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North Wind

Well R-51 Drill Plan

Installation of Well R-51, TA-18, Los Alamos National Laboratory

Task Order 3
In accordance with
Master Task Order Agreement 72006-000-09

Revision 0

November 13, 2009

Approved:

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REVISION HISTORY

Revision No.	Effective Date	Sections Affected	Description
0	11/13/09		Baseline document

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TABLES

FIGURES

APPENDICES

ACRONYMS

ASTM	American Society for Testing and Materials
ags	above ground surface
bgs	below ground surface
CPR	cardiopulmonary resuscitation
DOE	Department of Energy
EES-14	Earth and Environmental Sciences Division, Hydrology, Geochemistry, and Geology Group
EP	Environmental Programs
FM	Field Manager
ft	feet
HAZWOPER	Hazardous Waste Operations and Emergency Response
HE	high explosives
ID	inner diameter
IDW	investigation-derived waste
in.	inch
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
Layne	Layne Christensen Company
LWI	LANL work instruction
LWSP	Laboratory Water Stewardship Program
MDA	Material Disposal Area
mL	milliliter
NGWA	National Ground Water Association
NMED	New Mexico Environment Department
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
NWI	North Wind, Inc.
OD	outer diameter
PIC	person in charge
POC	point of contact

psi	pounds per square inch
PVC	polyvinyl chloride
RCT	Radiation Control Technician
SAP	Sampling and Analysis Plan
SAPP	sodium acid pyrophosphate
SMO	Sample Management Office
SOP	standard operating procedure
SSEHASP	Site-Specific Environmental Safety and Health Plan
SSO	Site Safety Officer
STR	Subcontract Technical Representative
SWPPP	Storm Water Pollution Prevention Plan
TA	technical area
TD	total depth
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WCSF	waste characterization strategy form

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL) Management and Operations contracted North Wind, Inc. (NWI) to manage the installation of regional aquifer Well R-51. The well is being installed to provide hydrogeology and water quality data required by the March 1, 2005, Compliance Order on Consent (Consent Order) agreed to by the New Mexico Environment Department (NMED) and the Department of Energy (DOE) for environmental remediation at LANL. NWI will complete this work for the Los Alamos National Security, LLC (LANS) Environmental Programs (EP) Directorate – Laboratory Water Stewardship Program (LWSP).

The proposed location for Well R-51 is in Pajarito Canyon, northwest of Technical Area 18 (TA-18). Well R-51 is being installed to satisfy a NMED requirement to provide water quality data from a regional aquifer monitoring well located southwest of two Material Disposal Areas (MDAs) at TA-54: MDA-H and MDA-J. Figure 1.0-1 shows the proposed location of Well R-51.

This drilling plan provides guidance for activities associated with drilling, installing, sampling, and testing the new monitoring Well R-51. The well will be drilled to a target depth of approximately 1050 feet (ft) below ground surface (bgs) in fanglomerate sediments of the Puye Formation.

The primary hydrogeologic and geochemical objective is to collect background data for the area upgradient of MDAs H and J. Local background data for regional groundwater quality upgradient of the potential releases from MDA-H and MDA-J at TA-54 are not available. These MDAs are known to have hazardous or radioactive inventory. Downgradient data that are applicable to regional aquifer Well R-17 and R-17i are lacking. Data from R-51 will provide upgradient comparisons with data from R-37 and R-52, which are both downgradient of MDA-H and MDA-J. In addition, groundwater levels in this area of the regional aquifer need to be established for water table maps.

The secondary objective is to determine whether perched-intermediate water zone(s) occur in the area downgradient of regional aquifer R-17/R17i, which is upstream of TA-18. This objective may only be addressed as borehole conditions allow, as the drilling methods will be optimized to accomplish the primary objective.

The tertiary objective is to define the hydrostratigraphy of the area by characterizing rock units that can impact contaminant flow in both the vadose and saturated zones. This objective will be determined from the drill cuttings and geophysical logs.

Perched water at R-51 could reveal contaminants from the upper Pajarito Canyon and its tributaries, where TA-9 and TA-22 are located. Contaminants from TA-9 and TA-22 include high explosive (HE) compounds, perchlorate, nitrate, and radionuclides. Groundwater analyses from the perched zone of Well R-17, located approximately 2.4 km upstream from R-51, showed little or no contamination. However, core samples from Wells R-17 and R-17i indicated tritium was present. The water samples analyzed from the regional aquifer at Well R-17 have not typically indicated significant contamination, although recent analyses detected tritium above background levels.

This drilling plan is in compliance with the scope of work set forth in Task Order 3 of Master Task Order Agreement Contract between LANS and NWI. The following sections provide an overview of the program management and operations.

1.1 Program Management and Operations

1.1.1 Project Staff

Tables 1.1-1 and 1.1-2 indicate the project roles, staff, and responsibilities for NWI project personnel and LANL project personnel, respectively. The overall project organization of the field personnel is shown on Figure 1.1-1. Additional qualified and experienced staff, both existing and new, may be added after submitting this drill plan. With approval of the LANL Subcontract Technical Representative (STR), staff will be identified and roles will be assigned prior to commencing the field work.

Project management, administration, and quality assurance oversight will be conducted out of NWI's Los Alamos, New Mexico office. The Field Manager (FM) or designee will provide oversight and will review ongoing operations as they relate to this drilling plan and will assist the drilling team with any technical, operational, or other project related issues.

During each drilling shift, a minimum of one NWI personnel will be present. The Field Geologist will have the following responsibilities:

- Maintain the field notes detailing general drill site activities;
- Compile and submit daily reports and drilling forms;
- Record down-hole tool types and lengths;
- Conduct lithologic logging;
- Conduct daily safety meetings; and,
- Inspect equipment.

The FM and/or Field Geologist will also be responsible for compliance with established health and safety documentation and will serve as the Site Safety Officer (SSO) in the absence of the project Health and Safety Officer.

A person in charge (PIC) will be designated at all times during field operations. The PIC is responsible for interaction with LANL personnel and other visitors to the site. Ordinarily, the PIC will be the FM. In the event that the FM is not present, the following person(s) will be designated and act as the PIC in this order, if the previous person is not present:

- Lead NWI Field Geologist, and
- Assistant NWI Geologist.

During an emergency situation, the following person(s) will be designated and act as the PIC in this order in the absence of on-site NWI personnel:

- Tool Pusher (i.e., Drilling Supervisor); and
- Driller.

1.1.2 Health and Safety Training

A Site-Specific Environmental Health and Safety Plan (SSEHASP) will be prepared for this site. Though not anticipated to be a hazardous waste site, all NWI personnel will be in compliance with Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements. In addition, at least two site personnel will be trained in first aid/cardiopulmonary resuscitation (CPR).

Before mobilization into the field, all staff will be trained to the following:

- EP-Wide Health and Safety Master Plan;
- SSEHASP;
- NWI EP-wide standard operating procedures (SOPs);
- Associated LANL work instructions (LWIs);
- NWI EP-wide Quality Assurance Plan;
- Operational Security Plan;
- Site-Specific security requirements (Exhibit G of the Task Order 3); and
- General field logging techniques and field operating expectations.

The FM will be responsible for monitoring adherence to the project plans and environmental safety and health requirements. Field personnel at the well site will be required to read, understand, and follow NWI-identified SOPs required to meet the scope of work.

Additionally, the following LANL training will be required for key field personnel and managers:

- LANL General Employee Training;
- TA-18 Security Plan (required for everyone who will be on-site);
- Emergency Management System Training (TP 7215);
- Annual Security Refresher;
- Integrated Work Management Overview (TP 6957);
- Substance Abuse Awareness (TP 458);
- Traffic Safety and Special Materials Convoys (TP 9311);
- EP-DIR-SOP-2011, R4, Personnel Training and Qualification;
- EP-DIR-SOP-4004, R1, Records Transmittal and Retrieval Process;
- EP-DIR-SOP-8001, R0, Inspection, Test, and Acceptance;

- EP-DIR-SOP-5006, R0, Control of Measuring and Testing Equipment; and
- Occupational Safety and Health Act 29 Code of Federal Regulations 1910.120 HAZWOPER 40-hour training. (It is a best management practice for this project. It is not a specific health and safety requirement.)

1.1.3 Security

Well R-51 is located within TA-18. While security escorts are not required, badges of all personnel will be swiped at the gate prior to them entering the well-site. In addition, site personnel will be required to sign an on-site uncleared visitors log maintained by NWI.

1.1.4 Schedule

Table 1.1-3 shows the tentative R-51 drilling schedule. Drilling is planned in two 12-hour shifts per day, with the first shift typically occurring from 0700-1900 and the second shift from 1900-0700.

1.1.5 Permits

A National Pollutant Discharge Elimination System (NPDES) Storm Water Pollution Prevention Plan (SWPPP) permit has been implemented. The SWPPP notice of intent (NOI), has been submitted to the United States Environmental Protection Agency (USEPA). Other required permits have been obtained through the LANL Permits and Requirements Identification process. The excavation permit is included in Appendix B. Copies of permits, notifications, inspection reports, and site access authorization will be maintained at the drilling site. A traffic control plan and a route map are included as Appendix C. The LANL-provided Spill Prevention Containment, Control and Countermeasures Plan is included in the SSEHASP. NWI will take over implementation of this plan because NWI plans to maintain bulk fuel storage at the drilling site.

1.1.6 New Mexico Environment Department Field Visits

When NMED personnel visit the site, the PIC will notify the STR or other LANL personnel that are listed (Table 1.1-2), if applicable, until contact has been made. Thus, LANL personnel shall maintain agency coordination.

2.0 FIELD ACTIVITIES

2.1 Site Preparation and Drilling Site Maintenance

Basic site preparation will be conducted by LANL personnel prior to drill rig and personnel mobilization. This task will include construction of access roads to provide adequate passage for transporting the drilling and support equipment to the site. Construction of the drilling pads, as well as the construction and lining of cuttings pits, will also be conducted by LANL. This task will also provide work areas for the drilling crew and the scientific/engineering personnel, and will provide adequate space for the drill rig, support equipment, and temporary storage of the investigation-derived waste (IDW).

