PART 1: GENERAL

1.01 SUMMARY:

A. All work done under this contract will be performed by a contractor currently licensed and in good standing with the Wyoming Board of Examining Water Well Drilling Contractors and Water Well Pump Installation Contractors.

B. All water well work done under this contract will be completed in a manner as to meet or exceed the State of Wyoming Minimum Well Construction Standards.

C. Description of Work: Furnishing all labor, equipment, supplies, and materials, to drill, construct and develop one water well.

D. Location: Work under this Contract is located in Carbon County Wyoming. The work location is shown on the drawing.

E. Work Data Sheet: Designates the type and quantity of work required at the project location, and dimensions required for typical well construction.

1.02 REFERENCES:

A. Referenced Specifications/Standards with Abbreviations and/or Acronyms: Wherever the following acronyms are used in these specifications or on the drawings, they are to be construed the same as the respective expressions represented. Copies of the referenced specifications/standards referred to herein may be procured by the Contractor, from the following:

ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
OSHA	Occupational Safety and Health Administration's Standards U.S. Department of Labor Occupational Safety and Health Administration Denver Area Office 333 West Colfax Avenue Denver, CO 80204
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, Il 60076
API	American Petroleum Institute

1220 L Street
Washington, DC 20005

AWS American Welding Society, Inc.
P.O. Box 351040
Miami, FL 33135

1.03 CERTIFICATES OF CONFORMANCE:

A. Requirements: The Contracting Officer may permit use, prior to sampling and testing, of materials when accompanied by Certificates of Conformance. Materials used on the basis of a Certificate of Conformance may be sampled and tested. Installation of materials on the basis of Certificates of Conformance shall not relieve the Contractor of responsibility for incorporating materials which conform to the requirements of the drawings and specifications. Material not conforming to those requirements will be subject to rejection, whether in place or not.

B. Format: The form of the Certificate of Conformance provided by the supplier shall be as follows:

1. The certificate shall state that the named product conforms to the Contract requirements.

2. The certificate shall either be accompanied with a certified copy of the test results, or certify that such test results are on file with the manufacturer and will be furnished to the Contracting Officer upon request.

3. The certificate shall provide the name and address of the manufacturer, the testing agency and the date of tests.

4. The certificate shall set forth the means of identification which will permit field determination of the product delivered as being the product covered by the certification.

1.04 QUALITY ASSURANCE:

A. Codes and Standards: The work shall comply with codes and standards applicable to each type of work and as listed in the individual sections of these specifications. This Contract incorporates materials, applications, and tests by reference, with the same force and effect as when they were given in full text.

B. Conflict: Where a conflict occurs between reference documents and project specifications, the project specifications shall govern.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Delivery: The Contractor shall protect products incorporated into the

work from damage while in transit to the site. Products must be delivered in original unopened containers with manufacturer's name, brand designation, and contents legibly indicated.

B. Storage: The Contractor shall provide temporary storage facilities for products. Storage shall comply with the manufacturer's instructions. The storage area shall permit access for inspection and handling.

C. Handling: The Contractor shall load and unload products in such a manner that protects them from damage until installation on the project.

1.06 PROJECT/SITE CONDITIONS:

A. Access to the Work:

1. Access to work shall be provided by and at the Contractor's expense.

2. Public or private access roads damaged by the Contractor shall be restored at the Contractor's expense and to the same condition as they were at the commencement of work.

3. Construction of access roads to the work will not be permitted. Access to the work shall be by existing roads and trails.

B. Environmental Considerations:

1. The Contractor shall exercise care to prevent unnecessary surface disturbance of the work areas.

2. The Contractor shall not travel cross-country when ground is wet enough to cause rutting.

1.07 SEQUENCING AND SCHEDULING:

A. Work Schedule: The schedule shall be submitted at the pre-work conference. When requested, the Contractor shall submit an updated schedule within 3 calendar days.

PART 2: PRODUCTS

See Division 2, Section WY-02761 SITEWORK, Well Drilling and Casing, Part 2: Products, for Products requirements for this Project.

PART 3: EXECUTION

3.01 PROJECT MEETINGS:

A. Pre-Work Conference:

1. Notification: A pre-work conference will be held prior to the start of work. The Contractor will be notified in advance of meeting time, date and place. The purpose will be to review required work, project

drawings and specifications, construction schedules, payroll and payments, required forms/format for recording drilling and logging information, and administrative provisions of the Contract.

2. Attendance: The Contractor, subcontractors and the persons responsible for coordination of the work shall be present at the meeting.

3. Presentation: The Contractor shall be prepared to summarize and explain procedures planned for the project.

B. Progress Meetings:

1. Location: Meetings shall be held at the project site, or as determined by the Contracting Officer.

2. Notification: Meetings may be called by either the Contracting Officer or the Contractor. Request shall state who should attend and include agenda.

