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Department of Energy
National Nuclear Security Administration
Sandia Field Office
P.O. Box 5400
Albuquerque, NM 87185

NNSA National Nuclear Security Administration

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Hazardous Waste Bureau

JAN 15 2019

Mr. John E. Kieling
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, New Mexico 87505

Subject: Submittal of Sandia National Laboratories Monitoring Well Installation Work Plan, Burn Site Groundwater Monitoring Wells CYN-MW16 through CYN-MW23, January 2019

Dear Mr. Kieling:

The Department of Energy/National Nuclear Security Administration and National Technology and Engineering Solutions of Sandia, LLC are submitting the *Monitoring Well Installation Work Plan, Burn Site Groundwater Monitoring Wells CYN-MW16 through CYN-MW23, January 2019*, for the Sandia National Laboratories/New Mexico to the Hazardous Waste Bureau of the New Mexico Environment Department. This work plan addresses the requirements set forth in your June 29, 2018, letter, *Disapproval: Recommendations for Additional Characterization Activities at the Burn Site Groundwater Area of Concern (AOC) for Sandia National Laboratories/New Mexico, Environmental Protection Agency identification number NM5890110518, HWB-SNL-07-015.*

If you have questions contact David Rast of our staff at (505) 845-5349.

Sincerely,

Jeffrey P. Harrell
Manager

Enclosure

cc: See page 2

cc w/enclosure:
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NNSA-2019-000011

MONITORING WELL INSTALLATION WORK PLAN, BURN SITE GROUNDWATER MONITORING WELLS CYN-MW16 THROUGH CYN-MW23, JANUARY 2019

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature _____ Date 12/19/2018

Paul E. Shoemaker
Defense Waste Management Programs
Sandia National Laboratories/New Mexico
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and

Signature _____ Date 1/15/19

Jeffrey P. Harrell, Manager
U.S. Department of Energy
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Sandia Field Office
Owner

Sandia National Laboratories

Sandia National Laboratories/New Mexico Environmental Restoration Project

Monitoring Well Installation Work Plan Burn Site Groundwater Monitoring Wells CYN-MW16 through CYN-MW23

January 2019

United States Department of Energy
Sandia Site Office

Sandia National Laboratories is a multi-program laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525. SAND2018-14101 O

Sandia National Laboratories/New Mexico Environmental Restoration Project

Monitoring Well Installation Work Plan Burn Site Groundwater Monitoring Wells CYN-MW16 through CYN-MW23

January 2015

United States Department of Energy
Sandia Site Office

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TABLE OF CONTENTS

LIST OF FIGURES

Figure

LIST OF TABLES

Table

LIST OF ATTACHMENTS

Attachment

ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ARCH	air-rotary casing-hammer
bgs	below ground surface
BSG	Burn Site Groundwater
CSSP	Contract-Specific Safety Plan
DC	drilling contractor
DOE	U. S. Department of Energy
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HWB	New Mexico Environment Department Hazardous Waste Bureau
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
NNSA	National Nuclear Security Administration
pH	potential of hydrogen
PVC	polyvinyl chloride
SFO	Sandia Field Office
SNL/NM	Sandia National Laboratories/New Mexico
WMP	Waste Management Plan
Work Plan	Monitoring Well Installation Work Plan

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1.0 PROJECT AND SITE INFORMATION

This Monitoring Well Installation Work Plan (Work Plan) describes the procedures that will be followed by the U.S. Department of Energy/National Nuclear Security Administration/Sandia Field Office (DOE/NNSA/SFO) and National Technology & Engineering Solutions of Sandia, LLC (NTESS) personnel, for the installation of monitoring wells associated with the Sandia National Laboratories/New Mexico (SNL/NM) Burn Site Groundwater (BSG) Area of Concern (AOC). This Work Plan outlines the activities and procedures for the phased installation of up to eight groundwater monitoring wells (CYN-MW16 through CYN-MW23). The selection of drilling locations was discussed previously with New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) staff during a field tour of the BSG AOC on June 14, 2017.

These wells will help define the extent of nitrate concentrations in groundwater and the potentiometric surface in the BSG AOC, which is located in Lurance Canyon on Kirtland Air Force Base (Figure 1). Specifically, these wells will define the downgradient extent of the nitrate plume and will also provide information on groundwater and contaminant conditions in the 2,000-foot data gap between existing wells CYN-MW3 and CYN-MW13. Under this Work Plan, four new monitoring wells will be installed and up to four "contingency wells" will be installed, if needed to define the downgradient extent of the nitrate plume. The number of contingency wells (four) are proposed because (1) the groundwater conditions downgradient of CYN-MW13 are poorly understood and (2) because (known) past testing operations do not explain the high nitrate concentrations in downgradient well CYN-MW13. Long-term sampling from these new well locations, along with other BSG monitoring wells, will provide data to characterize the AOC and assist in evaluating potential remedial actions.

