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DRILLING PLAN FOR REGIONAL AQUIFER WELL R-46

Los Alamos
NATIONAL LABORATORY
EST. 1943

31446

Prepared by TPMC for the Environmental Programs Directorate

Drilling Plan for Regional Aquifer Well R-46

December 2008

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ACRONYM LIST

APS	Accelerator Porosity Sonde
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BMP	Best management practices
CD	Compact disc
CMR	Combinable Magnetic Resonance
DOE	Department of Energy
EES	Earth & Environment Science Division
EP-WSP	Environmental Programs Water Stewardship Program
ER-SOP	Environment and Remediation Standard Operating Procedure
ES&H	Environment, Safety and Health
FMI	Formation Microimager
ft	Feet
FTL	Field Team Leader
FOD	Facility Operations Director
gal	Gallons
gpm	Gallons per minute
HP	Horsepower
ID	Inside diameter
IDW	Investigation Derived Waste
in	inch
IWD	Integrated Work Document
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security
MDA	Material Disposal Area
M&O	Management and Operations
NMED	New Mexico Environment Department
NTU	Nephelometric turbidity units
OD	Outside diameter
OM	Operations Manager
PIC	Person in charge
PM	Project manager
ppm	Parts per million
PR-ID	Project Review and Requirements Identification
PVC	Polyvinyl chloride
RCT	Radiological control technician

RP-1/ RP-3	Radiological protection group(s)
SMO	Sample management office
SOM	Shift Operations Manager
SOW	Statement of Work
STR	Subcontract Technical Representative
SWPPP	Storm Water Pollution Prevention Plan
TD	Total Depth
TOC	Total organic carbon
TPMC	TerranearPMC
WCSF	Waste Characterization Strategy Form

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1.0 INTRODUCTION

1.1 Background

TerranearPMC has been contracted to install a regional aquifer monitoring well by Los Alamos National Security (LANS) Environmental Directorate (EP) Water Stewardship Project (WSP). The regional aquifer well (designated as R-46) will be located at the head of Ten Site Canyon within Los Alamos National Laboratory (LANL) Technical Area (TA) 50 in Los Alamos County, New Mexico (Figure 1). All work will be performed under the statement of work (SOW) and in accordance with the Compliance Order on Consent (2005) between the New Mexico Environment Department (NMED) and the United States Department of Energy (DOE)/LANL, and the Drilling Work Plan for Regional Monitoring Well near Material Disposal Area (MDA) C (LA-UR-07-8369).

Regional aquifer monitoring well R-46 will be installed as part of the Environmental Programs-Water Stewardship Program. The R-46 well will be installed at a depth of approximately 1420 (ft) below ground surface (bgs). The screen interval will be located either within the Puye Formation or in pumiceous deposits below the Puye Formation.

R-46 will be drilled 100-ft into the regional aquifer and will be a single screen completion. The screen interval for R-46 will be installed in the uppermost transmissive zone within the Puye Formation or in pumiceous deposits below the Puye Formation. Well screen length will be determined based on conditions found during drilling and geophysical logging.

This Drilling Plan provides guidance for drilling, sampling, borehole geophysics, well installation, well development, sampling system installation, and site restoration activities. Project staff, health and safety, waste management, security, schedules, and required permits are also discussed in this document.

1.2 Objectives

The R-46 monitoring well is intended to provide hydrogeologic and groundwater quality data to achieve specific data quality objectives consistent with the Groundwater Protection Program for the Laboratory and the Compliance Order on Consent (March 2005) and the NMED approved workplan. Specifically, this new well is intended to ensure that adequate monitoring is in place for the corrective measures evaluation (CME) for MDA C. This well will provide downgradient detection monitoring for MDA C.

Secondary objectives are to collect drill-cutting samples, borehole geophysical data, and sample potential perched groundwater zones, if present.

The end-users of the data collected from this project will be LANL, DOE, NMED, and the general public.

2.0 ORGANIZATIONAL STRUCTURE

This project is being performed for LANS. The LANL Environmental Programs-Water Stewardship Program (EP-WSP) Drilling Subcontract Technical Representative (STR) will assist with obtaining the necessary LANL-required permits and assist with scheduling and logistical issues.

An organizational chart is presented in Table 1.

2.1 TerranearPMC Project Management Team

The TerranearPMC Management Team consists of the Program Manager, Project Manager (PM), Drilling Superintendent, Environment, Safety and Health (ES&H) Representative, and Quality Assurance (QA) Manager. The Management Team will review all task order work plans, ensure compliance with QA, ES&H plans, and perform project audits of ongoing work.

The Management Team will also provide technical assistance to the Field Team. In addition, they will provide health and safety oversight and quality control guidance for well-construction and procedure compliance.

The ES&H Representative will provide health and safety related technical assistance and senior review of all project specific safety plans. He will also conduct daily project site safety inspections. The TPMC and LANS Management Team key personnel and their respective roles are detailed in Table 2.

2.2 Field Team

TerranearPMC's field team personnel and their respective roles are shown in Table 2. Additional qualified staff may be added as necessary to ensure all project requirements are met. These staff will be identified and their roles assigned before work begins.