C. Final Inspection:

1. Meeting shall be held at the project site, or as determined by the Contracting Officer.

2. The Contractor shall notify the Contracting Officer in writing at least three working days before the completion date so the Government can schedule final inspection.

3. The Contractor shall require the superintendent to be present during this inspection.

3.02 WORK LAYOUT:

A. Requirements: The Government will set a stake to give the Contractor the well location.

PART 4: MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT:

A. Units: The work described in this section will not be measured for payment.

4.02 BASIS OF PAYMENT:

A. Payment: No direct payment for the work described under this section will be made. The Contractor shall include consideration for this item in the bid price for other items of the Contract.

END OF SECTION

PART 1: GENERAL

1.1 SUMMARY:

A. Section Includes: Record keeping, capping of well, disinfection of well, well logging, well abandonment, and mobilization.

1.2 SUBMITTALS:

A. General: Submittals shall be according to Specification 01009 - General Information and Requirements.

B. Records: Final well logs and reports described in this specification shall be furnished to the Contracting Officer (CO) in the format agreed upon at the Pre-Work Conference upon completion of the well.

1.3 RELATED WORK:

A. Specifications Sections:

General Information and Requirements	Section 01009
Water Well Drilling and Casing	Section 02671
Well Testing	Section 02672

PART 2: PRODUCTS

2.1 GOVERNMENT FURNISHED MATERIALS

A. See Section 01019, Government-Furnished Property if applicable.

2.2 CONTRACTOR-FURNISHED MATERIALS

A. Bentonite: Granular bentonite shall be American Colloid KWK, CS/55 or approved equal. Pellet bentonite shall be American Colloid Vol-Clay or approved equal.

B. Well cap or sanitary well seal designed to prevent pollutants from entering the well.

C. Disinfectant: Calcium hypochlorite (65% available chlorine) or alternative as approved by the Contracting Officer.

D. Sample Bags: Sample bags or other containers as approved by the Contracting Officer.

PART 3: EXECUTION

3.1 WELL LOG AND SAMPLES:

A. Well Log: The Contractor will record drilling and logging information in the format and/or on the forms agreed to at the pre-work conference. The Contractor maintained well log shall meet the state requirements and include entries for the formation and each apparent change in material penetrated, or every 10 feet, whichever is lesser. The log of the well shall show material penetrated and full descriptive notes made of each stratum found by the drill and difficulties or any usual conditions met in drilling. Water-bearing strata shall be described in detail as to loose or compact material, color, and if gravel, whether it is water-worn or angular. The presence of clay shall be noted. The log must be kept up to date with the progress of the well drilling and shall be available for inspection by the Contracting Officer during drilling operations and after completion of drilling.

B. Logging: The Contractor shall collect samples of well-cuttings at ten-foot intervals or at each formation change (whichever is less) and, as per the Contracting Officers instructions, place them in an orderly fashion on the ground near the drill site where they can be reviewed throughout the drilling process or placed in sample bags. The sample bags shall be marked showing the depth at which the samples were collected and the date and time that the samples were collected.

C. Information for State filing: The Contractor shall furnish the Contracting Officer with a copy of the drilling information (including the log and geophysical logs) required by the State Engineer's Office for filing on water wells.

3.2 ABANDONMENT OF THE WELL:

A. Abandonment Due to Contractor's Actions: When the drilled well must be abandoned because of actions of the Contractor, including but not limited to lost tools, damaged well, misalignment, inability to properly install casing string and/or gravel pack, or other causes attributed to carelessness or poor workmanship, the Contractor shall pull casing (if installed) that can be removed. If the casing cannot be pulled, cut the casing off three feet below grade. The contractor will then plug the hole in accordance with State regulations and requirements. The order to abandon the well must be in writing from the Contracting Officer. The abandonment must be witnessed by the Contracting Officer. The Contractor

shall be responsible for drilling a new well within 50 feet of the original well.

B. Abandonment Due to Other Causes: When the well must be abandoned because of inadequate quantity or quality of the water, or for another reason not the fault of the Contractor, the Contractor shall pull the casing (if installed) that can be removed. If the casing cannot be pulled, cut the casing off three feet below grade. The contractor will then plug the hole in accordance with State regulations and requirements. The order to abandon the well must be in writing from the Contracting Officer. The abandonment must be witnessed by the Contracting Officer.

3.3 SANITARY PROTECTION OF WELLS:

A. General: The Contractor shall protect the well during the construction and testing period to prevent tampering or seepage of contaminated water, petroleum products, or other contaminates into the well from the ground surface.