Task Description:	Installation of up to eight groundwater monitoring wells, and the preparation of a Monitoring Well Installation Report for the new wells
Scheduled Start Date:	To be determined–start of field work is contingent upon NMED HWB approval of this Work Plan
Estimated Completion Date:	To be determined–submittal of the Monitoring Well Installation Report to NMED HWB three months after completion of the wells

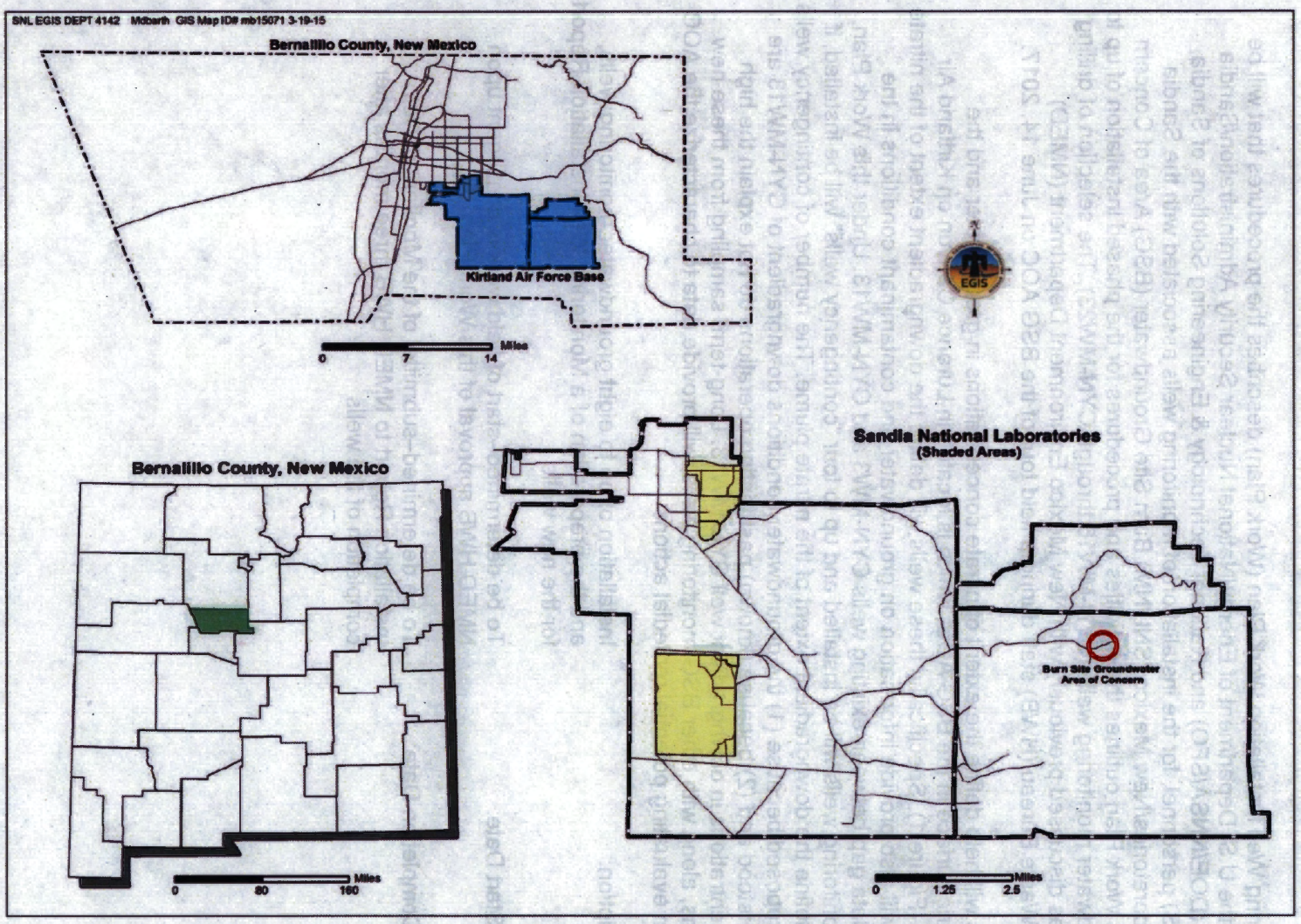

Figure 1.
Location of the Burn Site Groundwater Area of Concern

2.0 REGULATORY CRITERIA

The NMED HWB implements and enforces the Resource Conservation and Recovery Act requirements for SNL/NM.

