at each drilled-in pile location to the elevation specified in the plans.

2. Advance the drilled-in pile excavation to the tip elevation of the concrete socket per the approved installation plan.

3. Clean the drilled-in pile excavation to ensure that no fines or sediments are present per the approved installation plan.

4. Steel H-pile shall be placed with centralizers in the permanent casing.

5. Place the concrete using tremie pipe immediately after excavation bottom is approved by the Engineer.

6. The Contractor shall install CMP to support the ground above the top of the concrete to facilitate the placement of sand or bentonite.

**B. Air-Track Probes and Test Boring.**

1. Drill one test probe or one test boring at the center of each drilled-in pile location. Drill 2 inch minimum diameter probe or test boring to a depth as shown in the plans.

2. Test Borings: Equipment, methods, field records, sampling, final records, and storage of samples shall conform to Design Manual Chapter 200I-1. Fill in boreholes with neat cement grout.

3. Drill air-track probe or test borings at all drilled-in pile locations prior to the start of drilled-in pile excavation. Provide the logs to the Engineer. The probe log shall record rate of advance per foot, down pressure applied if any, rod drops, and any observation regarding the cuttings.

4. If voids, soil seams, or solution channels are detected, the Engineer shall be contacted for potential deeper probing or boring depth.

5. If the test probe hole has a diameter of 8 inches or greater, the test probe hole can be filled with drilled-in pile concrete in lieu of grout. Otherwise, fill drilled probe holes with neat cement grout.

6. Drilled-in pile installation shall not proceed until the Engineer issues the final tip elevation based on the results of the probing or boring.

**C. Drilled-In Pile Installation Plan.**

1. 2 weeks prior to the pre-construction conference, submit a list containing at least three drilled shafts or drilled-in pile projects with rock socket, of similar diameter and length to those shown on the plans, completed in the last three years. In the list of projects include names and phone numbers of owner's representatives who can verify the Contractor's participation

on those projects. In addition, submit a signed statement that the Contractor has inspected the project site and all the subsurface information made available in the contract documents.

**2.** Upon issuance of the final drilled-in pile tip elevation by the Engineer, and no later than 1 month prior to constructing drilled-in pile, submit a drilled-in pile installation plan for the Engineer to review. In this plan provide the following information:

- **a.** Name and experience record of firm(s) and associated personnel for the following:
  - **1)** Driller
  - **2)** Drilled-in pile superintendent.
  - **3)** Site exploration.
  - **4)** Confirmation boring
- **b.** List of proposed equipment to be used, including cranes, drills, augers, bailing buckets, grooving equipment, scouring equipment, final cleaning equipment, core sampling equipment, confirmation boring equipment, test probe equipment, tremies, casing, airlift pumps, etc.
- **c.** Details of overall construction operation sequence and the sequence of drilled-in pile construction in bents or groups.
- **d.** Details of excavation methods.
- **e.** Details of casing and forms, including installation and removal.
- **f.** Details of methods to clean the excavation, including air lift methods and spin bucket methods as applicable.
- **g.** Details of H-pile core placement, including support and centering methods.
- **h.** Details of H-pile splice and location of splice.
- **i.** Detail of centralizer and the way it is attached to the H-pile core.
- **j.** Details of concrete placement including procedures for tremie and method to prevent water or sediment intrusion at the discharge end.
- **k.** Concrete mix proposal.
- **l.** Details of methods to control cuttings, water, etc. with adjacent traffic conditions (vehicular or railroad if applicable).
- **m.** Details of final discharge of concrete at top of drilled-in pile, of removing contaminated concrete, and verifying concrete uniformity for site specific conditions.
- **n.** When casing is required, include details on casing to be used, including:
  - Specific length/depth of all casing proposed.
  - Specific evaluation and determination of casing (size, depth, etc.) required to prevent all drilled-in pile installation procedures from having an effect or impact on adjacent structures, railroads, etc.
- **o.** Contingency Plan: At the minimum, the contingency plan shall be developed to address the following situations:
  - Loss of drilling fluid during pile installation
  - Grout/concrete loss during pile installation
  - Artesian condition encountered during pile installation
  - Artesian condition encountered during probing or drilling of test boring
  - Loss of air track rods during probing

**3.** The Engineer will evaluate the drilled-in pile installation plan for conformance with the contract documents. Within 14 calendar days after receipt of the plan, the Engineer will notify the Contractor of additional information required or changes necessary to meet the contract requirements, or both. Field test the Engineer's procedural approvals. These approvals do not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the contract documents.

**4.** A pre-construction conference, in which the Engineer, Contractor, and drilling staff discuss the anticipated drilled-in pile process, will be required for this work prior to the start of excavation.

**D. Control and Disposal of Materials.**

Dispose of excavated material including water removed from the excavation. Collect and properly dispose off site all water displaced during final cleaning and concrete placement. Open pits for collection of materials will not be allowed. Control all excavated material, water, and other matter so that at no time it enters or encroaches upon the adjacent travel lanes, railroad, waterways, etc.

**E. Drilled-in Pile Excavation.**

**1. General.**

- **a.** Construct drilled-in pile excavation by the casing method described below to produce sound, durable concrete foundation free of defects.
- **b.** If the Engineer determines that the material encountered during excavation and/or present at tip elevation is unsuitable and/or differs from that anticipated in the design of the drilled-in pile, extend the drilled-in pile tip elevations as directed by the Engineer.
- **c.** Maintain a drilling log during soil and rock socket excavation. In the log, place information such as elevation, depth of penetration, drilling time in each of the strata, material description, and remarks. Furnish the log to the Engineer within 1 week after completion of the excavation.
- **d.** Construction of the drilled-in pile shall begin within 8 hours of completion of the excavation.
- **e.** Due to the potential presence of karst features, the Contractor shall be prepared for drilling fluid loss.

**2. Casing Method.**

- **a.** The casing method with the use of drilling fluid shall be used to advance the excavation through unstable material. Over-reaming to the outside diameter of the casing is required. The permanent casing shall be terminated at the top of bearing strata, as specified by the Engineer. The permanent casing shall be left in place.
- **b.** The purposes of using drilling fluid are to prevent drilled hole caving during excavation and to properly handle the artesian water condition prior to placing the permanent steel casing.
- **c.** The purposes of the permanent casing are to stabilize the excavation walls during drilling to prevent cave-ins as the result of potential vibrations, to minimize downdrag load after the drilled-in pile is constructed, and to prevent drilled-in pile installation procedures from having an impact on adjacent structures, railroads, etc.
- **d.** Place concrete via tremie method to displace the drilling fluid.

**F. Final Cleaning.**

**1.** Clean the bottom of excavation via method of scouring or air lift pump usage.

**2.** Clean the base of each excavation so that the base will have less than 1/2 inch of sediment or debris at the time of concrete placement.

**3.** The Engineer will visually inspect excavations.

**G. Excavation Inspection.**

Provide equipment for checking the dimensions and alignment of each excavation. Under the direction of the Engineer, verify the dimensions and alignment of the drilled-in pile under construction. After final cleaning, use a suitable weighted tape or other approved methods to measure final excavation depths.

**H. Placement of Steel H-Pile Cores.**

**1.** First construct a pile template that is capable of maintaining alignment and position of the H-pile core during installing within tolerances specified herein.

**2.** The steel H-pile cores shall be placed within 8 hours of the completion of the excavation.

**3.** The steel H-piles core shall be placed in the excavation to the length shown on the plans.

**4.** The steel H-piles core shall be placed and maintained in the center of the excavation.

**5.** The steel H-piles core shall be furnished and installed full length. A maximum of one splice shall be used; the splice shall be performed in accordance with Article 2501.03, P of the Standard Specifications.

**6.** Steel sections damaged during transportation, handling or installation shall be removed.

**7.** Steel sections spacing shall be +/- 3 inches from plan location and shall not be more than 1% off from vertical.

**8.** All cuts of steel H-pile sections shall be perpendicular to the axis of the pile.

## I. Concrete Placement.

### 1. General.

**a.** Place drilled-in pile concrete within 24 hours of the start of excavation of the rock socket. Place concrete within 8 hours of placing the steel H-pile.
**b.** Coordinate concrete batching and delivery with the batch plant so the time limits, as stated in the contract documents, between batching and delivery are not exceeded.
**c.** Place concrete in a continuous manner. Continue concrete placement after the excavation is full until good quality concrete is evident at the plan top elevation.
**d.** Calculate the volume of concrete needed to fill rock socket in competent rock and submit to Engineer for approval.
**e.** Record the top elevation of concrete and the volume of placed concrete at the top of competent rock. If the volume of concrete required to fill the rock socket exceeds the allowable differential, determine the cause of differential and notify the Engineer immediately.
**f.** Remove a sufficient volume of concrete from the top of freshly placed wet concrete to ensure elimination of all contaminated concrete at the top of drilled-in pile—a pump or air lift will be needed.
**g.** Place concrete through a tremie.
**h.** Complete placement of the concrete in the drilled-in pile within 3 hours. Adjust admixtures, when approved for use, for the conditions encountered on the job so the concrete remains in a workable plastic state throughout the 3 hour placement limit.
**i.** Leave all permanent casing in place.

### 2. Concrete Placement by Tremie.

**a.** For the tremie, comply with the following:
- The tremie shall be constructed so that it is watertight and will readily discharge concrete.
- The concrete shall be placed via a concrete pump or gravity tremie. A tremie shall have a hopper at the top that empties into a watertight tube at least eight inches in diameter. If a pump is used, a watertight tube shall be used with a minimum diameter of four inches.
- No aluminum parts shall come into contact with concrete.
- The discharge end of the tremie shall be constructed to prevent water intrusion and permit the free flow of concrete during placement operations.
- The tremie shall have sufficient mass so that it will rest on the excavation bottom before the start of concrete placement.
- Sufficient length to extend to the bottom of the excavation.

**b.** Maintain the discharge orifice between 5 feet and 10 feet below the surface of the fluid concrete.
**c.** Support the tremie so that it can be raised to increase the discharge of concrete and lowered to reduce the discharge of concrete.
**d.** Maintain a continuous flow of concrete. Ensure the concrete in the tremie maintains a positive pressure differential at all times to prevent introduction of air pockets or contaminants into the concrete.

**3. Concrete Placement by Pump line.**
Concrete placement by pump is not permitted without the use of a tremie pipe.

**J. Demonstration Drilled-in Pile.**

**1.** Demonstrate equipment and methods prior to construction of the first production drilled-in pile by installing a non-production drilled-in pile. Install on site at a location determined by the Engineer.

**2.** Construct the demonstration drilled-in pile in soil/rock as shown in the contract documents.

**3.** Construct the demonstration drilled-in pile according to the requirements of this specification with special emphasis on method of scouring, air lift pump usage, concrete delivery and coordination with the batch plant, concrete slump at the point of delivery, and concrete placement.

**4.** If the demonstration drilled-in pile installation demonstrates the equipment and methods used to construct drilled-in piles to the requirements of this specification are inadequate, the Engineer will require appropriate alterations in equipment or methods, or both, to eliminate the unsatisfactory results. The Contractor may be required to perform additional demonstration drilled-in piles until an adequate procedure is demonstrated and approved by the Engineer.

**5.** Do not begin constructing production drilled-in plies until the Engineer approves the methodology.

**K. Construction Tolerances.**
Drilled-in pile excavations and completed drilled-in piles not constructed within the required tolerances will be considered unacceptable. Correct all unacceptable excavations and completed drilled-in piles to the Engineer's satisfaction. Furnish materials and work necessary, including engineering analysis and redesign, to complete corrections for out of tolerance excavations (without either cost to the Contracting Authority or an extension of the completion dates of the project).

**1.** Ensure the drilled-in pile is within 3 inches of plan position at the top of drilled-in pile.

**2.** Ensure the vertical alignment of the excavation does not vary from the plan alignment by more than 1%.

**3.** Set full depth steel H-pile core section at the bottom of the excavation prior to concrete placement.

**4.** Casing dimensions are subject to American Pipe Institute tolerances applicable to regular steel pipe.

**5.** The top elevation of the concrete may have a tolerance of +/- 3 inches from the plan top of concrete elevation. Ensure sufficient steel H-pile core section length for embedment into abutment.

**6.** Use excavation equipment and methods that ensure the completed excavation will have a planar bottom. Ensure the excavation equipment cutting edges are normal to the equipment's vertical axis within a tolerance of 3/8 inch per foot of diameter.

**L. Testing Program.**

**1. General.**

**a.** Testing for all non-production and production drilled-in piles are required to ensure the quality and integrity of the piles.

**b.** Testing shall be done via Thermal Integrity Profile (TIP).

**c.** The testing method shall be selected by the Contractor and shall be capable of testing the installed length of the drilled-in piles.

**d.** The Contractor shall submit a summary report to the Engineer for approval within 5 working days after testing is conducted. The summary report shall include, at a minimum, the methodology of testing, list of equipment, details of test set-up, test data, and interpreted results.

