FINAL

FORT WINGATE DEPOT ACTIVITY GROUNDWATER MONITORING
NORTHERN AREA BACKGROUND WELL INSTALLATION
LETTER WORK PLAN

FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

September 18, 2017

Contract No. W912PP-17-C-0003

Prepared for:

US Army Corps of Engineers ®
Fort Worth District
819 Taylor Street, Room 3A12
Fort Worth, Texas 76102

Prepared by:

Sundance Consulting, Inc.
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Rcvd 1-2-18 M.P.

State of New Mexico
ENVIRONMENT DEPARTMENT

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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

December 30, 2017

Mark Patterson
BRAC Environmental Coordinator
Fort Wingate Depot Activity
13497 Elton Road
North Lima, OH 44452

Steve Smith
USACE
CESWF-PER-DD
819 Taylor Street, Room 3B06
Fort Worth, TX 76102

RE: APPROVAL WITH MODIFICATIONS
FINAL FORT WINGATE DEPOT ACTIVITY GROUNDWATER MONITORING NORTHERN AREA BACKGROUND WELL INSTALLATION LETTER WORK PLAN
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO
EPA ID# NM6213820974
HWB-FWDA-17-008

Dear Messrs. Patterson and Smith:

The New Mexico Environment Department (NMED) is in receipt of the Fort Wingate Depot Activity (Permittee) *Final Fort Wingate Depot Activity Groundwater Monitoring Northern Area Background Well Installation Letter Work Plan* (Work Plan), dated September 18, 2017. NMED has reviewed the Work Plan and hereby issues this Approval with Modifications. The Permittee must address the following comments.

1. Section 5.0, Field Methodology, lines 15-16, page 5

Permittee Statement: "Field personnel will install screen throughout the thickness of the target bedrock unit."

NMED Comment: There are two water-bearing zones (first and second bedrock water-bearing zones) in the target bedrock unit underneath the facility. Each bedrock background

groundwater monitoring well must be screened across one water-bearing zone only, not both. If, while installing screen for the bedrock aquifer, the water-bearing zones cannot be isolated, groundwater samples collected from the two-combined water-bearing zones will not represent actual background conditions. In a response letter, propose to isolate each water-bearing zone.

2. Section 5.0, Field Methodology, lines 17-18, page 5

Permittee Statement: "Field personnel will install 2-inch diameter schedule 40 polyvinyl chloride (PVC) groundwater monitoring wells with a 2-inch annulus."

NMED Comment: Detection of common plastic additives such as bis(2-ethylhexyl) phthalate is a recurring issue during the groundwater monitoring events at the facility. In addition, PVC is less desirable for monitoring wells where organic constituents are analyzed due to its potential for sorption and leaching of contaminants. NMED recommends using stainless steel as a well screen material for bedrock background monitoring wells. In addition, the Permittee must make an effort to minimize such contamination while purging and sampling (e.g., equipment (pumps, tubing and bailers) must be selected accordingly). No revisions are necessary.

3. Figure 3, Schematic of Proposed Well Construction

NMED Comment: The schematic of proposed well construction in Figure 3 does not depict separate outer and inner casings. The Permittee must propose to install the wells with an appropriate seal or telescoped well casing in order to prevent cross-contamination between the alluvial and bedrock aquifers. Include the revised figure in a response letter.

4. Section 5.0, Field Methodology, lines 37-38, page 5

Permittee Statement: "The well monument will be coated with protective orange paint as required by FWDA."

NMED Comment: The Permittee must make sure that the paint does not contain compounds that may interfere with the contaminants of potential concern at the facility. No revisions are necessary.

5. Section 5.0, Field Methodology, lines 6-9, page 6

Permittee Statement: "Groundwater samples will be collected from the four new bedrock background groundwater monitoring wells in accordance with the approved Interim Groundwater Monitoring Plan and will be consistent with the same analytical suite as the sentinel wells, MW23 and MW24."

NMED Comment: The analytical suite for sentinel wells, MW23 and MW24 includes nitrate/nitrite, explosives, perchlorate, TAL metals, VOC, SVOC, TPH-DRO and TPH-GRO.

Although the proposed analytical suite may be sufficient for future monitoring purposes at the facility, PCBs, pesticides, and herbicides analyses must be conducted by EPA Methods 8082A, 8081A and 8151A, respectively, during the initial sampling events. If these analytes are not detected in the groundwater samples collected from the proposed background groundwater monitoring wells during the first two monitoring events, the analysis may be discontinued for subsequent groundwater sampling events. In the response letter, propose to include analysis for PCBs, pesticides, and herbicides during the initial two sampling events in addition to the proposed analytical suite for the groundwater samples collected from the proposed background groundwater monitoring wells.

The Permittee must address all comments contained in this Approval with Modifications in the future reports and work plans. A response letter addressing Comments 1, 3, and 5 must be submitted no later than **May 30, 2018**.