NWI will place containment basins beneath the drill rig and support vehicles and equipment prior to commencement of drilling activities at each location. Berms will be constructed to surround the work areas to prevent run-on and run-off of precipitation from the site, in accordance with the SWPPP. NWI will install high-visibility safety fencing around drill cuttings pits that will be 6 ft away from these berms. Rope ladders and life rings will be accessible and placed near the pits.

During drilling activities, NWI will keep the drilling site and work areas safe, neat, and in orderly condition at all times. NWI will maintain temporary fencing and barricades and will be responsible for snow removal in the immediate vicinity of the drill site.

2.1.1 Radiological Screening

LANL will screen and clear the work zone and access roads prior to mobilization and site-preparation activities. A Radiation Control Technician (RCT) from the Radiation Protection 1, TA-18 RCT pool will screen and clear the drill site and all equipment prior to entry to TA-18 and prior to demobilization from LANL upon completion of work.

2.1.2 Field Office and Site Services

A trailer (or equivalent shelter) will be used as a field office. Potable water will be provided to the drill site either from a hose extending from a hydrant to the drill site or from a water truck filled at LANL fire hydrant(s) #19-484 and/or 22-058 and transported to the drill site. Figure 2.1-1 shows the water source locations near Well R-51.

2.1.3 Lay-Down Area

A primary lay-down area for all drilling contractors is provided at the northwest corner of the intersection of NM State Highway 4 and Pajarito Road. Figure 2.1-2 shows the main lay-down area for the R-51 project. In addition, a smaller, alternate lay-down yard located down canyon of the R-51 drill site will be available to provide temporary work space.

2.2 Well Drilling

Layne Christensen Company (Layne), under contract to and direct supervision of NWI, will drill the R-51 borehole. Necessary drilling equipment will be situated near the drill site in a safe and secure manner. The orientation and placement of this equipment will depend upon the physical constraints at the drilling site. Figures 2.2-1 and 2.2-2 show the site layout and dimensions.

2.2.1 Drilling

2.2.1.1 Drilling Methods

Drilling will be conducted with methods selected to optimize the potential of completing the well without the use of any drilling additives in or immediately above the target zone of saturation. The methods selected are a combination of open hole and casing-advance. Each interval of open hole or casing-advance will be optimized to meet well objectives.

The R-51 borehole will be drilled using a Schramm Inc. T130XD Rotadrill dual rotary drilling rig with casing rotator. The dual rotary system will allow for advancement of the casing with the casing rotator while drilling with conventional air/mist/foam methods with the drill string. Casing will be used to protect the open borehole intervals; to advance the borehole when open borehole drilling is not possible; and to secure the borehole through unstable zones or through significant perched groundwater intervals. In the event of occurrence of perched groundwater, perched intervals will be sealed off with cement containing $CaCl^2$, which will allow for a more rapid set-up of the cement, and will increase the likelihood of successfully sealing off perched water intervals.

The top of the regional aquifer is projected at approximately 887 ft bgs. The borehole will be advanced from ground surface to the depth where it encounters competent rock, where the surface conductor casing will then be installed to the competent rock depth. From the base of the

surface conductor, the borehole will be advanced to 787 ft bgs utilizing open borehole drilling methods with water and foam injection. Below 787 ft bgs, only potable municipal water will be injected. Below 787 ft bgs, dual rotary methods with 12-in casing advance will be utilized to advance the borehole to the projected TD. It is expected that the borehole will be underreamed in order to advance the 12-in casing. If 12-in casing advance becomes too difficult or impossible, 10-in casing will be installed to TD.

2.2.1.2 Drilling Additives

Fluids and additives that may be used to facilitate drilling are consistent with those previously used in the drilling program at LANL and have been characterized geochemically. The fluids and additives previously authorized by NMED include:

1. Potable water from the municipal water supply, which may be used to aid in the delivery of other drilling additives and to cool the drill bit;

2. QUIK-FOAM™, a blend of alcohol ethoxy sulfates, which may be used as a foaming agent; and

3. AQF-2™, an anionic surfactant, which may be used as a foaming agent.

4. Seadrill S-110™, a silicone emulsion, or Suppressor 3579™, a blend of white mineral oil and paraffin, which may be used as defoaming agents.

Complete records will be maintained detailing the type, amount, and volume of drilling fluid used; the borehole depth where the drilling fluid is added; the amount of drilling fluid in storage; and, the volume of drilling fluid recovered. No drilling fluids, except potable municipal water, will be used within 100 ft of the regional aquifer. If the regional aquifer cannot be reached without adding other drilling fluids, the situation will be discussed with LANL and NMED personnel. In addition, no other chemicals, except those listed above, will be added to the borehole without approval from LANL and NMED.

2.2.1.3 Drilling Contingencies

NWI will attempt to drill the borehole with the methods described above. However, drilling conditions may require converting to alternative drilling methods. NWI will consult with LANL before modifying the above referenced drilling methods.

Historically, borehole instability and/or the loss of drilling fluid circulation have been the most common difficult drilling conditions encountered. In preparation for this possibility, additional tooling will be stored within the Los Alamos area to expedite the change in drilling procedures. Layne will have a complete mud rotary drilling system available, if needed. The mud system will include bits, pumps, shaker table, and other tools necessary to convert to mud rotary drilling.

2.2.1.4 Dust Control

The drill rig may generate dust during dry drilling operations. Dust control will be implemented by applying potable water to the drill rig discharge line.

2.3 Coring

Core sampling is not planned for R-51.

2.4 Groundwater Detection

Methods for groundwater detection may include driller's observations, water-level measurements, borehole video, and borehole geophysics. If groundwater is encountered at any point, the presence of water will be checked using a water level meter through the drill string. LANL will be notified within 4 hours of groundwater detection if detection occurs during the day shift, and no later than 10:00 am the following morning if detection occurs during the night shift. The presence of water will be verified as necessary by LANL personnel.

Depth to water measurements will be conducted in accordance with the following NWI SOPs:

- NWI ENVP-007, Water Level Measurements, Rev. 2; and
- NWI ENVP-014, Sampling Equipment Decontamination, Rev. 1.

2.5 Sample Collection Procedures

2.5.1 Groundwater Sample Collection

Sample collection and handling activities will be conducted in accordance with the following LANL and NWI requirements and/or SOPs.

- Filtering and Chemical Preservation of Water Samples, ENV-WQH-SOP-066;
- Field Water Quality Analyses, ENV-DO-203;
- Groundwater Sampling, SOP-5232;
- Field Decontamination of Equipment, EP-ERSS-SOP-5061;
- NWI ENVP-002, Sample Handling, Packaging and Shipping, Rev. 1;
- NWI ENVP-004, Collection of Quality Control Samples, Rev. 1;
- NWI ENVP-006, Groundwater Sampling, Rev. 3;
- NWI ENVP-014, Sampling Equipment Decontamination, Rev. 1;
- NWI ENVP-021, Chain of Custody Documentation, Rev. 4; and
- NWI LWI-010, Filtering and Chemical Preservation of Water Samples, Rev. 0.

The Sampling and Analysis Plan (SAP) (Table 2.5-1) details the analyte suite, container size, and preservation for the groundwater screening samples that will be collected in the open borehole and in the completed well.

2.5.1.1 Perched Groundwater Sampling

Perched water, if present, is expected to be related to the contact between various units at a shallower depth. There is the potential for perched groundwater at three depths in R-51. Perched groundwater may be encountered at 160 ft bgs, within the Cerro Toledo Interval; at 518 ft bgs, and at the top of the Cerros del Rio basalt contact; and also at approximately 800 ft bgs, at the

base of the Cerros del Rio basalt. Perched zones will be sampled and then sealed off through the emplacement of a concrete plug, which will then be drilled out before continuing to the target depth.

2.5.1.2 Regional Groundwater Sampling

The regional groundwater is projected at 887 ft bgs, in the mid-section of the Puye Formation approximately 70 or 80 ft below the base of the Cerros del Rio basalt. Groundwater screening samples will be collected during drilling at any perched groundwater zones producing sufficient water for sampling.

Two samples will be collected at the first encounter of samplable water within the regional aquifer and at TD. These groundwater screening samples will be analyzed for metals/cations (dissolved and total) and metals/anions, including perchlorate (dissolved), by Earth and Environmental Sciences Division, Hydrology, Geochemistry, and Geology Group (EES-14). Additional analyses for high explosives, tritium, and volatile organic compounds (VOCs) will be completed.

A sample will be collected from the discharge of the pumping system usually between 10 and 60 days after well development and at the completion of aquifer testing, in accordance with the Consent Order. These samples will be analyzed for the full suite of constituents, including radiochemistry, metals/cations, general inorganic chemicals, high explosives, VOCs, and stable isotopes. If R-51 is completed as a two-screen well, the first characterization samples will be collected at the end of each constant rate pumping test through a stainless steel discharge pipe.

Samples will be analyzed for the constituents listed in the SAP (see Table 2.5-1).

Subsequent groundwater samples will be collected under the current *2009 Interim Facility-Wide Groundwater Monitoring Plan* (LANL 2009, EP2009-0143).

2.5.1.3 Groundwater Sample Handling Procedures

Groundwater samples will be kept on ice and delivered to the Sample Management Office (SMO) for processing. After processing, NWI personnel or available LANL personnel will transport the groundwater samples to EES-14 for analysis. EES-14 will provide rapid turn-around analyses for the screening analytes (see Table 2.5-1). The results of the analyses will be used to evaluate whether perched water zones should be isolated with casing before the regional aquifer is penetrated.

2.5.1.4 NMED Split Sampling

NMED personnel may perform a field visit to collect a split of the groundwater samples during drilling. The procedure for an NMED visit is as follows.

- The STR will notify NMED personnel when the drilling team encounters, or is expected to encounter, water-bearing zones.
- Once on-site, NMED personnel will sign the visitor's log.
- Due to restrictions outlined in the Health and Safety Plan, it is necessary that NMED personnel collect a split of the groundwater sample outside of the exclusion zone.

- In the case of limited groundwater volume, the appropriate LANL analyte suite outlined in Table 2.5-1 will be given priority.