B. Seal: When the well is completed, install a cap or sanitary well seal designed to prevent pollutants from entering the well. Seal or screen off equipment openings that permit direct access to the well to prevent entrance of foreign matter or contaminates.

C. Grading: Slope the surface immediately surrounding the top of the well casing wellhead away from the well in all directions.

D. Correcting Contamination: If the well becomes contaminated, or water with undesirable physical or chemical characteristics enter the well due to the neglect of the Contractor, corrective work including the supplying of casing, seals, sterilizing agents, or other materials as may be necessary to prevent contamination of the aquifers shall be performed at the Contractor's expense.

3.4 DISINFECTION

A. General: All disinfection shall be done in the presence of the Contracting Officer. Disinfection (both following drilling and following pump installation) shall be done in compliance with the State of Wyoming Water Well Minimum Construction Standards.

PART 4: MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. General:

1. Rig or Standby time will not be paid for.

2. No payment will be made for drilling, installing casing, removing casing, or the plugging of a well abandoned due to Contractor's actions.

3. No payment will be made for record keeping, disinfection of the well, or furnishing and installing the cap or compression seal. The Contractor shall include consideration for these items in the bid price for other items of the Contract.

B. Units:

1. Payment will be made for furnishing and installing materials for the quantity abandoned due to causes not the fault of the contractor. Pulling casing and plugging the hole when the well is abandoned due to causes not the fault of the Contractor will be based on the price negotiated by the Contracting Officer.

2. Mobilization to the job site and between locations will be measured and paid for as a lump sum.

4.2 BASIS OF PAYMENT:

A. Payment: Prices and payment will be full compensation for the work described in this section. Payment will be made under:

Pay Item	Pay Unit
WY-02670 (1) Mobilization	Lump Sum

END OF SECTION

PART 1: GENERAL

1.1 SUMMARY:

A. Section Includes: Drilling, casing, developing, preliminary testing, and installing Contractor-furnished and Government furnished property in water wells.

1.2 RELATED WORK:

A. Specifications Sections:

General Information and Requirements	Section 01009
Water Wells	Section 02670
Well Testing	Section 02672

1.3 REFERENCES:

A. American Association of State Highway and Transportation Officials

AASHTO T 26	Test for Quality of Water to be Used in Concrete

B. American Society for Testing and Materials:

ASTM A 53-REV A-89	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A589-96(2001)	Standard Specification for Seamless and Welded Carbon Steel Water-Well Pipe
ASTM D 1785-99	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241-00	Standard Specification for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464-99	Standard Specification for Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466-02	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2467-02	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564-02	Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Piping Systems
ASTM D 2855-96	Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings
ASTM F 480-02	Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80
ASTM F 656-02	Standard Specification for Primers for Use in Solvent Cement Joints of Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
PCA 5420 Old Orchard Road Skokie, Il 60076	Portland Cement Association
API 1220 L Street Washington, DC 20005	American Petroleum Institute
AWS P.O. Box 351040 Miami, FL 33135	American Welding Society, Inc.
ACI ACI World Headquarters 38800 Country Club Dr. Farmington Hills, MI 48331-3439	American Concrete Institute

1.4 SUBMITTALS:

A. Certification: Furnish written certification from the manufacturer certifying that the Contractor-furnished property conforms to the requirements of this section. Submittals shall be in accordance with Section 01009-General Information and Requirements.

B. Records: The Contractor will complete a report on the completion of the well to include

information supplementary to the well log. This can be submitted on a form 7240-1, Record of Wells (as supplied by the Contracting Officer), or in a format approved at the pre-work conference. The Contractor shall submit this report to the Contracting Officer.

C. Information for State filing: The Contractor shall furnish the Contracting Officer with a copy of the drilling information required by the State Engineer's Office for filing on water wells.

1.5 PROJECT CONDITIONS:

A. Well Depths and Material Quantities: Well depths and material quantities listed in the Work Data Sheet and Schedule of Items are estimates. The final determination of depths and material quantities will be made in the field by the Contracting Officer and will depend on actual geological conditions encountered during the drilling operations. The Contracting Officer will have the option of ordering abandonment of a well at any point during the drilling operation. Well abandonment shall be in accordance with Specifications 02670 – Water Wells.

B. Rig and Standby Time: No rig or standby time will be paid for in this Contract.

1.6 SCHEDULING:

A. Drilling Program: At the Pre-work Conference, the Contractor shall submit to the Contracting Officer for approval a complete and practicable drilling program. The program shall provide for orderly performance of the work and be in such form and detail as to show the following:

1. Sequence of drilling and testing operations.

2. The days of the week and month that work is to be performed.

3. The number and length of each shift per day. The length of a shift may be extended in the field as required to avoid interrupting a drilling and/or testing operation.

