FOREST SERVICE SUPPLEMENTAL SPECIFICATIONS

For

ASHLEY LAKE NORTH CAMPGROUND RENOVATION

OPTION ITEM 1

U.S.D.A Forest Service, Region 1
Flathead National Forest, Tally Lake Ranger District
Flathead County, Montana

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Well Specifications:

Public Water Supply Well

for

Ashley Lake North Campground

1.0 DESCRIPTION OF PROJECT

This project entails completion of a public water supply well to service the renovation of the Ashley Lake North Campground. The proposed well location is approximately 48.208° North latitude and 114.624° West Longitude, in Section 11 of Township 28 North, Range 24 West.

The Ashley Lake North Campground currently does not have a Public Water System (PWS). It is the intention of the Forest Service to provide a Transient, Non-Community (TNC) drinking water system for the campground. The proposed water system would serve a total of 12 camping sites and one host site.

The campground is located on the Tally Lake Ranger District, Flathead National Forest. The campground is located along North Ashley Lake Road, approximately 20 miles west of Kalispell, Montana.

1.1 WELL COMPLETION DESIGN

Well construction will entail installation of a minimum of 25 feet of unperforated casing. 10-inch nominal diameter surface casing shall be used, and 6-inch nominal diameter casing will then be advanced to the top of the producing aquifer where drilling will then proceed, open hole until sufficient yield has been reached. It is anticipated the total depth of the well will be approximately 100-150 feet. Well development, method to be agreed upon by the contractor and COR (Contracting Officer's Representative), will be performed prior to installation of the test pump. A surface seal consisting of bentonite or neat cement grout will be placed in the annulus between the 10-inch surface casing and the permanent 6-inch well casing to the total depth of the annulus as the temporary 10-inch surface casing is removed. Flowing well conditions are not expected; if encountered the well will be sealed in accordance with ARM 32.21.658. Please refer to the Site Plan and Well Plan for design and construction details, attached as Appendix A and Appendix B.

2.0 WELL CONSTRUCTION

Construction of the public supply wells shall be performed by a licensed water well contractor in accordance with Title 37, Chapter 43, MCA and Title 36, Chapter 21, ARM, March 1997 (current editions), and DEQ-3 (2018 edition), with the following additional requirements.

2.1 DRILLING FLUIDS AND ADDITIVES

It is anticipated that the wells will be drilled with air rotary methods. The drilling fluids in this case shall be compressed air containing a surfactant (foam), polymer, and/or bentonite gel injected into the compressed air stream. All drilling fluid additives must be approved by the National Sanitation Foundation (NSF) or similar ANSI accredited laboratory organization and shall be used as prescribed by the manufacturers of the products and in accordance with recognized industry standards and practices to ensure a workmanlike result.

2.2 CASING AND GROUTING REQUIREMENTS

2.2.1 Casing Selection

The surface and main well casing shall be steel, in new condition, free of pits, breaks and contamination, and shall meet minimum ASTM A53 specifications for line pipe. All permanent well casing shall be 6-inch nominal diameter with a minimum wall thickness of 0.250. The contractor may use casing with greater then 0.250-inch wall thickness, if desired. The method of placement of the casing shall be the contractor's choice. Steel casing shall be equipped with a drive shoe in accordance with ARM 36.21.644 when driven.

2.2.2 Method of Joining

All casing joints shall be welded and shall be watertight. If welded casing joints are used, the weld shall be a full penetrating weld at least equal in thickness to the wall thickness of the casing. Welded casing joints shall have a tensile strength equal to or greater than that of the casing.

2.2.3 Minimum Protected Depths

The wells shall have unperforated casing to a minimum depth of 25 feet from the ground surface. The wells shall not be constructed to draw water from a water table aquifer within 25 feet of the ground surface.