2.5.2 Cuttings Sampling

Samples of cuttings generated during the drilling of R-51 will be collected from the drilling rig discharge line at 5-ft intervals. The cuttings will be examined to determine lithologic characteristics and to prepare the borehole lithologic log. Sample collection of the borehole cuttings is outlined in Table 2.5-1. The sampling will be conducted in accordance with the following NWI SOPs:

- NWI ENVP-014, Sampling Equipment Decontamination, Rev. 1;
- NWI LWI-001, Geologic Logging of Cuttings and Core, Rev. 0; and
- NWI LWI-011, Transportation and Admittance of Borehole Materials to the Field Support Facility, Rev. 0.

Portions of the cuttings will be sieved using >#10 and >#35 mesh sieves and placed in chip trays along with a sample of unsieved cuttings. Finer sieved sizes or bulk cuttings will be collected when >#10 mesh materials are absent. The remaining cuttings will be placed in Ziploc® bags (approximately 200 to 300 milliliters [mL]), labeled, and archived in core boxes. Cuttings will be screened by an RCT before being removed from the drilling site.

Zones where no cuttings are returned (e.g., zones of lost circulation) will be indicated by labeling the appropriate depths in the sample trays with “no returns.” If foam or drilling mud is used during drilling, cuttings return lag time will be recorded. Up-hole velocities will be calculated based on borehole diameter and fluid volumes used. Physical measurements of lag time may also be made by clean circulating the borehole, drilling a 6-in. interval, and measuring the up-hole travel time.

2.6 Down-Hole Geophysics

As conditions allow, LANL’s borehole video camera, natural gamma, and induction tools will be used to view and test the 15-in. diameter, open borehole prior to lowering the 12-in. well casing.

If open borehole conditions exist, the following geophysical logs may be conducted by LANL’s contractor, Schlumberger, Inc., including:

- Accelerator Porosity Sonde (Neutron Porosity),
- Array Induction,
- Combined Magnetic Resonance,
- Natural and Spectral Gamma,
- Formation Micro-Imager logs.

These logs will be used to characterize the hydrogeologic properties of rocks within the saturated zone of the regional aquifer.

After well casing is placed, a full suite of geophysical logs, collected by Schlumberger, Inc., is expected to be run in the borehole. The geophysical logs may include the following:

- Accelerator Porosity Sonde,
- Triple Lithodensity,
- Elemental Capture,
- Natural Gamma, and
- Spectral Gamma logs.

The geophysical logs will also be used to select the well screen depth. The suite and timing of geophysical logging will depend on borehole conditions.

2.7 Well Installation and Completion

R-51 is expected to penetrate the top of regional saturation in gravels of the Puye Formation at approximately 887 ft below land surface and is tentatively designed with two 10-ft-long screens within the regional zone of saturation, as shown on Figure 2.7-1. Actual screen lengths and positions will be based on the data acquired during drilling, video logging, and geophysical logging. It is anticipated that the upper screen interval will be near the top of saturation, with a fully submerged sand pack; while the deeper screen interval will be approximately 50 ft lower, to target a highly-productive zone and thereby allowing adequate separation for placement of the Baski sampling system.

Final well design will be based on discussions between NWI, LANL, DOE, and NMED personnel.

2.7.1 Well Construction

The well casing and screen will be provided by LANL. The casing and screen will be factory-cleaned before shipment and delivery to LANL. Additional decontamination of the stainless steel components will be performed on-site prior to well construction using high pressure, heated water, if necessary. Water used during decontamination will be managed in accordance with the waste characterization strategy form (WCSF).

The well will be constructed of 5.0-in. inner diameter (ID)/5.563-in. outer diameter (OD) type A304 welded stainless steel casing fabricated to American Society for Testing and Materials (ASTM) standard A312, “Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.” A slag apron and a “witch’s hat” will be placed around the casing being welded to prevent slag and welding debris from entering the borehole or well casing. Stainless steel casing will be placed below the screen to provide a 20-ft sump (to be determined by LANL). Centralizers will be placed immediately above and below the screen. The well casing string will be suspended in the borehole during backfill and will not be allowed to rest on the bottom of the borehole at any time.

Two screened intervals will be installed in R-51 unless otherwise directed by the STR, and will be placed and constructed based on site-specific information and as determined during discussions between NWI, LANL, DOE, and NMED personnel. Each screened interval of R-51 is planned to consist of one 12-ft length of 5.563-in. OD compatible, 0.020-in. rod-based wire-wrapped well screen, giving each well screen an effective screen length of 10 ft.

A 2.5-in. OD steel tremie pipe will be used during well construction to place annular fill materials down-hole. The bottom of the borehole will be tagged prior to well installation and approximately 30 ft of bentonite chips will be placed in the bottom of the borehole around the sump, to within 5 ft of the bottom of the screen. Potable water will be used to transport the bentonite chips down-hole.

The lower primary filter pack will consist of 10/20 (coarser) sand and will be placed on top of the lower bentonite seal to approximately 5 ft above the top of the screen. The actual primary filter pack interval will be based on site-specific conditions. After placement, the screened interval will be swabbed to promote settling and compaction of the primary filter pack. A 2-ft-thick transition zone of 20/40 (finer) sand will be placed above the primary filter pack.

Bentonite chips will be placed on top of the fine sand collar to 5 ft below the upper screen. The bentonite seal will be allowed to hydrate for at least 4 hours prior to emplacement of the upper primary filter pack, which will consist of 10/20 sand and will be placed on top of the bentonite seal to approximately 5 ft above the top of the screen. The actual upper primary filter pack interval will be based on site-specific conditions. After placement, the screened interval will be swabbed to promote settling and compaction of the primary filter pack. A 2-ft-thick transition zone of 20/40 sand will be placed above the primary filter pack.

Above the upper transition zone, bentonite chips will be placed to 60 ft bgs. Type I Portland cement with IDP-381 per Baroid specifications, or other LANL-approved mix, will be used to fill the borehole annulus from the top of the bentonite seal to roughly 3 ft bgs. The depth to annular materials will be measured periodically to determine if the materials are settling properly. Down-hole video and natural gamma logs will be performed by LANL to confirm well construction (see section 2.6).

2.7.2 Well Development

The well may be developed by both mechanical and chemical means. Mechanical means include swabbing, bailing, and pumping. Chemical means include the use of sodium acid pyrophosphate (SAPP) or AQUA-CLEAR PFD™ to remove natural and added clays and/or chlorination to kill bacteria introduced during well completion.

A packer will be used to isolate the specific well screening intervals during pumping after initial swabbing and bailing. During the pumping stage of well development, the following water-quality parameters will be monitored for each zone:

- pH,
- Specific conductance,
- Temperature,
- Turbidity,
- Total organic carbon (TOC)
- Dissolved oxygen,
- Oxidation-Reduction Potential (ORP), and
- VOCs (including acetone), as applicable.

The water quality limit for turbidity is <5 nephelometric turbidity units (NTUs) and for TOC is <2 parts per million. The other parameters should be stable.

Hydraulic testing will be considered if a significant water-producing horizon is encountered.

Development water will be containerized and managed as described in section 2.8, Investigation-Derived Waste.

2.7.3 Aquifer Testing

Aquifer testing of the screened intervals will be conducted by David Schafer and Associates. A NWI field staff member will be present during aquifer testing to oversee and record field activity, and to assist David Schafer and Associates.

LANL will provide the stainless steel pipe for the pump install for the aquifer test. Prior to conducting the aquifer tests of the two screened zones, water level and local barometric data will be collected over a period of 2 days. Barometric data from LANL's meteorology towers will be used as the source of barometric measurements. An additional day will be allowed to optimize pumping rates, collect additional early test data, and to fill the discharge pipe. A suitable pump and discharge pipe will be installed in the well and the discharge pipe will have check valves installed every 200 ft. Inflatable packers will be used to isolate the two screened zones and to reduce casing storage effects. Non-vented transducers will be used during aquifer testing.

Aquifer tests for each zone will last for 24 hours, followed by 24 hours of monitoring for water level recovery data. Characterization samples will be collected by LANL staff at the end of each day.

2.7.4 Sampling System Installation

A Baski sampling system, appropriately designed for the dual completion of the two screened zones, will be installed in Well R-51 after completion of well development. A design schematic of the Baski sampling system will be submitted to LANL for approval prior to ordering the system from Baski. The pump will have a stainless steel check valve installed to protect it against backflow. All materials that contact the groundwater sample will be constructed of either stainless steel or Teflon, although brass check valves may be used in the discharge pipe above the water table. A 1-in. ID, passivated stainless steel pipe will be used for the discharge and will have a weep valve installed approximately 20 ft bgs to prevent freezing. To measure the water level and for transducer installation, two 1-in. ID strings of polyvinyl chloride (PVC) pipe will be installed to sufficient depths to set a dedicated transducer, an In-Situ LevelTroll™, below the anticipated pumping water level. The bottom 6 in. of the PVC pipe will be slotted and a closed-end cap will be installed. In addition, a weather-resistant pump control box will be installed adjacent to the wellhead.

Groundwater samples will be collected from the completed well at the conclusion of the aquifer testing, through the stainless steel pipe, if the well is completed with dual screened zones. These samples will be analyzed for the full suite of constituents, including:

- Radiochemistry,
- Metals/cations,
- General inorganic chemicals,

- HE,
- VOCs, and
- Stable isotopes.

Subsequent groundwater samples will be collected under the *2007 Interim Facility-Wide Groundwater Monitoring Plan* (LANL 2007, EP2007-0277).

2.7.5 Surface Completion

The monitoring well surface completion for R-51 will include a 16-in steel outer casing to protect the stainless steel monitoring well. The casing will be installed a minimum of 3-ft bgs, and the top of the protective casing will be set at 3-ft ags. A weep hole will be drilled in the base of the protective casing to prevent build-up of water inside. The top of the protective casing will be fitted with a tamper-proof well cover plate and will be set in a 10-ft × 10-ft × 6-in-thick reinforced concrete pad (2,500 psi, minimum). The surface pad will be sloped so that fluids will drain away from the protective casing. Four removable safety bollards will be set in the pad around the wellhead. The bollards will serve as traffic barriers but will allow access during well sampling or maintenance. A brass survey marker will then be placed in the northwest corner of the pad.