During the drilling operations, there will be two onsite TerranearPMC personnel. One geologist will be onsite full time as the Field Team Leader (FTL) and lead site geologist. The other TerranearPMC team member will assist the geologist as needed. The field geologists will maintain field notes detailing daily site activities, compile and submit daily field reports, document down-hole tools, collect samples, conduct lithologic logging, document wastes generated, and conduct daily safety meetings and equipment inspections. The FTL will be the main point of contact at the site.

Field operations will run 24-hours a day, seven days per week and shifts will be 12-hours per day throughout the duration of the project. Shift changes will occur at 0630 and 1830 hours. TerranearPMC staff will rotate shifts on a regular basis. TerranearPMC field team members will be interchangeable and their exact scheduling is expected to be flexible.

2.3 Drilling Subcontractor

Boart Longyear will be the drilling subcontractor supporting the drilling, well installation, and development of R-46. The drilling subcontractor will be responsible for site safety, consistent and adequate sample recovery, ensuring that equipment is appropriate for the goals of the drilling project and in proper working order, and that daily drilling logs are maintained.

The Boart Longyear drilling staff will rotate on a 14-day schedule. Continuous 24-hour per day operations will require three crews. Two crews will start the job and will work 14 consecutive days before the relief crew arrives. The relief crew will work 14 consecutive days, giving the start-up crews each 7-day breaks. In this fashion, the crews will likely rotate day and night shifts continuously. One of the start-up crews will work a 21-day shift at the beginning of operations.

3.0 FIELD ACTIVITIES

Field activities will include well drilling, sample collection, down-hole geophysical characterization, well installation, well development, aquifer testing, permanent sampling system installation, surface completion, and site restoration. The Drilling Work Plan for Regional Monitoring Well near MDA C (LA-UR-07-8369) will be used to guide field operations and ensure all objectives are met. A tentative schedule for project field activities is presented in Table 3.

3.1 Well Drilling

Drilling equipment and supplies for the completion of the project will be staged around the work site in an organized and secure manner. Surplus and/or inactive equipment and supplies may be stored at the LANL drilling project laydown yard located at the northwest corner of Pajarito Road and New Mexico State Road 4. Access to the laydown yard is through a locked gate. The FTL will control the gate key.

3.1.1 Mobilization

Mobilization will consist of transporting and setting up equipment at the location. Mobilization will include the following:

- Mobilize drill rig, trailers, support vehicles, drilling tools and materials, and well construction materials to the drill site.
- Stage alternative drilling tools and construction materials at the laydown yard.
- Entrance radiological screening of all equipment and tooling by RP-1.
- Set up drill rig, trailers, support vehicles and tools at the location.
- Review scope of work and project-specific health and safety issues with crew.
- Complete all required training for all personnel.
- Obtain Facility Operations Director (FOD) Work Authorization, including rig inspection and Integrated Work Document (IWD) review.

The R-46 site will be accessed on Puye Road just off of Pajarito Road.

3.1.2 Drilling Methods

The borehole for R-46 will be drilled using a Foremost DR-24 HD drill rig. Specifications for this machine may be found at Foremost's website (http://www.foremostmobile.com/index.php). The potential presence of intermediate-depth groundwater (potentially present above or within the dacitic lavas of the Puye Formation) and the condition of the dacitic lavas will impact drilling method choices for the R-46 borehole.

The primary drilling methods will be conventional dual-rotary casing-advance and open-hole drilling. Several different sizes of casing will be available. The casing diameters will be sufficient to allow smaller casing to telescope through larger casing with the smallest diameter casing allowing a minimum 2-in annular filter pack thickness. All casings will be standard wall, A53 grade B welded casing and the anticipated sizes for R-46 are 18-in, 16-in, and 12-in.

Figure 2 illustrates the predicted stratigraphy and proposed well design for R-46. The discussion of drilling methods that follows refers to the stratigraphic contacts shown in Figure 2.

A retractable 18-in casing will be advanced with fluid-assisted air-rotary methods into and potentially through the Tschirege member of the Bandelier Tuff to an estimated depth of 300 ft bgs. A retractable 16-in casing will then be advanced with fluid-assisted air-rotary methods through any remaining Tschirege member of the Bandelier Tuff, the Cerro Toledo Interval, the Otowi member of the Bandelier Tuff, the Guaje Pumice Bed, and any underlying Puye Formation sediments to the top of the dacitic lavas at an estimated depth of 640 ft bgs. Observations of potential perched water on top of the dacitic lavas will be made upon landing the 16-in casing on the dacitic lava unit.

A 15-in open borehole will then be advanced with fluid-assisted air-rotary methods and down-hole hammer through the dacitic lavas (an estimated minimum depth of 970 ft bgs). Drilling conditions in the dacitic lavas at the R-46 location are uncertain. Previous boreholes indicate competent drilling conditions, but intervals containing cinders, sediments, and thin lava flows could be encountered. The primary strategy for managing unstable borehole conditions will be to advance the open borehole as far as possible, cement problematic intervals, and then redrill the cemented interval(s). Similarly, if perched groundwater is present within the lavas, the primary strategy will be to cement the perched interval in order to seal the borehole and redrill the cemented interval.

The total depth (TD) of the borehole is dependent upon the depth of the top of the regional aquifer as the borehole will be advanced 100-ft into the regional aquifer. Drilling conditions and requirements in the Puye Formation sediments will be evaluated when the formation is encountered. It is anticipated that a 15-in open hole will be established through the entire dacitic lava sequence and will extend some depth into the Puye sediments. Then 12-in casing and dual rotary methods will be used to reach TD. It is possible, given the projected TD of R-46, that 12-in casing may not reach the entire depth to TD. If that should be the case, 10-in casing will be available and will be employed to reach TD.