Should you have any questions, please contact Michiya Suzuki of my staff at (505) 476-6059.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
M. Suzuki, NMED HWB
C. Hendrickson, U.S. EPA Region 6
L. Rodgers, Navajo Nation
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M. Harrington, Pueblo of Zuni
C. Seoutewa, Southwest Region BIA
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File: FWDA 2017 and Reading, Groundwater, FWDA-17-008

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REPORT DOCUMENTATION PAGE

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1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
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4. TITLE AND SUBTITLE
Final Fort Wingate Depot Activity Groundwater Monitoring Northern Area Background Well Installation Letter Work Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

5a. CONTRACT NUMBER
W912PP-17-C-0003

6. AUTHOR(S)
JohnDavid Nance, Program Manager, Sundance Consulting, Inc.
Beth Davis, Project Manager, Sundance Consulting, Inc.

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Corps of Engineers
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10. SPONSOR/MONITOR'S ACRONYM(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release, distribution is unlimited.

13. SUPPLEMENTARY NOTES
This Letter Work Plan detailing the installation of 4 additional background monitoring wells, was approved by the New Mexico Environment Department-Hazardous Waste Bureau as required by RCRA permit number NM 6213820974.

14. ABSTRACT
This Letter Work Plan (Plan) has been prepared by Sundance Consulting, Inc. (Sundance) to describe the specific field methods and procedures for the installation of four bedrock background groundwater monitoring wells in the Northern Area of Fort Wingate Depot Activity (FWDA; Study Area). The proposed bedrock groundwater monitoring wells will serve as background groundwater wells within the northern area of FWDA. These background groundwater monitoring wells are required to supplement the evaluation of background constituent values within the water-bearing bedrock sandstone units currently being evaluated for contaminant plume nature and extent under a separate cover. This Plan was prepared in accordance with contract number W912PP-17-C-0003, Performance Work Statement, Section 11.0, Optional Task 40: Installation of Background Monitoring Wells. The contract was issued by the United States Army Corps of Engineers (USACE), Albuquerque District, on March 7, 2017.

15. SUBJECT TERMS
FWDA, Fort Wingate Depot Activity, four bedrock background groundwater monitoring wells, install wells

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Mark Patterson
Unclassified	Unclassified	Unclassified	SAR	26	**19b. TELEPHONE NUMBER** *(include area code)* 330-358-7312

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Fort Wingate Depot Activity Groundwater Monitoring
Northern Area Background Well Installation
Letter Work Plan

Fort Wingate Depot Activity, McKinley County, New Mexico

September 18, 2017

1.0 INTRODUCTION

This Letter Work Plan (Plan) has been prepared by Sundance Consulting, Inc. (Sundance) to describe the specific field methods and procedures for the installation of four bedrock background groundwater monitoring wells in the Northern Area of Fort Wingate Depot Activity (FWDA; Study Area). This Plan was prepared in accordance with contract number W912PP-17-C-0003, Performance Work Statement, Section 11.0, Optional Task 40: Installation of Background Monitoring Wells. The contract was issued by the United States Army Corps of Engineers (USACE), Albuquerque District, on March 7, 2017.

2.0 PURPOSE AND SCOPE

A Northern Area groundwater background evaluation, titled *Final Technical Memorandum, Northern Area Groundwater Background Evaluation for Fort Wingate Depot Activity McKinley County, New Mexico*, *Revision 1* (Sundance, 2015), was previously submitted to the New Mexico Environment Department (NMED) for review. After disapproval from NMED and several iterations of the evaluation, Sundance and the USACE determined that additional bedrock groundwater monitoring wells were necessary to be installed up-gradient of potential source areas prior to resubmission of the background evaluation report. The proposed bedrock groundwater monitoring wells will serve as background groundwater wells within the Northern Area of the FWDA. These background groundwater monitoring wells are required to supplement the evaluation of background constituent values within the water-bearing bedrock sandstone units currently being evaluated for contaminant plume nature and extent under a separate cover.

Field activities proposed within this Plan include:

- Drill four soil borings in the water-bearing bedrock sandstone to approximately 150, 220, 275, and 300 feet below ground surface (bgs) along the eastern edge of the known shallow bedrock aquifer.
- Install four background groundwater monitoring wells within soil borings.
- Surface complete each groundwater monitoring well with a lockable well monument, a 4-feet by 4-feet concrete well pad, and four steel bollards.
- Develop four newly installed background groundwater monitoring wells.
- Measure water levels prior to groundwater sampling.
- Collect groundwater samples of known groundwater constituents from each newly installed and developed background groundwater monitoring well.

3.0 SITE BACKGROUND

The FWDA is located approximately seven miles east of Gallup, New Mexico, and currently occupies approximately 15,277 acres of land in McKinley County, New Mexico (Figure 1). The FWDA is mostly surrounded by federally owned or administered lands, including both national forest and tribal lands. The major land use areas that overlay the Study Area consist of the following:

- The Administration Area – encompassing approximately 800 acres in the northern portion of the FWDA, which contains former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities.
- The Workshop Area – encompassing approximately 700 acres to the south of the Administration Area, which consists of an industrial area containing former ammunition maintenance and renovation facilities, the former trinitrotoluene (TNT) washout facility, and the TNT leaching beds area. Buildings and related structures in this area were demolished in 2010.