To meet these regulatory requirements, and in response to the NMED HWB disapproval letter of June 29, 2018 (NMED June 2018), the following tasks will be completed:

- Submit this Work Plan to the NMED HWB and New Mexico Office of the State Engineer (NMOSE) requesting to install new groundwater monitoring wells CYN-MW16 through CYN-MW19 and potentially installing new groundwater monitoring wells CYN-MW20 through CYN-MW23.
- Use a NMOSE-licensed well driller and approved construction materials to install the groundwater monitoring wells (NMOSE August 2005).
- Upon completion of the field program, submit a Monitoring Well Installation Report to the NMED HWB and NMOSE.

3.0 PRE-FIELD ACTIVITIES

Activities that must be completed prior to implementing the drilling operations include external and internal activities.

The external activities are:

- Submittal and approval from the DOE/NNSA/SFO of the National Environmental Policy Act checklist.
- Approval of this Work Plan by NMED HWB.
- Submittal to and approval from the NMOSE of the well installation permit application.

The following activities are subject to internal approval by various SNL/NM organizations:

- Preparation of an SNL/NM excavation (dig) permit.
- Field delineation of sensitive features (cultural and/or biological resources).
- Preparation and approval of the SNL/NM site-specific Health and Safety Plan (HASP).
- Preparation of the SNL/NM Engineered Safety Tool and Safety Case.
- Preparation of the SNL/NM Statement of Work for drilling and well installation.

- Preparation and approval of the Contract-Specific Safety Plan (CSSP) by the drilling contractor (DC), a NM-licensed well driller.
- Preparation of the SNL/NM Primary Hazard Screening document.
- Preparation of the SNL/NM Technical Work Document.
- Preparation of the SNL/NM Waste Management Plan (WMP).
- Coordinate sampling, shipping, and analytical requirements with the SNL/NM Sample Management Office.
- Completion, review, and approval of the SNL/NM field work punch list.
- Conduct the SNL/NM readiness review meeting.

4.0 HEALTH AND SAFETY

The field personnel will perform field activities safely in accordance with the HASP and CSSP. Level D personal protective equipment is anticipated for all drilling and well installation operations. Training records associated with the drilling personnel will be maintained on-site and will be available at the commencement of drilling activities. The field personnel will operate under both the HASP and CSSP and will have SNL/NM-required training, including 40-hour Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response (HAZWOPER) training and a current 8-hour annual-HAZWOPER refresher course certificate.

An SNL/NM subject matter expert will perform a safety inspection of the drill rig and associated equipment before drilling commences. If any of the items are found to be in poor condition, significantly different than bid by the DC, or inadequate, the SNL/NM representative may delay commencement of drilling until the DC provides the equipment/services required. Daily equipment inspections for the drill rig and support equipment shall be documented by the DC and the records maintained on site. Noticeable drips of hydraulic oil, fuel, or other fluids will be contained by plastic sheeting placed under the rig at each drilling location. The leaks will either be repaired immediately at the site, the rig will be removed from the site for required repairs, or the DC will provide a substitute rig.

Prior to the start of drilling operations, SNL/NM Facilities Engineering will complete an excavation permit for the vicinity of the proposed wells. SNL/NM personnel will mark on the ground surface the buried utilities that may be present at each of the drilling locations. The DC will physically verify that buried utilities are not present by "potholing" with a hand shovel to a depth of 3 feet below ground surface (bgs) or encountering native soil/bedrock at each drilling location. If needed, the DC can adjust each drilling location by a maximum of 10 feet laterally to ensure safe drilling operations relative to buried utilities and/or other features (i.e., adjacent monitoring wells, overhead powerlines, or fence) that limit adequate working space. However, buried utilities are not anticipated to be a concern at these drilling locations.

Work areas will be set up in accordance with the HASP and coordinated with facility management personnel, including but not limited to, exclusion zone delineation and signage, applicable alternative routes for traffic and pedestrians, eye wash safety equipment, and sanitation facilities. SNL/NM personnel will ensure that waste containers for soil cuttings, development water, and trash have been obtained and are ready for drilling operations.

