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KLEINFELDER DRILLING WORK PLAN FOR CHARACTERIZATION WELLS R-10 AND R-10a LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NEW MEXICO PROJECT NO. 49436

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KLEINFELDER DRILLING PLAN FOR
CHARACTERIZATION WELLS R-10 AND R-10A
LOS ALAMOS NATIONAL LABORATORY
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PROJECT NO. 49436

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1.0 INTRODUCTION

This drilling plan provides guidance for the site preparation, drilling, sampling, installation, testing, and site restoration activities associated with Regional Characterization wells R-10 and R-10a. The wells will be located in lower Sandia Canyon within San Ildefonso Pueblo. A map of the Los Alamos area showing the well locations is presented in Figure 1.

R-10 will be installed to a depth (approximately 1165 feet [ft]) sufficient to monitor the hydraulic responses to pumping in the Buckman well field. Well R-10a is primarily a monitoring well designed to monitor water-quality data near the top of the regional aquifer (approximately 756 ft).

This Drilling Plan is in compliance with the scope of work set forth in US Army Corps of Engineers (USACE) Task Order W91238-04-F-0096 and is being performed for the United States Department of Energy (DOE) and the Los Alamos National Laboratory (LANL). The following sections provide an overview of the program management and operations.

1.1 PROGRAM MANAGEMENT AND OPERATIONS

1.1.1 Project Staff

Kleinfelder's proposed project staff and their respective roles are detailed in Table 1. The overall project organization is shown schematically in Figure 2. Additional qualified and experienced staff (existing and new) may be added after submitting this drilling plan. These staff will be identified and their roles assigned before work begins.

Program management, administration, and quality assurance oversight will be conducted out of Kleinfelder's Regional office located in Albuquerque, New Mexico. The Field Manager will provide oversight and will review ongoing operations as they relate to this drilling plan and assist the drilling team with any technical, operational, or other project-related issues.

During each drilling shift, two Kleinfelder or Kleinfelder-subcontracted geologists will be present. The field geologists will maintain field notes detailing general drill site activities, compile and submit daily reports and drilling forms, keep track of down-hole tool types and lengths, conduct lithologic logging, and conduct daily safety meetings and equipment inspections. The field geologist will also be responsible for compliance with established health and safety documentation, and serve as Site Safety Officer (SSO) in the absence of the project health and safety officer.

1.1.2 Health and Safety Training

All staff will be trained to the Site-Specific Health and Safety Plan (SSHASP), Standard Operating Procedures (SOPs) (LANL, 2002a; LANL, 2001a; LANL, 2001b; LANL, 2001c; LANL, 2000), the Contractor's Quality Management Plan (CQMP) (Kleinfelder, 2003), work instructions, and applicable quality procedures as appropriate to their assigned roles. The Field Manager will be responsible for monitoring adherence to the project plans and SSHASP requirements. LANL general employee training (GET), fire-watch training, general orientation, and health and safety training, reading and following LANL standard operating procedures

(SOPs) Occupational Safety and Health Act 29 Code of Federal Regulations 1910.120 (HAZWOPER 40-hour) training, and Kleinfelder work instructions (WIs) will be required for field personnel at these well sites.

1.1.3 Security

Wells R-10 and R-10a are located in lower Sandia Canyon on San Ildefonso Pueblo land. Site access is via a secured, unpaved road off New Mexico State Highway 4 and is controlled by the San Ildefonso Pueblo. Kleinfelder and Kleinfelder-subcontracted personnel working at the R-10/R10a site will have LANL security badges. Kleinfelder employees and subcontractors will follow the requirements outlined in the San Ildefonso Pueblo issued access permit (Pueblo de San Ildefonso, 2005).

1.1.4 Schedule

The tentative schedule for drilling of R-10a and R-10 is found in Table 2. Drilling is scheduled to occur during daylight hours, typically 12-hr days. Longer operational days may be necessary due to delays in project schedule, critical well construction events, or poor down-hole stability.

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 has been submitted to the United States Environmental Protection Agency (Appendix A). Other required permits have been obtained through the LANL Permits and Requirements Identification process. DOE obtained site access permits from San Ildefonso (Appendix B). Copies of permits, notifications, inspection reports, and site access authorization will be maintained at the drill site. Included in Appendix C is a traffic control plan.

1.1.6 New Mexico Environment Department Field Visits

Should New Mexico Environment Department (NMED) personnel visit the site for any reason, the field geologist on duty will notify the DOE and LANL personnel that are listed in Table 3. The field geologist will continue attempts to notify DOE and LANL personnel until contact with one of the individuals from each agency has been made.

2.0 FIELD ACTIVITES

Field activities will include site preparation, well drilling, sample collection, down-hole geophysical characterization, well installation, surface completion, and site restoration. The Sampling and Analysis Plan (SAP) for calendar year 2005 (LANL, 2005) will guide field operations.

2.1 SITE PREPARATION

Layout of the well site is shown in Figure 3. Kleinfelder will conduct the following pre-mobilization activities:

- Conduct radiological survey of access road and drill site in conjunction with LANL radiological control technicians (RCTs) assigned to the site;
- Install mobile field offices and site services;
- Construct drill pad and lay-down areas;
- Implement road improvements along access roads.

2.1.1 Radiological Screening

An RCT from Health Safety and Radiation (HSR)-1 will screen the drill site and all equipment prior to drilling related activities.

2.1.2 Field Office and Site Services

A trailer will function as a field office. Potable water will be trucked to the site from a Los Alamos County Otowi-4 water source located near the entrance to the Pueblo Canyon access road. Fresh water will be temporarily contained in a 21,000-gallon portable tank.

2.1.3 Drill Pads and Lay-Down Areas

The drill pad area (approximately 70 ft by 160 ft in size) will be leveled and cleared of brush/small trees. Approximately 4 inches of base coarse will be spread on the pad and wheel-rolled with site construction equipment. Safety fencing will surround the location as shown in Figure 3. Pad size and shape may be modified due to site constraints. Storm water and sediment run-off controls will be installed and will include silt fencing, hay bale barriers, and other best management practices (BMPs).

2.1.4 Road Construction and Improvements

Road improvements may be necessary for access and will be limited as much as possible. A survey of the access road indicated no archeological findings within the roadway alignment; therefore, road improvements will be limited to within the existing roadway. Minimal upgrading, such as minor clearing and resurfacing (including addition of base course), may be necessary as a result of weather and use impacts. Base course may also be used along access roads, as necessary, but will not be placed in watercourses. Felled timber and brush from the access road

improvements and pad construction will be neatly stacked and left on site with approval from the San Ildefenso Pueblo; some of these materials may be used in erosion control and/or site restoration. Dust suppression on roads will be accomplished by application of water to areas where dust is created. The applied water will be either potable water or development water approved for use by NMED and DOE.

2.2 WELL DRILLING

WDC Exploration and Wells (WDC) drilling company will drill the boreholes under contract to and the direct supervision of Kleinfelder. Equipment for the completion of the drilling project will be situated around the work site in a safe and secure manner (Figure 3). Equipment orientation and placement will depend on physical constraints at the drill site.

2.2.1 Drilling

2.2.1.1 Air/Foam Rotary Drilling Methods

Boreholes for R-10 and R-10a will be drilled using a Failing Co. Speedstar 50K or 90K drill rig; alternative rigs with similar capacity may be used. The estimated depth to the top of the regional aquifer is approximately 665 ft bgs. Drilling will begin with R-10a (proposed total depth [TD] of 765 ft), followed by drilling R-10 (proposed TD of 1,165 ft). R-10a will be located at the west end (upgradient side) of the drill site. R-10 will be located approximately 50 ft to 100 ft east of R-10a. Well development for R-10a will occur as soon as practicable in order to complete this task prior to drilling with mud in R-10.