4.0 SITE CONDITIONS

Climate – The average seasonal temperatures for the area vary with elevation and topographic features. During winter, daily temperatures fluctuate as much as 50 to 70 degrees Fahrenheit (°F) in a 24-hour period. In summer, daily high temperatures are between 85°F and 95°F (M&E, 1992). Average temperatures in winter are about 27°F and in summer 70°F, while extreme temperatures are as low as -30°F in winter and as high as 100°F in summer. There are 100 to 150 frost-free days during the year from the middle of May to the middle of October (M&E, 1992).

Topography – The Study Area is relatively flat with higher elevations in the south. Elevations in the northern area are approximately 6,660 feet above mean sea level. Surface runoff during rainfall/snowmelt events drains into arroyos that flow only during precipitation events, or pools locally in low areas where it evaporates or infiltrates. The Rio Puerco runs east to west north of the administration area along the northern border of the FWDA. This river flows at the surface only during rainfall and snowmelt events.

Soils – The soils found in the Study Area are consistent with those occurring in cool plateau and mountain regions of New Mexico. The major soil types present at the FWDA are variants/complexes of sands, loams, clays, and rocks. These soils are relatively thin and the parent bedrock is either at or near the surface in more than a quarter of the FWDA. The soils are generally as follows, from south to north: Rehobeth, Bamac, Aquima-Hawaikuh, Zia, Rizno-Tekapo, and Evark-Arabrab.

Geology – The FWDA lies within a small basin defined on the south and east boundaries by the Zuni Mountains (Zuni Uplift), on the west by the Nutria Monocline, and on the north by the South Fork of the Rio Puerco (USGS, 2009). The Laramide Orogeny, occurring approximately 75 to 35 million years ago, contributed to the present basin configuration. Orogenic uplift tilted bedrock underlying the majority of FWDA to the northwest at an angle of approximately 5 degrees (USACE, 2011).

The northern boundary of the FWDA terminates in the strike valley of the South Fork of the Rio Puerco. The valley represents the transition between the Zuni Uplift to the south and the Chaco Slope to the north. The Chaco Slope is a gently north-dipping slope between the Zuni Uplift and the inner San Juan Basin (USACE, 2011). Bedrock underlying most of the northern area of the FWDA dips to the northwest at an angle of approximately five to six degrees. The structural orientation of the bedrock and overlying alluvium substantially influences the movement of local groundwater near FWDA. The groundwater gradient in the uppermost bedrock units of the northern area is primarily to the northwest and west, generally following the structural dip of the geologic units (USACE, 2013).

Stratigraphy – Quaternary alluvial and colluvial deposits unconformably overlie the Triassic-age bedrock in the lower elevation and northern portions of the FWDA (Anderson et al., 2003). The Triassic Petrified Forest Formation underlays the alluvial and colluvial deposits in the Study Area. The Petrified Forest Formation comprises more than 75 percent (%) of the bedrock exposed at the surface throughout the FWDA and consists primarily of mudstone, claystone, and minor amounts of muddy sandstone. The Petrified Forest Formation consists of three members: the Painted Desert Member (upper), the Sonsela Sandstone Member (middle), and the Blue Mesa Member (lower). The upper Painted Desert Member and the lower Blue Mesa Member each consist of mudstone, siltstone, sandy-mudstone, and lenticular sandstone layers. Sandstone lenses within the Painted Desert and Blue Mesa Members are thin (generally less than 20 feet thick), laterally discontinuous, and contain high quantities of very fine, muddy matrix. Thus, the apparent permeability of these lenses and of the Painted Desert and Blue Mesa Members are very low.

5.0 FIELD METHODOLOGY

Sundance, in coordination with the USACE, has identified the locations to install four background groundwater monitoring wells to supplement the Northern Area groundwater background evaluation (Figure 2; Sundance, 2015). To install the groundwater monitoring wells at proposed locations, Sundance, with their subcontracted driller, Yellow Jacket Drilling, will mobilize a TSi 150T Sonic drill rig and support vehicles to drill to the prescribed depths for each groundwater monitoring well (Figure 2). Sonic drilling technology generates continuous soil and rock cores from the subsurface. Soil and rock cores will be contained in boxes and maintained onsite, thus eliminating soil investigation-derived waste (IDW).

The following section summarizes the permitting, field planning documentation, and specific field methods and standards to be utilized for the performance of drilling and installation of the four proposed bedrock background groundwater monitoring wells.

Permitting – Sundance will submit documents to the New Mexico Office of the State Engineer (OSE), District 1, for review and approval to drill the proposed groundwater monitoring wells. Operations will be conducted in accordance with the OSE current guidance for drilling monitoring wells (OSE, 2017). Sundance will collect global positioning satellite (GPS) coordinates of the proposed groundwater monitoring well locations to use in the location submission to the OSE.