**2. Thermal Integrity Profile.**

**a.** The Contractor shall perform the TIP testing by obtaining records of the heat generated by curing cement (hydration energy) to assess the quality of drilled-in piles. TIP measurements that are colder than normal indicate necks, inclusions, or poor quality concrete, while warmer than normal measurements are indicative of bulges. Variation in temperatures across the pile section can reveal reinforcement eccentricity. The TIP testing shall meet the requirements of ASTM D7949 and be performed along the full length of each drilled in pile.

**b.** The top of the concrete shall be covered with plastic to maintain the temperature for a minimum of 72 hours after the completion of the concrete placement.

**c.** Equipment: The Contractor shall supply all materials and equipment required to perform TIP tests. Equipment to perform the test shall have the following minimum requirements:

- Four thermal wire cables equally spaced at 90 degrees around the perimeter, attached to elements welded to the steel H-pile. The method of installation of thermal wire cables shall be included in the installation plan.
- Ability to collect data at user defined time intervals (typically 15 to 60 minutes).
- A computer based TIP data acquisition system to monitor temperature versus time after casting.

**150237a.04 METHOD OF MEASUREMENT.**

Measurement will be as follows:

**A. Air-track Probe or Test Boring.**
Feet, to the nearest 0.5 foot, measured down from the top of the abutment berm. Any drilling above this elevation is considered incidental.

**B. Drilled-In Pile in Soil.**
Feet, to the nearest 0.5 foot, constructed in soil.

**C. Drilled-In Pile in Rock.**
Feet, to the nearest 0.5 foot, constructed in rock.

**D. Steel H-Pile.**
Feet, to the nearest 0.5 foot, constructed.

**E. Demonstration Drilled-in Pile.**
Feet, to the nearest 0.5 foot, constructed and approved.

**F. Testing Program.**
Each, for each performed test for non-production and production piles.

**150237a.05 BASIS OF PAYMENT.**
Payment will be the contract unit prices as follows:

**A. Air-track Probe or Test Boring.**

**1.** Per foot.

**2.** Payment is full compensation for all equipment, labor, and materials necessary to satisfactorily complete the air-track probe or test boring including:
- Drilling and excavation air-track probe or test boring
- Furnishing and placing of grout backfill
- Disposal of excavated materials, water, and all other materials

**B. Drilled-In Pile in Soil.**

**1.** Per foot.

**2.** Payment is full compensation for all equipment, labor, and materials (except steel H- Pile Core) necessary to satisfactorily construct the drilled-in pile including:
- Drilling and excavation in soil
- Use of drilling fluid and all fluid loss during drilling (no additional compensation for fluid loss)
- Supplying and installing permanent steel casing
- Furnishing and placing concrete (up to 150% of the total theoretical volume of concrete), sand, bentonite, and any CMP required to support the ground to facilitate the installation of the sand and bentonite. The cost and installation effort of the CMP is considered incidental to the cost of the drilled-in piles.
- Drilled-in pile inspection
- Disposal of excavated materials, water, and all other materials

**C. Drilled-In Pile in Rock.**

**1.** Per foot.

**2.** Payment is full compensation for all equipment, labor, and materials (except steel H- Pile Core) necessary to satisfactorily construct the drilled-in pile including:
- Drilling and excavation of rock socket
- Use of drilling fluid and all fluid loss during drilling (no additional compensation for fluid loss)
- Furnishing and placing concrete (up to 150% of the total theoretical volume of concrete),
- Drilled-in pile inspection
- Disposal of excavated materials, water, and all other materials

**D. Steel H-Pile.**
Per foot, including centralizers and placement within the permanent casing/CMP.

**E. Demonstration Drilled-in Pile.**

**1.** Per foot.

**2.** Payment is full compensation for all equipment, labor, and materials necessary to satisfactorily construct the approved drilled-in pile including:
- Drilling and excavation of drilled-in pile in soil and rock socket

- Use of drilling fluid and all fluid loss during drilling (no additional compensation for fluid loss)
- Supplying and installing permanent casing
- Furnishing and placing H-pile core and centralizers
- Furnishing and placing concrete (up to 150% of the total theoretical volume of concrete),
- Drilled-in pile inspection
- Disposal of excavated materials, water, and all other materials

**F. Testing Program.**

Testing for all non-production and production piles, including all equipment, labor, and materials necessary to satisfactorily perform the test in accordance with the specified requirements.

**SP-150243a**
**(Replaces SP-150243)**

**SPECIAL PROVISIONS**
**FOR**
**TEMPORARY DEWATERING SYSTEM**

**Black Hawk County**
**NHSX-063-6(96)--3H-07**

**Effective Date**
**June 20, 2017**

**THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

## 150243a.01 DESCRIPTION.

**A.** This section covers installation, operation and decommissioning of the temporary dewatering system. The Contractor shall furnish all labor, materials, equipment and means to construct the project entitled US 63 Groundwater Suppression Project Wells DW-1 through DW-22, as shown on the plans and described herein. The work includes, but is not limited to, the following:

**1.** Drill, install, and develop 25 temporary dewatering wells, including three contingency wells.

**2.** Equip each temporary dewatering well with a submersible pump with capacities falling in three groups (100, 150, and 200 gallons per minute), and a control panel.

**3.** Equip each well with a control panel and level transmitter.

**4.** Furnish well head piping, valves and associated fittings as shown in the plans.

**5.** Furnish each well with a subsurface vault box.

**6.** Connect the well head piping to the header discharge pipe.

**7.** Furnish and install air release valve manholes, including all mechanical components.

**8.** Provide heat tracing and insulation for all piping and valves within dewatering well vault box and air release valve manhole.

**9.** Coordinate with utility, and design and install electrical system to power the temporary dewatering system.

**10.** Provide all instrumentation as indicated and run cable as necessary for operation of the dewatering wells.

**11.** Start up and test system.

**12.** Convert nine temporary dewatering wells into permanent groundwater monitoring wells for long term monitoring of groundwater levels. Abandon the other temporary dewatering wells.

**13.** Remove all temporary dewatering well related equipment, vault boxes, wellhead piping, temporary header discharge pipe, valves and air release manholes and restore each location.

**B.** The above general outline of principal features does not in any way limit the responsibility of the Contractor to perform all work and furnish the required materials, equipment, labor, and means as shown or required by the contract documents.

**C.** Materials, equipment, labor, etc., obviously a part of the work and necessary for the proper operation and installation of same, although not specifically indicated in the contract documents, shall be provided as if called for in detail without additional cost to the Contracting Authority.

**D. Performance Requirements.**

**1.** The temporary dewatering system shall lower the groundwater table 1 to 2 feet below the bottom of the excavation, as indicated in the plans. The temporary dewatering system shall be installed and in operation prior to excavation for groundwater suppression system installation.

**2.** The temporary dewatering system shall also be in operation before placing any proposed additional fill to the existing US 63, unless the proposed groundwater suppression system is installed and fully operational.

**3.** In addition to the temporary dewatering system shown in the plans, open pumping methods, such as sump pumps, are required to complete installation of the proposed groundwater suppression in the dry. The Contractor shall be prepared to provide additional open pumping methods as needed.

**4.** The power required to operate the temporary dewatering system shall be supplied from nearby transformers. Available transformers are listed in Appendix A of this Special Provision.

**E.** Qualifications: The Contractor shall meet the qualification requirements described in this section in order to perform the work.

**1.** All temporary dewatering system work shall be performed by an experienced construction dewatering Contractor who has at least 5 years of experience and has completed at least three similar projects involving construction dewatering using predrainage methods consisting of deep wells in similar ground conditions. The project superintendent shall have at least 5 years of experience supervising construction dewatering operations.

**2.** In addition, only Well Certified Contractor and Well Plugging Contractor meeting certifications requirements in the Iowa Administrative Code (IAC), Environmental Protection Commission (567), Chapter 82, are allowed to perform the well services.

**150243a.02 MATERIALS.**

**A. Well Drilling Mobilization and Cleanup.**
provide all materials and equipment required to accomplish the work as specified.

**B. Drilling.**

**1.** General: All equipment shall be in good working condition prior to use in the work. The Contractor shall operate and maintain equipment in conformance with manufacturer's recommendations.

**2. Drilling Equipment.**
- **a.** The Contractor shall provide mud rotary drilling rig(s) capable of completing the dewatering wells as shown on the well construction details shown on the plans.
- **b.** The Contractor shall provide at least one complete hydraulic rotary drilling unit, all tools, required accessories, power, lighting, bits, submersible pump, well screens, well casing, pit casing, cement, water for drilling, an air compressor for developing the well, an orifice weir or flowmeter for measuring discharge, and experienced personnel required to conduct efficient drilling operations in accordance with the requirements established in this special provision.
- **c.** The drilling unit shall be in good condition and capable of drilling a hole with a minimum diameter of 14 inches to accommodate a 10 inch casing, and shall be capable of drilling to a depth of approximately 60 feet below grade.

**3. Drilling Fluid.**
- **a.** The Contractor shall provide all drilling fluids, water, and additives as required. The Contractor shall use potable water or degradable synthetic organic drilling fluid throughout the drilling. The drilling fluid shall be a polymeric additive or other suitable material, to be approved by the Engineer, compatible for use with water having an estimated total dissolved solids concentration of 100 to 3,000 mg/l, and chloride concentration up to approximately 2000 mg/l. The use of bentonite in conjunction with the organic drilling fluid is allowable but shall be minimized. The Contractor shall achieve consistent mud control and circulation to lift cuttings from the hole and prevent caving. The Contractor shall minimize the introduction of non-native clays, additives, and water into the formation during drilling and well development. The Contractor shall review the selected fluids and additives with the Engineer prior to drilling.
- **b.** The water used for drilling shall be fresh water approved by the Engineer's representative.

**4. Test and Sampling Equipment.**
- **a.** The Contractor shall provide equipment for measuring drilling fluid properties.
- **b.** The Contractor shall provide sampling bags or containers.

**C. Well Screen Assembly.**

**1.** The Contractor shall provide the well screen(s) and all materials and equipment necessary to fabricate and install the well screen assembly as specified.

**2.** The well screen(s) shall be made of Schedule 40 PVC and be of the continuous-slot type as manufactured by ~~UOP~~ Johnson, ~~Howard Smith, Cooke, Roscoe Moss, or equal~~ Certain-Teed, Western Well Screen, or Atlantic Screen and Manufacturing, Inc.

**3.** The well screen(s) shall adhere to the schedule for screen slot sizes designed for each well which appears in the plans.

**4.** All wells shall contain a flush-thread coupling and bottom cap.

**D. Well Casing.**

**1.** General: The Contractor shall provide all materials and equipment necessary for joining and installing the casing as specified. The Contractor may install surface casing at no additional cost to the DOT if the upper portion of the borehole is unstable during drilling of the well boring. Surface casing shall consist of pipe of sufficient strength to hold the borehole open until grouting is completed. The depth of setting shall be left to the Contractor's discretion with final approval by the Engineer.

**2. Well Casing.**

**a.** The Contractor shall provide all casing of the types, thicknesses, diameters, and weights specified. All casing shall be of new first quality material and free of defects in workmanship and handling.

**b.** All casing shall be made of PVC which conforms to ASTM D1785 or equal.

**c.** A polyethylene coreline will be installed in each dewatering well from grade to the top of the pump inlet to accommodate permanent installation of a pressure transducer, and periodic water level measurements with an electric sounding device.

**d.** The casing and polyethylene coreline shall be as specified in the following listing:

| Well | Purpose | Diameter (inches) (ID/OD) | Wall Thickness (inches) | Weight (pounds/ft) | Material |
|---|---|---|---|---|---|
| All Wells | Well casing | 10.00/10.75 | 0.365 | 7.53 | Schedule 40 PVC |
| All Wells | M-scope/ transducer tube | 1.0/1.25 | 0.125 | 0.6 | Steel, black polyethylene coreline |

**3.** Fittings: The Contractor shall provide all fittings, drive shoes, and centering guides as necessary to complete the well.

**E. Well Filter Pack.**

**1.** General: The Contractor shall provide all filter pack gravel and the materials and equipment necessary for placing the filter pack as specified.

**2. Filter Pack.**

**a.** The gravel shall be thoroughly washed, sound, durable, well rounded basalt or siliceous material containing, when delivered, less than 5 percent silt and clay, and no organic material, anhydrite, gypsum, mica, or calcareous material. Specific gravity shall be not less than 2.5.

**b.** The size and gradation of the filter pack material appears listed in the plans. To confirm gravel pack grade, the Contractor shall provide grain size distribution analyses from samples selected from up to 10 of the well borings by the Engineer. Tentatively, the preferred standard (American) sieve sizes include Nos. 10, 14, 20, 30, 35, 40, 60, 120, and 230. These sieve sizes may be adjusted according to visual evaluation of sand samples.

**3. Gravel Sounding Device.**

**a.** The Contractor shall provide a measuring device to sound the gravel level in the hole during placement to detect bridging.

**b.** Prior to installing gravel pack, the hole shall be sounded to the base of the under ream cavity to ensure borehole is open and free of obstructions.