The proposed drilling method for the R-10a borehole is direct air-rotary with foam assist. A 16-inch-OD permanent surface conductor or a 13⅜-inch-OD removable drive casing will be set to approximately 50 ft bgs. The type of conductor casing to be installed will be determined by the driller. The proposed borehole target depth for Well R-10a is 765 ft bgs. The borehole initially will be drilled using a nominal 12¼-inch OD mill tooth tri-cone rotary drill bit until penetration rates decrease significantly. When penetration rates decrease, a nominal 12¼-inch OD down-the-hole hammer system may be used.

The proposed drilling method for R-10 is direct air-rotary and casing-hammer with foam assist, as needed. A 16-inch-OD permanent surface conductor or a 13⅜-inch-OD removable drive casing will be set to approximately 50 ft bgs. The type of conductor casing to be installed will be determined by the driller. The R-10 borehole will be drilled with a nominal 15-inch outside diameter (OD) mill tooth tri-cone rotary drill bit to the bottom of the Cerros del Rio Basalt (approximately 380 ft bgs). A nominal 11¾-inch-OD casing will be installed in the borehole and driven using an air-rotary casing hammer to the top of the water table (approximately 665 ft bgs). The borehole will then be advanced to the target depth using a nominal 10½-inch-OD mill tooth tri-cone rotary drill bit. Drilling mud may be used to maintain borehole integrity below the water table, if needed.

2.2.1.2 Drilling Additives

Drilling additives will be available for use, if needed. Only approved, previously used Baroid brand drilling products will be used during the drilling and completion of these wells. Possible

Baroid drilling additives and a brief description of each follows. Material Safety Data Sheets for these products are included as Appendix D.

1) **AQUAGEL GOLD SEAL®** – Added at a rate of 25-50 pounds (lb)/100 gallons (gal). This pure bentonite provides a viscous fluid that forms the basis for increasing the surface tension of the foam mix.

2) **EZ-MUD REGULAR™** – Added at a rate of 0.5-1.75 lb/100 gal. EZ-MUD is a synthetic polyacrylamide suspension that provides additional colloidal material to further increase the surface tension of the foam mix.

3) **PAC®-L** – Added at a rate of 3-7 lb/100 gal to fresh water to stabilize a water sensitive formation; added at a rate of 0.5-2 lbs/100 gals to reduce torque and lower circulating pressure.

4) **QUIK-FOAM®** – Added at a rate of 0.5-1.0% by volume. QUIK-FOAM® provides the surfactant necessary for foam formation.

5) **SODA ASH** – Added at a rate of 0.5-1.0 lbs/100 gal. Soda ash softens the water by removing hardness. Soda ash may be sued during direct mud rotary drilling to adjust the pH of the drilling mud.

2.2.1.3 Drilling Contingencies

Kleinfelder will attempt to drill each borehole with the methods described above. However, drilling conditions may require converting to alternative drilling methods. Kleinfelder will consult with DOE, USACE, NMED, and LANL before modifying the above referenced drilling techniques.

Historically, borehole instability and/or the loss of drilling fluid circulation have been the most common difficult drilling conditions encountered. In preparation of this, additional tooling will be stored within Los Alamos to expedite the change in drilling procedures. Three different sets of drive casing will be made available: 350 ft of 13⅜-in OD, 1,200 ft of 11¾-in. OD, and 2,000 ft of 9⅝-in. OD. The casing diameters are sufficient to allow for smaller diameter sets to telescope through larger sets. A complete mud rotary drilling system will also be provided and stored at the project lay-down yard. The mud system will include bits, pumps, shaker-table, and other tools necessary to quickly convert to mud rotary drilling.

Casing and mud rotary tools will be stored at the project lay-down yard located at the northwest corner of Pajarito Road and New Mexico State Road 4.

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 as a mist at the air discharge or by employing the LANL "Dust Hog" Filtration System.

2.3 CORING

There will be no core collected at either well location.

2.4 GROUNDWATER DETECTION

The presence of groundwater will be checked at target depths specified in Table 6 of the SAP. The target depths will be:

- base of the Cerros del Rio basalt
- top of olive-green lake bed sediments of the Older Alluvium

Regional groundwater is expected in the top of the Santa Fe Group sands and silts, approximately 665 ft bgs.

Once the specified depths are reached, the drilling tools will be removed from the borehole, and the presence of water will be checked using a water-level meter. The presence of water will be verified as necessary using the Kleinfelder provided down-hole camera. Additionally, if the driller notes any indication of groundwater, drilling will stop. If water exists in the borehole the drill string will be tripped out of the hole at the end of the shift to allow drill teams to check for accumulation of water in the borehole.

2.5 SAMPLE COLLECTION PROCEDURES

2.5.1 Groundwater Sample Collection

Sample collection and handling activities will be conducted in accordance with ER-SOP-01.02, ER-SOP-01.03, and ER-SOP-01.04 (LANL 2001b; LANL 2000; LANL 2002). The details of the analyte suite, container size, preservation, and preferred laboratories are outlined in Table 4A for groundwater screening samples and in Table 4B for groundwater samples collected from completed wells.

2.5.1.1 Perched Groundwater Sampling

If significant perched water is encountered, a sample will be collected using a bailer. In general, groundwater samples will be collected for dissolved metals, total metals, and anions, including perchlorate (Tables 4A and 4B). The collected groundwater will be placed in appropriate containers as specified in the SAP and delivered to the Sample Management Office (SMO).

2.5.1.2 Regional Groundwater Sampling

Sampling of the regional groundwater will occur at the water table (656 ft bgs) and the total depth of each well. A groundwater sample will not be collected until three consecutive water level readings, taken 15 minutes apart, are within 0.5 ft of the same depth, or as specified by an alternate method approved by USACE and DOE. A groundwater sample will then be collected, if practical, and processed.

A final groundwater sample will be collected at the completion of aquifer testing (see Section 2.7.3, below). The sample will be collected from the discharge of the pumping system. Samples will be collected and analyzed for the suite listed in Table 3B.

2.5.1.3 Groundwater Sample Handling Procedures

Groundwater samples will be kept on ice and delivered to SMO for processing. After processing, Kleinfelder or available LANL personnel will transport a subset of the groundwater samples to Earth and Environmental Sciences (EES)-6 for analyses. EES-6 will provide rapid turn-around analyses for various screening analyses. These screening analyses will be used to evaluate whether perched water zones should be isolated with drill casing before the regional aquifer is penetrated.

2.5.1.4 NMED Split Sampling

NMED personnel may perform a field visit or collect a split of groundwater sampled during drilling. The procedure for this process is as follows:

- Personnel from the NMED will be notified as far in advance as possible when drill teams encounter or anticipate encountering water-bearing zones [Michael Dale (672-0449) or Steve Yanicak (672-0448)].
- Once on site, NMED personnel will sign the visitor's log, and review and sign the Health and Safety Plan (HASP) and SSHASP.
- Due to the restrictions outlined in the HASP, it is necessary that NMED personnel collect a split of the groundwater sample outside the exclusion zone.
- In the case of limited groundwater volume, the LANL analyte suite outlined in Tables 3A and 3B, as appropriate, will be the priority.

2.5.2 Cuttings Sampling

In the first borehole that is drilled, sufficient quantities of cuttings will be collected from the borehole discharge line at approximately 5-ft intervals. The cuttings will be examined to determine lithologic characteristics and will be used to prepare the lithologic log. Sampling details are outlined in Table 4.

Portions of the cuttings will be sieved (using >#10 and >#35 mesh) and placed in chip trays along with unsieved cuttings. Finer sieve sizes or bulk cuttings will be collected when >10-mesh materials are absent. An additional aliquot of the >#10 fraction of cuttings (about 200 to 300 milliliters (mL)) will be prepared for all intervals where sufficient returns are available. The sieved fractions will be placed in labeled plastic bags and submitted to LANL. The remaining cuttings will be sealed in Ziploc® bags, labeled, and archived in core boxes. Cuttings will be screened by the RCTs before being removed from the site.