Sundance will coordinate with the FWDA Caretakers to obtain a utility clearance sign-off for the proposed groundwater monitoring wells per the GPS locations. Sundance's site representative will work with the FWDA Caretakers and USACE to ground-truth the proposed locations prior to commencing field operations. Notifications will be submitted to NMED, OSE, the Bureau of Indian Affairs, and White Sands Missile Range representatives prior to mobilization.

Sundance will submit a dig permit with New Mexico One Call, also known as NM-811. As this site is an Army Installation in closure, it is predicted that NM-811 will not have access or utilities within the boundaries of the FWDA; however, a proper submission will be conducted to verify and confirm no utilities from private entities exist at the proposed locations.

Operations will not be performed until a signed clearance has been received from the FWDA Caretakers, and concurrence of the operations is received from applicable stakeholders.

Cultural Resources – Traditional cultural properties (TCPs) and other cultural resources have been documented within the FWDA boundaries. The USACE-Fort Worth District has developed a Programmatic Agreement (PA) to specify procedures to be employed during environmental characterization and remediation activities. These procedures will be followed during performance of field work.

Maps showing the locations of TCPs relative to proposed investigation locations are not included in this Plan because it is a public document. Instead, the consultation process will include review by tribal cultural resource personnel to confirm the presence or absence of identified cultural resources within the proposed investigation locations. During the Work Plan review period, tribal cultural staff may visit the site and meet with Army representatives to view figures showing sample sites and inspect the area for cultural resources. Specific sampling locations will not be flagged, but the sampling area will be identified.

Pursuant to the PA, the Army will provide a letter to the Pueblo of Zuni, Navajo Nation, and State Historic Preservation Officer seeking comments on field operating procedures prior to the commencement of fieldwork.

Field Planning Documents – Along with this Plan, Sundance will utilize the approved Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) that is governing the current drilling activities being performed at the FWDA (Sundance, 2016). The approved APP/SSHP, along with the corresponding accident hazard analyses, covers drilling operations as well as mobilization, vehicle operation, and groundwater sampling. As the proposed locations are not located within areas of known ordnance operations, the requirement for Unexploded Ordnance support will not be necessary.

Monitoring Well Installation – Four bedrock background groundwater monitoring wells will be installed in accordance with NM Office of the State Engineer regulations (OSE, 2017) and the NM Administrative Code, 19.27.4.29 (NMAC, 2017). Anticipated depths for the proposed wells, listed from north to south, are:

- BGMW07 = 300 feet bgs
- BGMW08 = 275 feet bgs
- BGMW09 = 220 feet bgs

- BGMW10 = 150 feet bgs

The proposed bedrock background groundwater monitoring well depths were determined based on existing data of the bedrock water-bearing zones. TMW36 is the northern-most active bedrock well installed in the Study Area, with a depth of 157 feet bgs. The proposed location of BGMW10 is approximately 600 feet east of TMW36 (Figure 2). Based on the target sandstone and historic data, BGWM10 should intersect the sandstone consistent with TMW36. As the target sandstone (and bedrock units) dip to the north approximately five degrees, the other bedrock background groundwater monitoring wells should be deeper to the north so to intersect the same water bearing unit. Field personnel will advance and install BGMW10 first, as that proposed location has the most subsurface control of the four locations. Wells will then be drilled in secession moving northward, using subsurface data from the previous boring for refinements.

For the four bedrock background groundwater monitoring wells, a TSi 150 truck-mounted sonic drill rig will be used to continuously core the boring and advance surface casing through the alluvium to the confining bedrock layer to seal off the alluvial water-bearing zone from the bedrock water-bearing zone. Field personnel will install screen throughout the thickness of the target bedrock unit.

Field personnel will install 2-inch diameter schedule 40 polyvinyl chloride (PVC) groundwater monitoring wells with a 2-inch annulus. Monitoring wells will be installed with at least 20 feet of 2-inch inside diameter, schedule 40 PVC 0.010-inch machine-slotted screen with a cap attached to the bottom. As stated previously, screen will be installed throughout the thickness of the target bedrock unit, thus screen intervals may vary. Bedrock background groundwater monitoring wells will have centralizers placed at the top and bottom of the screen when appropriate. The filter pack will be silica sand and will extend from the bottom of the borehole to two feet above the screened interval (Figure 3).

Above the filter pack, a bentonite chip or pellet seal will be installed with a thickness of approximately five feet and hydrated with potable water every one-foot to provide a competent seal. The bentonite chips or pellets will be installed by a tremie pipe.

Above the bentonite seal, a neat cement grout will be installed from the top of the bentonite seal to three feet below ground surface by a tremie pipe.

The surface completion for each bedrock background groundwater monitoring well will consist of an 8-inch diameter by 6-foot long protective steel monument, which will be installed with three feet above the concrete pad and three feet into the ground. The concrete pad will be 4 feet long by 4 feet wide by 4 inches thick (Figure 3). Field personnel will install 4-inch diameter by 3-feet tall steel bollards around the well on the outside of the concrete pad. An approximate well monument stick-up height of three feet is required to accommodate a potential dedicated pump system. The well will be equipped with a security lock and will be tagged with corrosion-resistant identification. The well monument will be coated with protective orange paint as required by FWDA.