**F. Well Development.**

1. Swabbing Equipment: The Contractor shall furnish and install the following swabbing equipment for the dewatering wells, or equal.
   - **a.** Double swabbing device for 10-inch diameter screens. The swabs shall be separated by 2 feet of perforated pipe to accommodate air lift pumping while swabbing. Perforations shall occur at 90-degree angles around the pipe.
   - **b.** 4-inch diameter piping, to connect the swabbing pipe to the air compressor.
   - **c.** Swivel joints or flexible connections on the piping to permit vertical and rotational movement of the swabbing tool.
   - **d.** An airlift (air-line and eductor pipe) pump (air compressor).
   - **e.** Miscellaneous connecting pipe and fittings as required.

2. Airlift Development Equipment: Furnish an airlift (air-line and eductor pipe) pump (air compressor) capable of providing the necessary pressure and flow to pump the wells at rates up to 200 gallons per minute.

3. Sand Content Measuring Device: Provide a sand content measuring device such as a centrifugal sand separator like a Rossum Sand Tester as manufactured by Roscoe Moss Company, Geotech Environmental, Inc., or CGM Mining Solutions, Inc., or equal. The measuring device shall be capable of measuring a minimum sand content of 5 parts per million.

**G. Well Cement/Grout Seal.**

1. General: The Contractor shall provide all grout and the materials and equipment necessary for placement of the grout as specified, in accordance with the requirements of the IAC, Environmental Protection Commission (567), Chapter 49, article 49.9(3).

2. Portland cement shall conform to ASTM C150, Type I or II.

**H. Submersible Pumps.**

1. Definitions – Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards and of AWWA E101, American National Standard for Vertical Turbine Pumps-Line Shaft and Submersible Types.

2. Complete submersible pump, motor, all cable, and associated downhole components shall be provided as a complete functioning unit in compliance with AWWA E-101 and the applicable Hydraulic Institute Standards from the pump manufacturer. All components shall be manufactured, assembled and tested at the manufacturer's facility.

3. The submersible pump and motor shall be rated for continuous duty and shall be capable of pumping groundwater for dewatering over the specified flow range without surging, cavitation, or vibration. The pump shall not overload the motors for any point on the maximum speed pump performance characteristic curve throughout the entire pump operating range. The service factor for the motor shall not be applied when sizing the motor. To ensure vibration-free operation, all relative components of each pumping unit shall be statically and dynamically balanced. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. The amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of the Hydraulic Institute Standards. All parts of the pump shall be designed to withstand the stresses that will be imposed upon them during their handling, shipping, erection, and operation. The completed unit, when assembled and operating, shall be free of cavitation, vibration, noise, and oil or water leaks over the range of operation.

**4.** The Contractor shall coordinate pump requirements with drive manufacturer and be responsible for pump and drive requirements.

**5.** Pump Manufacturers
- **a.** Goulds.
- **b.** Grundfos.

**6.** Unless otherwise specified, materials shall comply with the following requirements. Materials of construction shall be as follows:
- **a.** Strainer: Type 316 Stainless Steel.
- **b.** Pump Bowls: Cast Iron, Glass-lined.
- **c.** Bowl Wear Rings: Stainless Steel.
- **d.** Impellers: Stainless Steel.
- **e.** Impeller Wear Rings: Stainless Steel.
- **f.** Seal Housings: Stainless Steel.
- **g.** Bearing Housings: Silicon Carbide.
- **h.** Surface Plate: Fabricated Steel - ASTM A36.
- **i.** Pump Shaft: Type 410 or 416 Stainless Steel.
- **j.** Bowl Bearings: Bronze.

**7.** Strength: Castings, fabrications, machined parts and drives shall conform to the industry standards for strength and durability and shall be rated for continuous duty over the entire operating range.

**8.** Cast iron: All cast iron used in pump construction shall be close-grained grey cast iron conforming to the requirements of ASTM Designation A48 CL30, or as specified.

**9.** Fabrications: Fabrications shall conform to the requirements of ASTM Designation A36 for fabricated steel.

**10.** Nameplates: The pump shall have a Type 316 stainless steel plate permanently attached to the discharge head into which the following information shall be impressed, engraved or embossed: Manufacturer's name, pump size, serial number, impeller diameter, capacity, head rating and speed. Nameplates shall also include information unique to each item of equipment and device to identify its function as described herein. Function nameplates shall be approximately 1 inch by 3 inches if made separately. Letters of function titles shall be not smaller than ¼ inch high.

**11. Pump Construction.**
- **a.** Bowls: The pump bowls shall be free of blow holes, sand holes or other detrimental defects.
- **b.** Sand Collar: The Contractor shall provide a sand collar to prevent sand from entering the suction bell bearing.
- **c.** Pump Shaft: Pump shaft shall be turned and ground. There shall be bronze bearings above and below each impeller. The length of the top and bottom bearings shall be a minimum of three times the shaft diameter.
- **d.** Impeller: The impeller shall be enclosed and statically balanced and fitted with wear rings.
- **e.** Cap Seal: Pump shall have a discharge case cap to seal off end of pump shaft from any cascading abrasives entrained in the pumped liquid when power is turned off.
- **f.** Strainer: The strainer will not restrict the flow of water with an open area in excess of four times the throat area of the suction case.
- **g.** Surface Plate: The surface plate shall be made of steel designed to support the total weight of the pump/motor, discharge column full of water, and pump discharge elbow. Surface plate shall be drilled to accommodate the 3 inch pump column pipe, level probe conduit, pump power cord conduit and bolt holes.

**h.** Column Pipe: Column pipe shall be Schedule 40 black steel pipe, with coupling connections or threaded pipe. Pipe shall be ASTM A53, grade B or equivalent APL. The column pipe shall be provided in 5 foot lengths to set the intake strainer at the necessary depth below the surface plate. Welding of bearings to column is not acceptable. All flange bolts shall be 304 stainless steel and of suitable size to mate flanges.

**i.** Column Couplings: The upper end of bottom and intermediate column pipes shall be fitted with coupling of ASTM A48, Class 30 cast iron, ductile iron, or steel.

**12. Motor.**

**a.** General: Oil-filled motor shall be filled with FDA approved food grade, high strength dielectric mineral oil and have automatic pressure balancing between reservoir and top bearing. The motor shall also have a double mechanical seal located in the top of the motor where its shaft extends through the motor housing.

**b. Power Cables.**

The electrical cable shall be marine submersible type consisting of three stranded conductors of the proper size to carry the full amperes of the motor at rated voltage. The conductors shall be insulated in accordance with IPCEA requirements. The cable shall be supported on the column pipe by means of cable clamps and stainless steel bands at 5 foot intervals. The cable shall terminate in a water proof junction box above the surface plate. Cable size shall be as required and shall be furnished by the pump and motor manufacturer. The cable shall have a plug in terminal to the motor. Motors shall be 460 volts, three-phase, 60 hz.

**c. Supplements.**

Refer to Pump Data Sheets at the end of this section.

**d. Accessories.**

**1)** Equipment Identification Plate: 16 gauge stainless steel with ¼ inch die- stamped equipment tag number securely mounted in a readily visible location.

**2)** Lifting Lugs: Equipment weighing over 100 pounds.

**3)** Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer.

**4)** Access Pipes: 2 inch I.D., black polyethylene M-scope tubes.

**5)** Safety Cable: Provide 3/8 inch 316L SST safety cable secured to pump housing and flange with 3 l 6L SST shackles.

**e. Level Element/Transmitter, Submersible, Water.**

**1) General.**

**a)** Function: Measure and transmit signal proportional to level.

**b)** Type: Totally submersible pressure sensor (loop powered).

**c)** Parts: Sensor, interconnecting cable, other parts as noted.

**2) Service.**

Fluid: Potable water, unless otherwise noted.

**3) Performance.**

**a) Process Range.**

**(1)** As noted.

**(2)** Provide fixed factory range such that noted process range is between 40% and 80% of fixed factory range.

**b)** Accuracy: 0.10 % of full scale, unless otherwise noted.

**c)** Temperature, Operating: -4°F to +140°F.

**d)** Overpressure:

**(1)** Proof: At least 1.5 times full scale.

**(2)** Burst: At least 2.0 times full scale.

**e)** Long Term Stability: +/- 0.10% full scale per year, typical.

**4) Features.**

**a) Sensor.**

**(1)** Silicon pressure-sensing element.

**(2)** Wetted parts as required for compatibility with process fluid or as noted, NEMA 6/IP 68 rating (submersible).

**(3)** Temperature compensation.
**(4) Dimensions, Nominal.**
**(a)** Diameter: Less than 1 inch.
**(b)** Length: 10 inches maximum.
**(5)** Loop powered, 9-30V dc.

**b) Interconnecting Cable.**
**(1)** Length: As required.
**(2)** Teflon sheathed, unless otherwise noted.
**(3)** Kevlar strain relief cord.
**(4)** Integral vent tube.

**c)** Sensor Termination Enclosure: Not required. Terminate in pump control panel located adjacent to well vault.

**d) Accessories.**
**(1)** Aneroid Bellows: If noted. Bellows shall be suitable for application.
**(2)** Cable Hanger, Kellems Type Grip: Required, unless otherwise noted.
**(3) Lightning Protection.**
**(a)** Internal (protects against water lightning strike): Required, unless otherwise noted.
**(b)** External (protects 4 mA to 20 mA dc output): Required, unless otherwise noted.

**5)** Signal Interface: 4 mA to 20 mA dc output, for load impedance of 0 ohm to 750 ohms, minimum for 24V dc supply without load adjustment.

**6) Manufacturers (provided they can furnish the noted options):** Endress & Hauser, Waterpilot FMX167A (22mm diameter), Druck PTX1730, or KPSI Model 320.

**~~f~~ 13. Factory Finishing of Discharge Piping Interior/Exterior and Column Pipe Interior/Exterior.**
**~~1)~~ a.** Surface Preparation: SP5, White metal blast cleaning.
**~~2)~~ b.** Paint Material: NSF Epoxy.
**~~3)~~ c.** Minimum Coats – Cover: Three coats, minimum dry film thickness per coat, 3 mil.

**~~g~~ 14. Source of Quality Control.**
**~~1)~~ a.** All tests shall be in accordance with AWWA E-101 and the Hydraulic Institute.
**~~2)~~ b.** Factory Inspections: Inspect for required construction, electrical connection, and intended function.
**~~3)~~ c.** Functional Test: Perform manufacturer's standard motor test on equipment.

## I. Electrical and Well Pump Control Panel.

### 1. General.
**a.** Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.
**b.** Products shall comply with all applicable provisions of NFPA 70.
**c.** Like Items of Equipment: End products of one manufacturer in order to achieve standardization.
**d.** Equipment Finish: Manufacturer's standard finish color, except where specific color is indicated.

### 2. Conduits.
**a.** PVC Coated Rigid Steel Conduit:
**1)** Meets requirements of ANSI C80.1 and UL6.
**2)** Material: Hot-dip galvanized, with PVC coating.

**b.** PVC Schedule 40 Conduit:

1) Meet requirements of NEMA TC 2 and UL 651.
2) UL listed for concrete encasement, underground direct burial, concealed or direct sunlight exposure, and 90 degrees C insulated conductors.
3) Furnish without factory-formed bell.

**3. Conductors.**

**a.** Insulation for 600 volt rated conductors.
1) No. 8 AWG and Smaller: Type THHN/THWN.
2) No. 6 AWG and Larger: Type XHHW.
3) Flexible Cord and Cable: Type SO, 600 volts.

**b.** No. 16 AWG, Twisted, Shielded Pair, Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 57 requirements.
1) Outer Jacket: 45 mil nominal thickness.
2) Dimension: 0.31 inch nominal OD.
3) Stranded with 20 AWG, seven strand tinned copper drain wire. Note: Ground shield in only one location.
4) Color Code: Pair conductors, black and red.

**4. Combination Motor Starter.**

**a.** Open style to be installed in separate well pump control panel.

**b.** Rating: See Electrical drawings for motor starter ratings.

**c.** Wiring: All external interface wired to numbered terminal blocks (NEMA type B wiring). Provide four additional spare terminal blocks for connection of control wiring "passing through" starter.

**d.** Power Connections: Provide lugs for connecting two No. 6 AWG conductors per phase on line connections. Note that the power to individual panels are "daisy-chained" and therefore two lugs per phase required.

**e.** Short Circuit Rating: 42,000 amps RMS.

**f.** Control Power Transformer: Fused on primary and secondary (120 Vac secondary). Provide additional capacity for heat trace in vault associated with well pump.

**5. Well Pump Control Panel.**

**a.** NEMA 4X aluminum. Hinged blank front, pad lockable. Interior hinged dead front door with process meter, indicating lights, selector switch, and circuit breaker handle interlocked with door (door cannot be opened unless the circuit breaker is off). The interior of the panel shall contain the combination motor starter and any other additional components. Size as shown on the plans. Note that size on plan is minimum size only. Modify size to accommodate components provided.

**b.** Indicating lights and selector switch shall be NEMA oil-tight. Indicating lights shall be LED type.

**c.** Provide sufficient room to the right of the combination starter to allow installation of two No. 2 AWG conductors per phase. (The power to the panels will be "daisy chained").