Lost-circulation zones (no cuttings returns) will be indicated by empty trays labeled "no returns" or equivalent. If foam or mud is used during drilling, cuttings return delay time will be recorded. Up-hole velocities will be calculated based on borehole size and fluid volumes used. Physical measurements of up-hole travel time may also be made. To do this, the borehole will be circulated clean, a 6-inch interval drilled, and up-hole travel time measured.

Due to the close proximity of the wells, the sample collection interval in the second borehole can be increased to 10-ft. An increase in the sample interval shall occur only at depths where sufficient cuttings were collected in the first borehole. At these depths, 500 to 700 mL of bulk

cuttings will be collected and placed in Ziploc® bags, labeled, and transferred to the LANL geology task leader. Sieving of the samples will not be required. Approval from the Field Manager will be obtained prior to changing sample collection strategies.

2.6 DOWN-HOLE GEOPHYSICS

Kleinfelder will perform video logging and natural gamma and induction array logging of R-10a using Kleinfelder-supplied equipment.

Schlumberger, a subcontractor of Kleinfelder, will perform the geophysical logging of the R-10 borehole. The geophysical logs to be produced are indicated in Table 6. The geophysical logging operation will consist of one mobilization after reaching the target depth for R-10. Personnel from environment, safety, and health (ESH) 12 typically perform radiological screening of Shlumberger's down-hole radioactive source tool. However, since the site and access to the site is on San Ildefenso Pueblo property, notification to ESH-12 will not be required. A Kleinfelder field staff member 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. A down-hole video of the borehole will be made using Kleinfelder-supplied equipment after geophysical logging, if practical.

2.7 WELL INSTALLATION AND COMPLETION

Data from geophysical and video logs will be used to determine the placement of the screened interval for the wells. The wells will be designed in accordance with LANL ER SOP-05.01 (LANL 2001c). DOE and LANL will provide an approved well design to Kleinfelder. Final well design will be based on discussions between DOE, Kleinfelder, LANL, and NMED.

2.7.1 Well Construction

The casing and well screen were 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 a high-pressure hot-water cleaner.

Each well will be constructed of 4.5-in. inside diameter (ID)/5.0-in. OD, type A304, stainless-steel casing fabricated to ASTM A312 standards. The screened intervals of each well are planned to consist of nominal 12-ft length(s) of 5-in. OD compatible, 0.020-in. rod-based wire-wrapped well screen. Each well screen has an effective screen length of 10 ft. Each screened interval will be placed and constructed based on site-specific information. Two screened intervals will be installed in R-10 and one screened interval will be installed in R-10a (see Figures 4 and 5), unless otherwise directed by DOE.

Stainless-steel casing will be placed below the bottom-most well screen to provide up to a 30-ft sump (as directed by DOE). External couplings, also of type A304 stainless steel fabricated to ASTM A312 standards, will be used to connect individual casing and screen joints. Centralizers will be placed immediately below, between, and above the well screen. An additional centralizer will be placed 100 ft above the top of each well screen.

A 2.5-in. OD steel tremie pipe will be used during well construction to place the annular fill materials. The bottom of the borehole will be tagged at the beginning of well installation and a 50/50 percent mix of bentonite chips and sand will be placed from the bottom of the borehole to within 5 feet of the bottom of the first screened interval.

The primary filter pack of each screened interval will consist of 10/20 sand and will be placed approximately 5 feet above and below the screened interval. The actual primary filter pack interval will be based on site-specific conditions. After placement, each screened interval will be swabbed to promote settling and compaction of the primary filter pack. A two to three-ft thick collar of 20/40 sand will placed above each primary filter pack

A bentonite seal consisting of a 50/50 percent mix of bentonite chips and sand will be paced above the fine sand collar. Potable water will be used to transport the materials down-hole. If the tremie pipe becomes plugged, a low concentration of EZ-MUD®/water solution may be used to place bentonite. This seal will be allowed to hydrate for at least 4 hours. The same bentonite seal mix will then be used to fill the borehole annulus to within 75 ft of ground surface. The mix will be hydrated in place every 50 to 100 ft.

Cement with a 2% bentonite, or other approved mix, will be used to fill the remainder of the borehole annulus. The depth to annular materials will be measured periodically to determine that the materials are settling properly. A down-hole video will be used to confirm well construction.

2.7.2 Well Development

Development of R-10a will begin immediately after the well has been constructed. Drilling of R-10 will not proceed until development of R-10a has been completed.

The primary objective of well development is to remove suspended sediment from the water until turbidity is less than 5 nephelometric turbidity units (NTUs) for three consecutive samples. Additional water quality parameters to be measured during development include pH, temperature, specific conductance, and total organic carbon (TOC). If the NTU standard isn't attainable, an alternate standard of stabilization of pH, temperature, and conductivity, and TOC levels less than 2.0 parts per million (ppm) must be achieved before termination of development procedures. Water samples will be collected daily in 40-mL septum vials and 250-mL poly bottles and transferred to EES-6 for TOC and anion analyses. Samples will be submitted unfiltered and without acid preservatives.

A Pulstar 12000 winch line rig or equivalent will be used for well development. Development of each well will begin by bailing and swabbing the screened interval and sump to remove bentonite materials, drilling fluids, formation sands and fines that had been introduced into the well during drilling and installation. Bailing will be conducted using a 3.5-gal. capacity, 3-in. OD by 10-ft long, stainless steel bailer. 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 4.25-in. OD, 1-in. thick rubber disc attached to the drill rod. The swabbing tool will be lowered into the well and drawn repeatedly across the screened intervals for approximately 1 hour. Water turbidity will not be measured during the bailing and swabbing processes.

A 4-in. diameter Grundfos submersible pump, with an appropriately sized pump motor, will be used for the final stage of well development. The pump intake will be set at multiple depths across the screened interval and in the sump to remove as much suspended sediment as possible from the well.

After development of the lower screen, a mechanical packer will be placed between the screened intervals in R-10 to prevent mixing of the upper and lower water bearing intervals. The mechanical packer will be left in place until the final sampling system is installed.

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

2.7.3 Aquifer Testing

Once development of each well is complete, an aquifer test will be performed. A constant-rate pumping test will be used in screened intervals where well development indicates the presence of high-transmissivity water bearing intervals. Injection or slug tests will be used in screened intervals where well development indicates the presence of low-transmissivity water bearing intervals. Aquifer testing will be conducted under the direct supervision of a professional hydrogeologist. The aquifer test data and results will be included in the well completion report.

Data from aquifer tests will be collected using an In-Situ brand non-vented data logger. A constant-rate pumping test will consist of collecting 24 hours each of aquifer background, response to pumping, and recovery data. A 4-in. diameter Grundfos submersible pump, with an appropriately sized pump motor, will be used for the pumping portion of the aquifer test. An inflatable packer will be installed above the submersible pump and inflated during pumping. This will be performed to minimize well casing storage effects. The water level will be confirmed with an electronic sounder before and after the aquifer test.

Injection or slug tests will be designed and conducted under the direct supervision of a professional hydrogeologist. The actual equipment and procedures used for aquifer testing will be based on site-specific conditions. Testing will typically consist of bailing the well dry after a data logger has been installed at the bottom of the well. The water level is allowed to recover and the test is repeated. The static water level will be considered recovered when 95% of the initial static water level (before testing began) has been obtained.

2.7.4 Sampling System Installation

Dedicated sampling systems will be installed in wells R-10 and R-10a. A Westbay multi-screen sampling (Westbay) system will be installed in well R-10. Prior to installation of the Westbay sampling system, the mechanical packer (installed after aquifer testing) will be removed from the well. The Westbay system will be installed by WDC using a Pulstar 12000 winch line rig, or equivalent. Installation will be performed under the direction of a Westbay representative. A Kleinfelder Representative will also be present during system installation.