A New Mexico licensed Professional Land Surveyor will survey the horizontal location and elevation of the permanent brass marker, the top of the well casing, the top of the protective outer casing, and the ground surface of the completed well. Data provided by the surveyor will be in North American Datum of 1983 State Plane Coordinates, including latitude, longitude, and elevation in relation to mean sea level (National Geodetic Vertical Datum of 1929). The accuracy of the survey data will be 0.1 ft for horizontal position and to the nearest 0.01 ft for vertical elevations. Survey data will be on file with NWI and provided in the well fact sheet and the well completion report.

2.8 Investigation-Derived Waste

Ordering of sample paperwork from SMO will be coordinated with the LANL waste generator. Investigation-derived waste (IDW) will be managed in accordance with SOP EP-SOP-5328, “Characterization and Management of Environmental Program Waste” (http://www.lanl.gov/environment/all/qa/adep.shtml). This SOP incorporates the requirements of applicable USEPA and NMED regulations, DOE orders, and Laboratory requirements. The primary waste streams include drill cuttings, drilling water, development water, purge water, decontamination water, and contact waste.

Drill cuttings will be managed in accordance with the WCSF and the NMED-approved “NOI Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes” (NMED 2007). Drilling, purge, and development waters will be managed in accordance with the NMED-approved “NOI Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water” (NMED 2006). Initially, drill cuttings and drilling water will be stored in lined pits. The contents of the pits will be characterized with direct sampling following completion of drilling activities, and waste determinations will be made from validated data in accordance with the WCSF included in Table 2.8-1. If validated analytical data show these wastes cannot be land-applied, they will be removed from the pit, containerized, and placed in accumulation areas appropriate to the type of waste. Cuttings, drilling water, development water, and purge water that cannot be land-applied and are that designated as hazardous waste will be sent to an authorized treatment, storage, or disposal facility within 90 days of containerization.

Development water, purge water, and decontamination water will be containerized separately at their point of generation, placed in an accumulation area appropriate to the type of waste, and directly sampled. Contact waste will be containerized at the point of generation, placed in an appropriate accumulation area, and characterized using acceptable knowledge of the media with which it came in contact.

2.9 Site Restoration

Site restoration will be performed by LANL.

3.0 REFERENCES

29 CFR 1910.120, 2002, Title 29, "Labor," Part 1910, "Occupational Safety and Health Administration," Subpart H, "Hazardous Materials," Section 1910.120, "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations*, Office of the Federal Register.

LANL, 2007, *2007 Interim Facility-Wide Groundwater Monitoring Plan*, LA-UR-07-3271, EP2007-0277, Los Alamos National Laboratory, May 2007.

LANL, 2009. "Exhibit D, Scope of Work and Technical Specifications, Drilling and Installation of Well R-51, R-52, and R-29 at LANL," Task Order 3 # 72006-003-09 in accordance with the Master Task Order Agreement, Los Alamos National Laboratory, Los Alamos, New Mexico (release date 9/10/09).

NMED, 2006, "NOI Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water," New Mexico Environment Department, November 2006.

NMED, 2007, "NOI Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes," New Mexico Environment Department, November 2007.

North Wind, Inc., 2009. "Environmental Programs-Wide Standard Operating Procedures for Los Alamos National Laboratory, Revision 0," January, 2009.

NWI ENVP-002, Sample Handling, Packaging and Shipping, Rev. 1, North Wind, Inc.

NWI ENVP-004, Collection of Quality Control Samples, Rev. 1, North Wind, Inc.

NWI ENVP-006, Groundwater Sampling, Rev. 3, North Wind, Inc.

NWI ENVP-007, Water Level Measurements, Rev. 2, North Wind, Inc.

NWI ENVP-014, Sampling Equipment Decontamination, Rev. 1, North Wind, Inc.

NWI ENVP-021, Chain of Custody Documentation, Rev. 4, North Wind, Inc.

NWI LWI-001, Geologic Logging of Cuttings and Core, Rev. 0, North Wind, Inc.

NWI LWI-010, Filtering and Chemical Preservation of Water Samples, Rev. 0, North Wind, Inc.

NWI LWI-011, Transportation and Admittance of Borehole Materials to the Field Support Facility, Rev. 0, North Wind, Inc.

SOP EP-SOP-5238, “Characterization and Management of Environmental Program Waste” (http://www.lanl.gov/environment/all/qa/adep.shtml).

Table 1.1-1
NWI Project Staff and Roles

Clear and unambiguous lines of authority and responsibility for safety matters are established and maintained at all organizational levels.

Role	Name	Description
Project Manager	Doug Jorgensen, PMP	The Project Manager has the responsibility to ensure that all project activities are performed safely and within applicable requirements.
Field Manager (FM)	Heather Smith, PG Brennon Orr	The FM is the primary communicator between the NWI integrated team and LANL STR. As a line manager, the FM is responsible for the protection of employees, the public, and the environment. In addition, the FM shall be responsible for the following: 1) oversee the day-to-day drilling and drilling-related operations; 2) manage the project field drilling operations, execute the work plan and schedule, enforce safety procedures and site controls, and document drilling field activities; and, 3) ensure that all personnel under their supervision clearly understand their authority, responsibility, and are accountable with Conduct of Operations requirements..
Lead Geologist	Brian Lucero Dan Osbourne, PG Greg Kinsman, PG Tom Klepfer Diane Oslo Ed Watson	The Lead Geologist (LG) provides oversight for drilling activities, monitoring well installation, as well as general site management/oversight services, including monitoring field conditions. In addition to oversight services, the LG will be responsible for geologic logging and sample collection, waste management, daily field progress reporting, and interacting with the LANL STR.
Environmental Safety & Health (ES&H) Representative	Jason Barkell Michael Lee	The ES&H representative, as part of the field team, shall be dedicated on-site. Personnel and shall work closely with CONTRACTOR management personnel to implement and administer SUBCONTRACTOR'S approved SSEHASP.
Environmental Professional	Melanie Lamb	The Environmental Professional will implement and administer SUBCONTRACTOR'S required environmental deliverables and CONTRACTOR'S environmental requirements.
Geologist/Sample Technician	Stephen Thomas Bill Larzelere Mike Whitson Kyle Morgan Desiree Staires Randall Boyle Liz Mockabee	The geologist/sample technician, as part of the field team, will perform general field activities including sampling, logging, documentation, drilling oversight, and waste management per the LG and the WMC.

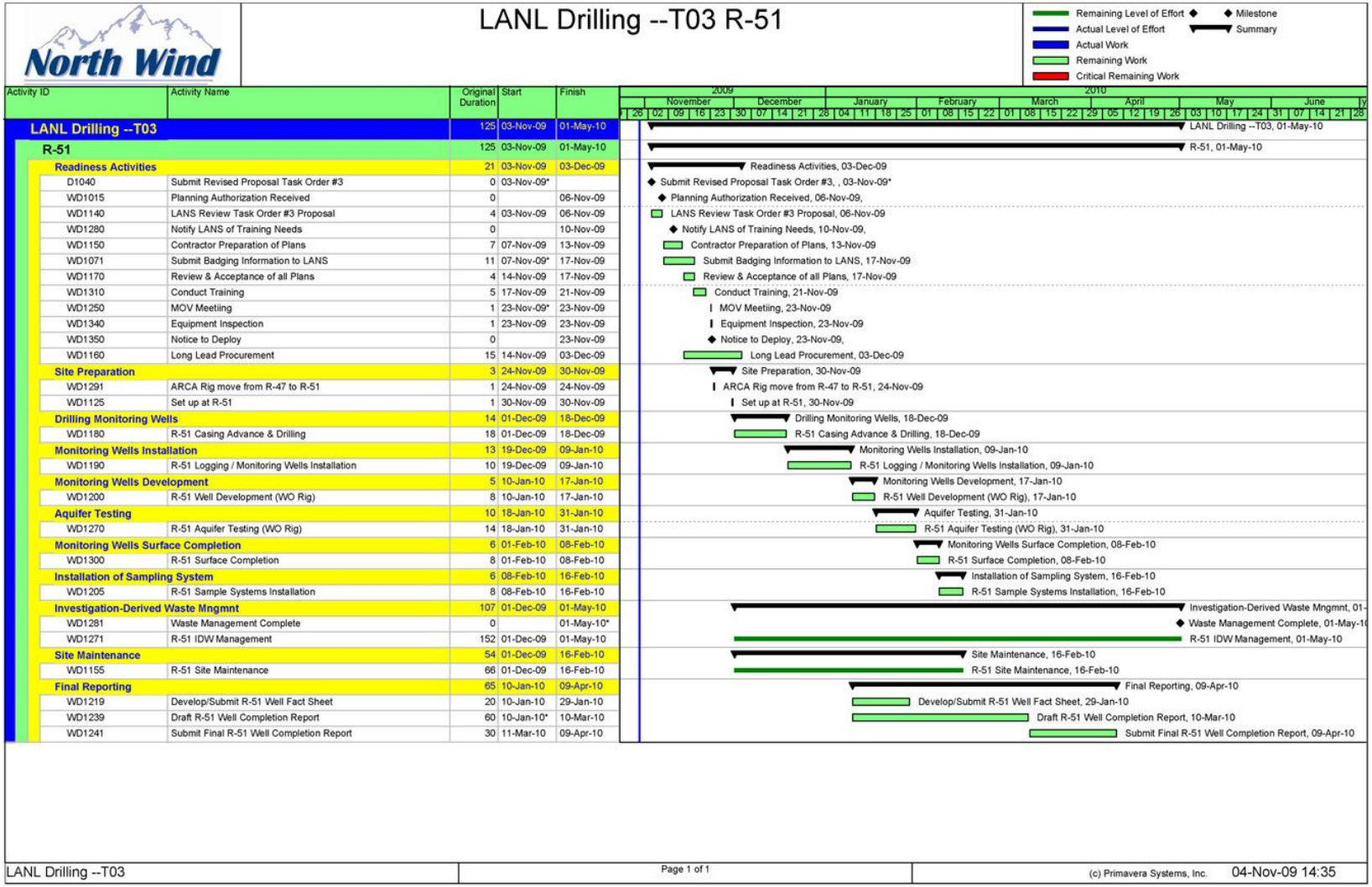
Table 1.1-1
(continued)

Role	Name	Description
Waste Management (WM) Coordinator	Kim Oman	The WM Coordinator shall provide support as follows: 1) responsible for the segregation, characterization, packaging and management of all waste forms generated by the project; 2) provide real-time support to the field team; and, 3) prepare packages for shipment, as necessary.
Waste Management (WM) Technician	Angela Trujillo	The WM Technician shall assist the LG and field team with supervision and implementation of waste management requirements and shall be directed in their work by the WM Coordinator.
Quality Assurance (QA) Specialist	Kitty Gandee Melanie Lamb	The QA Specialist shall assist the LG and field team with supervision and implementation of quality assurance requirements.