Well Development – Completed bedrock background groundwater monitoring wells will be developed in accordance with NM Office of the State Engineer regulations (OSE, 2017) and the NM Administrative Code, 19.27.4.29 (NMAC, 2017). The wells will be developed after a minimum of 48 hours have elapsed after completion of the well installation. Field personnel will

develop bedrock groundwater monitoring wells by surge blocking, bailing, and/or pumping until the turbidity of the extracted water is less than 100 nephelometric turbidity units (NTU), if obtainable. As the water-bearing units at FWDA contain high volumes of fines and silts, a determination whether a well has sufficiently developed may need to be made in the field and authorized by Sundance's Project Manager.

Groundwater Sampling – Groundwater samples will be collected from the four new bedrock background groundwater monitoring wells in accordance with the approved Interim Groundwater Monitoring Plan and will be consistent with the same analytical suite as the sentinel wells, MW23 and MW24. Prior to purging and sampling, a minimum of 24 hours will elapse from the completion of development of a given groundwater monitoring well. Field personnel will purge groundwater monitoring wells prior to sampling using low-flow purging equipment or bailers until three consecutive readings are recorded for the following:

- ± 10% of temperature, conductivity, and oxidation reduction potential.
- ± 10% OR less than (<) 1.0 NTU for turbidity.
- ± 10% OR < 1.0 milligrams per liter (mg/L) for dissolved oxygen.
- ± 5% for pH.

Following well purging, field personnel will collect groundwater samples and submit the samples for analysis for the target contaminants of potential concern (COPCs) and parameters identified for the respective groundwater plumes related to the Interim Groundwater Monitoring Program for FWDA (Innovar 2016). The contracted analytical laboratory will analyze samples in accordance with the project quality objectives and requirements of the Department of Defense-Quality Systems Manual (DoD-QSM) Version 5.0.

Field Documentation – Field personnel will maintain appropriate field documentation for all activities as part of the formal project documentation. Field sampling documentation and data reporting will provide sufficient information to verify report conclusions and demonstrate that quality control procedures were followed during implementation of proposed field activities.

A soil classification log will be used by the Field Geologist to log the drilled soil borings. The soil classification log conforms to industry standards and includes the following information:

- Project number
- Soil boring name/number
- Names of the drilling company and the operator
- Name of the geologist completing the log information
- Soil logging information
- Dates drilling begins and ends
- Observed drilling conditions (e.g., hard or soft drilling, rig chattering, sticky conditions, etc.)
- Location where samples were collected, sample ID, and time of collection

Each soil boring will be logged in accordance with ASTM International (ASTM) Standards D-2487, D-2488, and D-653 (ASTM, 2006, 2009a, and 2009b). Soil descriptions and classification will conform to the ASTM Unified Soil Classification System. Location and names for the proposed wells are provided on Figure 2.

All soil borings/monitoring wells will follow the soil boring naming convention as provided by the USACE. The four monitoring wells will be numbered as:

- BGMW07
- BGMW08
- BGMW09
- BGMW10

Other documentation may be generated as a part of this field effort, and are listed below:

- Daily tailgate safety meeting forms
- Daily Field Logbooks
- Field Work Variances
- Sample collection logs
- Soil classification logs
- Equipment calibration records
- Sample labels/COC forms
- Photo documentation

Surveying – Following the field-sampling program, the groundwater monitoring well locations will be surveyed by a New Mexico-licensed professional surveyor to the nearest tenth of a foot (horizontal). The surveyor will measure elevations for the new monitoring wells at ground surface, top of the surface monument, and top of well casing (PVC) at points on the north side of the well to the nearest one hundredth of a foot (vertical).

Soil boring sample locations will be surveyed horizontally to the nearest one foot. Vertical elevation will not be recorded for soil boring sample locations.

The professional surveyor will reference horizontal coordinates for all sample locations to the North American Datum of 1983, State Plane New Mexico West Grid represented in units of feet. They will also reference vertical coordinates for monitoring well elevations to the North American Vertical Datum of 1988, or NAVD 88.

Decontamination – Field personnel will perform decontamination of reusable sampling equipment to ensure chemical analyses reflect actual concentrations at sampling locations by maintaining the quality of samples and preventing cross-contamination. Field personnel will use the standard equipment decontamination procedures during completion of soil sampling activities, drilling activities, and between drilling locations. These procedures are as follows:

- Drillers will decontaminate drilling rigs (Sonic) prior to entering the Study Area. This consists of spray-washing or steam-cleaning dirt and debris from rig exterior and components and fully inspecting for any oil, hydraulic fluid, fuels, or operational fluid leaks. If any leaks are detected, the deficient rig will not be allowed onsite until the deficiency is resolved.
- Drillers will decontaminate drilling rigs and equipment between soil boring locations, also consisting of spray-washing or steam-cleaning dirt and debris from rig exterior and components.
- Field personnel will dispose of the plastic sheeting and associated pad materials at an approved on-facility dumpster.
- After field cleaning, personnel will don clean gloves before handling equipment to prevent recontamination. Personnel will move the equipment away from the cleaning area to prevent recontamination. If the equipment is not to be immediately reused, personnel will cover the equipment with plastic sheeting or wrap in aluminum foil to prevent recontamination. The area where the equipment is stored prior to reuse must be free of contaminants.