2.2.4 Top Terminal Height

Casing stickup shall be sufficiently high above the land surface to prevent surface water runoff from covering the casing cap until the well utility building is constructed. The casing head shall extend not less than 18 inches above the finished ground surface and not less than 18 inches above the local surface runoff level. The casing of any water well shall extend not less than 18 inches above the established 100 year floodplain elevation or be capped with a watertight seal and vented above flood level. The ground surface immediately surrounding the top of the well casing shall be graded so as to drain surface water away from the well until the well utility building is constructed.

Sites subject to flooding must be provided with an earth mound surrounding the casing and terminating at an elevation at least two feet above the 100-year flood level or highest known flood elevation. The top of the well casing at sites subject to flooding must terminate at least three feet above the 100-year flood level or highest known flood elevation.

2.2.5 Sanitary Seal

Casing shall be sealed with bentonite or concrete grout. The minimum thickness of the seal shall be at least 1.5 inches on all sides of the casing between the casing and the borehole or the permanent casing and the surface (temporary) casing. In no case shall the grout seal be placed to a depth of less than 25 feet below the ground surface. Installation of seals will be performed according to ARM 36.21.654 through 36.21.658.

2.2.6 Temporary Capping

At all times during the progress of the work, the CONTRACTOR shall protect the wells in such manner as effectively to prevent either tampering with the wells or the entrance of foreign matter into them. Upon its completion, CONTRACTOR shall provide and set a substantial screwed, flanged or welded cap.

2.2.7 Centralizers

Well casing to be sealed into an oversize drill hole should be equipped with centering guides to ensure the proper centering of a casing. In all events, casings shall be centered in the sealed interval. Guides should be of steel, at least 1/4 inch in thickness, evenly spaced in groups of 3 or 4 in 20 foot intervals or less.

2.3 CONSOLIDATED FORMATIONS

The following special sealing methods may be required in situations where different techniques are necessary to protect aquifers.

2.3.1 In drilled wells that penetrate an aquifer either within a consolidated or confining formation, sealing of the casing shall conform with one of the following procedures

(i) an upper drill hole, at least three inches greater in diameter than the nominal size of the permanent well casing, shall extend from land surface to at least three feet into sound, consolidated formation. In no instance shall said upper drill hole extend less than 25 feet below land surface; and

(ii) unperforated permanent casing shall be installed to extend to this same depth, and the lower part of the casing shall be sealed into the rock formation with cement grout. The remainder of the annular space to land surface shall be filled with an appropriate sealing material (see Figure 2A at the end of this subchapter).

2.3.2 If temporary surface casing is used in either of the above procedures, this casing shall be of sufficient diameter to conform to the upper drill hole specifications. Withdrawal of the temporary casing shall take place simultaneously with proper sealing of the annular space to land surface.

2.4 UNCONSOLIDATED FORMATIONS WITHOUT SIGNIFICANT CLAY BEDS

The following special sealing methods may be required in situations where different techniques are necessary to protect aquifers.

2.4.1 In drilled wells that penetrate an aquifer overlain by unconsolidated formations such as sand and gravel without significant clay beds, an unperforated well casing shall extend to at least one foot below the known seasonal low water table. An upper drill hole having a diameter at least three inches greater than the nominal size of the permanent casing shall extend to at least 25 feet below land surface.

2.4.2 The annular space between the upper drill hole and the well casing shall be kept at least one-half full with bentonite slurry throughout the driving of the permanent casing into the aquifer. After the permanent casing is set in its final position, the remaining annular space shall be filled to land surface with appropriate sealing material.

2.4.3 If the oversized drill hole is extended to the same depth as the permanent casing, a suitable bridge shall be installed between the casing and the drill hole at a position directly above the production aquifer. The remaining annular space shall be completely filled and sealed to land surface with appropriate sealing material.

2.4.4 A suitable bridge is one that prevents the sealing material from dropping into the producing formations and reducing the output of the well.

2.4.5 If temporary casing is used to maintain the oversized drill hole, the annular space shall be kept full with appropriate sealing material as the temporary casing is being withdrawn.

For drilling with cable tool rigs, see ARM 36.21.654.