Table 1.1-2
LANL Staff and Roles

Role	Name	Description
Procurement Specialist	Terry Forrester	The Procurement Specialist is the authority that directs commercial or technical changes to any subcontract.
STR	Robin Reynolds Marvin Gard Dave Anderson	The STR is the LANS employee with technical and performance oversight of the subcontractor's scope of work including, but not limited to, engineering, procurement, safety, quality, schedule, and coordinated execution of the work that is carried out by the subcontractor. The STR has no authority to direct commercial or technical changes to any subcontract.
Technical Lead	Mark Everett	Technical expert on-site
Environmental Health and Safety point of contact (POC)	Dave Dixson Oliver Wilton	LANS environmental safety oversight
Shift Operations Managers	Steve Pearson Jim Russell	Logistics oversight
Access Control Personnel (or F.O.D.) for TA-18	Marvin Gard or designee	Badge Control access for the main gate.
Waste Generator	Bennie Martinez	The waste generator is the LANS employee whose act or process produces hazardous waste or whose act first causes a hazardous waste to become subject to regulation.

Table 1.1-3
Drilling Schedule



Activity ID	Activity Name	Original Duration	Start	Finish
LANL Drilling --T03		125	03-Nov-09	01-May-10
R-51		125	03-Nov-09	01-May-10
Readiness Activities		21	03-Nov-09	03-Dec-09
D1040	Submit Revised Proposal Task Order #3	0	03-Nov-09*	
WD1015	Planning Authorization Received	0		06-Nov-09
WD1140	LANS Review Task Order #3 Proposal	4	03-Nov-09	06-Nov-09
WD1280	Notify LANS of Training Needs	0		10-Nov-09
WD1150	Contractor Preparation of Plans	7	07-Nov-09	13-Nov-09
WD1071	Submit Badging Information to LANS	11	07-Nov-09*	17-Nov-09
WD1170	Review & Acceptance of all Plans	4	14-Nov-09	17-Nov-09
WD1310	Conduct Training	5	17-Nov-09	21-Nov-09
WD1250	MOV Meeting	1	23-Nov-09*	23-Nov-09
WD1340	Equipment Inspection	1	23-Nov-09	23-Nov-09
WD1350	Notice to Deploy	0		23-Nov-09
WD1160	Long Lead Procurement	15	14-Nov-09	03-Dec-09
Site Preparation		3	24-Nov-09	30-Nov-09
WD1291	ARCA Rig move from R-47 to R-51	1	24-Nov-09	24-Nov-09
WD1125	Set up at R-51	1	30-Nov-09	30-Nov-09
Drilling Monitoring Wells		14	01-Dec-09	18-Dec-09
WD1180	R-51 Casing Advance & Drilling	18	01-Dec-09	18-Dec-09
Monitoring Wells Installation		13	19-Dec-09	09-Jan-10
WD1190	R-51 Logging / Monitoring Wells Installation	10	19-Dec-09	09-Jan-10
Monitoring Wells Development		5	10-Jan-10	17-Jan-10
WD1200	R-51 Well Development (WO Rig)	8	10-Jan-10	17-Jan-10
Aquifer Testing		10	18-Jan-10	31-Jan-10
WD1270	R-51 Aquifer Testing (WO Rig)	14	18-Jan-10	31-Jan-10
Monitoring Wells Surface Completion		6	01-Feb-10	08-Feb-10
WD1300	R-51 Surface Completion	8	01-Feb-10	08-Feb-10
Installation of Sampling System		6	08-Feb-10	16-Feb-10
WD1205	R-51 Sample Systems Installation	8	08-Feb-10	16-Feb-10
Investigation-Derived Waste Mngmnt		107	01-Dec-09	01-May-10
WD1281	Waste Management Complete	0		01-May-10*
WD1271	R-51 IDW Management	152	01-Dec-09	01-May-10
Site Maintenance		54	01-Dec-09	16-Feb-10
WD1155	R-51 Site Maintenance	66	01-Dec-09	16-Feb-10
Final Reporting		65	10-Jan-10	09-Apr-10
WD1219	Develop/Submit R-51 Well Fact Sheet	20	10-Jan-10	29-Jan-10
WD1239	Draft R-51 Well Completion Report	60	10-Jan-10*	10-Mar-10
WD1241	Submit Final R-51 Well Completion Report	30	11-Mar-10	09-Apr-10

LANL Drilling --T03 | Page 1 of 1 | (c) Primavera Systems, Inc. 04-Nov-09 14:35

Table 2.5-1
Sampling and Analysis Plan

Sample Type	Analysis	Lab	Method	Container	Preservative	Interval
Drill cuttings	Lithologic	N/A	Grab	chip tray #10 & #35 sieve and whole rock 200 ml to 300 ml plastic bags where sufficient	N/A	Every 5 ft
Perched zone water	Metals/anions including Perchlorate	EES-14	grab/airlift	1-liter poly	4°C	Any perched aquifer or every 20 ft in aquifer when drilling with case advance
	High explosives	GEL	grab/airlift	3 1-liter amber	4°C	Any perched aquifer or every 20 ft in aquifer when drilling with case advance
	VOCs	GEL	grab/airlift	2 40ml VOAs	HCL	Any perched aquifer or every 20 ft in aquifer when drilling with case advance
	Tritium	U of M	grab/airlift	500 ml poly	N/A	Any perched aquifer or every 20 ft in aquifer when drilling with case advance
Regional aquifer zone water	Metals/Anions (dissolved) including Perchlorate, and Metals/cations (dissolved and total)	EES-14	grab/airlift	1 liter poly	4°C	At first encounter and at total depth of well
	High explosives	GEL	grab/airlift	3 1-liter amber	4°C	At first encounter and at total depth of well
	VOCs	GEL	grab/airlift	2 40ml VOAs	4°C	At first encounter and at total depth of well
	Tritium	U of M	grab/airlift	500 ml poly	4°C	At first encounter and at total depth of well

Table 2.5-1
(continued)

Sample Type	Analysis	Lab	Method	Container	Preservative	Interval
Well development (pumping) screening water (confirmation sample everyday)	pH	Field	Grab	N/A	N/A*	At the screen interval, hourly
	Specific conductance	Field	Grab	N/A	N/A	At the screen interval
	Temperature	Field	Grab	N/A	N/A	At the screen interval
	Dissolved oxygen	Field	Grab	N/A	N/A	At the screen interval
	Oxygen reduction potential	Field	Grab	N/A	N/A	At the screen interval
	Turbidity	Field	Grab	N/A	N/A	At the screen interval
	TOC	EES-14	Grab	2 40ml VOAs	N/A	At the screen interval
Daily	VOCs, including acetone	GEL	Grab	2 40ml VOAs	4°C	At the screen interval
Final aquifer test (sampling staff)	Metals/anions including Perchlorate	EES-14	Grab	1 liter poly	4°C	At the screen interval
	High Explosives	GEL	Grab	3 1 liter amber	4°C	At the screen interval
	General inorganic chemicals	GEL	Grab	1 liter poly	4°C	At the screen interval
	Metals/cations	GEL	Grab	1 liter poly	4°C	At the screen interval
	Stable Isotopes	EES-14	Grab	2 40ml VOAs	4°C	At the screen interval
	VOCs	GEL	Grab	2 40ml VOAs	4°C	At the screen interval
	Radiochemistry	GEL	Grab	1 gallon poly	4°C	At the screen interval

EES-14 = Earth and Environmental Sciences Division, Hydrology, Geochemistry, and Geology Group
GEL = General Engineering Laboratory
U of M = University of Miami
TOC = total organic carbon
VOA = volatile organic analysis
VOC = volatile organic compound

Notes: RAD swipes will be collected on all equipment downhole and parked on-site screened entering and leaving.
Rinsate samples will be collected on tanks not certified as clean.
* N/A = Not applicable.