A Grundfos™ submersible pump sampling system will be installed in R-10a. The system will be sized to provide a minimum of 3 gallons per minute (gpm) of water flow at the ground surface. All materials that contact the groundwater sample will be constructed of either stainless steel or Teflon, although brass check valves may be used above the groundwater table. To measure water

levels in the wells, a 1-inch inside diameter pipe will be installed to sufficient depth to set a dedicated transducer below the measured static water level. A weather-resistant pump control box will be installed next to the wellhead.

2.7.5 Surface Completion

The wellhead completion for each well will include a steel outer casing to protect the stainless steel monitoring well. A weep-hole will be installed to prevent build-up of water inside of the protective casing. The top of the protective casing will be fitted with a tamper-proof well cover plate and will be set in a 5-ft x 5-ft x 6-inch-thick reinforced concrete pad. A brass survey monument will be placed in the northwest corner of the pad.

A set of four safety bollards will be placed around each pad to protect the well from traffic. One of the four bollards will be designed for easy removal to allow access during well or sampling system maintenance.

A New Mexico licensed Professional Land Surveyor will survey the horizontal location and elevation of both completed wells. Data provided by the surveyor will include North American Datum 83 State Plane Coordinates, latitude and longitude, and elevation in relation to mean sea level (National Geodetic Vertical Datum 29). The accuracy of the survey data will be in accordance with NMED Regulations. Survey data will be on file with Kleinfelder, Inc., and provided in the completion report.

2.8 INVESTIGATION-DERIVED WASTE

Fluids produced during drilling, well development, and testing will be sampled and analyzed in accordance with the attached Waste Characterization Strategy Form (WCSF) [see Appendix E]. Cuttings and water samples will be collected from the cuttings pit and submitted under chain of custody documentation to the SMO.

All water produced during the drilling and development of the wells will be containerized, sampled, and evaluated for compliance with NM Water Quality Control Commission Regulation 3103 groundwater standards and applicable Resource Conservation and Recovery Act regulatory limits before any discharge occurs. Decisions regarding the discharge of drilling and development water will be made in accordance with the "Workplan NOI Decision Tree" (Revised July 15, 2002) and in coordination with NMED.

Drilling and development water approved for discharge will be applied to the land surface or used for dust suppression on access roads or the drill site in accordance with the terms and conditions of the original NOI (August 2, 2001). No water will be discharged until permission is granted through the approval process outlined in the WCSF and by San Ildefonso Pueblo.

Cuttings approved for on-site management will be left in the cuttings pit and buried, after the cuttings pit liner has been removed, or used as fill in site restoration or road maintenance.

2.9 SITE RESTORATION

Site restoration will conform to requirements of the SWPPP. The road improvements and drilling pad will be left in place to facilitate future well sampling and maintenance. The drill pad will be reduced by approximately 50% during site restoration. The cuttings pit will be backfilled and ground surface will be recontoured. An attempt will be made to compact the backfill in the cuttings pit, however to ensure future safety no parking or driving will be permitted over the former pit location. Metal posts will be installed to identify the perimeter of the cuttings pit after burial. Erosion control will be accomplished in accordance with LANL's BMP guidance document. Reseeding of the site will be performed using a San Ildefonso Pueblo-approved seed mix. All site restoration activities are subject to San Ildefonso Pueblo approval.

3.0 REFERENCES

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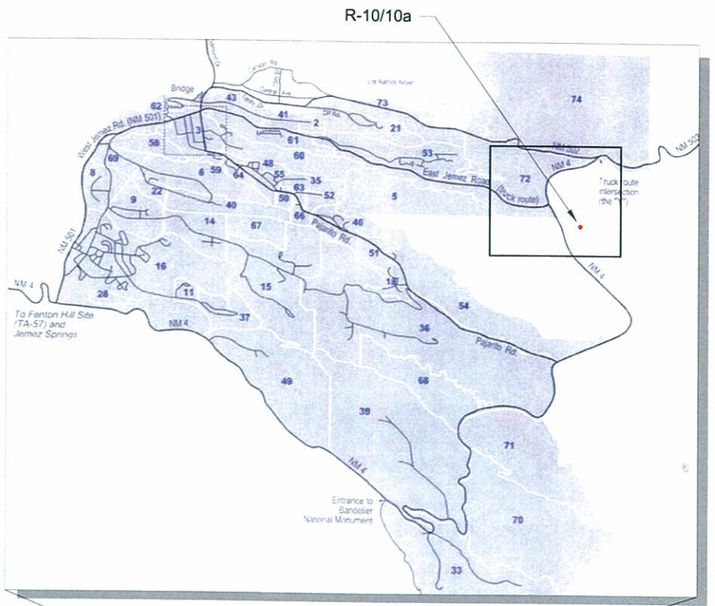
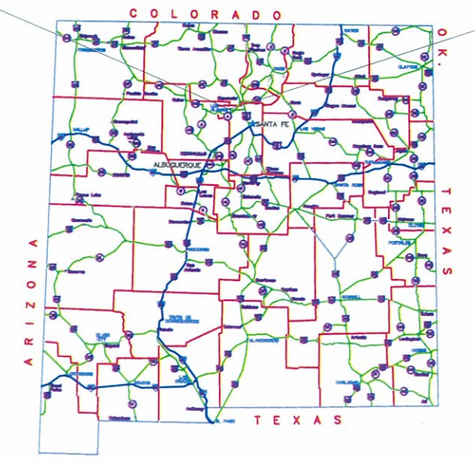
FIGURES

Legend

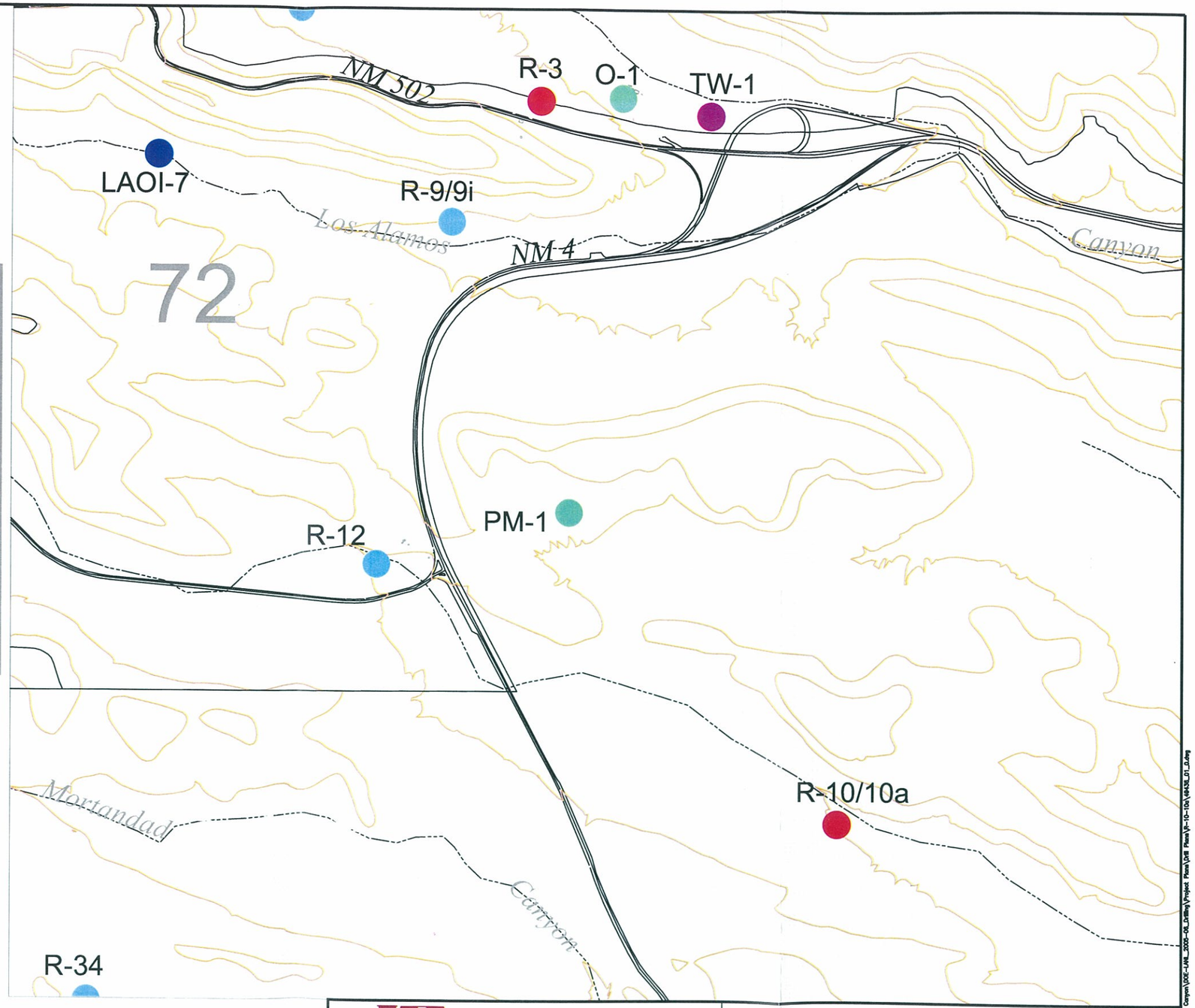
- = Regional aquifer wells (proposed)
- = Intermediate perched zone wells (proposed)
- = Regional aquifer wells installed since 1998
- = Older test wells
- = Water supply wells
- 58 = Technical area identification
- = 100-ft contours