All casing strings installed in the R-46 borehole will use welded drive shoes on the bottom of the string to protect the leading edge of the casing and to assist in cutting the borehole. The drive shoes will be cut off the casing strings using a pneumatic casing cutter on drill rods before casing extraction. Larger casing strings and the attached drive shoes will be cut prior to installing smaller casing strings. Short sections of each string of casing and the attached drive shoes will remain in the borehole and will be isolated in bentonite during well construction.

The DR24-HD drill rig will move off the R-46 borehole after the deepest casing drive shoe has been cut. All well construction, development, and similar activities will be carried out by a work-over (pump hoist) rig.

3.1.3 Proposed Alternative Drilling Methods

Drilling conditions may require converting to alternative methods. Consultation with the LANL STR will precede any deviations from the above referenced drilling methods. Conventional dual-rotary and casing advance will be the primary drilling methods employed at the R-46 borehole.

3.1.4 Drilling Additives

Potable water from a municipal source will be used to cool the drilling tools, help evacuate cuttings from the borehole and suppress dust from the discharge of dry returns. Filtered compressed air will be the primary circulation ‘fluid’ for returning cuttings to the surface. Drilling foam will be used as needed and will be terminated approximately 100 ft above the top of the regional aquifer. Descriptions of potential drilling foaming agents are as follows.

- AQF-2®: Added at a rate of 0.5 to 2.0% by volume. AQF-2 is an anionic surfactant that is added to fresh water for air/foam, air/gel-foam, or mist drilling applications. AQF-2 is the newest foaming agent in the Baroid line and is the preferred foaming agent for environmental drilling applications.
- Quik Foam®: Added at a rate of 0.5 to 1.0% by volume. Quik Foam provides the surfactant necessary for foam formation.

Portland Type I/II cement with either no aggregate or a small amount of sand may be used for sealing perched groundwater intervals or managing unstable borehole conditions in the dacitic lavas of the Puye Formation. Hydrated bentonite chips may be used for sealing perched groundwater intervals within 100-ft of the predicted top of the regional aquifer.

3.1.5 Decontamination

Decontamination of the drill rig and tools will be performed by hot water/steam pressure washing before arriving onsite prior to the start of drilling activities and before leaving the site. Decontamination water will be containerized in 55-gallon drums, properly labeled and stored onsite. Decontamination of sample tools will be performed with a wire brush followed by spraying with Fantastik® and wiping clean with paper towels. Bailers will be washed with LiquiNox® detergent and potable water and rinsed with deionized water prior to sample collection.

3.1.6 Demobilization

Demobilization activities will include:

- Final decontamination and screening for radioactivity by RP-1 of the drill rig, tools, and support equipment.
- Loading and removal of the drilling tools, including alternative tools, from the site.
- Removal of the drill rig and support vehicles from the site.
- Staging and securing of investigation derived wastes (IDW) for future disposition.
- Removal of municipal waste (e.g. materials packaging).
- Final site cleanup.

The LANL STR will inspect the site prior to final demobilization of the drill crew. Final demobilization of the drill crew will not be permitted until the condition of the site is acceptable to the STR.

3.2 Groundwater Detection

The primary indicator for perched water will be driller’s observations. If the driller notes any indication of groundwater, drilling will stop, the drilling tools will be removed from the borehole and the presence of water will be verified using a water level meter. Alternatively, if the drill tools employed allow, the presence of water may be verified through the tooling without removal from the borehole. If water exists in the borehole the tools will either be pulled from the borehole or remain out of the hole to allow the field team to check for accumulation of water in the borehole and collect a sample for analysis.

3.3 Sample Collection Procedures

All samples will be collect by the TPMC field team and transported to the SMO and/or EES-14 laboratory, as appropriate. A ‘samples collected’ table will be maintained electronically and submitted to the STR at the conclusion of each phase of the project.

3.3.1 Groundwater Screening and Groundwater Characterization Sample Collection

Sample collection and handling procedures will be conducted in accordance with TPMC procedures equivalent to ENV-DO-306, SOP-01.03, and SOP-01.04 (LANL 2001b, LANL 2000, LANL 2002). See Table 4 for analytical suites, container size, and preservation.

Groundwater screening samples will be collected if significant perched groundwater is encountered, at 20-ft. intervals within the regional aquifer, and from the well screen interval at the end of well development. Screening samples will be analyzed for dissolved cations/metals and anions by the LANL Earth and Environmental Sciences Division (Group EES-14) chemistry laboratory.

Groundwater characterization samples will be collected from the completed well between 10 and 60 days after well development in accordance with the Consent Order. The samples will be analyzed for the full suite of constituents including: radioactive elements, metals/cations, general inorganic chemicals, volatile and semi-volatile organic compounds, and stable isotopes of hydrogen, nitrogen, and oxygen. This sampling event will be performed by others and is not a part of this drilling plan.