Table 2.8-1
Waste Characterization for Wells R-51 and R-52[a]

Waste Description	Waste # 1 Contact Waste	Waste #2 Drill cuttings	Waste #3 Drilling Fluids	Waste #4 Development Water	Waste #5 Decontamination Fluids
Volume					
Packaging	Drums or roll-off bins	Lined pit or approved containers	Lined pit or approved containers	Approved Containers	Approved Containers
Regulatory Classification					
Radioactive (rad)	X	X	X	X	X
Solid	X	—	—	—	—
Hazardous	X	X	X	X	X
Mixed (hazardous and rad)	X	X	X	X	X
Toxic Substances Control Act	—	—	—	—	—
New Mexico Special Waste	—	—	—	—	—
Industrial	X	X	X	X	—
Sanitary Wastewater	—	—	—	—	X
Characterization Method					
Acceptable knowledge (AK): Existing Data/Documentation	X	—	—	—	X
AK: Site Characterization	—	—	—	—	—
Direct Sampling of Containerized Waste	—	X	X	X	X
Analytical Testing					
Volatile Organic Compounds (EPA 8260-B)	—	X	X	X	X
Semi volatile Organic Compounds (EPA 8270-C)	—	X	X	X	X
Organic Pesticides (EPA 8081-A)	—	X	X	X	X
Organic Herbicides (EPA 8151-A)	—	X	X	X	X
PCBs (EPA 8082)	—	—	X	X	—
Total Metals (EPA 6010-B/7471-A)	—	X	X1	X1	X
Total Cyanide (EPA 9012-A)	—	X	X2	X2	X
General (NO3+NO2, F, Cl, SO4, TDS, pH, microtox/COD/TSS)	—	X (nitrates if land applied)	X	X	X3

TABLE 2.8-1
(CONTINUED)

Waste Description	Waste # 1 Contact Waste	Waste #2 Drill cuttings	Waste #3 Drilling Fluids	Waste #4 Development Water	Waste #5 Decontamination Fluids
Perchlorates	—	—	x	X	X
High Explosives Constituents (EPA 8330/8321-A)	—	X4	X	X	—
Asbestos	—	—	—	—	—
BTEX (EPA-8021b)	—	—	—	—	
Tot. pet. hydrocarbon (TPH)-GRO (EPA 8015-M) TPH-DRO (EPA-8015-M)	—	X (if visible stain)	—	—	—
Toxicity characteristic leaching procedure (TCLP) Metals (EPA 1311/6010-B)	—	X	—	—	—
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)	—	—	—	—	—
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)	—	—	—	—	—
Radium 226 & 228 (EPA 9320)	—	X	X	X	—
Gross Alpha (alpha counting) (EPA 900)	—	X	X	X	X
Gross Beta (beta counting) (EPA 900)	—	X	X	X	X
Tritium (liquid scintillation) (EPA 906.0)	—	X	X	X	X
Gamma spectroscopy (EPA 901.1)	—	—	X	X	X
Isotopic plutonium (chem. separation/alpha spec.) (HASL-300)	—	X	X	X	X
Isotopic uranium (chem. separation/alpha spec.) (HASL-300)	—	X	X	X	X
Total uranium (6020 inductively coupled plasma mass spectroscopy [ICPMS])	—	—	—	—	—
Strontium-90 (EPA 905)	—	X	X	X	—
Americium-241 (Separation/alpha spec.) (HASL-300)	—	X	X	X	—

TABLE 2.8-1
(CONTINUED)

Waste Description	Waste #6 Municipal Solid Waste	Waste #7 PCS	Waste #8 Concrete Chips and Concrete Slurry
Volume			
Packaging	**Approved Containers**	**Approved Containers**	**Approved Containers**
Regulatory classification			
Radioactive	—	X	X
Solid	X	—	X
Hazardous	—	—	X
Mixed (hazardous and radioactive)	—	—	—
Toxic Substances Control Act (TSCA)	—	—	—
New Mexico Special Waste	—	X	—
Industrial	—	X	X
Characterization Method	—		
Acceptable knowledge (AK): Existing Data/Documentation	—	X	X
AK: Site Characterization	X	X (rad only)	X
Direct Sampling of Containerized Waste	—	X	X (as needed)
Analytical Testing	—		
Volatile Organic Compounds (EPA 8260-B)		X	—
Semivolatile Organic Compounds (EPA 8270-C)	—	X	—
Organic Pesticides (EPA 8081-A)	—	—	—
Organic Herbicides (EPA 8151-A)	—	—	—
PCBs (EPA 8082)	—	X	—
Total Metals (EPA 6010-B/7471-A)	—	—	X (if required by ENV-RCRA)
Total Cyanide (EPA 9012-A)	—	X	—
General (NO3+NO2, F, Cl, SO4, TDS, pH, microtox/COD/TSS)	—	—	—
Perchlorates	—	—	—
High Explosives Constituents (EPA 8330/8321-A)	—	—	X4
Asbestos	—	—	—
BTEX (EPA-8021b)	—	—	—
Total petroleum hydrocarbon (TPH)-GRO (EPA 8015-M) TPH-DRO (EPA 8015-M)	—	X	—
TCLP Metals (EPA 1311/6010-B)	—	X	—
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)	—	X	—
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)	—	X	—
Radium 226 & 228 (EPA 9320)	—	—	—
Gross Alpha (alpha counting) (EPA 900)	—	X	—
Gross Beta (beta counting) (EPA 900)	—	X	—
Tritium (liquid scintillation) (EPA 906.0)	—	X	—
Gamma spectroscopy (EPA 901.1)	—	X	—
Isotopic plutonium (23hem.. Separation/alpha spec.) (HASL-300)	—	X	—
Isotopic uranium (23hem.. Separation/alpha spec.) (HASL-300)	—	X	—
Total uranium (6020 inductively coupled plasma mass spectroscopy [ICPMS])	—	—	—
Strontium-90 (EPA 905)	—	X	—
Americium-241 (23hem. Separation/alpha spec.) (HASL-300)	—	X	—

TABLE 2.8-1
(CONTINUED)

1-FILTERED METALS REQUIRED FOR LAND APPLICATION (EXCEPT HG)
2-FILTERED CYANIDE FOR LAND APPLICATION
3-ANALYZE FOR MICROTOX//COD/TSS/TDS/Oil and Grease and pH for SWWS Plant; include TOC, Total Nitrogen, and Total Nitrates for RLWTF.
4-For well R-51
NOTE: Multiple sampling may be required to ensure WAC requirements are met.

Note: Section 1.2 of the TCLP method 1311 states "If a total analysis of the waste demonstrates that individual analytes are not present in the waste, or that they are present but at such low concentrations that the appropriate regulatory levels could not possibly be exceeded, the TCLP need not be run." The methodology for using total waste analyses determination for the 40 TC constituents is as follows:

Liquids – Wastes containing less than 0.5% filterable solids do not require extraction and therefore by filtering the waste and measuring the total constituent levels of the filtrate and comparing those levels to regulatory levels is appropriate.

Solids – Constituent concentrations from the extraction fluid of wastes that are 100% physical solids are divided by 20 (reflecting the 20 to 1 ratio of TCLP extraction) and then compared to the regulatory levels. If the theoretical levels do not equal or exceed the regulatory levels, the TCLP need not be run. If the levels do equal or exceed the regulatory levels, the generator may either declare the waste hazardous or run TCLP analyses

REFERENCES

P-409, *Waste Management*
ADEP-SOP-5238, *Characterization and Management of Environmental Program Waste* (September 2009)
ENV-RCRA-SOP-10.1, *Land Application of Groundwater* (May 2008)
ENV-RCRA-QP-11.1, *Land Application of Drill Cuttings* (August 2008)
R-51 and R-52 DRAFT Drilling Work Plans

Waste Characterization Strategy Form

Signatures	**Date**
EP Project Leader (Mark Everett)	
WES-WA Waste Management Coordinator (Victor Garde)	
ENV-RCRA Representative (Jocelyn Buckley)	
WES-WA Representative (Jose D. Ortega)	
Waste Certification Program Representative (Michelle Coriz)	
Los Alamos National Laboratory **EP**	

[A] From the *Waste Characterization Strategy Form for TA-54, Wells R-51 & R-52*, EP-0571.