VICINITY MAP

NOT TO SCALE



1000 0 500 1000

SCALE: 1 inch = 1000 ft

KLEINFELDER	
Drawn By: C Landon	Date: June 2005
Project No.: 49436	Filename: 49436_01_0.dwg
Scale: 1" = 1000'	Revision: –

SITE LOCATION MAP
Characterization Wells R-10/10a
Sandia Canyon - San Ildefonso Pueblo
Los Alamos National Laboratory
Los Alamos, New Mexico

FIGURE
1

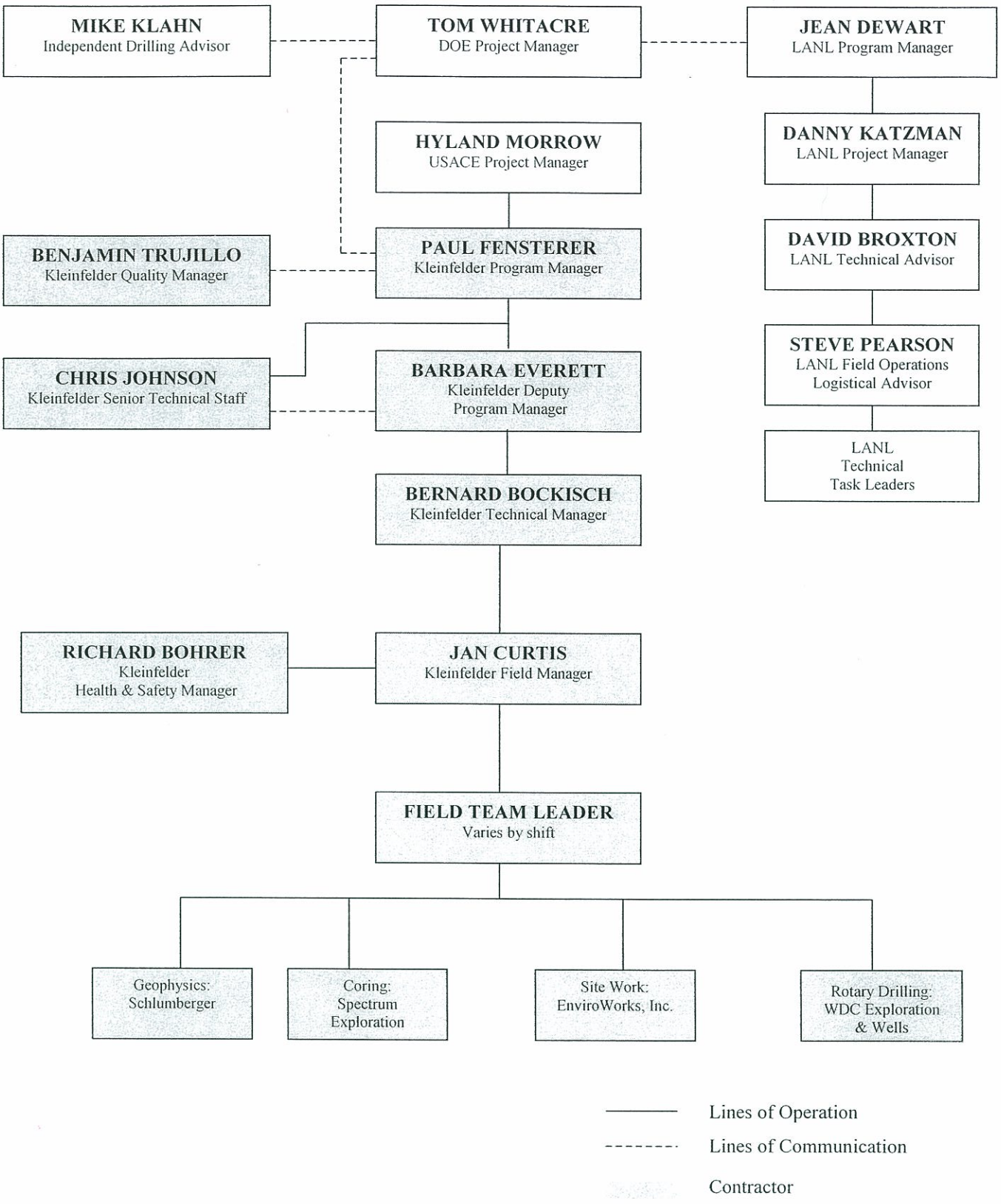
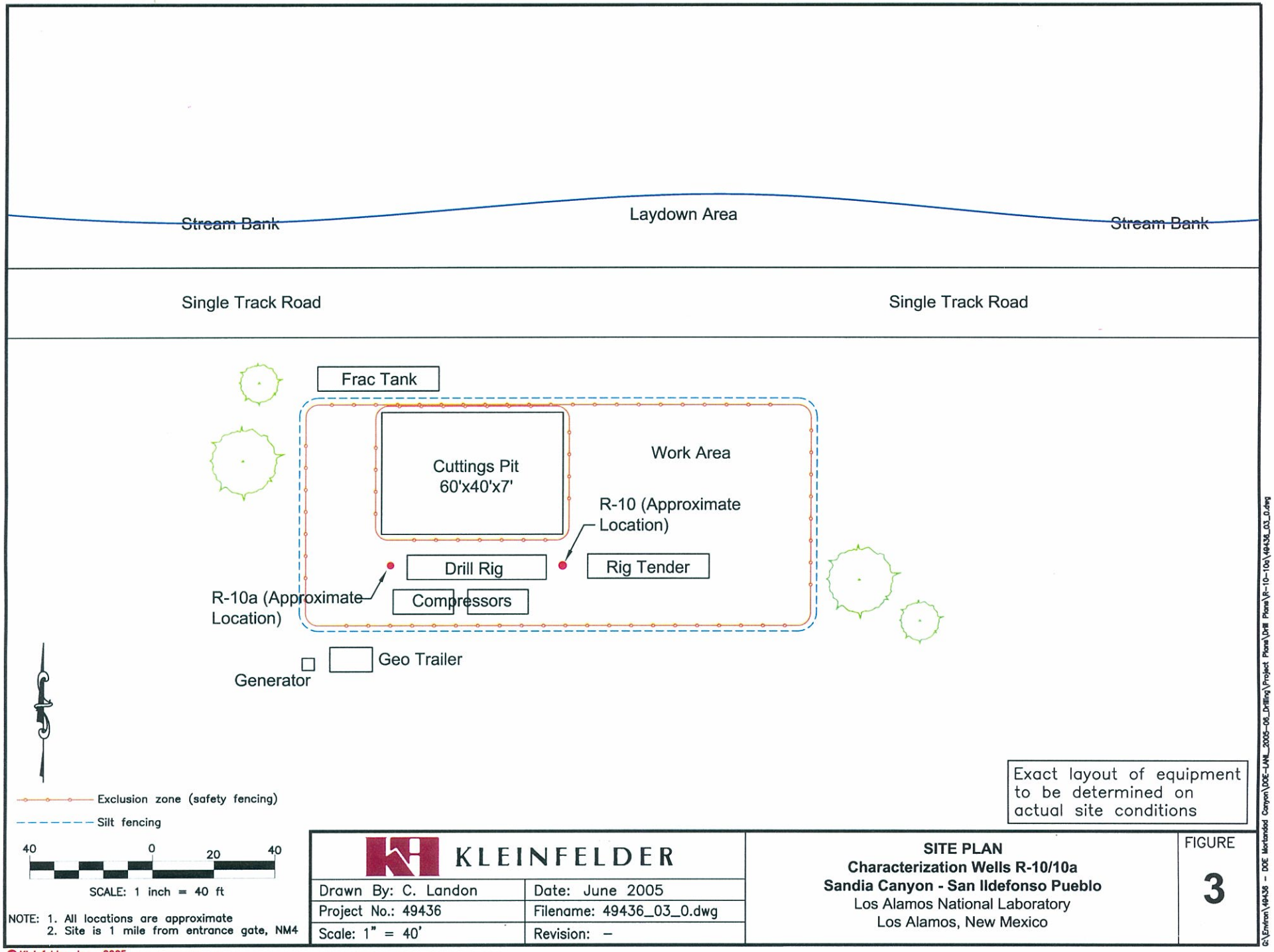