5.0 EQUIPMENT DECONTAMINATION

The drill rig and related equipment, including well development equipment, will be decontaminated at the decontamination pad in Technical Area-III or at Building 9925 - Environmental Resources Field Operations prior to beginning of drilling operations. Decontamination of equipment will also be required after completing each well. Decontamination waste will be kept to a minimum and contained in drums placed on spill control pallets at the decontamination pad, consistent with the WMP. The drill rig and associated equipment will be decontaminated after the last well is installed and prior to leaving SNL/NM property.

6.0 DRILLING AND MONITORING WELL INSTALLATION

Four monitoring wells are required by NMED HWB (NMED June 2018) (Figure 2, locations A through D), and an additional four wells were selected by SNL/NM as a contingency for determining the downgradient extent of contamination (Figure 2, locations E through H). If the groundwater concentrations of constituents of concern at location D are below drinking water standards, then the contingency wells will not be required. Locations E through H are shown schematically, and the actual locations may be moved with NMED HWB approval (and DOE/NNSA/SFO National Environmental Policy Act approval) to account for the groundwater elevation and elevated contaminant concentrations determined at location D. Well identification numbers will be sequentially assigned in the field.

The boreholes will be drilled using a combination of air-rotary casing-hammer (in alluvium) and air-rotary downhole-hammer (in bedrock) drilling methods depending on subsurface conditions. The precise location of the wells will be determined in the field to avoid culturally sensitive areas and existing aboveground and underground utilities and structures. The objective is to install 5-inch nominal diameter polyvinyl chloride (PVC)-casing monitoring well to provide representative groundwater samples. Well screens for these monitoring wells will extend from approximately 5 feet above the water table to 25 feet below the water table to be consistent with other monitoring wells at the site. Actual screen placement will be based on the observed lithology of the aquifer material with the well screen placed at the first water-producing fracture.

6.1 Borehole Drilling

The drilling methods will use environmentally-friendly lubricants. The drilling method is suitable for penetrating highly variable unconsolidated lithologies (such as cobbles, boulders, gravel, sand, clay, and caliche) and competent bedrock. The air-rotary casing-hammer method will be

used to drill through unconsolidated deposits (estimated to be less than 40 feet thick). Once competent bedrock (Precambrian igneous and metamorphic rocks, or Paleozoic sedimentary rocks) is encountered at the new well locations, air rotary downhole hammer drilling without casing advance will be used to drill to the total depth. The projected depths are discussed below.

The borehole lithology will be logged by the SNL/NM field geologist during drilling. The total depth of the boreholes for each well will be determined by the SNL/NM field geologist, and will be dependent on water yield encountered during drilling and downhole camera video. The total depth is anticipated to be approximately 25 to 35 feet below the uppermost water-bearing fracture. Water levels in the current monitoring well network range from approximately 101 to 327 feet bgs (Table 1). The depths to the uppermost water-producing bedrock fracture at individual well locations range from 124 to 379 feet bgs. The depth to the bottom of the screen interval in the existing wells range from 130 to 397 feet bgs. It is anticipated that the new wells will not be deeper than 400 feet bgs. The depth of the first groundwater encountered will be noted and recorded on the borehole log. The uncased portion of the borehole will be video logged using a wire-line camera for evaluating bedrock fracture patterns.

Minimal amounts of water (but no other foams/liquids) in the form of "mist" may be introduced into the borehole to aid in the removal of soil cuttings. Waste generation will be kept to a minimum. Borehole cuttings will be contained within an area adjacent to the drilling location. Water produced from the well during drilling or development will be contained in 55-gallon drums and placed on spill control pallets. Management and final disposition of soil cuttings and water will be performed as stipulated in the WMP.