4. Type of rig and support equipment.

5. Plan for disposal of waste.

6. Mud (and/or air) program (list of additives, mixing rate) if applicable.

7. Materials list and specifications (casing, slotted casing, well screen, gravel pack, grout, disinfectant, and any other materials incorporated into the project).

8. Drilling water source.

PART 2: PRODUCTS

2.1 GOVERNMENT FURNISHED MATERIALS

A. See Section 01019, Government-Furnished Property if applicable.

2.2 CONTRACTOR-FURNISHED MATERIALS

A. Casing: Materials specified shall be new and free from defects. However, if the contractor deems it necessary or desirable to use temporary casing, the casing may be used, subject to the approval of the Contracting Officer.

B. PVC Well Casing (including any slotted casing): Polyvinyl Chloride (PVC) well casing shall conform as referenced in Section 1.3 B and shall carry the National Sanitation Foundation (NSF) seal of approval for well casing (NSF-WC). Each section of PVC plastic casing shall be marked to show, at a minimum, the diameter, type of material, standard number, SDR number or Schedule, and United States manufacturer. Casing shall be Certa-Lok brand name or approved equal. Physical dimension shall be described in the Contractor's submittal based on the SDR number or Schedule required for the well bore conditions defined by the Contracting Officer. Casing (including slotted casing) shall be of the size shown on the Work Data Sheet.

C. PVC Casing Couplings and Fittings: Casing coupling shall be of the same material as casing, with a pressure rating equal to or greater that casing, and shall be Certa-Lok Coupling brand name, or approved equal. The coupling shall be watertight with locking groves, PVC spline, and gaskets manufactured for specifically for the coupling. Solvent-weld type fittings shall be designed to be interference free for at least one-half of the socket depth and have a beveled entrance to prevent wiping off solvents while being installed.

D. PVC Solvent: Primer and cement shall be recommended and approved by the pipe manufacturer. Primer and cement shall be approved by NSF for drinking water.

E. Steel Casing Joints: Shall be watertight and may be either welded or threaded and coupled.

F. Steel Casing: Well casing shall be API Limited-Service grade (or better – i.e., J-55), 15.5

pounds/foot, threaded & coupled. Materials specified shall be new and free from defects. However, if the contractor deems it necessary or desirable to use temporary casing, the casing may be used, subject to the approval of the Contracting Officer.

G. Bentonite: Granular bentonite shall be American Colloid KWK, CS/55 or approved equal. Pellet bentonite shall be American Colloid Vol-Clay or approved equal.

H. Stainless Steel Well Screen (if required): The well screens shall be of the size shown on the Work Data Sheet. The screens shall be of wire-wound, cage-type, V-slot, all-welded construction, type 304 stainless steel. The column, tensile and collapse strengths shall be certified for depth and casing of individual wells. At least 95% of the screen slot opening shall be completely clean and free of burrs, frayed edges, cuttings, slag, and other such materials.

I. Drilling Fluid Additive: An NSF drinking water approved sodium or ammonium base, biodegradable foaming agent ("High Foam" or an approved equal) will be allowed for air-rotary drilling. Other additives (i.e., Drispac Plus, Alcomer 123L, etc.) must be submitted with the drilling plan and approved by the Contracting Officer.

J. Gravel Packing: The gravel-pack material shall be clean, with well-rounded grains that are smooth and uniform. The material shall consist of a minimum of 95% siliceous particles, with a maximum of 5% calcareous material. The gravel pack will be of appropriate size for the slot size in the screen or slotted casings installed in the well and as approved by the Contracting Officer.

K. Grout: Grout may be pelletized bentonite, or bentonite gravel material free of dirt and foreign matter, hydrated per manufacturer's specification <u>or</u> bentonite grout (i.e., Black Hills Ultra Grout or equivalent) mixed to a minimum specific gravity of 9.75 to 9.85 pounds per gallon with a minimum solids content of 22% to 25%.

L. Cement Grout Mix: Neat Cement Grout shall consist of a mixture of Type II Portland cement and not more than 6 gallons of clean water per bag (94-pound bag or one cubic foot). Sand Cement Grout must consist of a mixture of Type II Portland cement, sand, water, and a maximum of 2% calcium chloride in a proportion of not more than 6 gallons of water per sack of cement (94-pound sack or one cubic foot) and not more than one part sand to one part cement.

M. Water used for drilling and cementing operations shall be potable water or from a source approved by the Contracting Officer.

N. Casing Centralizers: Shall be stainless steel, or a Contracting Officer approved alternate, sized to fit the casing and the borehole placed on the bottom, top, and through the screened interval and spaced not more than 20 feet apart.