3.3.2 Cuttings Samples

Cuttings will be collected from the discharge line at 5-ft intervals. The cuttings will be examined to determine lithologic characteristics and will be used to prepare lithologic logs. Portions of the cuttings will be wet sieved (using #10 and #35 mesh) and placed in chip trays along with unsieved cuttings. The sieved fractions in chip trays will be submitted to the LANL archive. Lost circulation zones with no cuttings returns will be indicated by empty chip trays and cuttings-loss markers (core boxes) labeled ‘no returns’. The remaining bulk cuttings will be sealed in Ziploc® bags, labeled, and archived in core boxes. The core boxes and chip trays will be delivered to the LANL archive at the conclusion of drilling activities. A summary of cuttings sampling is presented in Table 5.

3.4 Down-Hole Geophysics

The R-46 borehole may be logged with LANL-owned geophysical tools as requested during drilling. It is anticipated that LANL geophysical runs will be coordinated with specific drilling targets (e.g. upon reaching TD or before hanging a casing string in an open portion of the borehole). Additionally, the LANL-owned down-hole video camera may be used to evaluate and remedy adverse conditions.

Subcontract geophysical logging may be performed in the R-46 borehole by Schlumberger Water Services. If requested, Schlumberger will log the entire borehole after TD is reached. The following cased-hole Schlumberger geophysical suite may be run in the R-46 borehole:

- Natural and Spectral Gamma Logs
- Elemental Capture Sonde (ECS)

- Accelerator Porosity Sonde (APS)
- Triple Litho Density

In the event that the borehole is open, the following open-hole Schlumberger geophysical suite will be performed:

- Natural and Spectral Gamma Logs
- Accelerator Porosity Sonde (APS)
- Formation Microimager (FMI); can only be operated below the water table
- Array Induction
- Combinable Magnetic Resonance (CMR)

The logs will be used to characterize the hydraulic properties of saturated rocks within the regional aquifer and to help select the well screen interval. The geophysical logging operation will consist of one mobilization after reaching the total depth for R-46. Personnel from RP-3 will perform radiological screening and documentation of Schlumberger's down-hole radioactive source tool(s) upon arrival and prior to departure. If logging is conducted in an open hole, no radioactive sources will be used, however, RP-3 will be notified. A TPMC field crewmember will be present during logging operations to oversee logging runs and calibration checks.

Schlumberger will process the geophysical logs and provide a preliminary interpretation within 24 hours of completion. Five copies of the raw field geophysical logs and a compact disc (CD) containing the field logs (in .las format) will be provided to LANL immediately after completion of logging. Final logs, electronic files, and montages will be provided in the well completion report.

The drilling subcontractor shall assist in hanging a sheave from the rig mast or tophead for wireline access to the borehole during all geophysical logging operations.

3.5 Well Installation and Completion

One well screen (approximate length of 20-ft) will be placed in the most productive interval identified within the upper 100 ft of the regional aquifer. Data from screening samples and the lithologic, geophysical, and video logs will be used to determine the exact placement of the screened interval of the well. The well will be designed in accordance with TPMC's procedure equivalent to LANL ER SOP-05.01. LANL will provide an approved well design to TPMC prior to the start of well installation. Final well design will be based on data review and discussions between TPMC, EP-WSP, DOE and NMED.

The total well screen length and well construction details will be based upon site-specific conditions and will be approved by the LANL STR in writing before the start of well construction. NMED will approve the design prior to well construction.

3.5.1 Well Construction

The well will be constructed of 5.0-in. inside diameter (ID)/ 5.56-in outside diameter (OD), type A304, stainless steel casing fabricated to ASTM A312 standards provided by LANS. The screened interval of the well will consist of nominal 11-ft length(s) of 5.3-in OD, 0.020-in slot, rod-based wire wrapped well screen. Each well screen segment has an effective screen length of 10 ft. Stainless-steel casing will be installed below the bottom-most well screen to provide up to a 20 ft sump with a threaded end cap. External couplings, also of type A304 stainless steel fabricated to ASTM A312 standards, will be used to connect individual casing and screen joints. All well screen and casing will be thoroughly washed/ decontaminated before use and wrapped in plastic if staged after washing. Centralizers will be placed immediately above and below the well screen. A secure cap will be welded or threaded onto the top of the well casing to prevent backfill materials from entering the well during construction.

A tremie pipe will be used during well construction to gravity feed the annular fill materials below the regional aquifer water table. The bottom of the borehole will be tagged at the beginning of well installation and bentonite chips will be placed from the bottom of the borehole to within 5 ft of the bottom of the screened interval. The well shall be supported from the top at all times during construction.

The primary filter pack of the screened interval will consist of 10/20 sand and will be placed approximately 5 ft above and below the screened interval. The primary filter pack material and interval will be based on site-specific data. After placement, the screened interval will be swabbed to promote settling and compaction of the primary filter pack. A two to five foot thick collar of finer-grained (20/40) sand will be placed above the primary filter pack.

A bentonite seal consisting of 100 percent bentonite chips or pellets will be placed above the fine sand collar. Potable water will be used to transport the materials down-hole.

Backfill material will consist of bentonite chips to fill the borehole annulus to within 100 ft of the ground surface. Cement with 2 to 5% bentonite, or other approved mix, will be used to fill the remainder of the borehole annulus. The depth to annular material will be measured periodically to determine that the materials are settling properly.