**d.** All conduit entries to panel shall be made at the bottom of the enclosure. Top mounted conduits are unacceptable.

**e.** Provide process meter to display well level and to provide automatic pump control to maintain well level set points entered on process meter. Process meter shall be similar to Precision Digital Model PD6000-6R5, Automation Direct Model DPM2, or Red Lion Model PAX. Provide meter with two form C relay contact outputs individually programmable. One contact shall be programmed as pump on-off and the other contact shall be programmed as high level alarm to activate panel mounted strobe light. Provide meter with 4-20 mA input, integral 24VDC power to power two-wire level element, and individually programmable 4-20 mA output.

**f.** See control diagram in plans for additional requirements.

**J. PVC Pipe.**

**1. Piping.**
- **a.** All header discharge pipe and dewatering well head piping shall be PVC schedule 80 and have nominal diameter as specified in the plans.
- **b.** Materials in contact with water shall conform to NSF 61 acceptance.
- **c.** Schedule 80 PVC: Type I, Grade I or Class 12454-B conforming to ASTM D1784 and ASTM D1785. Pipe shall be manufactured with titanium dioxide for ultraviolet protection.
- **d.** Threaded Nipples: Schedule 80 PVC.

**2. Fittings.**
Schedule 80: ASTM D2466 and ASTM D2467 for socket weld type and Schedule 80 ASTM D2464 for threaded type.

**3. Joints.**
Solvent socket weld except where connection to threaded valves and equipment may require future disassembly.

**4. Flanges.**
One-piece, molded hub type PVC flat face flange in accordance with Fittings above, ASME B16.1, Class 125 drilling

**5. Bolting.**
- **a.** Flat Face Mating Flange and In Corrosive Areas: ASTM A193/A193M, Type 316 stainless steel Grade B8M hex head bolts, ASTM A194/A194M Grade 8M hex head nuts and ASTM F436 Type 3 alloy washers at nuts and bolt heads. Achieve 40% to 60% of bolt minimum yield stress.
- **b.** With Raised Face Mating Flange: Carbon steel ASTM A307 Grade B square head bolts, ASTM A563 Grade A heavy hex head nuts and ASTM F436 hardened steel washers at nuts and bolt heads. Achieve 40% to 60% of bolt minimum yield stress.

**6. Gaskets.**
Flat Face Mating Flange: Full faced 1/8 inch thick ethylene propylene (EPR) rubber, Durlon, 9200W RCA, Garlock Gylon 3510 or pipe manufacturer's recommendation.

**7. Solvent Cement.**
Socket type joints shall be made employing solvent cement that meets or exceeds the requirements of ASTM D2564 and primer that meets or exceeds requirements of ASTM F656, chemically resistant to the fluid service and as recommended by pipe and fitting manufacturer.

**8. Thread Lubricant.**
Teflon Tape.

**K. Pipe Supports**

**1. Saddle Supports, Pedestal Type.**
- **a.** Minimum standard weight pipe stanchion, saddle, and anchoring flange.
- **b.** Nonadjustable Saddle: MSS SP, Type 37 with U-bolt.
- **c.** Adjustable Saddle: MSS SP 58, Type 38 without clamp.

**2. Channel Type Support Systems.**
- **a.** Channel Size: 12 gauge, 1 5/8 inch wide minimum steel.
- **b.** Members and Connections: Design for loads using one-half of manufacturer's allowable loads.

**c.** Fasteners: Vinyl ester fiber, polyurethane base composite nuts and bolts, or encapsulated steel fasteners.

**d. Manufacturers and Products.**

**1)** B-Line; Strut System.

**2)** Unistrut.

**3)** Anvil; Power-Strut.

**L. Pipe Penetrations through Air Release Valve Manhole, Dewatering Well Vault Box and Discharge Point at Virden Creek Culvert**

Modular Mechanical Seal: As specified in Special Provisions for Groundwater Suppression System.

**M. Gate Valves.**

**1. Gate Valve 2 Inches to 24 Inches.**

Iron body, bronze mounted, flanged ends, solid wedge gate, nonrising bronze stem, Class 125 rated 125 psi SWP, 200 psi CWP for 2 inches through 12 inches and 100 psi SWP, 150 psi CWP for 14 inches through 24 inches.

**2. Globe Valves 2 Inches to 10 Inches.**

Iron body, bronze mounted, flanged ends, bronze seat, outside screw and yoke, bolted bonnet, Class 125 rated 125 psi SWP/200 psi CWP, complies with MSS SP-85 Type 1.

**3. Ball Valves 3 Inches and Smaller for General Water and Air Service.**

Two-piece, standard port, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, zinc-coated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110.

**4. Check Valves (at dewatering well), Type V604 Check Valve 2 1/2 Inches to 12 Inches.**

Flanged end, cast-iron body, bronze mounted swing type, solid bronze or cast-iron disc, bronze seat ring, rated 125-pound SWG, 200-pound WOG.

**5. Air Release Valves, Type V744, 1/2 Inch to 2 Inches**

**a.** Suitable for water service, automatically exhaust small amounts of entrained air that accumulates in a system. In CLOSED position, seat against resilient seat to prevent water leakage.

**b.** Rated 150 psi working pressure, cast-iron or ductile iron body and cover, stainless steel float and trim, NPT threaded inlet and outlet, built and tested to AWWA C512.

**6. Check Valves (at temporary dewatering discharge points):**

Tideflex inline check valve.

**N. Dewatering Well Vault Box.**

**1.** Dewatering Well Vault shall be precast rectangular concrete vault as specified below.

**2.** Comply with ASTM C858.

**3.** Reinforcing Steel:

**a.** Deformed Bars: ASTM A615/A615M, Grade 60.

**b.** Welded Wire Fabric: ASTM A497/A497M.

**4.** Nominal Dimensions: As shown on plans.

5. Construction: Rigid type and behave monolithically.

6. Design Loads: As determined by ASTM C857.

7. Blockouts for penetrations shall be as shown on plans.

8. Sealant: Nonswelling preformed joint sealants to provide a lasting, watertight bond.

9. Mortar: Comply with ASTM C387/C387M, Type S or use Type I grout.

10. **Sidewalk Doors.**
    - **a.** Load Capacity: 300 pounds per square foot with maximum deflection of 1/150th of span.
    - **b.** Access door leaf: 1/4 inch.
    - **c.** Channel Frame: 1/4 inch-thick extruded aluminum trough frame with continuous anchor flange around perimeter. Weld 1 1/2 inch diameter drain coupling, and drain pipe, to frame trough at front right corner, unless indicated otherwise on plans.
    - **d.** Door Hinges: Heavy-duty brass or stainless steel with stainless steel pins through-bolted to cover plate with tamper-proof stainless steel bolts flush with top of cover and to outside leg of channel frame with stainless steel bolts and locknuts.
    - **e.** Lifting Mechanism: Stainless steel compression lift springs enclosed in telescoping vertical housing or stainless steel torsion lift springs.
    - **f.** Hold-Open Arm: Locks automatically in open position. Disengages with slight pull on vinyl grip with one hand. Door can be easily closed with one hand by pulling forward and down on vinyl grip.
    - **g.** Snap Lock: Stainless steel snap lock mounted on bottom of door leaf with removable topside key wrench and inside fixed lever handle. Threaded plug for flush outside surface with key wrench removed.

**O. Manholes for Air Release Valves.**

Manholes for Air Release Valves shall be precast circular concrete manholes in accordance with Article 4149.04 of the Standard Specifications.

**P. Concrete Anchors.**

1. Cast-In-Place Anchor Bolts: Headed type, unless otherwise shown on plans. Material Type: 316 SST.

2. Post-Installed Concrete Anchors: Material shall be 316 SST. Current ICC-ES Report indicating acceptance per IBC 2015 for anchors at structural applications in cracked concrete. Anchors shall be suitable for long-term loads. Use adhesive anchors for all applications except overhead anchorage. Use expansion anchors for overhead anchorage.

**Q. Trench Backfill for PVC Pipe.**

1. Pipe Bedding, Haunch Support and Primary and Secondary Backfill: Use Suitable Class II Material in accordance with Article 2552.02, C.1 of the Standard Specifications. Maximum particle size shall not exceed 0.75 inch.

2. **Final Trench Backfill.**
    - **a.** Use Suitable Backfill Material in accordance with Article 2552.02, A, 1, a of the Standard Specifications.
    - **b.** For pipe sections crossing US-63, between temporary dewatering wells DW-1 and DW-22, and between DW-13 and the temporary discharge point at Virden Creek

Enclosure, use Suitable Class II Material in accordance with Article 2552.02, C, 1 of the Standard Specifications.

**R. Heat Tracing and Insulation.**

**1. Heat Tracing.**

**a. System Design Requirements**

**1)** Heating load shall be calculated based upon a 50°F delta, 20 mph wind if pipes are located outdoors, insulation as specified, and shall include a 10% safety factor.

**2)** Heat loss calculations shall be based on Institute of Electrical and Electronics Engineers (IEEE) 515, Equation 1, Page 19.

**b. Electrical Heating Tape**

**1)** Cable: Self-limiting, parallel circuit construction consisting of continuous inner core of variable resistance conductive heating material between two parallel copper bus wires. Provide tinned copper braid for PVC, FRP, and stainless steel pipe applications.

**2)** UL Listing: Listed as self-limiting pipe tracing material for pipe freeze protection application in ordinary conditions.

**3)** Maximum Maintenance Temperature: 150°F.

**4)** Maximum Intermittent Temperature: 185°F.

**5)** Service Voltage: As indicated by branch circuits provided for heat tracing on the plans.

**6) Manufacturers and Products:**

**a)** Raychem; BTV-CR.

**b)** Thermon; BSX.

**c)** Nelson; CL1-J1 or L1-J1.

**c. Connection System**

**1)** Rating: NEMA 250, Type 4 and Factory Mutual approved.

**2)** Operating Monitor Light: Furnish with each circuit power connection kit to indicate when heat tracing is energized.

**3) Manufacturers and Products.**

**a) Power Connection Kit.**

**(1)** Raychem; JBS-100.

**(2)** Thermon; PCA-1-SR or DP-L.

**(3)** Nelson; PLT-BC.

**b) Splice Kit.**

**(1)** Raychem; S-150.

**(2)** Thermon; PCS-1-SR.

**(3)** Nelson; PLT-BS.

**c) Tee Kit.**

**(1)** Raychem; T-100.

**(2)** Thermon; DS-S.

**(3)** Nelson; PLT-BY.

**d) End Seal Kit.**

**(1)** Raychem; E-150.

**(2)** Thermon; DE-S.

**(3)** Nelson; LT-ME.

**e) Lighted End Seal Kit.**

**(1)** Raychem; E-100-L.

**(2)** Thermon; DLS.

**(3)** Nelson; LT-L.

**d. Securing Tape**

**1) Plastic Piping Systems.**

**a)** Type: Aluminum foil coated adhesive tape.

**b) Manufacturers and Products.**

**(1)** Raychem; AT-180.
**(2)** Thermon; AL-20P.
**(3)** Nelson; AT-50.

**2) Metallic Piping Systems.**
**a)** Type: Glass or polyester cloth pressure sensitive tape.
**b) Manufacturers and Products.**
**(1)** Raychem; GS54 or GT66.
**(2)** Thermon; PF-1.
**(3)** Nelson; GT-6 or GT-60.

**e. Pipe Mounted Thermostat.**
**1)** Type: Fixed, nonadjustable, set at 40°F.
**2)** Sensor: Fluid-filled with 3 foot capillary.
**3)** Enclosure: Glass-filled nylon, NEMA 250, Type 4X weatherproof with gasketed lid.
**4)** Switch: SP-ST, UL listed, rated 22 amps, 120 to 240V ac.

**f. Ambient Thermostat.**
**1)** Type: Adjustable setting (15°F to 140°F).
**2)** Sensor: Fluid-filled probe.
**3)** Enclosure: Epoxy-coated NEMA 250, Type 4X aluminum enclosure with exposed hardware of stainless steel.
**4)** Switch: SP-DT, UL or FM listed, rated 22 amps, 125 to 250V ac.

**2. Insulation.**
**a. Fiberglass.**
**1)** Material: UL rated, preformed, sectional bonded fiberglass per ASTM C585 with factory applied, Kraft paper with aluminum foil vapor barrier jacket with pressure-sensitive, self-sealing lap.
**2)** Insulation Temperature Rating: 0°F to 850°F.
**3)** Conductivity in accordance with ASHRAE 90.1 and maximum numerical value of 0.23 Btu-in./hr-square foot °F at 75°F.
**4)** Jacketing per ASTM C1136 with minimum water vapor transmission for jacket of 0.02 perm-inch per ASTM E96/E96M. Furnish with no jacket if field finish system specified.
**5)** Joints: Matching pressure-sensitive butt strips for sealing circumferential joints.
**6)** Flame Spread Rating: Less than 25 per ASTM E84.
**7)** Smoke Developed Index: Less than 50 per ASTM E84.

**b. Insulation at Pipe Hangers and Supports.**
Nonmetallic Pipe: High-density insert, thickness equal to adjoining insulation of Type 3 or other rigid insulation or manufactured pre-insulated pipe hanger and insulation shield. Extend insert beyond shield.