O. Disinfectant: Calcium hypochlorite (65% available chlorine) or alternative as approved by the Contracting Officer.

2.3 EQUIPMENT:

A. Drilling Equipment: Except otherwise specified, the type of drilling equipment shall be determined by the driller (Contractor).

B. Minimum Equipment: The Contractor shall furnish equipment of sufficient size and in sufficient quantities to drill 1-1/2 times the estimated drilling depth of the deepest well listed in the Work Data Sheet.

C. Air Volume Requirement: (Air-Rotary Drilling): Contractors intending to use air-rotary drilling equipment should be aware of the volume of air required to maintain proper up-hole velocity to lift the drill cuttings from the bore hole under various conditions. The volume of air produced by an on-rig compressor, or in conjunction with auxiliary compressors shall be sufficient to lift drill cuttings to the ground surface for the size and estimated depth (1-1/2 times the estimated depth) of the bore holes shown on the Work Data Sheet.

D. Well Development: Well development methodology and equipment (jetting, surging, surge block, swabbing, etc.) shall be approved by the contracting officer.

2.4 CEMENT FOR PLUGS AND CASING SEAL:

A. Cement: The cement slurry shall be API Class G, slurry weight 15.8 lbs. per gallon (118 lbs. per cu. Ft.) mixed with not more than 5 gallons of water per 94-pound sack. The cement shall be in bulk with any additives blended at the bulk-cement facility. Additives may include 2% Calcium Chloride materials to help prevent circulation loss or additives determined necessary after the hole is drilled. All additives must be approved by the contracting officer prior to use. The mixing water shall be potable.

2.5 CEMENT GROUT:

A. Cement Grout: Shall be API Glass G Cement or equivalent. Cement shall have an accelerant and include ¼ pound of flow seal per sack. Variations from cement as specified must be approved by the Contracting Officer.

B. Grout Placement: The casing will be cemented from the top of the production zone to the land surface. The grout may be placed by any method that assures complete filling of the annulus from the top of the production zone to the surface including pumping down the casing and displacing or utilizing a tremie in the annular space.

C. Grout volume will include estimated 30% overrun or 10% overrun based on volumes calculated from the geophysical logs.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Drilling Location: Drill the well at the location staked by the Contracting Officer.

B. Order of Drilling: The drilling of the well hole shall be done in two steps. A pilot hole will be drilled and then reamed. Contracting Officer (CO) must witness drilling of pilot hole. Drilling shall continue until water of adequate quality and quantity has been encountered or that unfavorable conditions require hole abandonment. If drilling results are favorable for completing well, Contractor shall then ream the pilot hole to full size to the required depth.

C. Work Time Limits: Completion of final hole reaming, casing installation, gravel pack placement, and initiation of grout placement shall be done within one continuous workday. Failure to comply with this time limit shall be sufficient cause to abandon hole due to Contractor's actions if the well cannot be successfully completed in accordance with Specification 02670 - Water Wells.

D. Hole Size: The hole shall be of sufficient diameter to provide a minimum 2” annulus. In example, not less than 9-1/2 inch for 5-inch nominal size casing and large enough to accommodate tremie pipe.

E. Estimated Drilling Depth: As shown on Work Data Sheet.

F. Using Pilot Hole as Test Well: If the Contractor drills a pilot hole and encounters water, the Contracting Officer, after considering all the evidence, shall determine whether to deepen the hole, enlarge the hole to the size specified, or to abandon the well. The pilot hole shall be a minimum of 5 inches in diameter.

G. Water Used to Facilitate Completion of Well: Any water introduced into a well by the Contractor to facilitate drilling, developing, cleaning and gravel packing operations,

including water added to an approved drilling additive shall be potable water or from a supply approved by the Contracting Officer.

H. Drilling Fluid Additives: All drilling fluid additives must be approved by the Contracting Officer and be NSF approved for drinking water.

I. Recirculation and Mud Drilling: Bentonite based mud drilling is discouraged. If bentonite-based muds are proposed under special drilling circumstances, justification must be provided to the Contracting Officer. All drilling programs (polymer-based muds, bentonite-based muds, air foam, etc.) must be approved by the Contracting Officer.

J. Depth of Casing: The hole shall be cased the full depth unless casing of a portion of the well is deemed unnecessary by the Contracting Officer.

K. Backfill: If in the process of locating water-bearing strata, the well was drilled deeper than needed, the Contractor shall back fill the well with approved formation stabilizer to a point 20 feet below the bottom of the lowest water-bearing strata. Back fill shall be disinfected in the same manner as the gravel pack.

L. Casing Installation: Casing shall be installed in accordance with the drilling method used. For PVC casing, the joined casing string shall be installed in a predrilled hole. Casing shall not be dropped onto the bottom of the well hole, nor forced down against the bottom of the hole during installation. Casing shall be kept continually suspended during and after installation, until such time that all of the gravel pack and grout have been properly installed.