3.5.2 Well Development

Development of R-46 will begin no sooner than 24-hrs after the well has been cemented to ground surface. The primary objective of well development is to develop the filter pack and remove suspended sediment from the well until water turbidity is less than 5 nephelometric turbidity units (NTUs) for three consecutive samples collected at 30-minute intervals. Additional water quality parameters to be measured during development include pH, temperature, specific conductance, dissolved oxygen, and total organic carbon (TOC). If the turbidity standard is not attainable, an alternate standard of stabilization of pH, temperature, conductivity, and a TOC level of less than 2.0 parts per million (ppm) must be achieved before termination of development procedures. Water will be collected daily in 40-ml septum vials and 250-ml poly bottles and transferred to LANL Earth and Environmental Sciences Division (EES-14) laboratory for analysis. Samples will be submitted unfiltered and without preservatives.

Development of the well will begin by bailing and swabbing the screened interval and sump to remove any backfill and/or formation materials that have been introduced into the well during drilling and well construction and clean the filter pack. Bailing will continue until water clarity visibly improves.

The screened interval will be swabbed using a surge block to enhance filter pack development. The surge block will consist of a 4.75-in. OD, 1-in. thick nylon (or similar) disc attached to a weighted static rod operated on a wireline. The swabbing tool will be lowered into the well and drawn repeatedly across the screened interval for approximately 1 hour. Water turbidity will not be measured during the bailing and swabbing process.

A 4-in. diameter submersible pump with an appropriately sized pump motor will be used for the final stage of the well development. The submersible pump used during development will be a larger unit, capable of moving larger volumes (20+ gallons per minute), than the pump to be installed for the dedicated sampling system. The pump intake will be set at multiple depths within the screened interval and in the sump to remove as much suspended sediment as possible until the desired results (parameters) are achieved.

3.5.3 Sampling System Installation

A dedicated sampling system consisting of a 4-in, Grundfos® submersible pump (environmentally retrofitted with Teflon®) with a 4-in, 3-phase, 460-volt, Viton fitted Franklin® submersible motor will be installed in the well. The pump size (horsepower) will be specified after well screen interval specific capacity observations are made during well development.

All materials that contact the groundwater will be constructed of either stainless steel, Teflon, or PVC. All components of the pump column will be new. The pump column will be constructed of 1 in. threaded/coupled stainless steel pipe with check valves installed in the pipe string every 200 ft. A weep hole will be installed at the bottom of the uppermost pipe joint to protect the pump column from freezing. To measure water levels in the well, two 1-in. inside diameter (ID) schedule 80 polyvinyl chloride (PVC) pipes will be installed to sufficient depth to set a dedicated transducer below the measured static water level and to provide access for manual water level measurements. The PVC transducer tubes will be equipped with a 6-in section of 0.010 in. slot screen with a threaded end cap at the bottom of the tube. A weather-resistant pump control box will be installed next to the wellhead.

3.5.4 Surface Completion

The wellhead surface completion will include a 10-in. steel outer protective casing to protect the stainless steel monitoring well. The wellhead completion will be a ‘stick-up’ with an overall height, including riser cap, of 3-ft, 6-in. A weep-hole will be installed to prevent water build-up inside the protective casing. The top of the protective casing will be fitted with a LANL supplied tamper-proof well cover plate and will be set in a 10-ft by 10-ft by 6-in.-thick reinforced concrete pad. A brass survey monument, imprinted with well identification information, will be placed in the northwest corner of the pad. A total of four bollards, painted yellow for visibility, will be set at the outside corners of the pad to protect the well from traffic. All four bollards will be designed for easy removal to allow access to the well.

Southwest Mountain Surveys, a New Mexico licensed professional land surveyor, will survey the well location and elevation. Survey points will include: ground surface elevation near the concrete pad, the top of the brass pin in the concrete pad, the top of the well casing, and the top of the protective casing. The accuracy of the survey data will be in accordance with NMED Regulations and LANL procedure. Survey data will be supplied to the LANL STR and will also be provided in the completion report.

3.6 Investigation Derived Waste

All IDW generated during implementation of this work plan will be managed in accordance with applicable Environmental Programs–Waste and Environmental Services (EP-WES) and Environmental Protection Water Quality and Resource Conservation Recovery Group (ENV-

RCRA) standard operating procedures (SOPs). These SOPs incorporate the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, Department of Energy (DOE) orders, and Laboratory requirements. Documents applicable to the characterization and management of IDW are the following:

- EP-ERSS-SOP-5022, Characterization and Management of Environmental Restoration Project Waste (http://int.lanl.gov/environment/all/docs/qa/ep_qa/EP-ERSS-SOP-5022.pdf);
- the NMED-approved Notice of Intent (NOI) Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water; and
- the NMED-approved NOI decision Tree for IDW Solids from Construction of Wells and Boreholes.

A WCSF will be prepared in accordance with EP-ERSS-SOP-5022 and will provide more detailed information on waste descriptions, quantities, handling, and disposition.

The primary waste streams include drill cuttings, water generated during drilling, water generated during development of the well, contact waste, cement cuttings and/or concrete slurry, and decontamination water. All wastes will initially be managed as non-hazardous. The drill cuttings, drilling water, development water will be characterized with representative direct sampling and waste determinations made from validated data. The contact wastes and cement cuttings and/or concrete slurry will be characterized using acceptable knowledge of the waste materials, the methods of generation, and the levels of contamination observed in the environmental media.