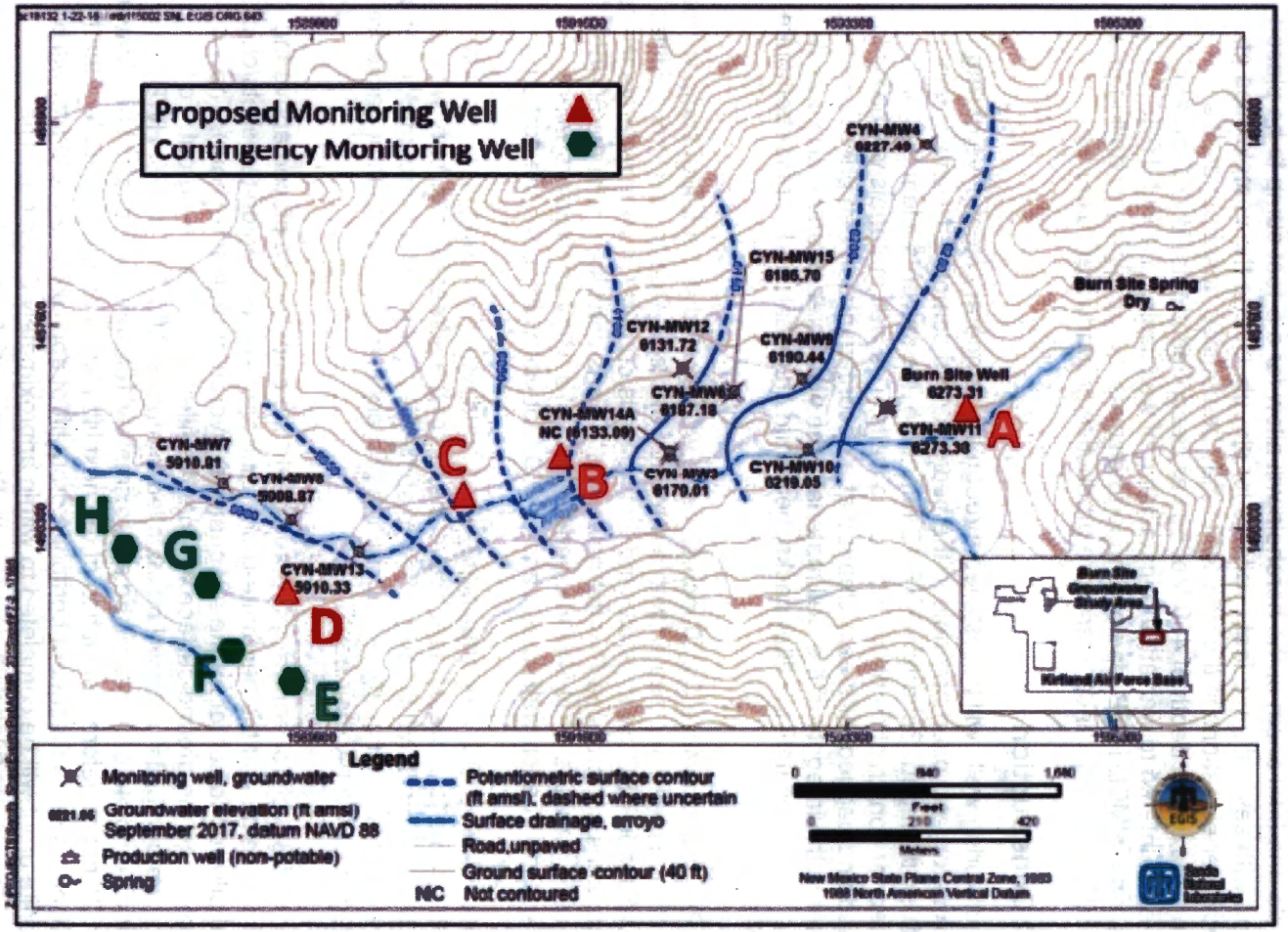

Figure 2.
Burn Site Groundwater Well Locations and Potentiometric Surface Map (September 2017 data)
Showing Approximate Locations of Proposed and Contingency Groundwater Monitoring Wells (location of wells E through H are approximate and will depend on potentiometric surface based on well D)

Due to semi-confined conditions and the nature of fracture flow in a structurally complex bedrock aquifer, depths to groundwater at existing wells in the BSG AOC are quite variable and discontinuous. The conceptual model of the BSG hydrogeologic setting is presented in the Annual Groundwater Monitoring Report, Calendar Year 2017 (SNL/NM June 2018). As determined in the field, the total depth of the borehole will allow for a 5-foot sump to be placed below the screen and with several more feet available for slough. Due to the complexities of fracture flow, groundwater elevations in the new wells may be considerably deeper. If a borehole is drilled to a maximum depth of 400 feet bgs as described in this Work Plan and insufficient water is encountered to warrant the installation of well casing, DOE/ NTESS personnel will contact the NMED HWB lead by phone to discuss the possibility of drilling to a maximum depth of 500 feet bgs to encounter more productive groundwater fractures.

6.2 Well Construction

The groundwater monitoring wells will be installed through the temporary steel drive casing (nominal 10-inch diameter) and open borehole in the bedrock, and completed using 5-inch nominal diameter, flush threaded, Schedule-80 PVC riser pipe. No solvents, cleaners, or lubricants will be used for construction of the monitoring wells. The well materials will be delivered pre-cleaned and bagged, or steam-cleaned at a decontamination pad prior to installation. To preserve the integrity of the well materials, the well screens and riser pipes will be suspended in the boreholes until the filter packs, bentonite chip seal, and annular bentonite-grout seal are installed.