1. Casing joints shall be watertight.

2. 5 to 20 feet of casing (blank or slotted, as determined by the contracting officer), sealed, and pointed or capped at the lower end, may be required below the primary screen (rat hole).
3. The casing string shall be capped on the bottom.

M. Water-Bearing Strata: If it is necessary to extend casing through developable water-bearing zones, the portion of the casing opposite the water bearing zones shall be screened or sealed off as determined in the field by the Contracting Officer.

1. Casing centralizers shall be installed on the casing immediately above and below the screened zone, and every 20 feet through the screened zone.

N. Surface Seal: Installation of the seal shall be performed in the presence of the Contracting Officer. No work shall be done on the well until surface grout has set at least 24 hours after final placement.

O. Stainless Steel Well Screen (if specified): The Contractor shall select the installation method, in accordance with the screen manufacturer's recommendations. Screens may have either a weld ring, pipe-thread, or spline lock-end fittings. Welds shall be made with stainless-steel welding rod. The screen fittings shall be stainless steel of the same type as the screen. Joints must be straight and tight and retain 100% of the original screen strength.

P. Gravel Packing: Install approximately a 2-inch thickness (minimum) of gravel pack material in the annular space in the zones opposite the screens including 5 to 20 feet below (rat hole) and five feet above and below each screened zone or as determined by the Contracting Officer upon review of the logs. Placement of gravel pack and grout shall be performed in the presence of the Contracting Officer.

1. Disinfection: Disinfect the gravel pack material by mixing 1 pound of calcium hypochlorite (65% available chlorine) in each cubic yard of packing material as it is installed in the well.

Q. Water Bearing Formation Seal: Install bentonite gravel or pellet material for a thickness of ten feet directly above the gravel pack. This material shall be installed in the same manner as the gravel packing. Installation of the seal shall be performed in the presence of the Contracting Officer.

R. Zone Isolation Seal: If water yielding zones are encountered that are of unacceptable quality water, these zones will be sealed off with bentonite. Install bentonite grout, gravel, or pellet material for a thickness of at least ten feet directly above and below the zone to be isolated.

S. Grout: Install grout in the remaining zones in the well which do not require gravel pack material or surface grout. Installation of the grout shall be performed in the presence of the Contracting Officer.

T. Well Log and Samples: Shall be taken in accordance with Specification 02670 -Water Wells.

U. Hole Cleanliness: The drilled hole shall be kept clean to prevent plugging off small yields of water. Sufficient compressed air, and water as needed, shall be circulated to prevent cuttings from booting or caking walls of hole. Circulation shall be established before drilling begins and shall be maintained throughout the drilling process. The return of

cuttings to ground surface shall be continuous. When drilling stops, circulation shall be maintained until all cuttings have returned to ground surface. Failure to maintain a clean hole shall be sufficient cause to abandon hole due to Contractor's actions in accordance with Specification 02670 - Water Wells.

V. Well Development: Well development methodology (jetting, surging, surge block, swabbing, etc.) shall be approved by the contracting officer. Contractor shall be cognizant of the collapse strength of the casing and hydraulic conditions of the well in order to perform well development in a manner as to not compromise the casing and well. After the well has been completely constructed and all drilling fluids and additives removed from the well, each exposed water-bearing zone targeted for water production shall be developed. Development work shall be performed in the presence of the Contracting Officer.

W. Preliminary Well Testing: The Contractor shall make preliminary yield tests, as specified in Specification 02672 – Part 3.1 Preliminary Yield Testing of the Well, on each water bearing zone penetrated. If water in adequate quantity and quality is obtained the well shall be cased and developed.

3.2 FIELD QUALITY CONTROL:

A. Alignment:

1. As per the State of Wyoming Water Well Minimum Construction Standards, the well shall drift off plumb no more than one degree per 100 feet of borehole. The alignment shall allow a 40-foot-long section of pipe, ½ inch less than the inside diameter of the casing, to pass freely from the top of the casing through the anticipated pump setting depth.

2. If the well does not pass the alignment test, correct the alignment, or abandon the well and drill a new well within 50 feet of the original hole, at no additional cost to the Government. The Contractor shall abandon in accordance with state law, prior to starting a new hole.

B. Well Development:

1. The Contractor shall develop the well until the produced water does not contain appreciable amounts of sand, silt, or turbidity.

3.3 PROTECTION:

A. Drilling Waste: Drilling waste such as drilling fluid and drill cuttings shall be removed so that wastes will not interfere with installation of the well platform and pumping equipment and will not pollute surface waters or cause contamination of the well. Drill cuttings shall be scattered so that the material is 1-inch or less in depth or as approved by the contracting officer.