Drill cuttings and drilling/development water will initially be stored in above-ground or below-ground lined pits. If analytical data show they are hazardous, they will be excavated and placed in a registered accumulation area for shipment to an authorized treatment, storage, or disposal facility (TSDF) within 90-days of containerization. The other wastes will be segregated from the cuttings and drilling/development water and containerized in appropriate containers. Waste determinations for the other wastes should be made within 70 days of the date of generation so that waste can be dispositioned within 90 days if the waste is hazardous. Based on waste determinations, the wastes will be managed in waste staging areas appropriate for the regulatory status of the waste. Waste accumulation area postings, labeling, storage duration, and inspection requirements will be based on IDW type and classification, and regulatory and Laboratory requirements.

Table 1

R-46 Project Organizational Chart

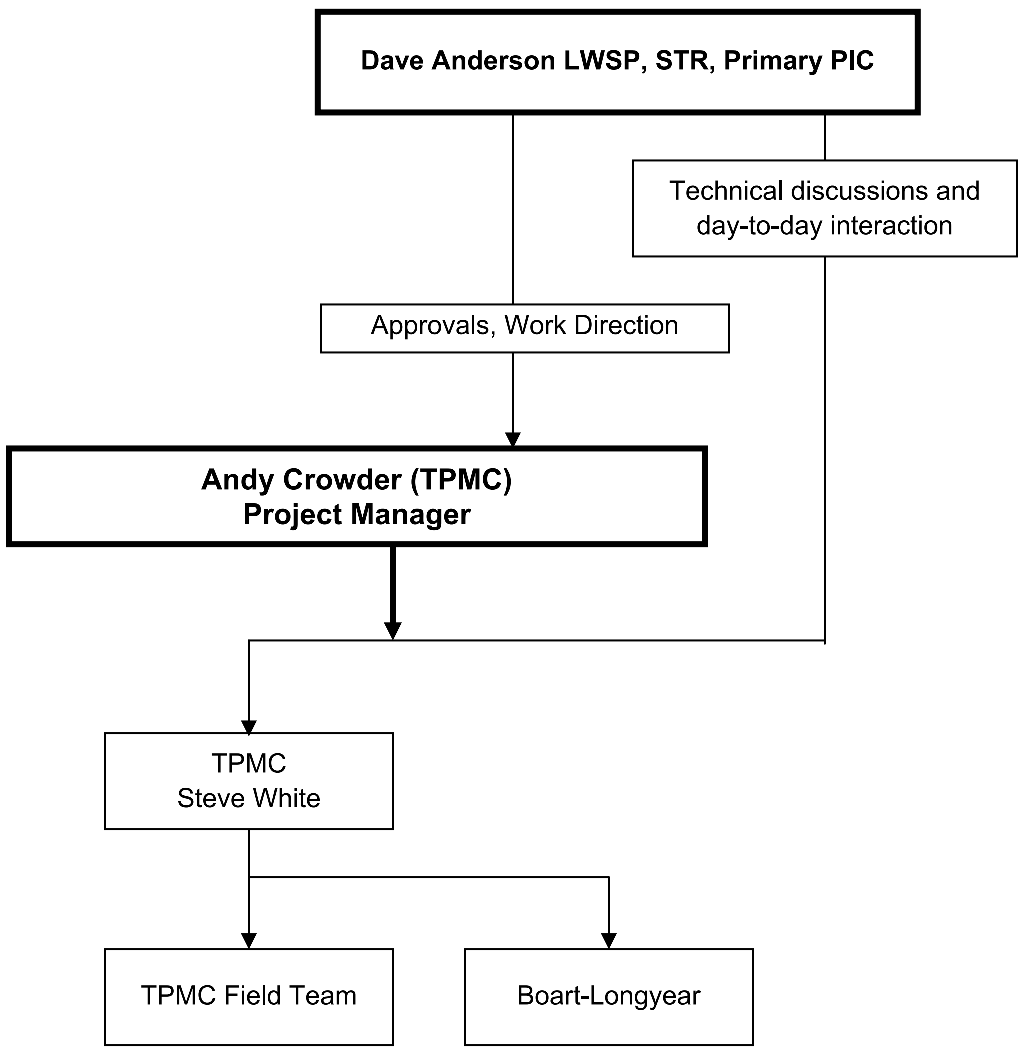

Table 2
TerranearPMC Key Team Personnel Roles and Responsibilities

Name	Role	Responsibilities
Peter Gram	Program Manager	Program Management
Andy Crowder	Project Manager, Alternate Person in Charge (PIC)	Project management, budget, resource commitments, and LANS interaction
Steve White	Drilling Superintendent, Principal Field Team Leader (FTL), Alternate PIC	Project and field management, LANS interaction, geology, and subcontractor coordination
Paul Sawyer	ES&H Representative	IWD and Health and Safety compliance
Al Whiteaker	Quality Assurance Manager	Quality assurance management oversight
Gary Stoopes	Environmental Professional	Regulatory compliance
Ryan McGuill	Field Geologist, FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Rick Lawerence	Field Geologist, FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Andy Miller	Field Geologist, FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Rich Leishman	Field Geologist, FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Pattie Baucom	Field Geologist, FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Selene Moseley	Field Waste Management Technician	Management of waste and implementation of WCSF
Marty McCoy	Boart Longyear Drilling Supervisor	Project and technical management oversight of drilling operations
David McCurdy	Boart Longyear Tool Pusher	Project and technical management oversight of drilling operations