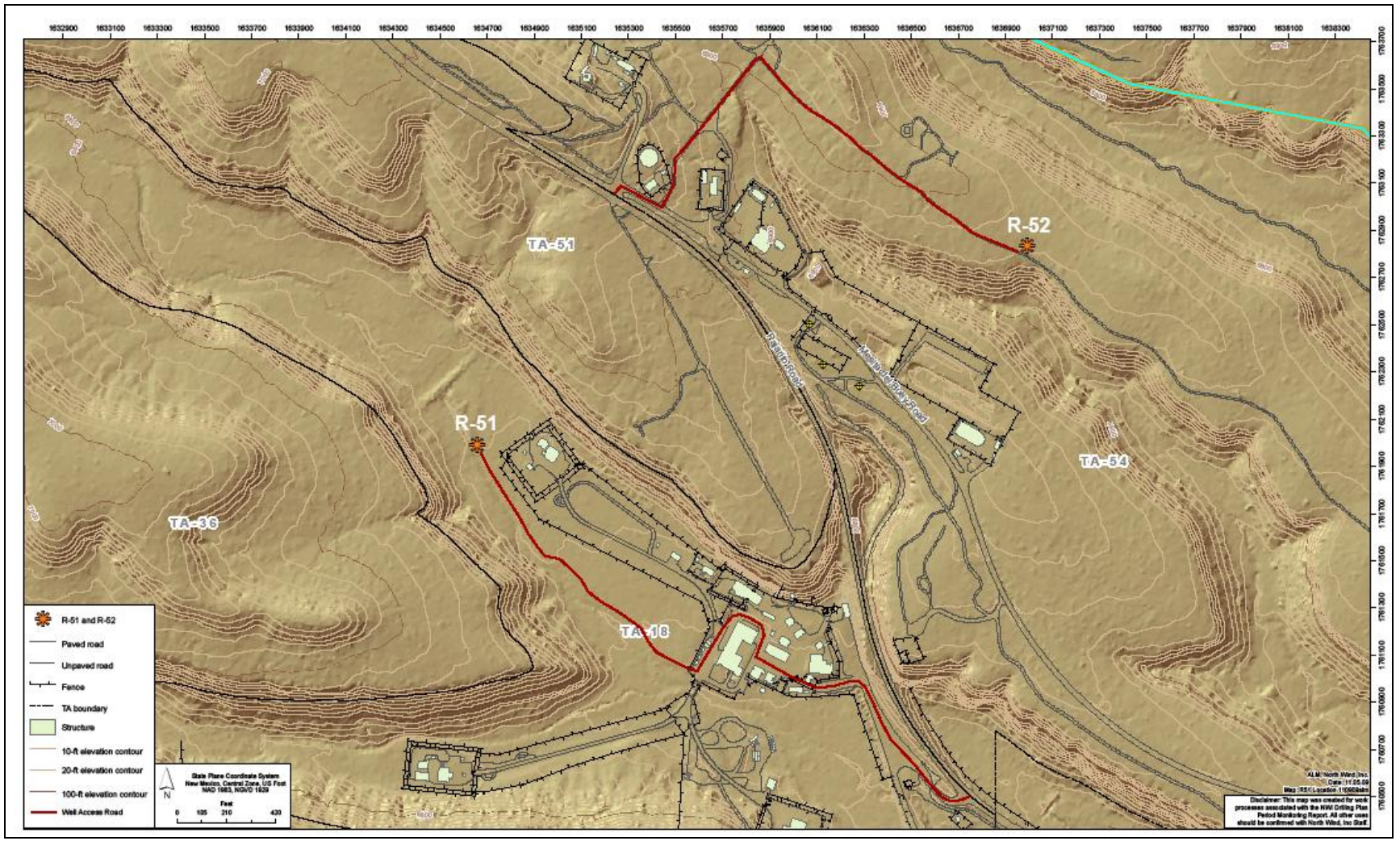


Figure 1.0-1 Location of Wells R-51 at TA-18 and R-52 at TA-54

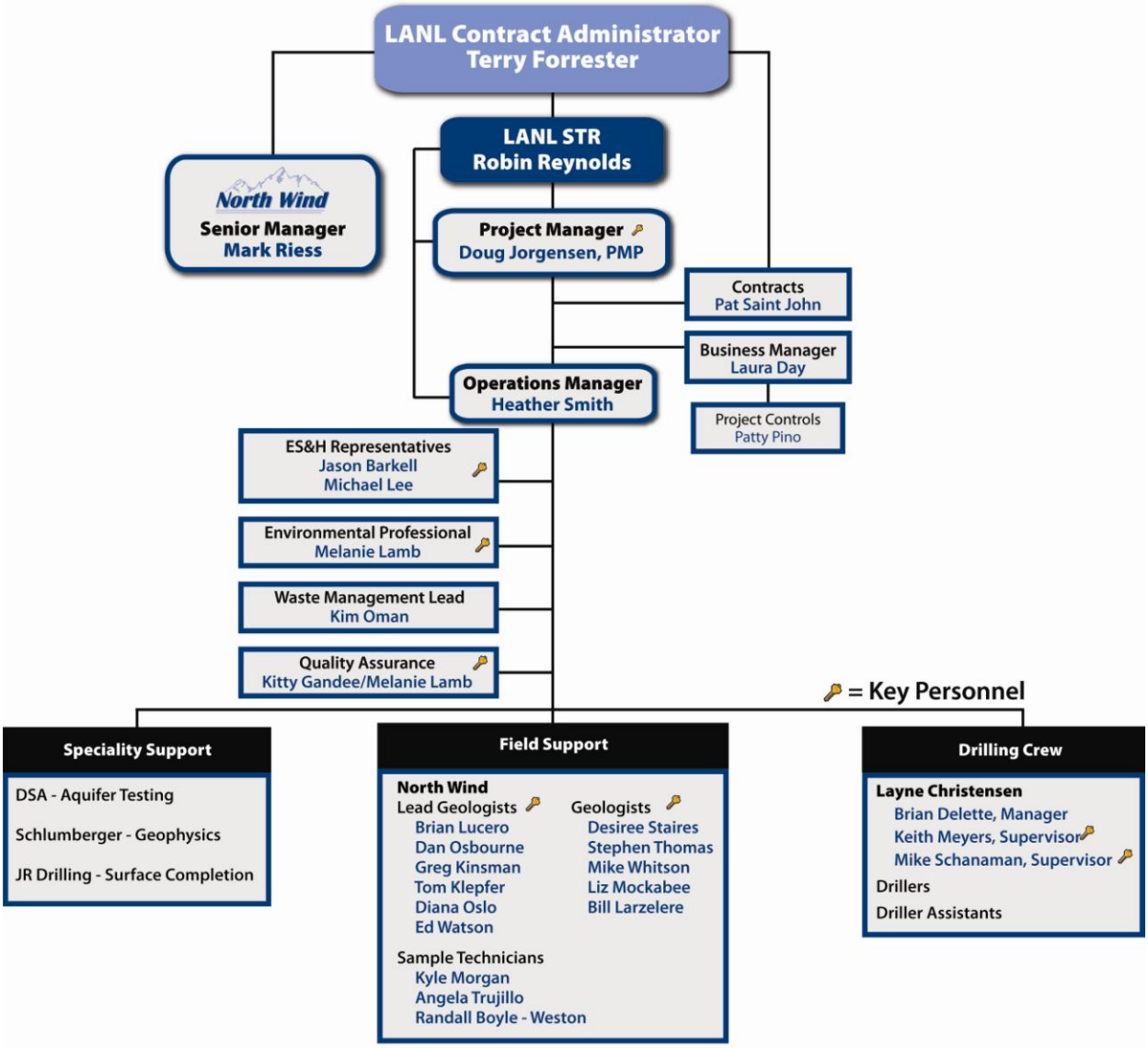


Figure 1.1-1 Project field organization chart

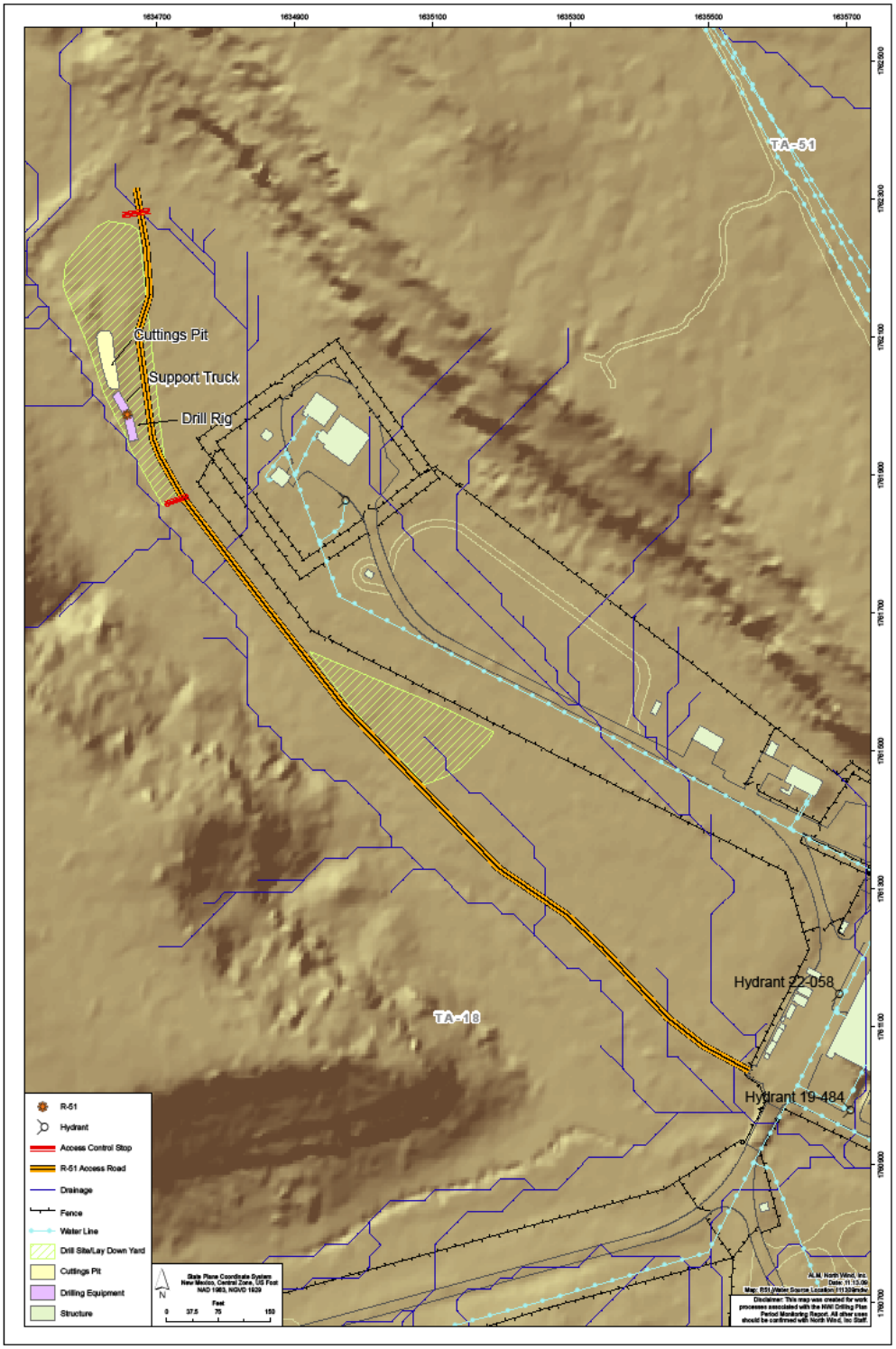


Figure 2.1-1 Water source locations at TA-18 near Well R-51

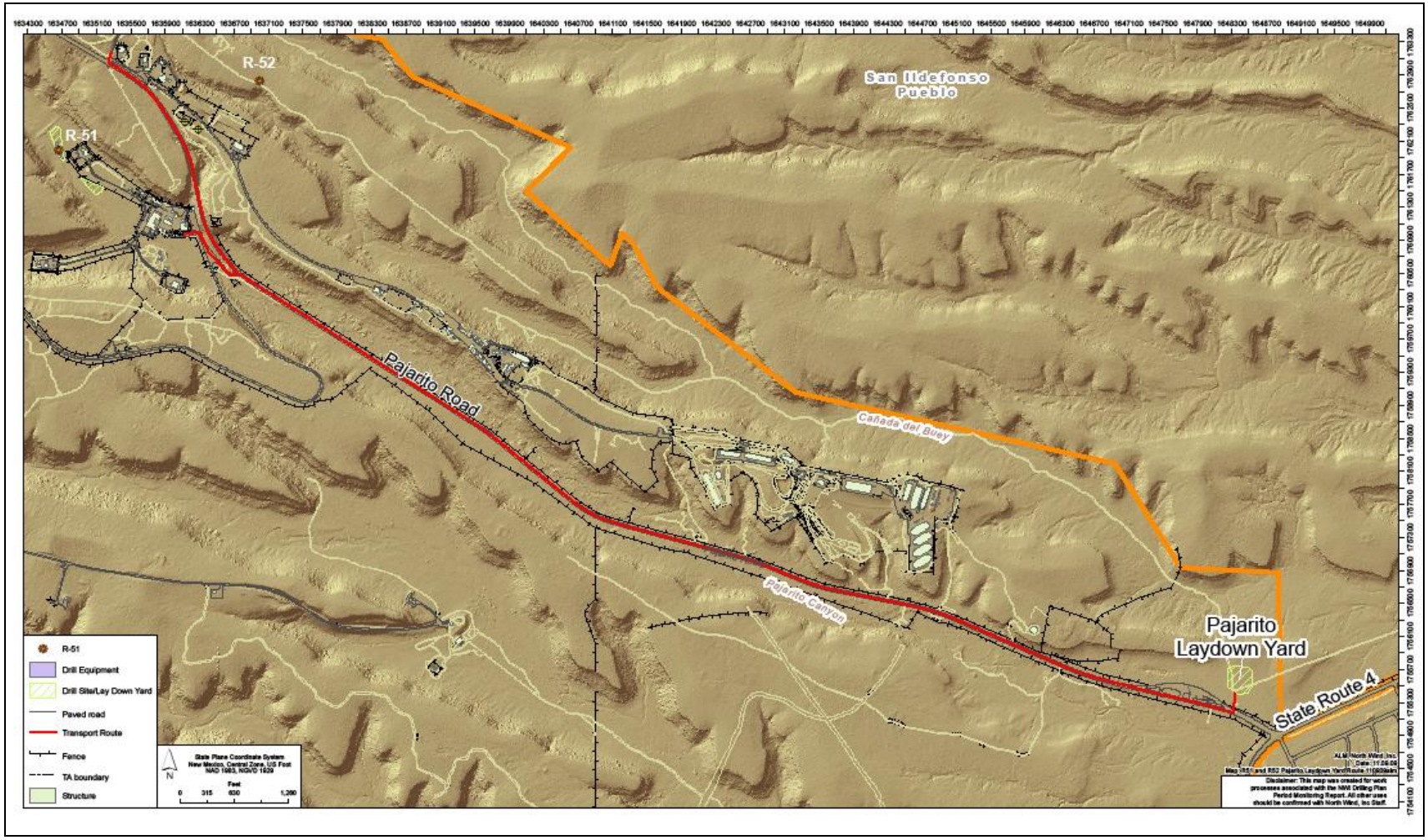