2.5 UNCONSOLIDATED FORMATIONS WITH CLAY BEDS

In drilled wells that penetrate an aquifer overlain by clay or other unconsolidated deposits such as sand and gravel in which significant (at least 6 feet thick) interbeds of clay are present, the well casing may be terminated in such clay strata, provided that the casing be sealed in substantially the same manner as is required in the case of consolidated formations

2.6 SPECIAL SEALING STANDARDS FOR FLOWING WELLS

When flowing water is encountered in the well, an unperforated well casing shall extend into the confining stratum overlying the artesian zone. The casing shall be adequately sealed into the confining stratum so as to prevent surface and subsurface leakage from the artesian zone.

2.6.1 If the well flows at land surface, it shall be equipped with a control valve so that the flow can be completely stopped.

2.6.2 The well shall be completed with packers or appropriate sealing material that will eliminate leakage around the well casing.

The driller is responsible to use all reasonable methods and care to prevent leakage around the well casing within a reasonable time frame or until the board is satisfied that the leakage is controlled.

2.7 PACKERS

Packers are not required for this project

2.8 WELL SCREEN

The well screen or casing perforations shall be installed by a method common for the type of water bearing formation encountered. From previous drilling at nearby sites, it is anticipated the screen or casing perforations will be installed in slightly fractured to broken light to dark gray rock.

Casing perforations shall be no closer than 25 feet to the ground surface. Perforations or well screen shall be located below the lowest expected static water level. Depth and length of perforations shall be approved by the CO.

2.9 DEVELOPMENT

Once completed and before conducting yield and drawdown tests, the well shall be developed to remove all fines, drill cuttings, drilling fluids and additives. The method of developing shall be determined by the well drilling CONTRACTOR, and approved by the COR, after well completion and be in accordance with ARM 36.21.653.

2.10 WELL PUMPS

Submersible pumps shall be utilized. The pump will be selected by the ENGINEER following development and testing. The pump column shall be equipped with a check valve. Electrical cables must be firmly attached to the pump column pipe at twenty-foot intervals or less.

NOTE: The contractor shall supply appropriate electrical wiring from the water well pump to the

control box plus twenty feet.
Permanent, weatherproof control boxes shall be installed at each well head.

The pump will be selected by the COR following development and testing. In the event that the proposed well does not produce adequate water supply, the Forest Service may choose to install a handpump on the well head,

3.0 WATER QUALITY

3.1 DISINFECTION

Disinfection shall be performed in accordance with ARM 36.21.662 as detailed in this section.

3.1.1 Timing

Disinfection shall be accomplished when well development is complete and prior to installation of the test pump. The disinfecting solution shall be displaced into the bottom of the well through the development tool string and additional disinfecting solution pumped or sprayed into the top of the well to disinfect the casing above the static water level and to further displace the deeper disinfecting solution into the aquifer. The disinfectant shall be a chlorine solution prepared with liquid sodium hypochlorite. The disinfecting solution shall be purged from the well during test pumping.

3.1.2 Disinfectants

Chlorine compounds approved by Federal or local regulatory agencies shall be used as disinfectants. The disinfectant shall be delivered to the site of the work in original closed containers. The disinfectant shall be recently purchased. Chlorine compounds in dry form shall not be stored for more than one year and storage of liquid compounds shall not exceed 60 days. During storage, disinfectants shall not be exposed to the atmosphere or to direct sunlight. Unless superseded by governmental regulation, the quantity of chlorine compounds used for disinfection shall be sufficient to produce a minimum of 50 mg/l (milligrams per liter) available chlorine in solution when mixed with the total volume of water in the well. A 50 mg/l solution should result from utilizing quantities of chlorine compounds, proportioned to the depth of water, as listed in the chlorination table. The solution shall contain enough chlorine to leave a residual of 25 parts per million throughout the well for a period of 24 hours

Table 2. Chlorine Compound to Dose 100 Feet of Water-Filled Well at 50 mg/l.