Table 2 (Continued)
LANS Key Team Personnel Roles and Responsibilities

Name	Role	Responsibilities
Matt Riggs	LANL Water Stewardship Program (LWSP) Deputy Responsible Line Manager (RLM)	Responsible to the RLM Program Director for the overall planning, coordination, approval execution and closeout for this project.
Mike Alexander	LWSP Facility Ops Director (FOD)	Facility Operations Management/Coordination
Dave Anderson/ Robin Reynolds	LWSP, Primary Person-in-Charge (PIC), Subcontract Technical Representative (STR)	Assigned the authority and responsibility to perform the overall planning, coordination, execution and closeout for this project. Is the single Point-of-Contact for LANS and Subcontractor interaction.

Table 3
Tentative Drilling Schedule

Activity	Start Date	Date of Completion
Drill Site Preparation	Complete	Complete
Driller Mobilization	12/12/08	12/13/08
R-46 Drilling	12/13/08	1/15/09
R-46 Geophysics	1/15/09	1/16/09
R-46 Well Construction	1/17/09	2/6/09
R-46 Development	2/7/09	2/10/09
R-46 Pump Installations	TBD	TBD
IDW Analyses	TBD	TBD
Site Restoration	TBD	TBD

Notes: TBD = to be determined

Table 4
Analytical Suites, Sample Containers, Preservation, Sample Volume, and Preferred Laboratories for Groundwater collection from Well R-38

Analytical Suite	Sample Container	Filtered (0.45 micron filter)	Sample Volume (L)	Preferred Laboratory
Groundwater Screening Samples				
Metals/cations (dissolved)	poly	No	1.0	EES-14*
Anions (dissolved (including perchlorate)	poly	No	1.0	EES-14
Total Organic Carbon (TOC)	Amber glass	No	40 ml	EES-14

Notes:

*EES-14: LANL Earth and Environmental Sciences-Hydrology, Geochemistry and Geology Group.

Table 5
Sample Collection Activities for Drill Cuttings

Sample Description	Test	Sample Size	Container	Sample Frequency
Cuttings	Bulk cuttings systematically collected for archival purposes and for supplemental sample needs	500-700 ml	Plastic Ziploc™ bags	One sample every 5-ft.
Cuttings	Sieved cuttings for lithologic description and binocular microscope examination	Enough to partly fill trays	Plastic chip trays	One sample every cutting run (nominally every 5-ft.) Normally, an unseived sample, >10 mesh sample, and a >35 mesh sample every cuttings run.