Investigation-Derived Waste Disposal – IDW will be managed in accordance with the Investigation-Derived Waste Management Plan as published in the *Parcel 3 Groundwater RCRA Facility Investigation Work Plan* (Sundance, 2016). IDW generated during the RFI activities will consist of water produced from drilling activities; decontamination fluids; disposable sampling equipment; and personal protective equipment (PPE). Note that it is anticipated that no soil and rock IDW will be generated as all recovered material will be contained in boxes and maintained onsite, thus eliminating soil and rock IDW. These IDW categories will be managed as follows:

1. Large volumes of groundwater from drilling activities within bedrock water-bearing zones are anticipated. Field personnel will utilize portable water tanks to collect, manage, and characterize groundwater during drilling. The collected water will be stored for appropriate characterization and disposal.
2. Small volumes of decontamination fluids are anticipated. Decontamination fluids will be contained within the temporary decontamination pad areas during active sampling and decontamination activities onsite. Accumulated wash and rinse water will then be containerized and combined with produced waters related to drilling for appropriate characterization and disposal.
3. Used, non-decontaminated disposable sampling equipment and PPE is anticipated. Field personnel will place these items in polyethylene trash bags and treat as general refuse. Field personnel will place refuse in the suitable facility trash receptacle daily.

In the event IDW is characterized as a hazardous waste, it will be managed in accordance with the requirements of Large Quantity Generators of hazardous waste (USEPA, 1996), and the Investigation-Derived Waste Management Plan (Sundance, 2016).

Sundance will coordinate with the on-site BRACD caretakers for all IDW management and disposal activities.

6.0 REFERENCES

Anderson et al, 2003. *Geology of the Fort Wingate Quadrangle, McKinley County,* New Mexico by Orin J. Anderson, Charles H. Maxwell, and Spencer G. Lucas. Open-file Report 473. New Mexico Bureau of Geology and Mineral Resources. September 2003.

ASTM International (ASTM), 2006, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM Method D 2487-06.

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OSE, 2017. *"Well Drillers and Drill Rig Supervisor Information and Reports,"* New Mexico Office of the State Engineer/Interstate Stream Commission, accessed July 10, 2017, http://www.ose.state.nm.us/STST/index.php.

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USGS, 2009. *Geochemical Evidence of Groundwater Flow Paths and the Fate and transport of Constituents of Concern in the Alluvial Aquifer at Fort Wingate Deport Activity, New Mexico, 2009.* United States Geological Survey for the United States Army Corps of Engineers, 2009.

Figures

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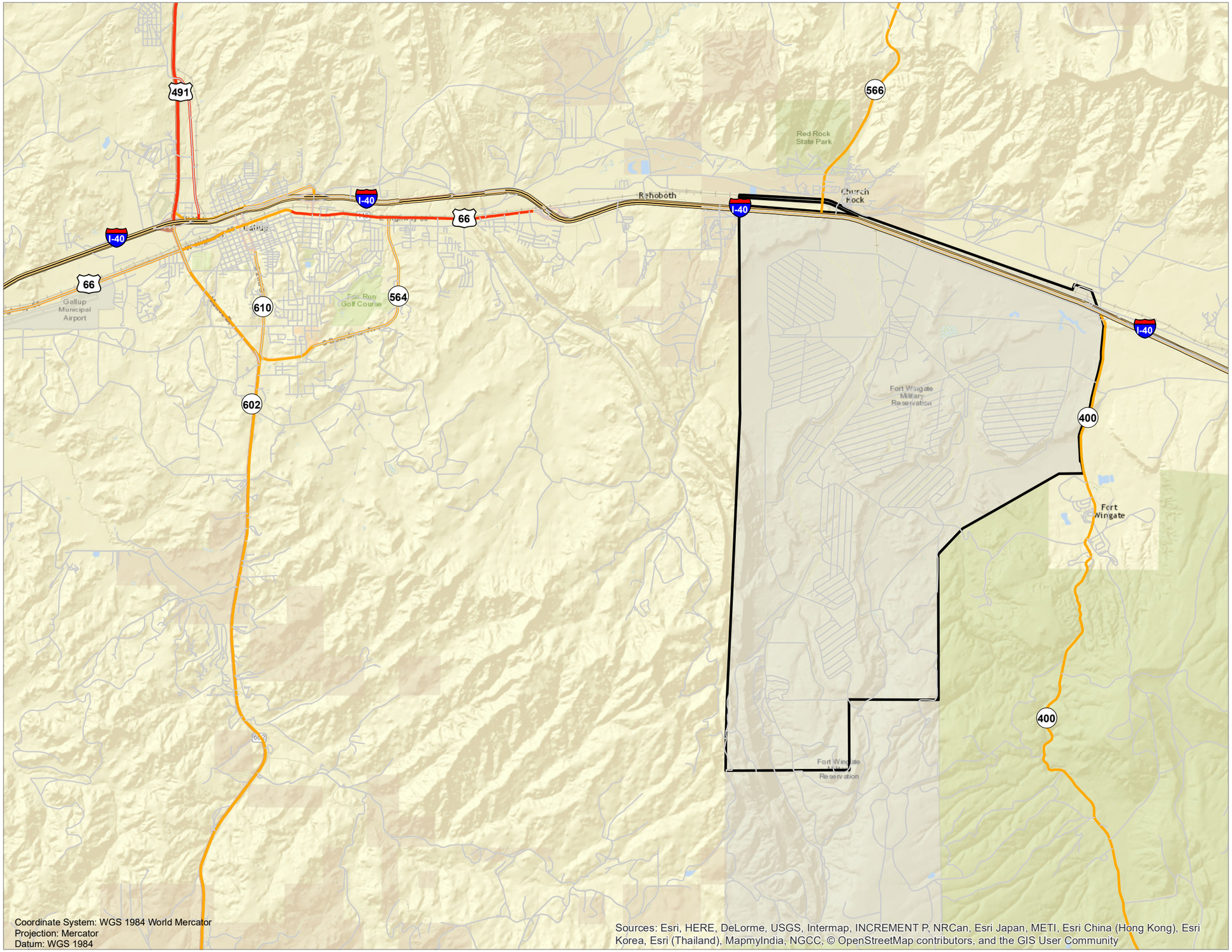