A 30-foot length of PVC screen with a 0.020-inch slot size will be used and a 5-foot sump will be placed at the base of the screen and sealed with a threaded end cap. Due to previous declines in groundwater elevations in BSG groundwater monitoring wells of up to 3 to 4 feet per year, the use of 30-foot well screens are proposed for the new wells. This is consistent with the 30-foot strategy previously used for wells CYN-MW14A and CYN-MW15. PVC centralizers will be placed at the base and top of each well screen and at 100-foot intervals above the screen.

A primary filter pack of clean #10-20 (or equivalent) silica sand will be placed in the annulus from the bottom of the sump to at least 5 feet above the top of the screen. Preliminary well development using a surge block will be performed to settle the filter pack. A 5-foot thick layer of clean #60 (or equivalent) sand will be placed above the primary filter pack. Both filter packs will be tagged using a tag line to verify their depth.

A 30-foot thick layer of 3/8-inch (or equivalent) grade bentonite chips will be placed above the filter pack prior to emplacement of the bentonite-grout annular seal. The bentonite pellets/chips will be hydrated and allowed to set for a time adequate for hydration (at least 1 hour). The remaining annular space to the ground surface will then be filled with bentonite grout. To prevent overloading, the bentonite grout will be installed in multiple lifts. Per NMED HWB requirements, the first bentonite grout lift will be approximately 100-foot thick and will be allowed to set a minimum of 24 hours before installation of the next lift. Based on the anticipated depth to groundwater, only one more subsequent bentonite grout lift of approximately 200 feet will be required. The bentonite grout will be completed to within approximately 5 feet bgs. The remainder of the annulus will be filled with concrete as the well pad is poured.

Table 1.
Specifications of Existing Groundwater Monitoring Wells in the Burn Site Groundwater Area of Concern

Well	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Depth to Water in Casing (feet bgs) [a]	Depth to Uppermost Water-Producing Bedrock Fracture (feet bgs) [b]	Completion Zone
CYN-MW3	120.0	130.0	134.25	124	Bedrock (metamorphics)
CYN-MW4	260.0	280.0	229.43	264	Bedrock (quartzite)
CYN-MW6	141.5	161.3	156.19	42	Bedrock (metamorphics)
CYN-MW7	315.0	334.2	305.54	325	Bedrock (granitic gneiss)
CYN-MW8	338.5	358.3	321.24	341	Bedrock (granitic gneiss)
CYN-MW9	175.8	195.8	170.23	180	Bedrock (metamorphics)
CYN-MW10	150.4	170.4	123.50	160	Bedrock (metamorphics)
CYN-MW11	229.8	249.8	101.03	230	Bedrock (metamorphics)
CYN-MW12	252.5	272.5	213.44	261	Bedrock (metamorphics)
CYN-MW13	376.8	396.8	327.46	379	Bedrock (granitic gneiss)
CYN-MW14A	263.6	293.6	182.76	280	Bedrock (metamorphics)
CYN-MW15	160.0	192.0	157.74	174	Bedrock (metamorphics)

Notes:

bgs - below ground surface
[a] Depth to water measured in September 2017.
[b] Depth to water-producing bedrock fracture encountered while drilling; based on soil cuttings, standing water in borehole, and/or borehole video results.

The well casing will extend approximately 30 inches above ground surface and be sealed with a water-tight cap. The well will be completed with protective steel casing (stovepipe) with a hinged locking cap; the protective casing will be painted yellow. A 3-foot by 3-foot, sloped concrete pad approximately 4 inches thick will be constructed around each protective steel casing. The pad will contain a 3-inch diameter brass cap stamped with the well identification number. Three, 4-inch diameter concrete-filled, steel guard posts (also painted yellow) will be placed around the pad, equidistant from the well. The guard posts will extend 2.5 feet above, and at least 2 feet bgs.

6.3 Well Development

Well development will be initiated after at least 48 hours following final grout placement. Each well will be developed for approximately 4 to 8 hours, and will consist of pumping, surge-block, swabbing, and bailing techniques. During development, the groundwater field parameters (pH, specific conductivity, temperature, and turbidity) will be monitored, and development will continue until parameters have stabilized. All development water will be contained in drums and will not be allowed to discharge to the ground surface. All waste will be disposed of according to applicable State and Federal regulations and in accordance with the site-specific WMP. The method of development, the volume of water added or removed, the parameters measured, the results of the measurements, and the time these activities take place will be documented on

field forms. If addition of water is necessary during development of a low yielding well, then only potable water will be used.