**c. Insulation Finish Systems**
**1)** Aluminum Roll Jacketing: For straight run piping, wrought aluminum Alloy 3003, 5005, 1100, or 3105 to ASTM B209 with H-14 temper, in accordance with ASTM C1729, minimum 0.016 inch thickness, with smooth mill finish.
**2)** Vapor Barrier: Provide factory applied vapor barrier, heat and pressure bonded to inner surface of aluminum jacketing.
**3)** Fitting Covers: Material as for aluminum roll jacketing, premolded, one or two piece covers, which includes elbows, tee/valves, end caps, mechanical line couplings, and specialty fittings.

**S. Temporary Piezometer.**

**1.** Riser pipe for piezometers shall consist of schedule 40 or thicker PVC pipe with flush threaded couplings. All PVC pipe shall have a nominal diameter of 2 inches. A PVC cap for the riser shall be provided. Sensing tips shall consist of 2 inch ID factory-slotted PVC threaded pipe, with 0.02 inch size openings, 60 inches in length.

**2.** A valve box assembly or steel casing with protective cover shall be provided for piezometers (PZ). Each protective cover shall be 2 inches larger in inside diameter than the rod or riser pipe within, or a minimum of 4 inches, whichever is greater. The valve box shall have a minimum depth below ground surface of 1.5 feet. The valve box shall have a bolting cover.

**T. Well Abandonment.**
Well plugging material shall satisfy the requirements in the Iowa Administrative Code (IAC), Environmental Protection Commission (567), Chapter 39.

**U. Site Restoration.**
The Contractor shall backfill trenches with Suitable Class II or Class III Backfill Material in accordance with Article 2552.02, C of the Standard Specifications.

## 150243a.03 CONSTRUCTION.

### A. Submittal

**1.** Qualifications: The Contractor shall submit the resumes of the personnel and the Contractor that will perform the work and submit qualifications for the Contractor and Contractor's personnel that meet the requirements of Section 1.F, "Qualification". In addition, the Contractor shall submit required certifications.

**2.** The Contractor shall submit detailed work plan prior to mobilization. At a minimum, the work plan shall include the following items.
- **a.** Proposed well, vault box, and air release valve manhole location plan and layout.
- **b.** Proposed header discharge pipe layout and profile.
- **c.** Overall construction sequence of temporary dewatering system.
- **d.** Drilling and well installation sequence.
- **e.** Any proposed earthwork associated with access and installation of temporary dewatering system.
- **f.** Well abandonment plan and detail.
- **g.** Well conversion plan and detail for wells that will be converted to permanent groundwater monitoring wells.
- **h.** Site restoration plan.

**3.** Valve Box and Air Release Valve Manhole: The Contractor shall provide shop drawings for precast structures showing general geometry, total depth, relative elevations and orientation of all connecting pipes and connection detail between precast segments. Shop drawings shall also include details of cover, invert and steps.

**4.** Well Screen Assembly: The Contractor shall provide specification sheets for well screen and riser.

**5.** Well Casing: The Contractor shall provide shop drawings and/or catalog cuts for well casing for review and approval.

**4. Well Filter Pack.**
- **a.** The Contractor shall submit grain size analyses for filter pack gravel for review and approval.
- **b.** The Contractor shall submit a 5-pound sample for each of the proposed filter pack material for approval prior to delivery of filter pack to the site.

**5. Well Development.**

**a.** The Contractor shall submit a detailed description and supplementary information on proposed methods of development other than those mentioned in this special provision.
**b.** The Contractor shall provide a list of at least two references where the Contractor's proposed method of development has been successfully applied to similar type screened dewatering wells.

**6.** Submersible pumps: The Contractor shall submit the following for review and approval prior to incorporation of the work:
**a.** All new pumping equipment shall be tested at the factory. The manufacturer shall provide a factory certified pump curve of the actual pump intended for installation.
**b.** Make, model, weight, and horsepower of each equipment assembly.
**c.** Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
**d.** Performance data curves showing total dynamic head, flowrate, brake horsepower demand, shutoff head, NPSH and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
**e.** Pump maximum downthrust or upthrust in pounds.
**f.** Detailed structural, mechanical and electrical drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.
**g.** Power and control wiring diagrams, including terminals and numbers.
**h.** Complete motor nameplate data, as defined by National Electrical Manufacturer's Association (NEMA), MG 1, Motors and Generators, motor manufacturer, and including any motor modifications.
**i.** Motor data, including the manufacturer; the minimum guaranteed efficiency and power factor at full load, % load, and Yi load; locked rotor current in amps; full load current in amps; the motor speed in rpm; service factor; and mounting details.
**j.** Thrust bearing life.
**k.** Type of thrust bearing and guide bearing.
**l.** Assembly and Installation Drawings. After the above equipment submittals have been approved, the Contractor shall submit complete fabrication, assembly, pump column, and installation drawings, together with detailed specifications and data covering materials of construction, weight of the pump, power drive assembly, parts, devices, wiring diagrams, and other accessories forming a part of the equipment furnished, for approval. Drawings, specifications, and other data required to be submitted shall include, but shall not be limited to, the following:
**1)** Materials of pump construction including shafts, bearings, impellers, castings, pump base, stuffing boxes, and shaft guards.
**2)** Electric motor data including size, make, type designations, wiring diagram of thermal protection, description and rating of motor moisture sensing system, and mounting details.
**m.** Factory, Functional and Performance Test Reports and Logs.
**n.** Manufacturer's Certification of Compliance that the factory finish system is identical to the requirements specified herein.
**o.** Special shipping, storage and protection, and handling instructions.
**p.** Manufacturer's printed installation instructions.
**q.** Manufacturer's Certificate of Proper Installation.
**r.** Suggested spare parts list to maintain the equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
**s.** List of special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

**7.** Electrical and Well Pump Control Panel: The Contractor shall submit shop drawings for the following for review and approval prior to incorporation of the work:
- **a.** Conduits.
- **b.** Conductors.
- **c.** Combination motor starters including circuit breaker handle interlocked with dead front door.
- **d.** Well pump control panels.
- **e.** Process meters.
- **f.** Indicating lights and selector switches.
- **g.** Alarm horn.
- **h.** Level element.

**8.** Monitoring Results of Temporary Piezometers: The Contractor shall submit readings within 24 hours after the readings are taken.

**B. Well Drilling Mobilization and Cleanup.**

**1. General.**
- **a.** The Contractor shall install temporary dewatering wells DW-1 through DW-22 at the locations shown in the plans.
- **b.** Bidders are advised to carefully inspect the existing facilities before preparing their proposals.
- **c.** Set up well drilling equipment in the areas designated by the Engineer. Accomplish all required work in accordance with applicable portions of this Special Provision.

**2.** Onsite Utilities: The Contractor is responsible for finding locally or providing potable water for drilling.

**3.** Contamination Precautions: The Contractor shall avoid contamination of the project area. Do not dump waste oil, rubbish, or other waste materials on the ground.

**4. Cleanup of Construction Areas.**
- **a.** Upon completion and acceptance of the wells, the Contractor shall remove from the site the drill rig and equipment, complete, and all debris, unused materials, temporary construction buildings, and other miscellaneous items resulting from or used in the operations; replace or repair any facility which has been damaged during the construction work; and restore the site as nearly as possible to its original condition.
- **b.** The Contractor is responsible for disposing of all drilling fluids.

**C. Drilling.**

**1. General.**
- **a.** The Contractor shall notify the Engineer one week prior to starting drilling.
- **b.** The Contractor shall provide at all times a thoroughly experienced, competent, and certified driller during all operations at the drill site.
- **c.** The borehole shall be drilled so as to permit the installation of the casing and screen(s) straight and plumb to the tolerances specified in this Special Provision.
- **d.** The Contractor shall drill and construct the 10 inch diameter dewatering wells as follows:
  - **1)** The Contractor will install 10 inch diameter dewatering wells penetrating through soil only or soil and bedrock. These wells will require a minimum nominal drill-hole diameter of 14 inches to the bottom of dewatering well elevations shown on the plans.
  - **2)** Well construction details are shown on the plans. Well construction intervals on the plans are based on evaluation of local geology. Actual settings may require adjustment in the field.

3) During the drilling, the Contractor shall collect ditch samples of drill cuttings every 5 feet for visual soil classification and generate drill logs.
4) The use of mud circulation pits is not allowed. The Contractor shall provide the necessary equipment, such as frac tanks, for mud circulation operation.

**e.** Use drilling fluids and additives specifically approved by the Engineer shall be used. The Contractor shall achieve consistent mud control and circulation to lift cuttings from the borehole and prevent caving. The Contractor shall minimize the introduction of non-native clays, additives, and water into the formation during drilling and well development.

**2. Abandoned Hole.**

**a.** If the Contractor fails to complete the test hole to the total depth as specified by the Engineer, or fails test requirements as specified, or if the casing or screen is broken or collapses, the well will not be considered satisfactory and the well will be abandoned and plugged by the Contractor at the Contractor's own expense, according to the Iowa Administrative Code (IAC), Environmental Protection Commission (567), Chapter 39.

**b.** The Contractor may, at their own expense, salvage any casing installed in the abandoned hole.

**c.** The Contractor shall then move to another designated location approved by the Engineer and drill a second well in accordance with this Special Provision.

**3.** Compliance with Governmental Regulations: The Contractor shall construct the well in strict conformance with all laws, rules, regulations, and standards related to the construction of wells in the State of Iowa and County of Black Hawk.

**4.** Protection of Water Quality: The Contractor shall take all necessary precautions to prevent contaminated water, gasoline, or other deleterious substances from entering the well, either through the opening or by seepage through the ground surface. The Contractor shall maintain these precautions during and after construction of the well until accepted by the Iowa DOT.

**5. Driller's Log and Other Logs.**

**a.** Lithologic and drilling rate logs shall be maintained by the driller, recording the type of material encountered in the well borings, drilling times, depth of the hole, and thickness of the geologic unit. The Contractor shall prepare logs for every well boring. A record of daily activities shall be kept by the Contractor and shall be furnished to the Engineer's representative at the completion of the Contract. The Engineer will approve the manner in which the logs are kept. All logs shall be available to the Engineer for their inspection at all times during the life of the Contract.

**b.** The driller's log and time drilling log shall be turned over to the Engineer at the conclusion of the project.

**6. Disposal of Cuttings and Water.**

**a.** The Contractor is responsible for removing drill cuttings from the site.

**b.** Disposal of drilling and development fluids is the responsibility of the Contractor.

**7. Standby Time.**

**a.** During the progress of well construction and sampling operations under this Special Provision, it may be necessary for the Iowa DOT to perform work of a nature that will require the services of the drilling crew and drilling equipment, or work that may require the crew and equipment to stand idle during normal working hours. In such an event, the Engineer shall order the Contractor to furnish assistance or to cease operations, and will state the anticipated extent or duration thereof. The Contractor shall promptly furnish such assistance, or cease operations, and shall receive reimbursement therefore as set forth in the Bid Schedule.

**b.** Idle time of the drilling crew and equipment, during normal working hours, not ordered in writing by the Engineer shall not be reimbursable under this Contract.

**c.** Payment for standby time shall be granted only for delays caused by the Iowa DOT. No standby will be paid for any delays caused by driller's error, repairs to equipment, or for any delay due to the Contractor's inability to procure, provide, or maintain the necessary equipment, materials, or supplies to enable the job to continue without delays. Periods of down time caused by inclement weather shall not be charged as standby time. Work stoppage for the 24 hour minimum setting time of cement grout shall not be charged as standby time.

**D. Well Screen Assembly.**

**1.** The Contractor shall install the well screen assemblies and fittings in conformance with the well screen manufacturer's recommendations.

**2.** After setting the well screen assembly, the Contractor shall measure from the ground surface to the bottom of the screen to assure a depth consistent with the schedule listed in the Plans. Further, the depth of the under ream cavity outside the screen shall be sounded to total depth before adding well filter pack.

**E. Well Casing.**

**1.** The Contractor shall install specified casing in hole plumb and straight.

**2.** All casing shall be installed by a method appropriate to the attached well construction drawing, as selected by the Contractor and reviewed by the Engineer.

**3.** Casing lengths featured in the Plans are tentative; final casing lengths shall be determined in the field by the Engineer.

**4.** Casing lengths shall be joined watertight by a method appropriate to the material used, as selected by the Contractor, so that the resulting joint shall have the same structural integrity as the casing itself.

**5.** If threaded and coupled joints are used, couplings shall be API or equivalent, made up so that when tight, all threads will be buried in the lip of the coupling.

**F. Well Filter Pack.**

**1.** General: If high viscosity drilling fluid has been used in drilling, it shall be thinned with water prior to placement of gravel.

**2.** Placing Gravel: The gravel shall be introduced at a metered uniform rate in a manner that will allow even placement of the gravel. Every precaution shall be taken to ensure placement of the gravel pack continuously from the bottom of the well to a point 10 feet above the well screen without separation or bridging of the materials as they are introduced into the well. During placement of the gravel, the top of the gravel shall be continuously sounded to measure its rate of rise and to determine if bridging is occurring. At the discretion of the Engineer, gravel may be added to top off the packs in the dewatering wells which may have undergone significant settlement during development.

**G. Well Development.**

**1.** The total development time for each well shall run 8 hours. The Engineer shall be the sole judge to the termination of development on each well, and may alter development time.