Figure 2.1-2 Route to the Pajarito lay-down yard for Wells R-51 and R-52

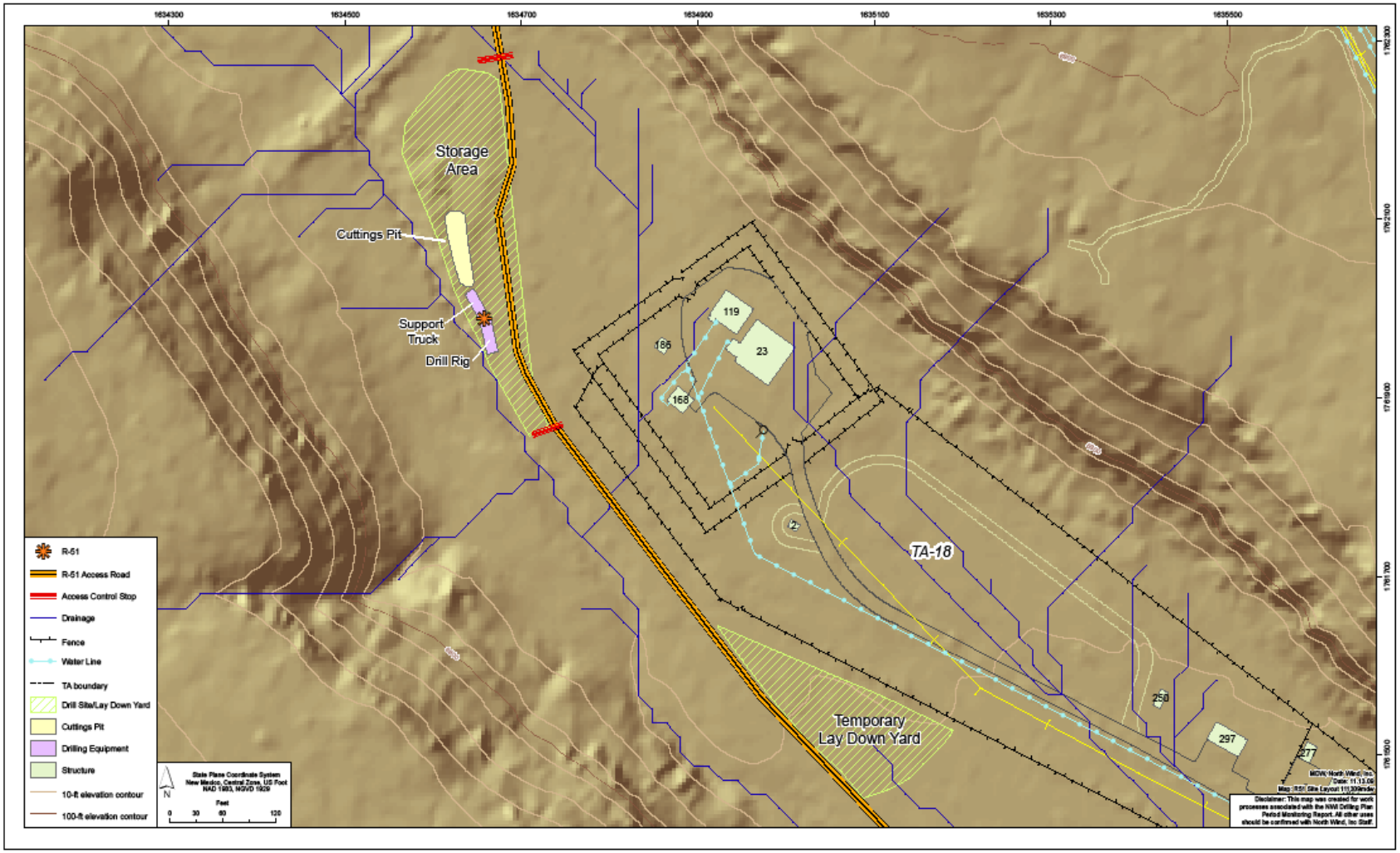


Figure 2.2-1 Well R-51 site layout

Figure 2.2-2 Well Pad and Laydown Area Dimensions.

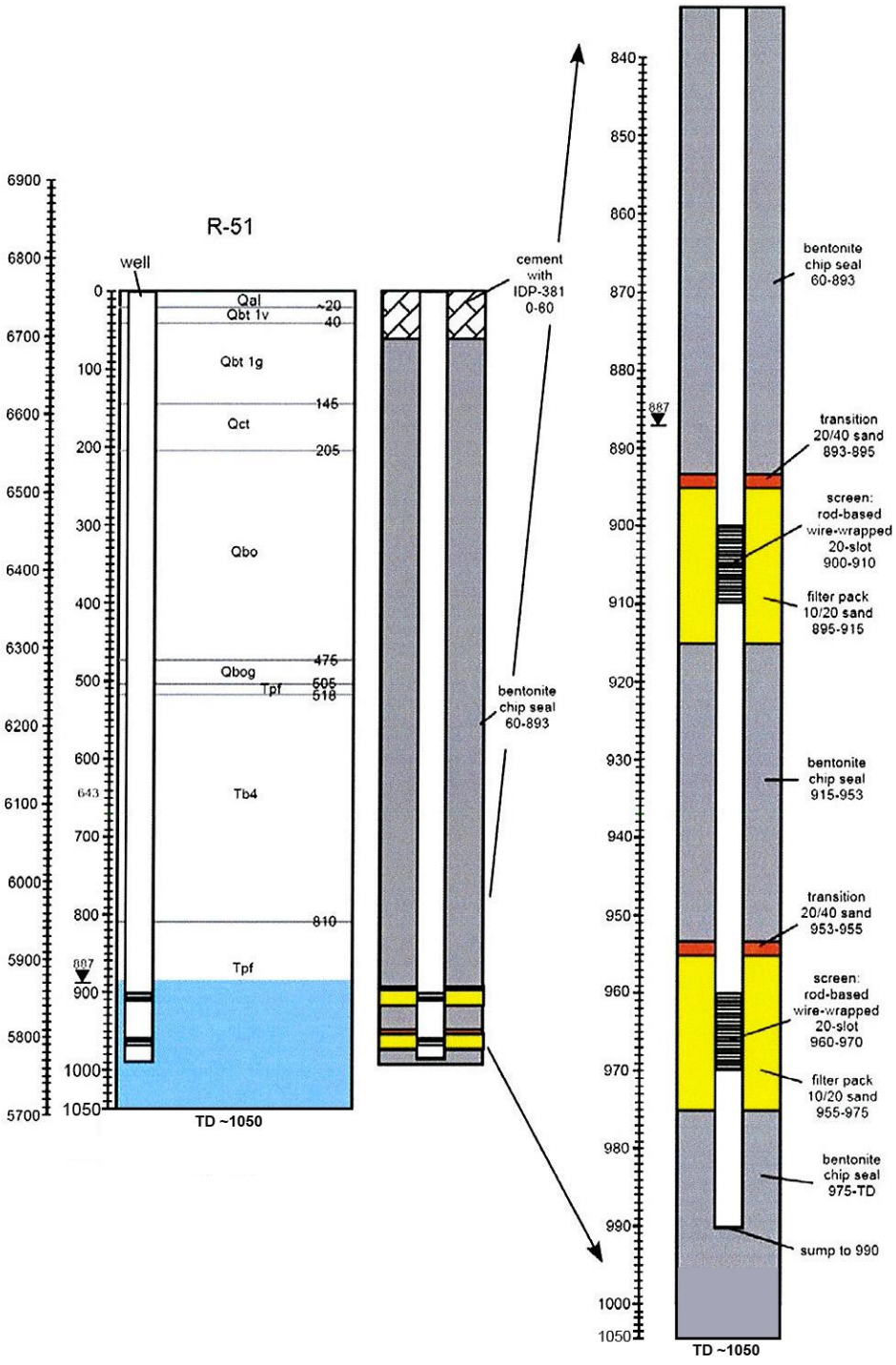


Figure 2.7-1 Proposed well design schematic for well R-51