During well development, a minimum of five well-bore volumes of groundwater will be removed. One well-bore volume is calculated as the interior casing volume using the saturated screen interval, plus the estimated porosity of the corresponding saturated filter pack. After the minimum volume has been removed, development will continue until representative groundwater is obtained using a flow cell and field instruments. Representative water is assumed to be obtained when pH, temperature, and specific conductivity readings stabilize (less than 10 percent variability over three consecutive well bore volumes) and the water is visually clear of suspended solids with a target turbidity of less than 5 Nephelometric Turbidity Units.

6.4 Phased Well Installation

Because the downgradient extent of the nitrate plume is not known, a phased well installation process will be used. The potential framework for the phased approach is described below and will be finalized based on discussions with the DC.

1. Drill, install, and develop monitoring well D, determine tentative well elevation with SNL/NM Global Positioning System (accuracy of ± 5.0 feet).
2. Move drill rig and crew to location of next well (A, B or C).
3. While the second well is being installed, a) sample groundwater at well D and analyze for nitrate plus nitrite by U.S. Environmental Protection Agency Method 353.2, b) plot potentiometric surface using newly determined groundwater elevation at well D.
4. Based on groundwater analytical results from well D (compare constituents of concern to drinking water standards), determine if downgradient well E is required. If so, install well E approximately 500 feet downgradient.
5. If the groundwater analytical results (from off-site laboratory) from well D are below drinking water standards, only three more wells (A through C) will be installed.
6. Based on groundwater analytical results from contingency well E (compare constituents of concern to drinking water standards), sequentially determine if downgradient wells F, G, or H are required. If so, determine the potentiometric surface and install each well sequentially approximately 500 feet downgradient from each other.

6.5 Groundwater Monitoring

The four and up to eight new monitoring wells will be incorporated into the BSG AOC groundwater monitoring program as they come on-line. Groundwater elevations will be measured quarterly for preparation of hydrographs and potentiometric surface maps. Geochemical samples will be monitored for the same historical parameters and frequency to match the existing program (SNL/NM June 2018) and include the following:

Analyte	Analytical Method	Frequency
DRO	SW846-8015D	Semiannual
GRO	SW846-8015A/B	Semiannual
NPN	EPA 353.2	Semiannual
Perchlorate [a]	EPA 314.0	Quarterly

NOTES:

[a] In compliance with the Consent Order (NMED April 2014), perchlorate analysis will be performed for a minimum of four quarters.

DRO = Diesel range organics.
EPA = U.S. Environmental Protection Agency
GRO = Gasoline range organics.
NPN = Nitrate plus nitrate (reported as nitrogen).

Additional samples will be collected to supplement the waste management process and may include volatile organic compounds, high explosives, major anions, metals, and radiological screening parameters.

7.0 WELL SURVEYING

The new monitoring wells will be surveyed relative to North American Datum of 1983 (NAD 83), and elevations surveyed relative to North American Vertical Datum of 1988 (NAVD 88). Survey data will include northings, eastings, and elevations to the nearest 0.01 feet. Survey elevations will be established at top-of-casing and ground surface, with a permanent marker indicating the point of survey. A licensed New Mexico professional surveyor will complete and certify the well survey.

8.0 RECORDS MANAGEMENT AND REPORTING

Based on the requirements established by the NMED HWB, NMOSE, and SNL/NM procedures, the field activities associated with installation of the monitoring wells will be documented

accordingly. The well installation field activities will be documented in a field log book per guidance in SNL/NM Field Operating Procedures. A Monitoring Well Installation Report will be prepared and submitted to the NMED HWB within 90 days upon completion of all well installation and development activities (including contingency wells). The report will document all site activities and provide the final as-built well completion diagram developed from the Groundwater Monitoring Well Data Sheet (Attachment 1). The report will contain a narrative describing work performed at the site and any variances to the site-specific Work Plan. Information to be contained in the report includes: (1) daily field activity notes, (2) all materials used, (3) final as-built well completion diagrams, and (4) notification of the SNL/NM geographic information system group and the appropriate regulatory agencies (NMED HWB and NMOSE).