2. The Contractor shall provide a combination of two methods of mechanical development, which shall include 1) swabbing with a double swab or surge block, 2) airlift pumping, or 3) other method to be approved by the Engineer. Also, some polyphosphate treatment may be applied to loosen clay minerals around the borehole.

3. **Swabbing and Airlift Pumping.**
   - **a.** The Contractor shall swab the screens by vigorously moving the swabbing tool up and down the well while simultaneously airlift pumping.
   - **b.** Development shall start at the bottom of the well screen and proceed upward. One 3 foot section of well screen will be developed at a time. Discharge from the well will run clear and free of fines before proceeding up the well to the next section of screen.
   - **c.** If the well screen sump or tailpipe fills with fines prior to completion of swabbing, the swabbing equipment shall be removed and the well cleaned to the bottom before resuming swabbing.
   - **d.** After swabbing and airlift pumping, the well shall be sounded and cleaned to the bottom by airlift pumping, bailing, or other equal method.
   - **e.** The Contractor shall operate the swabbing equipment continuously at such rates of discharge and for such periods of time as determined by the Engineer. The Engineer will determine when swabbing is complete.

4. **Airlift Development.**
   - **a.** The Contractor shall develop all of the wells by using the airlift pump with an air-line capable of reaching the bottom of the well and using the well casing as the eductor pipe. A smaller diameter eductor pipe may also be needed to increase uphole velocities.
   - **b.** The equipment shall be assembled and operated so that the air-line is capable of reaching the bottom of the well and may be placed inside of the swabbing tool or a smaller diameter eductor pipe. The bottom of the air-line and eductor pipe shall be capable of being moved the entire length of the well screen.
   - **c.** After the specified period of airlift development, if the well has filled with fines, the air-line shall be lowered to the bottom of the well and operated so a sufficient uphole velocity is achieved to remove the fines.
   - **d.** The Contractor shall operate the airlift development equipment continuously at such rates of discharge and for such periods of time as determined by the Engineer. The well shall be developed until the water is free from sand, silt, and turbidities as observed by the Engineer. The Engineer will determine when development is complete.

5. **Overpumping Development.**
   - **a.** Development by overpumping shall follow airlift pumping.
   - **b.** The Contractor shall provide a vertical turbine pump that can be pumped at rates up to 200 gallons per minute for overpumping development. The suction flange for the development pump shall be set at 2 feet above the screen to ensure pump bowls are not dewatered at elevated, development pumping rates.
   - **c.** A 1/2 inch diameter black polyethylene pipe shall be attached to the pump column, extending from the top of the uppermost pump bowl to 1 foot above the top of the well casing. This pipe will provide an access port for a water level indicator or pressure transducer for collecting water level elevations during development and specific capacity testing. This access piping can be reused when the permanent pump is reinstalled.
   - **d.** During overpumping redevelopment, the wells shall be surged by turning the pump on and off over a short time period. This type of development shall continue until discharge runs clear and free of sediment. After surging, the well shall be pumped at a rate that is approximately 120% to 150% of its operating rate (pump design flow rate) as shown in the Plans. Overpumping shall continue for at least 4 hours, and

until discharge is free of turbidity. The Engineer will determine when development is complete.

**e.** The Contractor shall be responsible for disposing of discharge effluent during over pumping. Typically, development effluent can be discharged to the ground surface adjacent to the site.

**6. Development Water Containment and Disposal.**

**a.** The method of containment shall completely contain swabbing or development water without affecting the effectiveness of the development method.

**b.** Containment shall minimize contact of the water with workers, Engineer, other people, pets, or animals.

**c.** Disposal of the development water from swabbing and airlift pumping is the responsibility of the Contractor.

## H. Well Grout Seal.

**1. Neat Cement Grout.**

**a.** Neat cement grout is required and shall consist of cement and water with not more than 6 gallons of water per 1 cubic foot of cement.

**b.** Sufficient annular opening shall be provided to permit a minimum 2 inches of grout around the protective casing, including couplings, if used.

**2. Additives.**

**a.** The use of special cements, bentonite to reduce shrinkage or other admixtures (ASTM C494) to reduce permeability, increase fluidity and/or control set time, and the composition of the resultant slurry shall be reviewed by the Engineer.

**b.** Consistency and method of mixing shall be reviewed by the Engineer prior to grouting.

**3. Placing.**

The method of grout placement shall be reviewed by the Engineer. If grouting below the water table, no method will be permitted that does not force grout from the bottom of the space to be grouted to the surface. The grouting shall be done continuously and in such a manner as will ensure the entire filling of the annular space in one operation. When grouting, the bottom of the tremie pipe will be set 6 inches above the top of the filter pack and withdrawn in increments as grout fills the annular space. No drilling operations will be permitted until the grout has cured. Curing time shall be a minimum of 24 hours.

## I. Submersible Pumps.

**1. Installation.**

**a.** The Contractor shall install submersible pumps in accordance with manufacturer's printed instructions and plans.

**b.** The Contractor shall provide level sensor to pump setting.

**c.** Suction and discharge piping shall be connected without imposing strain to pump flanges.

**d.** Anchor Bolts shall be placed accurately using equipment templates.

**2. Field Finishing.**

The Contractor shall touch up paint as required.

**3. Field Quality Control.**

**a.** The Contractor shall conduct functional tests on each pump as follows:

**1)** Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.

**2) Vibration Test.**

**a)** Test with unit installed and in normal operation, and discharging to the connected piping systems at rates over all operating speeds as approved by Engineer, and with actual building structures and foundations provided shall not develop vibration exceeding the 80% of the limits specified in HIS 9.6.4.

**b)** If unit exhibits vibration in excess of limits specified, adjust or modify as necessary. Unit that cannot be adjusted or modified to conform as specified shall be replaced.

**3)** Flow Output: Measured by plant instrumentation.

**4)** Test for continuous 3 hour period.

**b.** Performance Test: In accordance with Hydraulic Institute Standards.

**4. Manufacturer's Services.**

A Manufacturer's Representative shall be present on site or at a classroom designated by the Contracting Authority, for minimum person-days listed below, travel time excluded:

**a.** 1 person-days for installation assistance and inspection.

**b.** 1 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.

**c.** 2 person-days for post-startup training of Iowa DOT personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Iowa DOT.

**5. Supplements.**

The supplements listed below, following "End of Section," are a part of this Specification.

**a.** Pump Data Sheets.

**b.** Induction Motor Data Sheet.

**J. Air Release Manhole and Dewatering Well Vault Box.**

The Contractor shall perform installation in accordance with Section 2435 of the Standard Specifications.

**K. Pipe Penetrations through Air Release Valve Manhole, Dewatering Well Vault Box and Discharge Point at Virden Creek Culvert.**

**1.** The Contractor shall form or core circular opening and install pipe with modular mechanical seal in accordance with the manufacturer recommendations.

**2.** At each of the temporary dewatering discharge points:

**a.** Core at the same tapping locations proposed for the permanent storm sewer.

**b.** Divert flow in the Virden Creek Enclosure as necessary to accomplish the work. Obtain approval of the diversion plan from the Engineer.

**c.** Install pipe flush with inside wall of the Virden Creek Enclosure structure.

**d.** Install Tideflex inline check valve on the temporary discharge header pipe for backflow prevention from Virden Creek Enclosure.

**L. Valves Installation.**

**1.** The Contractor shall install valves so handles operate from fully open to fully closed without encountering obstructions.

**2.** The Contractor shall install valves in locations specified in the plans for easy access for routine operation and maintenance.

**3.** The Contractor shall install valves in accordance with manufacturer's recommendations.

**M. Trench Excavation and Backfill for Header Discharge Pipe and Other Below-Grade Conduits.**

Shall be performed in accordance with Section 2552 of the Standard Specifications, except:

1. Do not allow material to free fall into the pipe zone until after at least 2 feet of material has been provided over top of pipe.

2. Do not use power driven impact type compactors for compaction until at least 4 feet of material is placed over top of pipe.

**N. Buried Pipe Installation.**

1. **Placement General.**
   - **a.** Keep trench dry until pipe laying and joining are completed.
   - **b.** Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.
   - **c.** Measure for grade at pipe invert, not at top of pipe.
   - **d.** Excavate trench bottom and sides of ample dimensions to permit visual inspection and testing of entire flange, valve, or connection.
   - **e.** Prevent foreign material from entering pipe during placement.
   - **f.** Close and block open end of last laid pipe section when placement operations are not in progress and at close of day's work.
   - **g.** Lay pipe upgrade with bell ends pointing in direction of laying.
   - **h.** Deflect pipe at joints for pipelines laid on a curve using unsymmetrical closure of spigot into bell. If joint deflection of standard pipe lengths will not accommodate horizontal or vertical curves in alignment, provide:
     - **1)** Shorter pipe lengths.
     - **2)** Special mitered joints.
     - **3)** Standard or special fabricated bends.
   - **i.** After joint has been made, check pipe alignment and grade.
   - **j.** Place sufficient pipe zone material to secure pipe from movement before next joint is installed.
   - **k.** Prevent uplift and floating of pipe prior to backfilling.

2. **PVC Pipe Placement.**
   - **a.** Lay pipe snaking from one side of trench to other.
   - **b.** Offset: As recommended by manufacturer for maximum temperature variation between time of solvent welding and during operation.
   - **c.** Do not lay pipe when temperature is below 40°F, or above 90°F when exposed to direct sunlight.
   - **d.** Shield ends to be joined from direct sunlight prior to and during the laying operation.

**O. Electrical and Well Pump Control Panel.**

1. **General.**
   - **a.** Workmanship shall comply with all applicable provisions of NECA 5055.
   - **b.** Install materials and equipment in hazardous areas in a manner acceptable to regulatory authority having jurisdiction for the class, division, and group of hazardous area indicated.
   - **c.** Ground equipment, enclosures, and complete conduit system securely in accordance with applicable sections of NFPA 70.

2. **Motor Starter.**
   Field adjust trip settings of motor starter magnetic circuit breakers in accordance with manufacturer's instructions.

3. **Conduits and Fittings.**
   - **a. General.**
     - **1)** Do not install crushed or deformed raceways.

**2)** Avoid trapped raceways in damp and wet locations.
**3)** Prevent plaster, dirt, or trash from lodging in raceways, boxes, fittings, and equipment during the course of construction. Clear clogged raceways of obstructions.
**4)** Secure conduits entering cabinets, pull boxes or outlet boxes with galvanized knockouts and bushings, on both sides of box wall.

**b. PVC Coated Rigid Steel Conduits.**
All exposed conduits shall be PVC coated rigid steel. When transition from below grade to above grade, use PVC coated rigid steel from a minimum 12 inches below grade.

**c. PVC Conduits.**
Use only in direct buried applications. Minimum depth 18 inches. May be routed with well pumps discharge piping.

**4. Conductors.**
**a.** Conduit system shall be complete prior to drawing conductors.
**b.** Lubricate prior to drawing into conduit. Lubrication type shall be as approved by conductor manufacturer.
**c.** Identification:
**1)** Where two or more conduits run to a single outlet box, color code each circuit as a guide in making connections.
**2)** Carry colors continuously throughout the system if more than one multiwire branch circuit is carried through a single raceway.
**3)** Connect circuit conductors of same color to same underground feeder conductor throughout installation.
**4) Colors.**
**a)** Neutral Wire: White.
**b)** Ground Wire: Green.

**5. Protection Following Installation.**
**a.** Protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation.
**b.** Cap conduit runs during construction with manufactured seals.

**P. Pipe Heat Tracing and Insulation.**

**1. General.**
**a.** The Contractor shall install all trace heating in accordance with the manufacturer's instructions and recommended practices.
**b.** The Contractor shall provide insulation as specified over all pipe heat tracing.
**c.** Metallic structures or materials used for support of heating cable or on which it is installed in accordance with applicable codes shall be grounded.
**d.** Wiring between power connection points of heat tracing cable branch lines shall be provided by heat tracing system supplier.
**e.** The Contractor shall provide end of circuit pilot lights on heat tracing circuits for buried piping.

**2. Electrical Heating Tape.**
**a.** The Contractor shall determine required length of electrical heating tape by considering length of circuit, number and type of fittings and fixtures, design heating load, and heating tape output.
**b.** Where design heating load exceeds heating tape capacity, install by spiraling.
**c.** The Contractor shall derate heating tape capacity when installed on plastic piping.
**d.** The Contractor shall install trace heating on services as follows:

| Service | Piping Material | Placement |
|---|---|---|
| Piping and valves | PVC Schedule 80 | Inside vaults and manholes |

**e.** The Contractor shall install additional heating tape at bolted flanges, valves, pipe supports, and other fittings and fixtures as recommended by supplier, but not less than the following:

| Item | Heating Tape Length (min. feet) |
|---|---|
| Bolted flanges (per pair) | Two times pipe diameter |
| Valves | Four times valve length |
| Pipe hanger or support penetrating insulation | Three times pipe diameter |

**3.** Heat Tracing Circuits: Individual lengths of heat tracing circuits shall be limited such that maximum single circuit capacity is 20 amps when starting the circuit at 40°F. Provide multiple 20 amp circuits as required at individual heat tracing locations.