Figure 2. Project Organization Chart

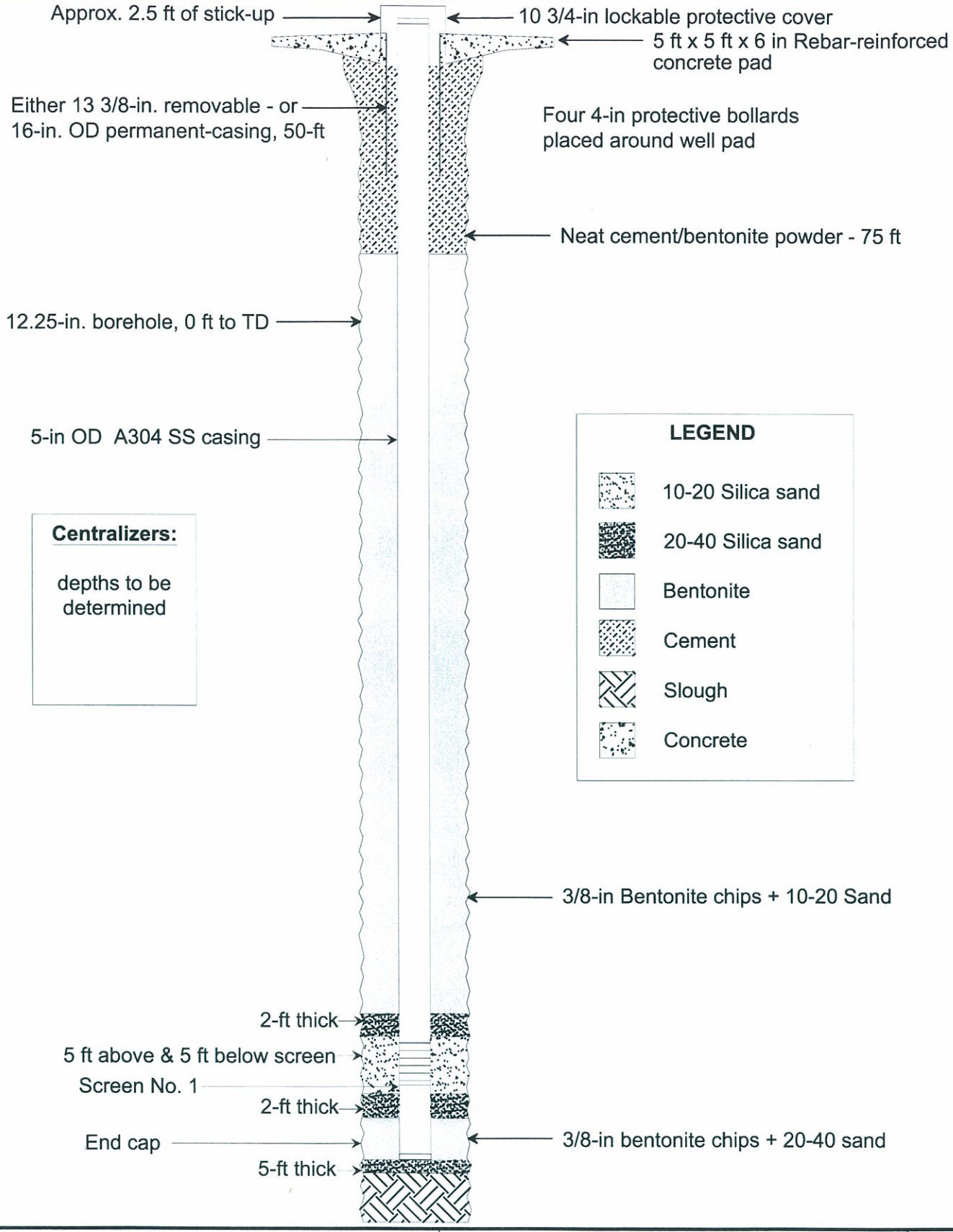


KLEINFELDER	
Drawn By: C. Landon	Date: June 2005
Project No.: 49436	Filename: 49436_03_0.dwg
Scale: 1" = 40'	Revision: –

SITE PLAN
Characterization Wells R-10/10a
Sandia Canyon - San Ildefonso Pueblo
Los Alamos National Laboratory
Los Alamos, New Mexico

FIGURE
3

G:\Environ\49436 - DOE Mortandad Canyon\DOE-LANL_2005-06_Drilling\Project Plans\Drill Plans\R-10-10a\49436_03_0.dwg