Legend

- FWDA Site Boundary
- Interstate
- US Highway
- State Highway
- County, Arterial Road

Notes

FWDA = Fort Wingate Depot Activity
US = United States

N
W E
S

0 0.5 1 2 3
Miles

0 1 2 4
Kilometers

Sundance Consulting Inc.

Figure 1

FWDA SITE LOCATION MAP

FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Author: Document Path: N:\FortWingate\DataDump_JDN_4-20-17\TO-0002_RFI\Maps\V3\FWDA-0001_RFI_ArmyDraft_Fig2_SiteLoc.mxd Document Name: FWDA-0001_RFI_ArmyDraft_Fig2_SiteLoc

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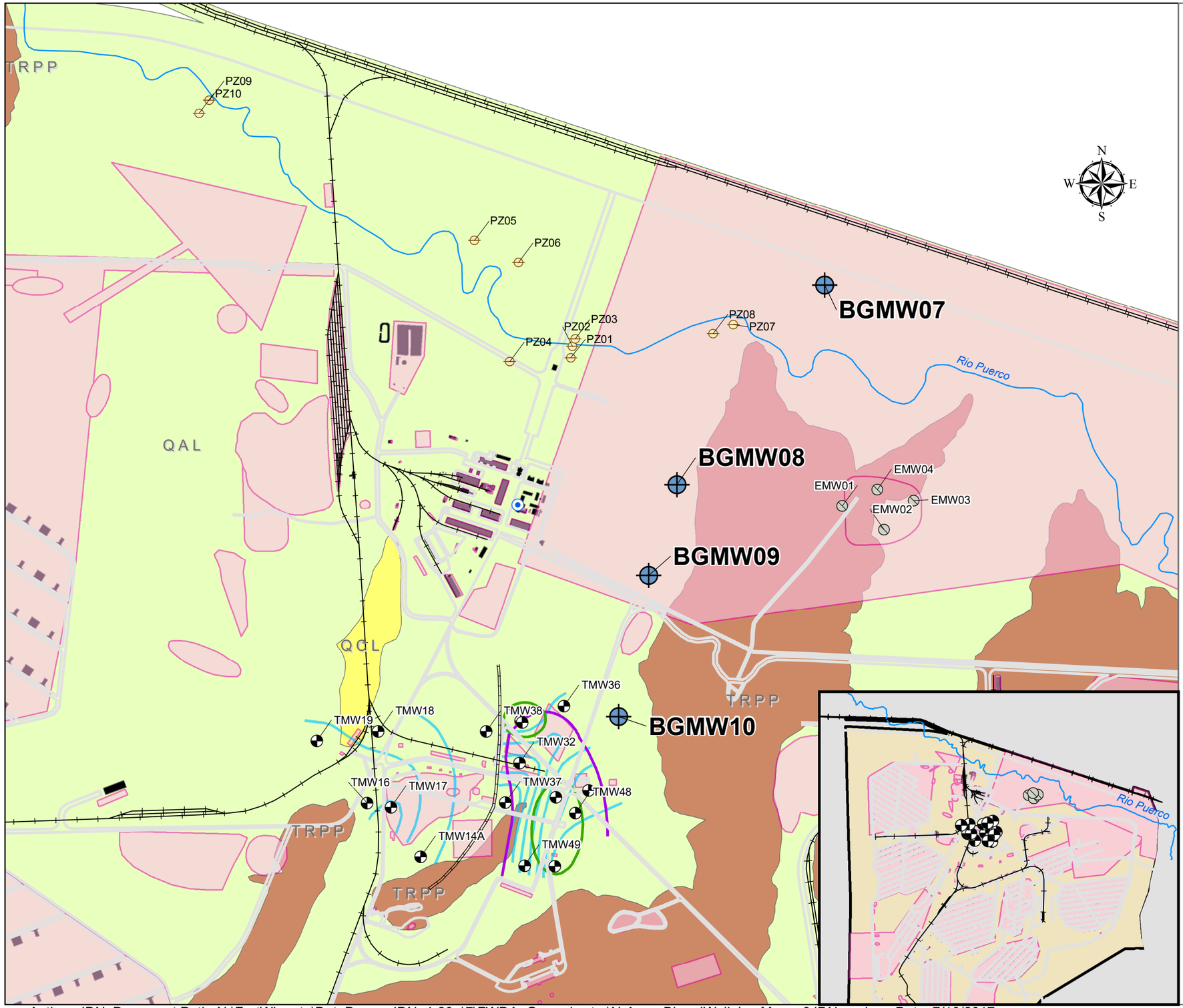