Casing Diameter (inches)	Volume per 100 feet (gallons)	70% HTH Per-chloron, etc. (dry weight)	25% Chloride of Lime (dry weight)	5.25% Purex Clorox, etc., (liquid measure)
2	16.3	¼ oz	½ oz	2 oz
4	65.3	1 oz	2 oz	9 oz
6	146.9	2 oz	4 oz	20 oz
8	261.1	3 oz	7 oz	2-1/8 pts
10	408.0	4 oz	11 oz	3-1/2 pts
12	587.5	6 oz	1 lb	5 pts
16	1,044.5	10 oz	1-3/4 lbs	1 gal
20	1,632.0	1 lb	3 lbs	1-2/3 gals
24	2,350.1	1½ lbs	4 lbs	2-1/3 gals

3.1.3 Disinfection Procedure

1. Upon completion of development and cleaning, and before the test pump is installed, the CONTRACTOR shall circulate the disinfecting agent mixture through the drill pipe or through tubing into the well in the required amount. The drill pipe or tubing shall discharge the disinfecting agent at a point 2 feet above the bottom plug on the tailpipe or the screen assembly.

2. When the specified amount of disinfecting agent has been circulated into the well, the drill pipe or tubing shall be withdrawn from the well. After the drill pipe or tubing has been withdrawn, the CONTRACTOR shall pump or pour into the well a volume of disinfecting agent equal to the interior volume of the well screen assembly to further displace the disinfecting agent into the formation around the well. The CONTRACTOR shall pour or pump the additional disinfecting agent into the well in such a manner as to wet those portions of the well above the static water level with disinfecting agent.

3. The disinfecting agent shall be left in the wells for a period of at least 24 hours. This may include the period of time during which test pump installation is accomplished.

4. After a 24-hour or longer contact period, the well shall be cleared of disinfecting agent by the test pumping.

5. The CONTRACTOR shall install a small hose bib on the test pump discharge pipe so that a hose can be used to spray disinfecting agent into the top of the well during pre-test pumping. The CONTRACTOR shall spray disinfecting agent into the top of the well during pre-test pumping to wet the parts of the pump column and well casing above the static water level with disinfecting agent.

   The disposal point for the purged water shall be selected so as to minimize potential damage to aquatic life or vegetation. Disposal of disinfected water shall not flow into surface waters.

3.2 PHYSICAL AND CHEMICAL QUALITY

1. Aquifer Tests

   It is anticipated that the water quality sampling will be conducted by the Contractor during aquifer testing and prior to disinfection as required in the specifications. This will consist of sampling and laboratory analysis of nitrate/nitrite and total dissolved solids or conductivity as a minimum

   Microbiological – Two or more water samples must be submitted to a certified laboratory for microbiological analysis at the end of well testing and at least 72 hours after disinfection.

   Chemical – Testing must include the constituents of ARM 17.38.216 for nontransient, noncommunity public water systems.

   Samples will be taken by the Contractor. Analytical testing shall be performed by a

laboratory certified by the Department of Public Health and Human Services. All water quality sampling results will be submitted to MDEQ for review and approval. Copies of the results shall be provided to the COR.

4.0 TESTING AND RECORDS

4.1 GEOLOGIC DATA

The sampling of formations shall be conducted in accordance with ARM 36.21.667 except that samples will be collected at intervals of five feet or less. A copy of each well log and a drillers log with accurate location, such as latitude and longitude or GIS coordinates with an accuracy of at least +/- 25 feet shall be submitted to Montana Department of Environmental Quality (MDEQ).

4.2 YIELD AND DRAWDOWN TEST

Aquifer testing results will be submitted electronically to MDEQ.

Yield and drawdown tests will have a test pump capacity, at maximum anticipated drawdown, at 1.5 times the quantity anticipated, and provide for continuous rate pumping at 1.5 times the design pump capacity for a minimum of 24 hours. The test may be terminated, at the direction of the COR, if stabilized drawdown occurs for a minimum of 6 hours for tests under 35 gpm and 8 hours for tests of 35 gpm or greater during testing. Testing will be performed on the well after disinfection and prior to installation of the production pump.