**4. Thermostats:**
- **a.** The Contractor shall install thermostats in accordance with manufacturer's instructions and as approved by Engineer.
- **b.** For each group of heat traced circuit, one ambient thermostat shall be installed.

**5. Field Quality Control:**
The Contractor shall test each circuit with 500 volt insulation tester between circuit and ground with neutrals isolated from ground. Insulation Resistance: Minimum 1000 megohms per 1000 feet.

**6. Piping Insulation**
- **a.** The Contractor shall insulate valve bodies, flanges, and pipe couplings.
- **b.** The Contractor shall insulate and vapor seal hangers, supports, anchors, and other piping appurtenances that are secured directly to cold surfaces.
- **c.** Heat Traced Piping: The Contractor shall apply insulation after heat-tracing work is completed and inspected.
- **d.** Flexible pipe couplings and expansion joints shall not be insulated
- **e. Minimum Insulation Thickness.**
  - **1)** Pipe Size from 1/4 to 3 inch diameter: 1 inch
  - **2)** Pipe Size from 3.5 to 10 inch diameter: 1.5 inch
  - **3)** Pipe Size from 12 to 16 inch diameter: 2 inch
  - **4)** Pipe Size from 18 to 24 inch diameter: 2.5 inch
- **f.** The Contractor shall install piping insulation in accordance with manufacturer's instructions and as specified herein.
- **g.** Insulation shall be installed after piping system has been pressure tested and leaks corrected.
- **h.** Insulation shall be installed over clean dry surfaces.
- **i.** The Contractor shall use insulating cements, lagging adhesives, and weatherproof mastics recommended by insulation manufacturer.
- **j.** Insulation shall not cover nameplates or code inspection stamps.
- **k.** The Contractor shall run insulation or insulation inserts continuously through pipe hangers and supports, wall openings, ceiling openings, and pipe sleeves, unless otherwise shown.

**l.** The Contractor shall install removable insulation sections on devices that require access for maintenance of equipment or removal, such as unions and strainer end plates.

**m.** The Contractor shall insulate valves and fittings with sleeved or cut pieces of same material.

**n.** Seal and tape joints.

**o. Vapor Barrier.**

**1)** The Contractor shall provide continuous vapor barrier at joints between rigid insulation and pipe insulation.

**2)** The Contractor shall install vapor barrier jackets with pipe hangers and supports outside jacket.

**3)** Staples and screws shall not be used to secure vapor sealed system components.

**p. Aluminum Jacket.**

**1)** The Contractor shall use continuous friction type joint to hold jacket in place, providing positive weatherproof seal over entire length of jacket.

**2)** Circumferential joints shall be secured with preformed snap straps containing weatherproof sealant.

**3)** On exterior piping, the Contractor shall apply coating over insulation and vapor barrier to prevent damage when aluminum fitting covers are installed.

**4)** Screws or rivets shall not be used to fasten fitting covers.

**5)** The Contractor shall install removable prefabricated aluminum covers on exterior flanges and unions.

**6)** The Contractor shall caulk and seal exterior joints to make watertight.

**q. Field Finishing.**

**1)** The Contractor shall apply coating of insulating cement where needed to obtain smooth and continuous appearance.

**2)** Where pipe labels or banding are specified, coating shall be applied to finished insulation, not to pipe.

**Q. Temporary Piezometers.**

**1.** The Contractor shall install temporary piezometers to confirm performance of the dewatering wells. Piezometers shall be at locations as shown in the plans.

**2.** Each piezometer shall extend to the depth at least 5 feet below the bottom of excavation of the groundwater interceptor trench, at location adjacent to the piezometer.

**3.** Drill borings using 4 inch minimum inside diameter casing and water. Drill the borings so as not to damage adjacent utilities.

**4.** Install the sensing tip, riser pipe, filter pack, filter pack seal, and annular space seal. Make pipe joints secure and watertight. Withdraw the drill casing in small increments as the backfill materials are placed, so that collapse of the borehole does not occur.

**5.** The minimum length of the slotted screen shall be 10 feet. The filter pack shall be installed from bottom of the boring up to 5 feet below ground surface. Place a bentonite seal above the filter pack seal.

**6.** The Contractor shall monitor the groundwater level at each piezometer location. Monitoring frequency shall be once per day after temporary dewater system is installed until the excavation for groundwater interceptor trench is completed.

**R. Well Abandonment.**

**1.** All temporary piezometers shall be abandoned and plugged at the end of construction.

2. Wells that are not converted to permanent groundwater monitoring well shall be abandoned and plugged at the end of construction.

3. Well plugging shall be performed in accordance with the Iowa Administrative Code (IAC), Environmental Protection Commission (567), Chapter 39.

**S. Site Restoration.**

1. The Contractor shall remove all temporary dewatering related equipment, vault boxes of temporary piezometers and abandoned dewatering wells, well header piping, temporary header discharge pipe, valves and air release manholes and restore each location. It should be noted that it may not be possible to remove the temporary header discharge pipe sections crossing US-63, between temporary dewatering wells DW-1 and DW-22, and DW-13 and temporary dewatering discharge point at Virden Creek Enclosure near STA 82+00, and these pipe sections shall be plug and fill with CLSM for abandonment in accordance with requirements in Article, 2503.03, F of the Standard Specifications.

2. Valve boxes of the dewatering wells that are converted into permanent groundwater monitoring well shall remain in place.

3. The Contractor shall support the ground and protect existing structures and utilities during removal of the temporary dewatering system.

4. The Contractor shall backfill all trenches with suitable Class II or Class III backfill material in accordance with Article 2552.02, C of the Standard Specifications. Backfill shall be placed in lifts not exceeding 6 inches. Compact backfill Class II backfill material in accordance to Article 2552.03, E.5.c and Class III backfill material in accordance to Article 2552.03, E.5.d of the Standard Specifications.

## 150243a.04 METHOD OF MEASUREMENT.

**A. Temporary Dewatering Well Drilling in Soil.**
Measurement for Temporary Dewatering Well Drilling in Soil will be by linear feet of drilling in soil.

**B. Temporary Dewatering Well Drilling in Rock.**
Measurement for Temporary Dewatering Well Drilling in Rock will be by linear feet of drilling in rock.

**C. Temporary Dewatering Well.**
Each size of temporary dewatering well will be counted.

**D. Air Release Valve Manhole.**
Each air release valve manhole will be counted.

**E. Header Discharge Pipe.**
Measurement for Header Discharge Pipe will be lump sum.

**F. Electricity Wiring for Temporary Dewatering System.**
Measurement for Electricity Wiring for Temporary Dewatering System will be lump sum.

**G. Temporary Dewatering Discharge Point.**
Each Temporary Dewatering Discharge Point will be counted.

**H. Temporary Piezometer.**
Each Temporary Piezometer will be counted.

**I. Operation of Temporary Dewatering System.**
Measurement for Operation of Temporary Dewatering System will be lump sum.

**150243a.05 BASIS OF PAYMENT.**

**A. Temporary Dewatering Well Drilling in Soil.**

**1.** Payment for Temporary Dewatering Well Drilling in Soil will be at the contract unit price per linear foot.
**2.** Payment is full compensation for perform drilling in soil and disposal of soil cuttings.

**B. Temporary Dewatering Well Drilling in Rock.**

**1.** Payment for Temporary Dewatering Well Drilling in Rock will be at the contract unit price per linear foot.

**2.** Payment is full compensation for performing drilling in rock and disposal of cuttings.

**C. Temporary Dewatering Well.**

**1.** Payment will be at the contract unit price for each size of well.

**2.** Payment is full compensation for:
- Furnishing and installing well screen assembly and well casing.
- Furnishing and placing well filter pack.
- Performing well development.
- Furnishing and placing well cement/grout seal.
- Furnishing, installing and removal of submersible pumps.
- Furnishing, installing and removal of well pump control panel and its concrete pad.
- Furnishing, installing and removal of dewatering well vault box and mechanical assembly inside each vault box (including pipe support, service saddles, valves, heat tracing and insulation, and pipe fittings).
- Furnishing, installing and removal of pipe penetrations through vault box.
- Furnishing, installing and removal of pipe between vault box and header discharge pipe.
- Excavation, temporary support (as needed), backfill and fill for vault box and concrete pad installation.
- Supplying the electricity to operate the temporary dewatering wells.
- Performing well abandonment and plugging, or conversion into permanent groundwater monitoring well (as per the plans).
- Site restoration at the temporary dewatering wells and vault box locations.

**D. Air Release Valve Manhole.**

**1.** Payment will be at the contract unit price for each air release valve manhole.

**2.** Payment is full compensation for:
- Excavation, temporary support (if needed), and backfill for air release valve manhole installation.
- Furnishing, installing and removal of air release valve manhole.
- Furnishing, installing and removal of air release valve.
- Furnishing, installing and removal of pipe penetrations through manhole.
- Site restoration at the air release valve manhole locations.

**E. Header Discharge Pipe.**

**1.** Payment for Header Discharge Pipe will be at the contract unit price per lump sum.

**2.** Payment is full compensation for:
- Earthwork for working platform.
- Excavation, temporary shoring (if needed) and backfill for header discharge pipe installation.
- Furnishing, installing and removal of header discharge pipe and associated fittings.
- Plugging and filling with CLSM for abandonment the temporary header discharge pipe sections crossing US-63, between temporary dewatering wells DW-1 and DW-22, and DW-13 and temporary dewatering discharge point at Virden Creek Enclosure near STA 82+00.
- Site restoration along the heading discharge pipe.

**F. Electricity Wiring for Temporary Dewatering System.**

**1.** Payment for Electrical Wiring for Temporary Dewatering System will be at the contract unit price per lump sum.

**2.** Payment is full compensation for furnishing, installing and removal of conduits, conductors, and combination motor starter, utility meters and circuit breakers.

**G. Temporary Dewatering Discharge Point.**

**1.** Payment will be at the contract unit price for each pipe penetration through discharge point at Virden Creek Culvert.

**2.** Payment is full compensation for:
- Excavation and backfill associated with pipe penetration work
- Furnishing and installing pipe penetration through Virden Creek Enclosure
- Furnishing and installing Tideflex inline check valve

**H. Temporary Piezometer.**

**1.** Payment will be at the contract unit price for each temporary piezometer.

**2.** Payment is full compensation for Installing, monitoring, and abandonment of temporary piezometers.

**I. Operation of Temporary Dewatering System.**

**1.** Payment will be at the contract unit price per lump sum.

**2.** Payment is full compensation for:
- Supplying the electricity to operate the temporary dewatering system.
- Operating the temporary dewatering system for the period as per the plans.

# PUMP DATA SHEET
# WELL PUMPS 1 to 5; AND 19 to 22

Project: U.S. 63 Groundwater Suppression

Owner:

Service: Dewatering

Pump Name: Well Pumps 1 to 5; and 19 to 22

Equip. Tag Number(s): P-1, P-2, P-3, P-4, P-5, P-19, P-20, P-21, and P-22

Pump Mfr.: Goulds; Grundfos

Size & Type: Submersible

No. Stages: Multiple

Serial No.:

Model No.: 85GS30 (Goulds), 85S30 (Grundfos)

No. Pumps Required: Nine

Drive Type: ☒ Constant ☐ Adjustable

| LIQUID | OPERATING CONDITIONS | SERVICE CONDITIONS |
|---|---|---|
| Name: Well Water | Capacity (U.S. gpm): | Temp (°F): Max 100 Min 50 |
| Pumping Temperature (°F): | Normal _____ Rated 100 | Rel. Hum (%): Max 100 Min 30 |
| Normal 55 Max 60 Min 50 | Total Dynamic Head (ft): 60 | Altitude (ft): Approx. EL 835 |
| Specific Gravity @ 60 °F: 1.0 | Suction Lift (psig): | ☐ Indoor ☐ Heated |
| Vapor Pressure (psia): | Max _____ Rated _____ | ☒ Outdoor ☒ Unheated |
| Viscosity (CP) @ _____ °F: | Submergence (min. ft.): 4 | Will Pump be Submerged? |
| pH: 6.5 – 8 | NPSH Available (ft): | ☒Yes ☐No |
| Corrosion/Erosion/Abrasion Caused by: | | Area Classification: |
| | | Other: |
| Remarks: | Remarks: | Remarks: |

**PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)**

Proposal Curve No.:

Pump Speed Range (rpm): 3,450

Efficiency (%): 55-65

Rated Power (BHP):

Min. Continuous Flow (gpm): 40

Max. Head (ft): 150 (Goulds), 110 (Grundfos)

Max. Power (BHP):

NPSH Required (ft water):

3% Head Drop

Suction Specific Speed:

Factory Testing:

☒Required ☐Not Required

Remarks:

Equipment Tag Number(s): P-1, P-2, P-3, P-4, P-5, P-19, P-20, P-21, and P-22

**PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)**

**Nozzles**

| | Size | Rating | Facing | Location |
|---|---|---|---|---|
| Suction | - | | | |
| Discharge | 2" | | | |

**Miscellaneous Connections**

| | Size | Location |
|---|---|---|
| Drain | | see dwgs |
| Vent | | see dwgs |
| Pres. Gauge | | see dwgs |
| Warm Up | | |

Casing Mount:

☒ Vertical

☐ Vertical Barrel

Shut-off Head (ft):

At 60°F: 185

At Norm. Pump. Temp.: _____

Outer Well Casing Dia. (in.): 10

Column depth (ft.) 26 – 36

Pump Shaft Dia. (In.): by mfr.