Legend

Bedrock Wells Northern Area

- Abandoned
- Active
- Supply Well 69
- Piezometer
- Proposed New Background Wells
- Interpreted Bedrock Structure
- FWDA Railroad
- Rio Puerco
- FWDA Roads
- Bedrock Nitrate Plume, Oct. 2016
- Bedrock Perchlorate Plume, Oct. 2016
- Bedrock Groundwater Contour
- FWDA SWMUs / AOCs

Buildings/Structures

- Existing

FWDA = Fort Wingate Depot Activity
SWMU = Solid Waste Management Unit
AOC = Area of Concern

0 700 1,400 2,800
Feet

0 230 460 920
Meters

FIGURE 2
PROPOSED BACKGROUND GROUNDWATER MONITORING WELL LOCATIONS

FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Author: JDN Document Path: N:\FortWingate\DataDump_JDN_4-20-17\FWDA_Groundwater\N-Area_BkgndWell_LocMap_v3JDN.mxd Date: 7/10/2017

Coordinate System: NAD 1983 UTM Zone 12N

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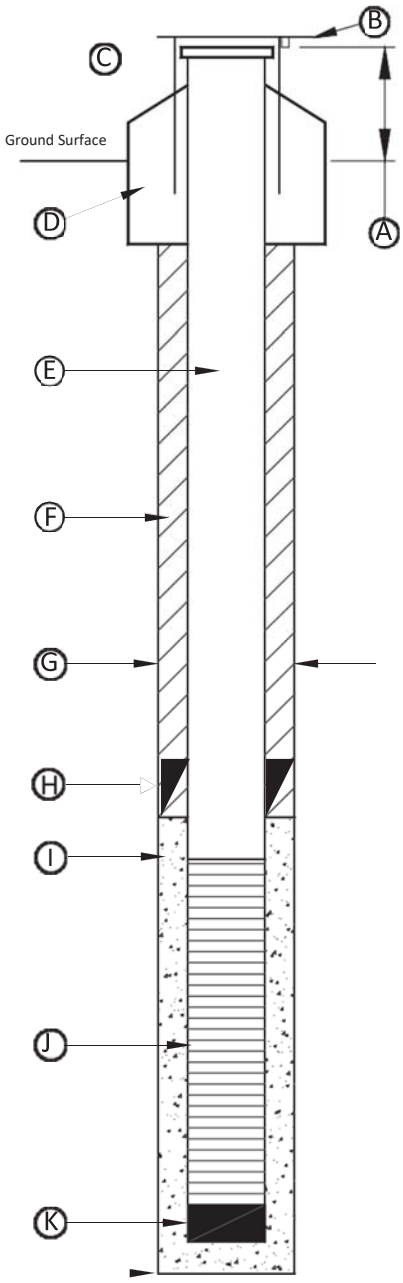
Figure 3
Schematic of Proposed Well Construction



A, B, C: Well Monument, eight-inch inside diameter Steel pipe six-feet long with three-feet subsurface and three-feet minimum above ground surface, with locking top cover

"D": Four-feet by four-feet cement well pad, at least six-inches thick

"E": Schedule 40, two-inch inside diameter PVC well casing with threaded connections

"F": Neat Cement Grout from bentonite seal to three feet below ground surface

"G": Six-inch diameter cored-boring advanced with Sonic continuous core technology (to allow for a two-inch annulus

"H": Bentonite chip seal, hydrated, five-feet thick

"I": Colorado Silica Sand, length of screened interval to two-feet above screen

"J": Schedule 40, two-inch inside diameter, PVC well casing screen, with one hundredth of an inch-thick slots (10-slot screen) (screened through entire targeted layer)

"K": PVC end cap placed at bottom of well casing

-- Figure is not to scale --

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