Aquifer testing will consist of a constant rate test. The discharge rate for the constant rate tests will be a minimum of 30 gpm. The duration of the constant rate tests will be a minimum 24 hours of continuous pumping. Drawdown measurements will be taken in the pumped wells throughout the period of constant rate pumping and recovery at 1 minute intervals. Measurements of residual drawdown during recovery will continue in the pumped wells for the first 48 hours after the constant rate test or until the rate of recovery indicates the groundwater levels have returned to essentially static conditions, as determined by the COR.

The following data, at a minimum will be provided: 1. Static water level, 2. Time of starting and ending each test cycle, 3. Pumping rate, 4. Test pump capacity-head characteristics, 5. Depth of test pump setting, 6. Maximum drawdown, 7. Pumping water levels taken so as to provide at least 10 evenly spaced data points per log cycle of time (in minutes) on a time-drawdown plot, and 8. Water recovery levels taken so as to provide at least 10 evenly spaced data points per log cycle of time (in minutes) on a time-drawdown plot.

Drawdown and recovery measurements shall be collected by means of a pressure transducer and electric logger provided by the Contractor. The Contractor will provide and install the water level measurement equipment and provide supervision of the tests. The Contractor will provide and operate the test pumping equipment and provide personnel to regulate the discharge rate throughout the tests, including periods of time when the COR or his representatives are not present. Provision of personnel to monitor and adjust the discharge rate during the duration of the constant discharge rate tests shall be the responsibility of the Contractor and shall be included in the unit rates for the pumping test.

4.3 PLUMBNESS AND ALIGNMENT TEST

1. General

The completed wells shall be sufficiently plumb and straight so that there will be no interference with installation, alignment, operation or future removal of the permanent well pumps. The well will be tested for plumbness and alignment in accordance with AWWA A100.

2. Borehole Alignment

It shall be the CONTRACTOR's responsibility to provide a tool string assembly and to utilize drilling methods that will result in completion of straight and plumb boreholes.

a. Plumbness and alignment of boreholes prior to casing installation are the CONTRACTOR's responsibility. Faulty borehole alignment resulting in stuck casing or screen or casing or screen refusal shall be corrected at the CONTRACTOR's expense.

b. If the plumbness or alignment of the boreholes comes into question due to problems experienced with casing or screen installation, the CONTRACTOR shall furnish at his own expense all labor, tools and equipment and perform or have performed by a qualified service company a drift indicator survey. A mechanical drift indicator shall be used to determine drift at intervals of 25 feet or less to the total depth of the hole. If a deflection from vertical exceeding one degree is measured, the CONTRACTOR will be required to correct the borehole alignment or abandon and plug the hole as directed by the COR and to drill at his own expense another hole.

c. In the case of disagreement between the CONTRACTOR and the COR as to the mechanical drift indicator disc interpretations, the mechanical drift indicator discs shall be analyzed by a service company and two copies of the service company's interpretation of the survey shall be supplied to the COR. This interpretation shall be binding on both parties. The selection of the service company making the interpretation shall be by agreement of both the COR and CONTRACTOR.

d. Records of deflection readings and all other pertinent information shall be kept and made part of the permanent well log and record. The COR may modify the requirements for borehole plumbness specified herein if in his judgment (1) the CONTRACTOR has exercised all possible care in constructing the well and the defect is due to circumstances beyond his control, (2) the utility of the completed well will not be materially affected, or (3) the cost of necessary remedial measures will be excessive.