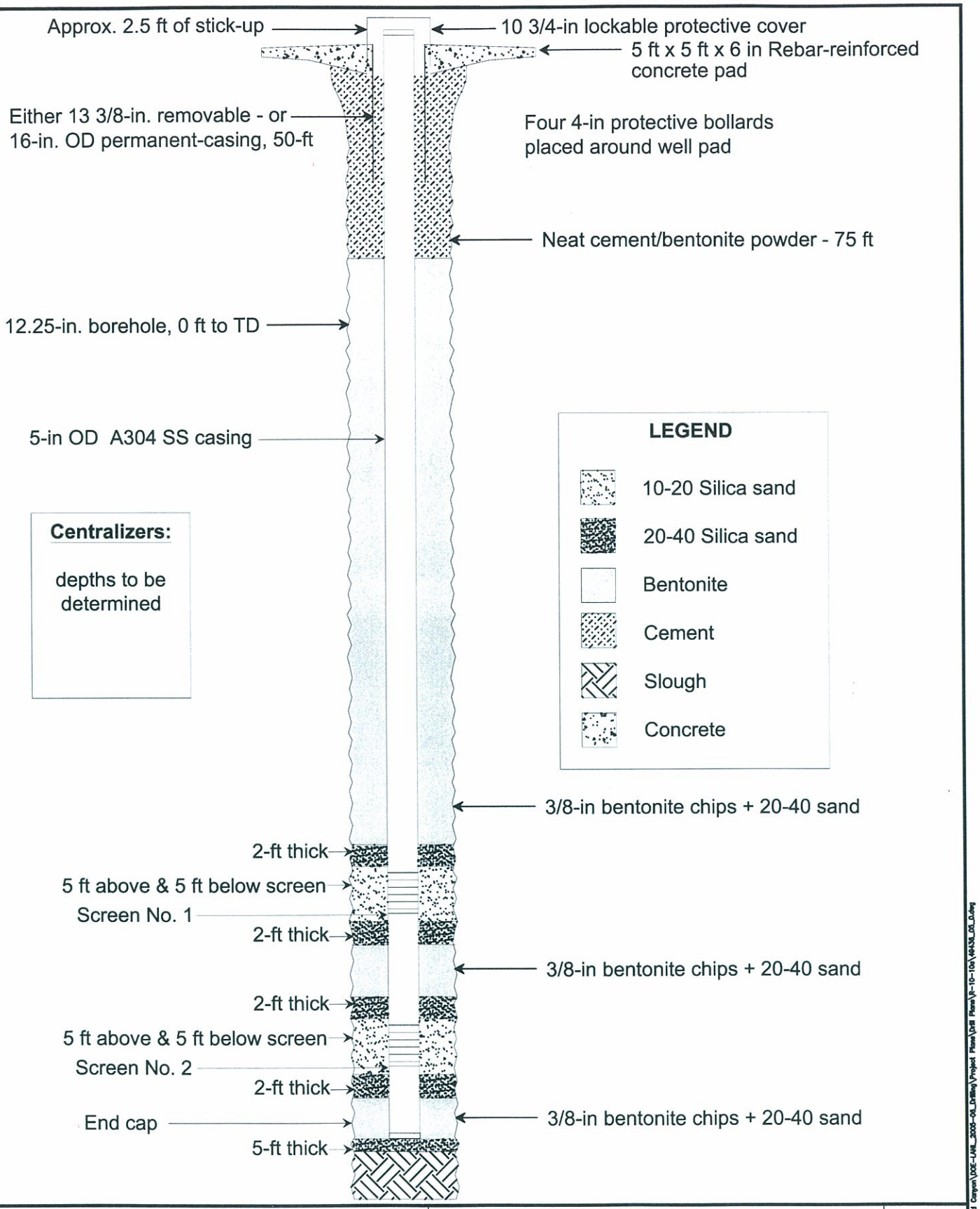


KLEINFELDER

Drawn By: C Landon	Date: June 2005
Project No.: 49436	Filename: 49436_04_0.dwg
Scale: –	Revision: –

TYPICAL ONE-SCREEN WELL COMPLETION
Characterization Well R-10a
Sandia Canyon - San Ildefonso Pueblo
Los Alamos National Laboratory
Los Alamos, New Mexico

FIGURE
4



KLEINFELDER

Drawn By: C Landon	Date: June 2005
Project No.: 49436	Filename: 49436_05_0.dwg
Scale: –	Revision: –

TYPICAL TWO-SCREEN WELL COMPLETION
Characterization Well R-10
Sandia Canyon - San Ildefonso Pueblo
Los Alamos National Laboratory
Los Alamos, New Mexico

FIGURE
5

TABLES

Table 1
Roles and Responsibilities

Name	Project Role	Responsibilities	Experience
Paul Fensterer	Program Manager	Program Management Controls, Client Interaction	Civil Engineering, Operations Management
Chris Johnson, RG	Chief Technical Leader	Technical Oversight and Quality Assurance	Hydrogeology, Well Design, Deep Well Drilling
Benjamin Trujillo	Quality Manager	Quality Assurance	Quality Assurance, Quality Control
Richard Bohrer, CIH	Health and Safety Manager	Kleinfelder Health & Safety Plan and Compliance	Industrial Hygiene. Field Investigations
Barbara Everett, PG, RG	Deputy Program Manager	Project Cost Controls	Hydrogeology, Program Management
Bernie Bockisch	Technical Manager	Project Technical Oversight	Geologic Engineering, Field Investigations, Environmental Sciences
Jan Curtis	Field Manager	Field Management, Field Geology, Subcontractor Coordinator	Geology, Field Management, Hydrology, Water Resources
Cember Hardison	Assistant Field Manager	LANL Logistical Coordinator, Subcontractor Coordinator	Quality Control, Field Work, Environmental Science
Catherine Goetz	Lead Geologist/Field Team Leader	Drill Oversight, Field Geology, Sampling	Geology and Geochemistry, Field Investigations

Table 2
DOE and LANL Contact Personnel

	DOE		LANL	
Personnel	Tom Whitacre	Matt Johansen	Jean Dewart	Danny Katzman
Office	665-5042	665-8265	665-0239	667-6333
Cell or Pager	699-2308	1-800-708-6139	699-0239	699-1042

Table 3
Tentative Drilling Schedule

Activity	Start Date	Date of Completion
Drilling of R-10a	7-11-05	8-10-05
Development of R-10a	8-11-05	8-17-05
Aquifer Recovery	8-18-05	8-21-05
Drilling of R-10	8-22-05	10-5-05
Development of R-10	10-6-05	10-19-05
Pump Testing	10-20-05	11-9-05
IDW Analyses	11-10-05	12-26-05
Site Restoration	12-27-05	1-3-06

Table 4A
Analytical Suites, Sample Containers, Preservation, Sample Volume, and Preferred Laboratories for Groundwater Samples Collection

Well	Analytical Suite	Sample Container	Preservation	Filtered through Acetate 0.45 micrometer	Volume (L)	Preferred Laboratory
R-10	Metals/cations (dissolved)	125-mL plastic	Nitric acid to pH 2, 4°C	Yes	0.125	EES-6[a]
	Metals/cations (total)	125-mL plastic	Nitric acid to pH 2, 4°C	No	0.125	EES-6
	Anions (including perchlorate) (dissolved)	125-mL plastic	None	Yes	0.125	EES-6
R-10a	Metals/cations (dissolved)	125-mL plastic	Nitric acid to pH 2, 4°C	Yes	0.125	EES-6
	Metals/cations (total)	125-mL plastic	Nitric acid to pH 2, 4°C	No	0.125	EES-6
	Anions (including perchlorate) (dissolved)	125-mL plastic	None	Yes	0.125	EES-6

[a] EES-6 = Earth and Environmental Sciences Hydrology, Geochemistry, and Geology Group

Table 4B
Containers, Preservation, and Volumes of Groundwater Samples for Characterization Sampling in Completed Wells

Number of Water Samples per Borehole	Analyte	Container	Preservation	Filtered through Acetate 0.45 micrometer	Volume (L)	Laboratory	Archive Sample	Archival Sample Volume (L)
Up to 5	Metals/cations (dissolved)	125-mL plastic	Nitric acid to pH 2, 4°C	Yes	0.125	EES-6	No	n/a[a]
Up to 5	Metals/cations (total)	125-mL plastic	Nitric acid to pH 2, 4°C	No	0.125	EES-6	No	n/a
Up to 5	Anions (including perchlorate) (dissolved)	125-mL plastic	None	Yes	0.125	EES-6	No	n/a
Up to 5	Perchlorate, IC, and/or LCMS/MS	1-L plastic	None	No	1.0	GEL	No	n/a
Up to 5	Total organic carbon	40-mL septum glass bottle	None	No	0.04	EES-6	No	n/a
Up to 5	Gamma spectroscopy, americium-241; cesium-137, plutonium-238, -239/240; uranium-234, -235/236, -238; strontium-90	1-gal. plastic	Nitric acid to pH 2, 4°C	No	4.55	GEL	Yes	4.55
Up to 5	Stable isotopes ($^{18}O/^{16}O$, D/H)	40-mL glass w/septum glass	Ambient temperature	No	0.04	EES-6	No	n/a
Up to 5	Stable isotopes ($^{15}N/^{14}N$)	Two 40-mL glass w/septum glass	Ambient temperature	No	0.08	EES-6	No	n/a
	Tritium (liquid scintillation)	500-mL poly	Ambient temperature	No	0.5	GEL	No	n/a
Up to 5	Tritium (low-level screening)	500-mL poly	Ambient temperature	No	0.5	University of Miami	Yes	0.5
Up to 5	ARS gross alpha, gross gamma plus ARS gross gamma	500-mL poly	Ambient temperature	No	0.5	ARS	Yes	0.5
						Total sample volume (L) for archived samples		**5.55**

[a] n/a = Not applicable.