B. Drilling Fluid and Water: Drilling fluids containing chemicals of any kind, including muddy water consisting of sediment and suspended sediment, shall be directed away from streams and surface bodies of water. Drilling fluids shall not come into contact with any streams, streambeds, or surface bodies of water. The Contractor is responsible for the cleanup of any streams, streambeds, or surface bodies of water that come into contact with drilling fluid chemicals, including muddy and dirty water, and the costs associated thereof.

C. Abandonment of the Well: Shall be in accordance with Specification 02670 - Water Wells.

D. Sanitary Protection: Shall be in accordance with Specification 02670 - Water Wells.

PART 4: MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. General:

1. Rig or Standby time will not be paid for.

2. No payment will be made for drilling, installing casing, removing casing, or the plugging of a well abandoned due to Contractor's actions.

3. No payment will be made for time spent developing and testing wells which occur prior to the well being completed (cased, gravel packed and grouted).

4. When the Contracting Officer determines that a well should be drilled deeper, the Contractor shall be required to drill a maximum of one and one-half times the estimated depth shown on the Work Data Sheet at the unit price bid. The Contractor shall be required to provide all additional work and materials needed to satisfactorily complete the deeper well, at the unit price bid for the respective work performed.

5. No payment will be made for disinfection of the well, furnishing and installing the cap

or compression seal, and casing centralizers. The Contractor shall include consideration for these items in the bid price for other items of the Contract.

B. Units:

1. Well drilling, installing casing and well screen, gravel pack material, bentonite seal, and grouting will be measured and paid for per linear foot.

2. Payment will be made per linear foot for drilling, installing casing and well screen, gravel pack material, bentonite seal, and grouting for the quantity abandoned due to causes not the fault of the Contractor.

3. Payment for pulling casing and plugging the hole when the well is abandoned due to causes not the fault of the Contractor will be based on the price negotiated by the Contracting Officer.

4. Well development and final testing will be measured and paid for by the number of hours of development and testing required for each well beginning when the pumps, compressors, and other equipment have been installed and actual development or testing have begun.

5. If the Contracting Officer determines from information obtained from a Contractor's pilot hole that the well site should be abandoned due to no fault of the Contractor, measurement and payment will be negotiated and the Contract will be modified in writing.

6. Mobilization to the job site and between locations will be measured and paid for as a lump sum.

4.2 BASIS OF PAYMENT:

A. Payment: Prices and payment will be full compensation for the work described in this section. Payment will be made under:

Pay Item		Pay Unit
WY-02671 (1)	Drilling Pilot Hole (5-inch min. dia.)	Linear Foot
WY-02671 (2)	Drilling Well Hole (9-1/2-inch min. dia.)	Linear Foot
WY-02671 (3)	Furnish and Install 5-Inch Casing	Linear Foot
WY-02671 (4)	Furnish and install 5-Inch Slotted Casing	Linear Foot

WY-02671 (5) Gravel Packing / Bentonite Seal .....Linear Foot
WY-02671 (6) Grout, Surface Grout.....Linear Foot
WY-02671 (7) Well Development .....Hours
WY-02671 (8) Well Testing.....Hours

END OF SECTION

PART 1: GENERAL

1.1 SUMMARY:

A. Section Includes: Well testing.

1.2 RELATED WORK:

A. Specifications Sections:

General Information and Requirements	Section 01009
Water Wells	Section 02670
Well Drilling and Casing	Section 02671

1.3 SUBMITTALS:

A. Submittals shall be in accordance with Section 01009-General Information and Requirements.

B. Records: Written documentation of final yield test, pumping test, and water quality analyses shall be furnished to the Contracting Officer in the format agreed upon at the Pre-Work Conference.

PART 2: PRODUCTS

2.1 EQUIPMENT:

A. Well Testing: All testing equipment shall be furnished by the Contractor.

1. Pumping Test Equipment: Equipment must at a minimum be able to test the well at 1-1/2 times the rate of flow stated in the Work Data Sheet. The pumping unit shall be equipped to regulate flow for the purpose of establishing yields at various depths.

2. Water Level Measurement: Equipment capable of measure water levels before, during and after testing and development (e-tape, airline, and/or transducer…) capable of a minimum accuracy of 0.1 feet.

3. Discharge Measurement: Flow meter for accurately measuring instantaneous and cumulative discharge to +/- ¼ GPM.

4. Flowing Well Pressure: Pressure gauge capable of accuracy to 0.5 PSI and equipment to facilitate shutting in the well.