3. Completed Well Alignment

a. In view of the fact that the production wells constructed under these specifications shall be pumped with submersible pumps, the requirement to measure the alignment of the completed well is waived, so long as installation of the hand pump will not be hindered do to faulty alignment. Alignment of completed wells shall be tested by lowering into the wells, from the top of the casing to the top of the screen assembly

riser pipe where telescope size screen is used or to the bottom of the well where pipe size screen is integral to the casing, a section of pipe 40 feet long or a dummy of the same length. The outer diameter of the pipe or dummy shall be not more than 1/2 inch smaller than the inside diameter of that part of the casing being tested when the casing diameter is a nominal 10 inches or less.

b. The test pipe or dummy when lowered into the casing shall pass freely the entire depth of that part of the casing being tested while being lowered slowly by a winch line. The winch drum shall not be allowed to freewheel during the alignment test. Should the test pipe or dummy fail to move freely through the specified length of casing, the alignment of the well shall be corrected by the CONTRACTOR at his own expense unless the COR accepts the alignment because, in his judgment, the use of the well for pumping by submersible pumping equipment at the design yield will not be materially affected by the alignment.

4. Completed Well Plumbness

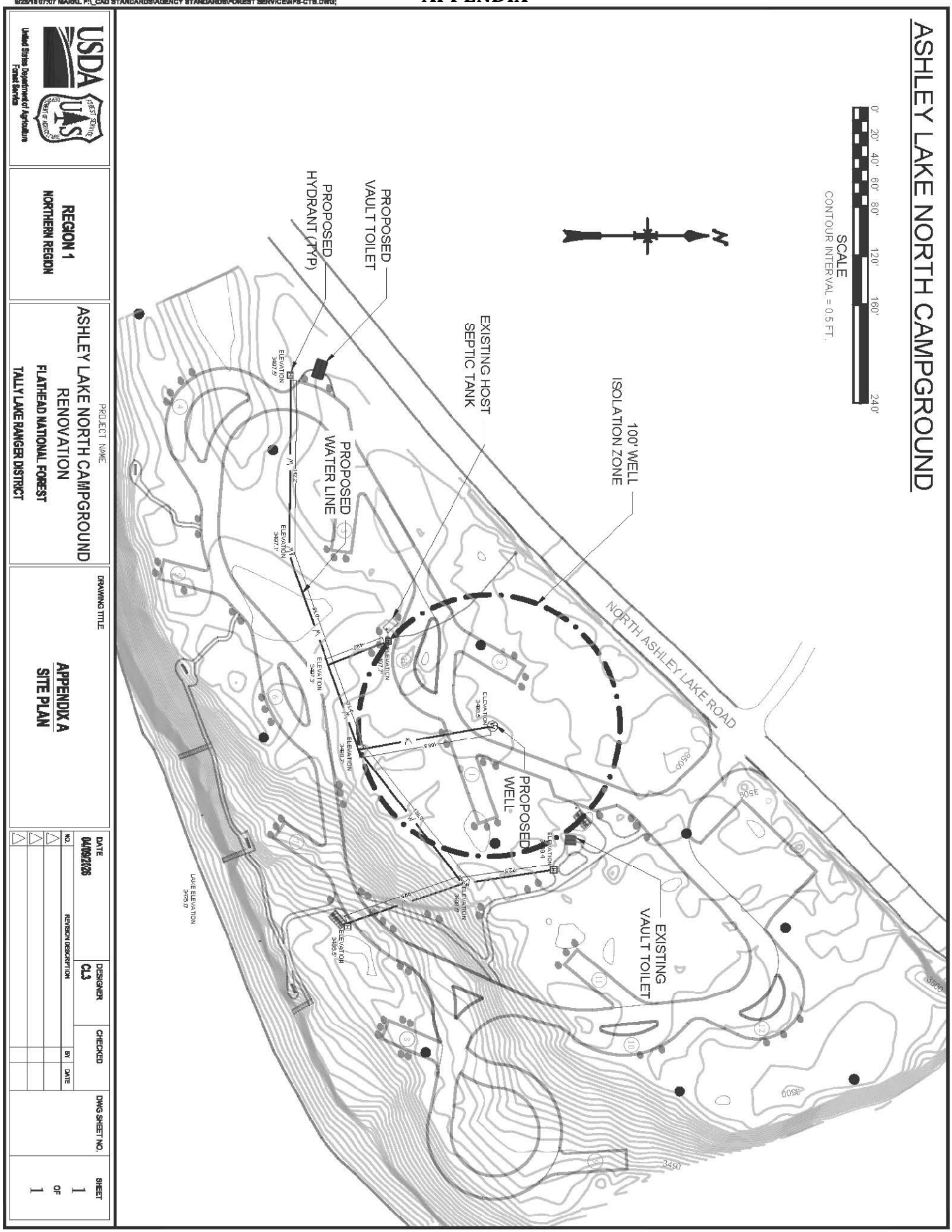
a. In view of the fact that the production wells constructed under these specifications shall be pumped with submersible pumps, the requirement to measure the plumbness of the completed well is waived, so long as the alignment of the well is satisfactory as tested by the procedures in this specification. If the alignment test specified above indicates faulty alignment, the CONTRACTOR shall provide, at his own expense, a drift indicator survey conforming to the specification for a drift indicator survey of open borehole, except in this case the survey shall be conducted in the main well casing from the top of the casing to the top of the well screen assembly riser pipe.