Column Size (In.): 3

Hydro Test Pressure (psig): _____

Field Testing: ☐ Not required

☒ Required, functional and performance

Impeller Type:

☐ Open ☒ Closed

Impeller Diameter (in.):

Rated _____ Max _____ Min _____

Bowl Size (in.) _____

No. of Stages: Multiple

Packing Mfr: _____

Type _____

Size/No. Rings _____

API Class Code _____

Manufacturer _____

Model _____

Manufacturer Code _____

Bearings (Type/No.):

Bowl _____

Lineshaft _____ Pump Shaft _____

Intermediate _____ Guide _____

Head Shaft: _____

Lubrication Type:

☐ Grease ☐ Oil

☒ Pumped Liquid

Coupling:

Manufacturer _____

Type _____ Model _____

Driver Half-Coupling Mounted by:

☐ Pump Mfr. ☐ Driver Mfr.

☐ Purchaser

Gland Type/Material: _____

Gland Plate Taps Required:

☐ Quench ☐ Flush
☐ Drain ☐ Vent

**MATERIALS (manufacturer to supply missing data)**

Bowl: _____

Bowl Wear Rings: _____

Column: _____

Remarks: _____

Impeller: _____

Impeller Wear Rings: _____

Bowl Bearing: _____

Head Shaft Bearing: _____

Lineshaft Bearing: _____

Shaft: _____

Shaft Sleeve: _____

Discharge Head:

Type _____

Material _____

**ADDITIONAL REQUIREMENTS**

Sole Plate
Suction Strainer

## INDUCTION MOTOR DATA SHEET

Project: U.S. 63 Groundwater Suppression

Owner: _____

Equipment Name: Well Pumps 1 to 5; and 19 to 22

Equipment Tag Number(s): P-1, P-2, P-3, P-4, P-5, P-19, P-20, P-21, and P-22

Type: Submersible motor, filled.

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 3 (max)

Voltage: 460

Phase: 3

Frequency: 60 Hz

Synchronous Speed: 3,450 rpm

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single-phase

Guaranteed Minimum Efficiency at Full Load: ____ percent

Guaranteed Minimum Power Factor at Full Load: ___ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: Submersible

Additional Motor Requirements:

Special Features:

Furnish pump with flow sleeve for motor cooling as recommended by manufacturer.

# PUMP DATA SHEET
# WELL PUMPS 12, 13, 14 AND 16

Project: U.S. 63 Groundwater Suppression

Owner:

Service: Dewatering

Pump Name: Well Pumps 12 ,13, 14 and 16

Equip. Tag Number(s): P-12, P-13, P-14 and P-16

Pump Mfr.: Goulds, Grundfos

Size & Type: Submersible

No. Stages: 2

Serial No.:

Model No.: 160L05 (Goulds), 230S50 (Grundfos)

No. Pumps Required: Four

Drive Type: ☒ Constant ☐ Adjustable

| LIQUID | OPERATING CONDITIONS | SERVICE CONDITIONS |
|---|---|---|
| Name: Well Water | Capacity (U.S. gpm): | Temp (°F): Max 100 Min 50 |
| Pumping Temperature (°F): | Normal ____ Rated 200 | Rel. Hum (%): Max 100 Min 30 |
| Normal 55 Max 60 Min 50 | Total Dynamic Head (ft): 60 | Altitude (ft): Approx. EL 835 |
| Specific Gravity @ 60 °F: 1.0 | Suction Lift (psig): | ☐ Indoor ☐ Heated |
| Vapor Pressure (psia): | Max ____ Rated ____ | ☒ Outdoor ☒ Unheated |
| Viscosity (CP) @ ____ °F: | Submergence (min. ft.): 4 | Will Pump be Submerged? |
| pH: 6.5 – 8 | NPSH Available (ft): | ☒Yes ☐No |
| Corrosion/Erosion/Abrasion Caused by: | | Area Classification: |
| | | Other: |
| Remarks: | Remarks: | Remarks: |

**PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)**

Proposal Curve No.:

Pump Speed Range (rpm): 3,450

Efficiency (%): 65

Rated Power (BHP):

Min. Continuous Flow (gpm): 50

Max. Head (ft): 145 (Goulds), 103 Grundfos

Max. Power (BHP):

NPSH Required (ft water):

3% Head Drop

Suction Specific Speed:

Factory Testing:

☒Required ☐Not Required

Remarks:

Equipment Tag Number(s): P-12, P-13, P-14 and P-16

**PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)**

**Nozzles**

| | Size | Rating | Facing | Location |
|---|---|---|---|---|
| Suction | - | | | |
| Discharge | 3" | | | |

**Miscellaneous Connections**

| | Size | Location |
|---|---|---|
| Drain | | see dwgs |
| Vent | | see dwgs |
| Pres. Gauge | | see dwgs |
| Warm Up | | |

Casing Mount:

☒ Vertical

☐ Vertical Barrel

Shut-off Head (ft):

At 60°F: 207

At Norm. Pump. Temp.: _____

Outer Well Casing Dia. (in.): 10

Column depth (ft.) 35 – 40

Pump Shaft Dia. (In.): by mfr.

Column Size (In.): 3

Hydro Test Pressure (psig): _____

Field Testing: ☐ Not required

☒ Required, functional and performance

Impeller Type:

☐ Open ☒ Closed

Impeller Diameter (in.):

Rated _____ Max _____ Min _____

Bowl Size (in.) _____

No. of Stages: 2

Packing Mfr: _____

Type _____

Size/No. Rings _____

API Class Code _____

Manufacturer _____

Model _____

Manufacturer Code _____

Bearings (Type/No.):

Bowl _____

Lineshaft _____ Pump Shaft _____

Intermediate _____ Guide _____

Head Shaft: _____

Lubrication Type:

☐ Grease ☐ Oil

☒ Pumped Liquid

Coupling:

Manufacturer _____

Type _____ Model _____

Driver Half-Coupling Mounted by:

☐ Pump Mfr. ☐ Driver Mfr.

☐ Purchaser

Gland Type/Material: _____

Gland Plate Taps Required:

☐ Quench ☐ Flush
☐ Drain ☐ Vent

**MATERIALS (manufacturer to supply missing data)**

Bowl: _____

Bowl Wear Rings: _____

Column: _____

Remarks: _____

_____

Impeller: _____

Impeller Wear Rings: _____

Bowl Bearing: _____

Head Shaft Bearing: _____

Lineshaft Bearing: _____

Shaft: _____

Shaft Sleeve: _____

Discharge Head:

Type _____

Material _____

**ADDITIONAL REQUIREMENTS**

Sole Plate
Suction Strainer

_____

## INDUCTION MOTOR DATA SHEET

Project: U.S. 63 Groundwater Suppression

Owner: _____

Equipment Name: Well Pumps 12, 13, 14 and 16

Equipment Tag Number(s): P-12, P-13, P-14 and P-16

Type: Submersible motor, filled.

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 5 (Goulds) or 7.5 (Grundfos)

Guaranteed Minimum Efficiency at Full Load: ____ percent

Voltage: 460

Guaranteed Minimum Power Factor at Full Load: _____ percent

Phase: 3

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Frequency: 60 Hz

Enclosure Type: Submersible

Synchronous Speed: 3,450 rpm

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single-phase

Additional Motor Requirements:

Special Features:

Furnish pump with flow sleeve for motor cooling as recommended by manufacturer.

# PUMP DATA SHEET
# WELL PUMPS 6 to 11, 15, 17, AND 18

Project: U.S. 63 Groundwater Suppression

Owner:

Service: Dewatering

Pump Name: Well Pumps 6, to 11, 15, 17 and 18

Equip. Tag Number(s): P-6, P-7, P-8, P-9, P-10, P-11, P-15, P-17, and P-18

Pump Mfr.: Goulds, Grundfos

Size & Type: Submersible

No. Stages:

Serial No.:

Model No.: 160L03 (Goulds), 150S50 (Grundfos)

No. Pumps Required: Nine

Drive Type: ☒ Constant ☐ Adjustable

| LIQUID | OPERATING CONDITIONS | SERVICE CONDITIONS |
|---|---|---|
| Name: Well Water | Capacity (U.S. gpm): | Temp (°F): Max 100 Min 50 |
| Pumping Temperature (°F): | Normal _____ Rated 150 | Rel. Hum (%): Max 100 Min 30 |
| Normal 55 Max 60 Min 50 | Total Dynamic Head (ft): 50 (Goulds), 60 (Grundfos) | Altitude (ft): Approx. EL 835 |
| Specific Gravity @ 60 °F: 1.0 | Suction Lift (psig): | ☐ Indoor ☐ Heated |
| Vapor Pressure (psia): | Max _____ Rated _____ | ☒ Outdoor ☒ Unheated |
| Viscosity (CP) @ _____ °F: | Submergence (min. ft.): 4 | Will Pump be Submerged? |
| pH: 6.5 – 8 | NPSH Available (ft): | ☒Yes ☐No |
| Corrosion/Erosion/Abrasion Caused by: | | Area Classification: |
| | | Other: |
| Remarks: | Remarks: | Remarks: |

**PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)**

| | | |
|---|---|---|
| Proposal Curve No.: | Min. Continuous Flow (gpm): 50 | NPSH Required (ft water): |
| Pump Speed Range (rpm): 3,450 | Max. Head (ft): 65 (Goulds), 110 (Grundfos) | 3% Head Drop |
| Efficiency (%): 70-80 | Max. Power (BHP): | Suction Specific Speed: |
| Rated Power (BHP): | | Factory Testing: |
| | | ☒Required ☐Not Required |

Remarks:

Equipment Tag Number(s): P-6, P-7, P-8, P-9, P-10, P-11, P-15, P-17, and P-18

**PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)**

**Nozzles**

| | Size | Rating | Facing | Location |
|---|---|---|---|---|
| Suction | - | | | |
| Discharge | 3" | | | |

**Miscellaneous Connections**

| | Size | Location |
|---|---|---|
| Drain | | see dwgs |
| Vent | | see dwgs |
| Pres. Gauge | | see dwgs |
| Warm Up | | |

Casing Mount:

☒ Vertical

☐ Vertical Barrel

Shut-off Head (ft):

At 60°F: 207

At Norm. Pump. Temp.: _____

Outer Well Casing Dia. (in.): 10

Column depth (ft.) 35 – 40

Pump Shaft Dia. (In.): by mfr.

Column Size (In.): 3

Hydro Test Pressure (psig): _____

Field Testing: ☐ Not required

☒ Required, functional and performance

Impeller Type:

☐ Open ☒ Closed

Impeller Diameter (in.):

Rated _____ Max _____ Min _____

Bowl Size (in.) _____

No. of Stages: _____

Packing Mfr: _____

Type _____

Size/No. Rings _____

API Class Code _____

Manufacturer _____

Model _____

Manufacturer Code _____

Bearings (Type/No.):

Bowl _____

Lineshaft _____ Pump Shaft _____

Intermediate _____ Guide _____

Head Shaft: _____

Lubrication Type:

☐ Grease ☐ Oil

☒ Pumped Liquid

Coupling:

Manufacturer _____

Type _____ Model _____

Driver Half-Coupling Mounted by:

☐ Pump Mfr. ☐ Driver Mfr.

☐ Purchaser

Gland Type/Material: _____

Gland Plate Taps Required:

☐ Quench ☐ Flush
☐ Drain ☐ Vent

**MATERIALS (manufacturer to supply missing data)**

Bowl: _____

Bowl Wear Rings: _____

Column: _____

Remarks: _____

Impeller: _____

Impeller Wear Rings: _____

Bowl Bearing: _____

Head Shaft Bearing: _____

Lineshaft Bearing: _____

Shaft: _____

Shaft Sleeve: _____

Discharge Head:

Type _____

Material _____

**ADDITIONAL REQUIREMENTS**

Sole Plate
Suction Strainer

## INDUCTION MOTOR DATA SHEET

Project: U.S. 63 Groundwater Suppression

Owner:

Equipment Name: Well Pumps 6, to 11, 15, 17 and 18

Equipment Tag Number(s): P-6, P-7, P-8, P-9, P-10, P-11, P-15, P-17, and P-18

Type: Submersible motor, filled.

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☐ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 3 (Goulds), 5 (Grundfos)

Guaranteed Minimum Efficiency at Full Load: ____

Voltage: 460

Guaranteed Minimum Power Factor at Full Load: __ percent

Phase: 3

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Frequency: 60 Hz

Enclosure Type: Submersible

Synchronous Speed: 3,450 rpm

☐ Thermal Protection: _____

☐ Space Heater: _____ volts, single-phase

Additional Motor Requirements:

Special Features:

Furnish pump with flow sleeve for motor cooling as recommended by manufacturer.

**APPENDIX A TRANSFORMER LOCATIONS**