The documentation will also include the 37 information elements required in Section VIII.D of the Consent Order (NMED April 2004). The following list of documents and records that are generated will be provided to the SNL/NM well file coordinator who, in turn, will submit them to the SNL/NM Customer-Funded Records Center:

- Well file contents checklist.
- Well Installation Work Plan with NMED HWB approval.
- Well Registry Data Sheet.
- Statement of Work for drilling the well.
- Drilling permit from NMOSE.
- Lithologic (boring) log.
- Well construction diagram and completion parameters.
- Well development data and groundwater parameters.
- Copies of field logbook.
- Survey plat containing elevations and locations in New Mexico State Plane coordinates (with an accuracy of ± 0.01 foot) from a New Mexico-licensed surveyor.
- Location map.
- Water level measurements.
- Waste management documentation.
- Photographs and video log.

9.0 SCHEDULE

Initiation of field work is dependent upon approval from NMED HWB of this Work Plan. However, pre-field activities will commence prior to NMED HWB approval to expedite the installation schedule but will not be completed until approval is received. The monitoring wells will be installed as soon as possible after NMED HWB's approval of the Work Plan. For planning purposes, the well installation field work is notionally scheduled to start in August 2019. Per the requirements of the Consent Order (NMED April 2004), DOE/NTESS personnel will notify the NMED HWB in writing, by e-mail, or by fax a minimum of 15 days prior to commencing field work. The Monitoring Well Installation Report will be submitted within three months after completion and surveying of the wells.

10.0 REFERENCES

New Mexico Environment Department (NMED), April 2004. "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order," New Mexico Environment Department, Santa Fe, New Mexico.

New Mexico Environment Department (NMED), June 2018. "Disapproval: Recommendations for Additional Characterization Activities at the Burn Site Groundwater Area of Concern (AOC), June 2018, Sandia National Laboratories [sic], EPA ID#NM5890110518, HWB-SNL-07-015," Letter to J.P Harrell (DOE/NNSA/SFO) and R.O. Griffith (SNL/NM) from J.K. Kieling, New Mexico Environment Department – Hazardous Waste Bureau, Santa Fe, New Mexico, June 29.

New Mexico Office of the State Engineer (NMOSE), August 2005. "Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells," New Mexico Office of the State Engineer, Santa Fe, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2018. "Annual Groundwater Monitoring Report, Calendar Year 2017," Sandia National Laboratories, Albuquerque, New Mexico, SAND2018-5930 R, 565 pp.

Attachment 1.
Groundwater Monitoring Well Data Sheet

Well Data for _____
Location/SWMU _____ Sandia National Laboratories/New Mexico

Items Required by the Order[a] Section VIII.D	Comments
1. Well name/number	
2. Date of well construction	Installation completed on -- Development completed on --
3. Drilling method	
4. Drilling contractor and name of driller	
5. Borehole diameter and well casing diameter	Borehole:
	Well casing:
6. Well depth	
7. Casing length	
8. Casing materials	
9. Casing and screen joint type	
10. Screened interval(s)	
11. Screen materials	
12. Screen slot size and design	
13. Filter pack material and gradation	Primary:
	Secondary:
14. Filter pack volume (calculated and actual)[b]	Calculated:
	Actual:
15. Filter pack placement method	
16. Filter pack interval(s)	Primary:
	Secondary:
17. Annular sealant composition	
18. Annular sealant placement method	
19. Annular sealant volume (calculated and actual)	Calculated:
	Actual: Chips:
20. Annular sealant interval(s)	
21. Surface sealant composition	
22. Surface seal placement method	
23. Surface sealant volume (calculated and actual)	Calculated:
	Actual:
24. Surface sealant interval	
25. Surface seal and well apron design and construction	
26. Well development procedure and turbidity measurements	

SNL/NM Well Installation Table (concluded)

Items Required by the Order[a] Section VIII.D	Comments
27. Well development purge volume(s) and stabilization parameter measurements	
28. Type and design and construction of protective casing	
29. Well cap and lock	
30. Ground surface elevation	
31. Survey reference point elevation on well casing	
32. Top of monitoring well casing elevation	
33. Top of protective steel casing elevation	
34. Name of geologist	
35. Initial water level	
36. Final water level	
37. Date of well development	

[a]New Mexico Environment Department, April 2004. "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act," § 74-4-10, New Mexico Environment Department, Santa Fe, New Mexico.

[b]Filter pack volume is defined as the total volume of the primary sand pack placed in annulus adjacent to the well casing, screen, sump, and if applicable below the sump.

amsl = above mean sea level.
bgs = below ground surface.
cfm = cubic feet per minute
ft = foot (feet).
ft^3 = cubic foot (feet).
ID = inside diameter.
MW = monitoring well.
OD = outside diameter.
psi = pounds per square inch
PVC = polyvinyl chloride.
SWMU = Solid Waste Management Unit