b. If the plumbness of the well should vary from the vertical in excess of two-thirds of the smallest inside diameter of that part of the well being tested per 100 feet of depth, the plumbness and alignment of the well shall be corrected by the CONTRACTOR at his own expense. Records of deflection readings and all other pertinent information shall be kept and made a part of the permanent well log and record.

c. Should the CONTRACTOR fail to correct the faulty alignment and plumbness, the COR may refuse to accept the well. The COR may modify the requirements for alignment and plumbness of the completed well if in his judgment the utility of the completed well to be pumped by submersible pumping equipment at the design rate as specified herein will not be materially affected nor interfere with the uniform placement of grout.

d. If approved by the COR, the CONTRACTOR may test plumbness by means of plumb bob displacement. The plumb bob displacement method may not be used unless a representative of the COR is present to inspect the procedures and measurements.

APPENDIX


9/25/18 07:07 MARKL P:_CAD STANDARDS\AGENCY STANDARDS\FOREST SERVICE\WFS-CTB.DWG;
ASHLEY LAKE NORTH CAMPGROUND
SCALE
CONTOUR INTERVAL = 0.5 FT.
0' 20' 40' 60' 80' 120' 160' 240'
N
100' WELL ISOLATION ZONE
EXISTING HOST SEPTIC TANK
PROPOSED VAULT TOILET
PROPOSED HYDRANT (TYP)
PROPOSED WATER LINE
PROPOSED WELL
EXISTING VAULT TOILET
NORTH ASHLEY LAKE ROAD
LAKE ELEVATION 3476.0
USDA FOREST SERVICE
United States Department of Agriculture Forest Service
REGION 1
NORTHERN REGION
PROJECT NAME
ASHLEY LAKE NORTH CAMPGROUND RENOVATION
FLATHEAD NATIONAL FOREST
TALLY LAKE RANGER DISTRICT
DRAWING TITLE
APPENDIX A
SITE PLAN
DATE
04/09/2018
DESIGNER
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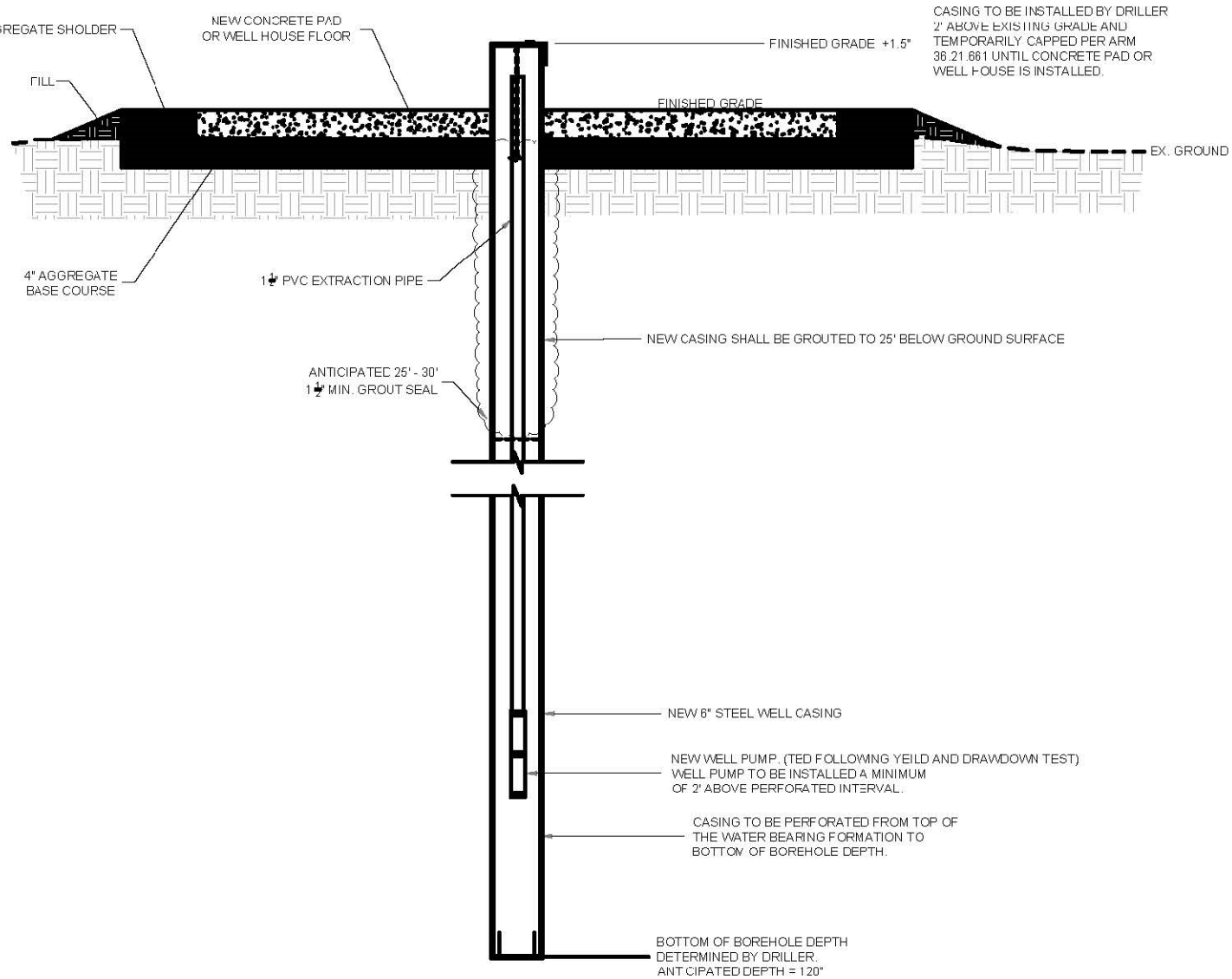
DWG SHEET NO.
SHEET
1 OF 1
NO.
REVISION DESCRIPTION
BY
DATE



WELL DETAIL

NOT TO SCALE

WELL NOTES:

1. CONTRACTOR SHALL CONSTRUCT WELL TO MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (MT DEQ) AND INDUSTRY STANDARDS FOR WATER WELLS.

USDA United States Department of Agriculture Forest Service	REGION 1 ################	PROJECT NAME ASHLEY LAKE NORTH CAMPGROUND RENOVATION FLATHEAD NATIONAL FOREST TALLY LAKE RANGER DISTRICT	DRAWING TITLE APPENDIX B WELL DETAIL	DATE 04/09/2026	DESIGNER CL3	CHECKED	DWG SHEET NO.
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SHEET 1 OF 1

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