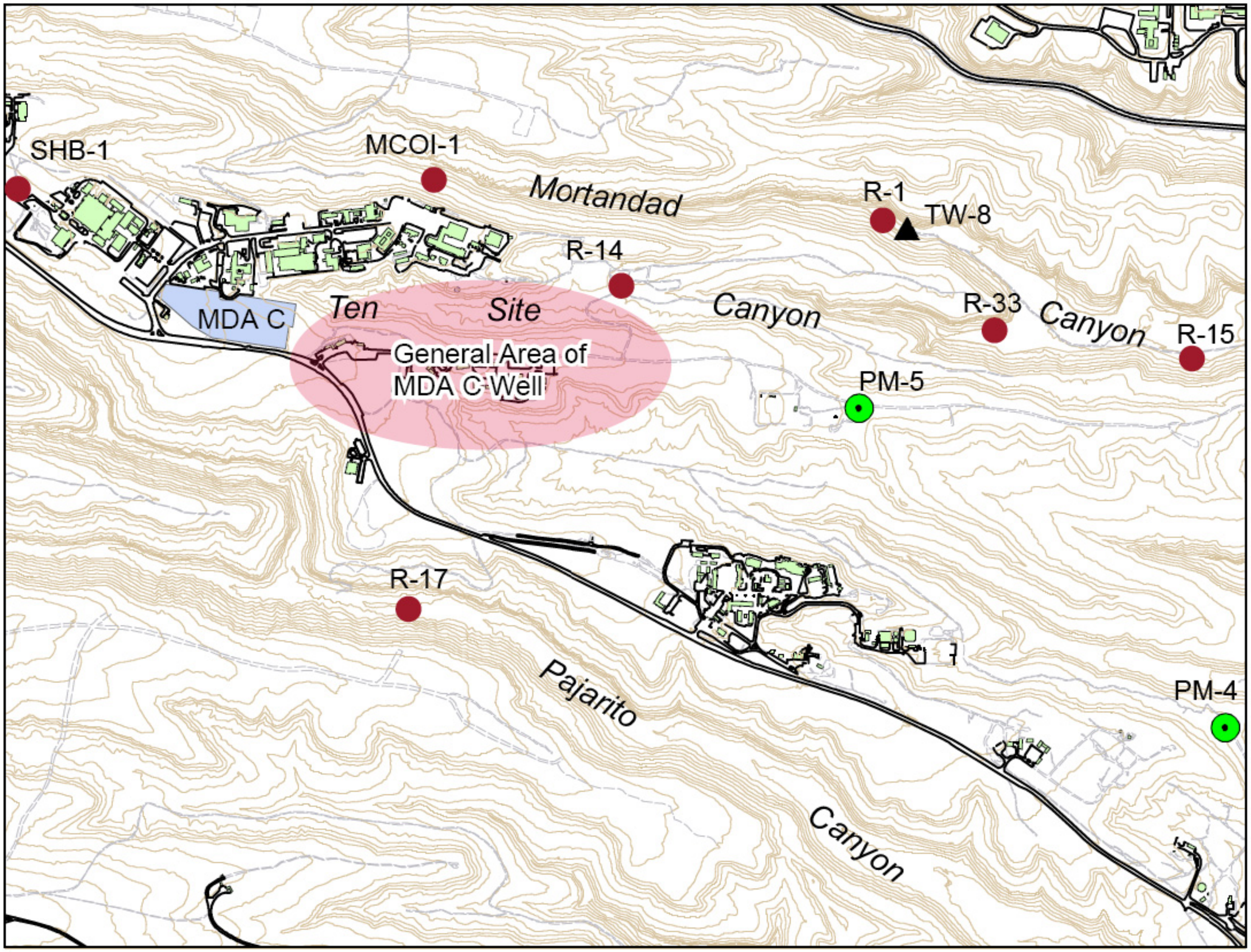

Figure 1 Proposed location of Regional Monitoring Well R-46

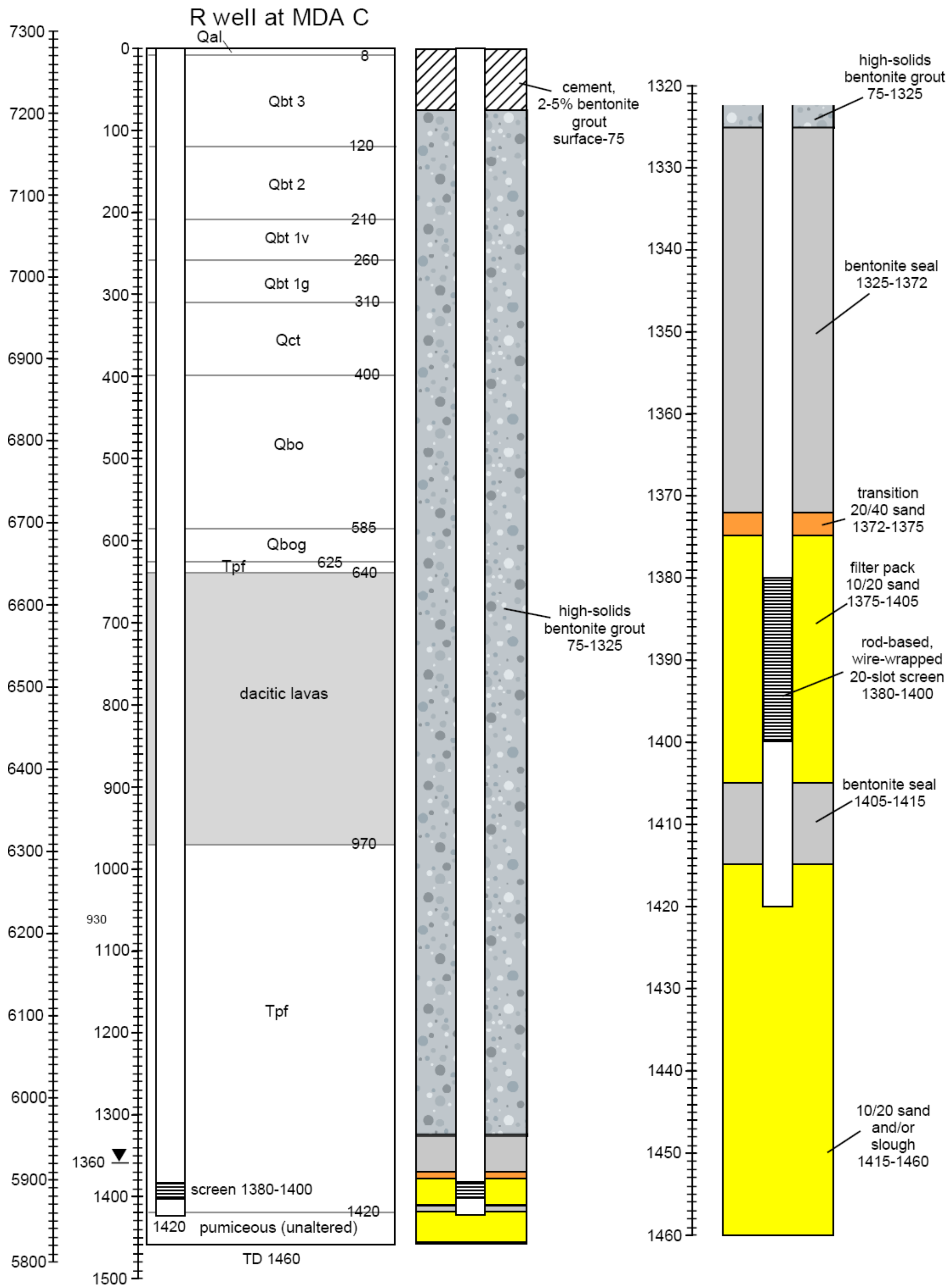

Figure 2 Predicted stratigraphy and proposed well design for Regional Monitoring Well R-46