PART 3: EXECUTION

3.1 PRELIMINARY YIELD TESTING OF THE WELL:

A. General: The Contractor shall make preliminary yield tests or estimates during drilling operations on each water-bearing stratum penetrated as requested by the Contracting Officer and only if the test will not compromise the bore-hole integrity. These tests are typically air-lift or air-lift/recovery tests that do not require the removal of the drill string.

After the well has been completely constructed and cleaned, the Contractor shall make a final preliminary yield test during the development of the well. The test may be conducted by air lift, bailer, or submersible pump. The Contracting Officer shall have the option of rejecting the air lift method on low yielding wells. If the Contracting Officer rejects the air lift method for determining yield, the Contractor will then be allowed to determine the approximate yield of the zone by calculating the gallons of water coming into the bore hole over a 20-minute period of time.

3.2 FINAL YIELD TESTING OF THE WELL:

A. General: After the well has been completely constructed and developed, the Contractor shall make a final determination of the hydraulic characteristics of the well (yield, specific capacity, pumping water level(s), static water level). The Contractor will utilize the pumping method for making final yield determinations on the well. The Contractor shall perform the yield test in the presence of the Contracting Officer. The Contractor shall provide a one working day notice to the Contracting Officer prior to performing the test.

B. Pumping Test Procedures:

1. Measure and record the depth from the ground surface to the static water level.

2. Test the well utilizing a test pump.

a. Install a submersible pump in the bottom of the well (or at a depth approved by the contracting officer).
b. Perform a step-rate test at ½, 1, and 1 ½ the required minimum acceptable rate as

listed on the Work Data Sheet. If the test pump has capacity above 1 ½ times the acceptable rate, pump for a fourth step at maximum pump capacity to produce a maximum drawdown or to pump capacity, whichever is controlling. Pump capacity must be at least 1-1/2 times the desired well yield.

3. Divert and measure the flow of water pumped out of the well through a metering or collection system capable of measuring accurately to within 1/4 gallon per minute (or better). Record a minimum of one reading every 10 minutes. Continue test until the rate of flow has not changed in a 60-minute period.

4. Immediately after pumping is discontinued, measure and record the elapsed time and water levels from the ground surface in 10-minute intervals until the water level has recovered to at least 90% of the static water level (recovery test).

C. Water Sample: Before completing the final pumping step of the Pumping Test, collect water samples for laboratory analysis as directed by the Contracting Officer and in containers provided by the Contracting Officer.

D. Cleaning: When testing is complete, remove sand and foreign material that may have collected in the well during the yield test.

E. Increasing yield: The Contracting Officer may direct the Contractor to attempt to increase the yield by bailing, surging, or other means of development if the desired minimum yield is not met.

PART 4: MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. General:
1. Rig or Standby time will not be paid for.

2. No payment will be made for time spent developing and testing wells which occur prior to the well being completed (cased, gravel packed and grouted).

B. Units:

1. Final testing will be measured and paid for by the number of hours beginning when the pumps, compressors, and other equipment have been installed and actual testing has

commenced. No payment will be made for time spent in set-up and tear-down.

2. Standby time will not be paid.

3. Time utilized in assembling, servicing, repairing equipment or any other nonproductive time shall not be paid.

4.2 BASIS OF PAYMENT:

A. Payment: Prices and payment will be full compensation for the work described in this section. Payment will be made under:

Pay Item	Pay Unit
WY-02672 (1) Well Testing	Hour

END OF SECTION

WORK DATA SHEET
For
Saulcy WATER WELL

Name of Well	Desired Min. Yield (GPM)	Estimated Drilling Depth (ft)	Estimated 5” PVC Casing (Lin. ft.)	.020 V-Slot Stainless Steel Screen (Lin. ft.)	.025 Slotted 5” PVC Screen (Lin.ft.)	Gravel Packing/ Bent.Seal (Lin. ft.)	Grout (Lin. ft.)	Water Producing Formation
Saulcy Well	10	350	190	0	160	240	110	Fractured Rock
TOTAL		**350**	**190**	**0**	**160**	**240**	**110**	

1. Flowing artesian wells are not anticipated.

2. Wells with over 500’ of grout will require bentonite or cement grout pumped in from the surface via a tremie pipe or through the casing.

3. If an adequate water supply zone is encountered before the total estimated depth is reached, continue to drill to a depth of 30 feet below the water bearing zone before drilling is terminated.

4. Well Drilling and testing must be done by a by a contractor currently licensed and in good standing with the Wyoming Board of Examining Water Well Drilling Contractors and Water Well Pump Installation Contractors.

5. The listed quantities for this well are estimated. Due to the nature of the aquifer (fractured rock), the contractor should have enough PVC casing on site to accommodate the possibility of completing the well utilizing as little as 20 feet of slotted casing.