Table 5
Sample Collection Activities for Drill Cuttings

Sample Description	Test	Sample Size	Container	Sample Frequency
Drilling				
Cuttings	Bulk cuttings systematically collected for archival purposes and for supplemental sample needs	500–700 mL	Plastic Ziploc™ bags	One sample every cuttings run (nominally every 5 ft)
Cuttings	Sieved cuttings for lithologic description and binocular microscope examination	Enough to partly fill trays	Plastic chip trays	One sample every cuttings run (nominally every 5 ft). Normally, an unsieved sample, a >10 mesh sample, and a >35 mesh sample every cuttings run.
Cuttings	Sieved cuttings for XRD[a], XRF[b], petrography	200–300 mL sieved or bulk, if necessary	Plastic Ziploc™ bags	One >10-mesh sample every cuttings run (nominally every 5 ft); finer sizes or bulk split will be substituted where >10-mesh size cannot be obtained.

Note: Priority of sample core collection when recovery is less than 100% should be anions, moisture content, and stable isotopes, radionuclides and tritium, and radiological screening.

[a] XRD = X-ray diffraction spectroscopy

[b] XRF = X-ray fluorescence

Table 6
Contracted Geophysical Logging Suite R-10

Tool	Cased	Uncased
Natural Gamma	X	X
Natural Gamma Ray Spectrometer (NGS)	X	X
Epithermal Compensated Neutron Log (CNL)	X	X
Caliper		X
Formation Micro-imager (FMI)		X
Array Induction Tool (AIT)		X
Triple LithoDensity (TLD)	X	X
Combinable Magnetic Resonance (CMR)		X
Elemental Capture Sonde (ECS)	X	X

APPENDIX A

NOI APPLICATION AND EPA ACKNOWLEDGEMENT

NOI Application Detail

Notice of Intent (NOI) for Stormwater Discharges Associated with Construction Activity Under a NPDES Permit

NOI Submitted Date: June 14, 2005	Status: Active
	Date Discharge Active: June 21, 2005

I. Permit Number

General Permit Number: NMR150000

Tracking Number for this Project: NMR15FA4I

II. Operator Information

Name: KLEINFELDER, INC

<STRONG<>

Street: 8300 JEFFERSON NE SUITE B

City: ALBUQUERQUE State: NM Zip Code: 87113

Phone: 505-344-7373

III. Project/Site Information

Project/Site Name: R-10 SANDIA CANYON

Project Street/Location: SANDIA CANYON

City: LOS ALAMOS State: NM Zip Code: 87544

County or similar government subdivision: Los Alamos

Latitude: 35.85 Longitude: 106.205833

Project Located in Indian country? Yes Territory: SAN ILDEFONSO PUEBLO

Estimated Start Date: June 24, 2005 Estimated Completion Date: June 24, 2008

Estimated Area to be Disturbed (to the nearest quarter acre): 1.5

IV. SWPPP Information

SWPPP Contact Name: TOM WHITACRE

Location of SWPPP for viewing: Other

SWPPP Street: USDOE, 528 35TH ST

City: LOS ALAMOS

State: NM Zip Code: 87544

Email: TWHITACRE@DOEAL.GOV	
V. Discharge Information	
Receiving Water: SANDIA CANYON Consistent with TMDL: Yes	
IV. Endangered Species Information	
I have satisfied permit eligibility with regard to protection of endangered species through the indicated section of Part I.B.3.e(2) of the permit under criterion E.	
VII. NOI Certification Information	
Certified By:	Signed?: Yes Date: May 22, 2005
Postmark Date: May 25, 2005	

NOI Application Detail

Notice of Intent (NOI) for Stormwater Discharges Associated with Construction Activity Under a NPDES Permit

NOI Submitted Date: June 14, 2005	Status: Active	
	Date Discharge Active: June 21, 2005	
I. Permit Number		
General Permit Number: NMR15000I		
Tracking Number for this Project: NMR15FA3I		
II. Operator Information		
Name: KLEINFELDER, INC		
<STRONG<>		
Street: 8300 JEFFERSON NE SUITE B		
City: ALBUQUERQUE	State: NM	Zip Code: 87113
Phone: 505-344-7373		
III. Project/Site Information		
Project/Site Name: R-10A		
Project Street/Location: SANDIA CANYON		
City: LOS ALAMOS	State: NM	Zip Code: 87544
County or similar government subdivision: Los Alamos		
Latitude: 35.85	Longitude: 106.205833	
Project Located in Indian country? Yes	Territory: SAN ILDEFONSO PUEBLO	
Estimated Start Date: June 24, 2005	Estimated Completion Date: June 24, 2008	
Estimated Area to be Disturbed (to the nearest quarter acre): 1.5		
IV. SWPPP Information		
SWPPP Contact Name: TOM WHITACRE		
Location of SWPPP for viewing: Other		
SWPPP Street: USDOE, 528 35TH ST		
City: LOS ALAMOS		

State: NM Zip Code: 87544	
Email: TWHITACRE@DOEAL.GOV	
V. Discharge Information	
Receiving Water: SANDIA CANYON	
Consistent with TMDL: Yes	
IV. Endangered Species Information	
I have satisfied permit eligibility with regard to protection of endangered species through the indicated section of Part I.B.3.e(2) of the permit under criterion E.	
VII. NOI Certification Information	
Certified By: PAUL FENSTERER	Signed?: Yes Date: May 22, 2005
Postmark Date: May 25, 2005	

APPENDIX B
PUEBLO DE SAN ILDEFENSO PERMIT

Route 5, Box 315-A
Santa Fe, NM 87506
(505) 455-2273
(505) 455-7351 (FAX)

RPM-FY05-010

REVOCABLE
PERMIT

A Permit is hereby issued by the Pueblo of San Ildefonso Governor and Tribal Council permit to:

Matt Johansen
Groundwater Program Manager
Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, NM 87544

Hereinafter called "Permittee", and its constituents to enter upon Pueblo premises as follows:

This permit is to gain access to Sandia Canyon on the San Ildefonso Pueblo Reservation, east of State Road 4.

For purpose/s herein stated:

To conduct drilling activities and fieldwork associated with planned regional well R-10.

Party shall consist of 10 to 12 to be present for stated purpose/s on the following date/s:
(# Of individuals)

Date of permit: June 27, 2005 thru September 30, 2005

In consideration of the above privilege, the Permittee agrees to comply with all Tribal regulations and submit their jurisdiction to said Pueblo:

This permit shall indemnify the Pueblo of San Ildefonso of any responsibility or liability for theft, loss, damages, or injury to person/s or property.

The following are addendum's and provisions to this permit:

1. Permittees' shall remain within designated area/s only.
2. Permittees' shall not remove, disturb, or eradicate any cultural matter in the designated areas.
3. Permittees' shall restore surface area after project is completed.

Permittee — Date: 6-24-05

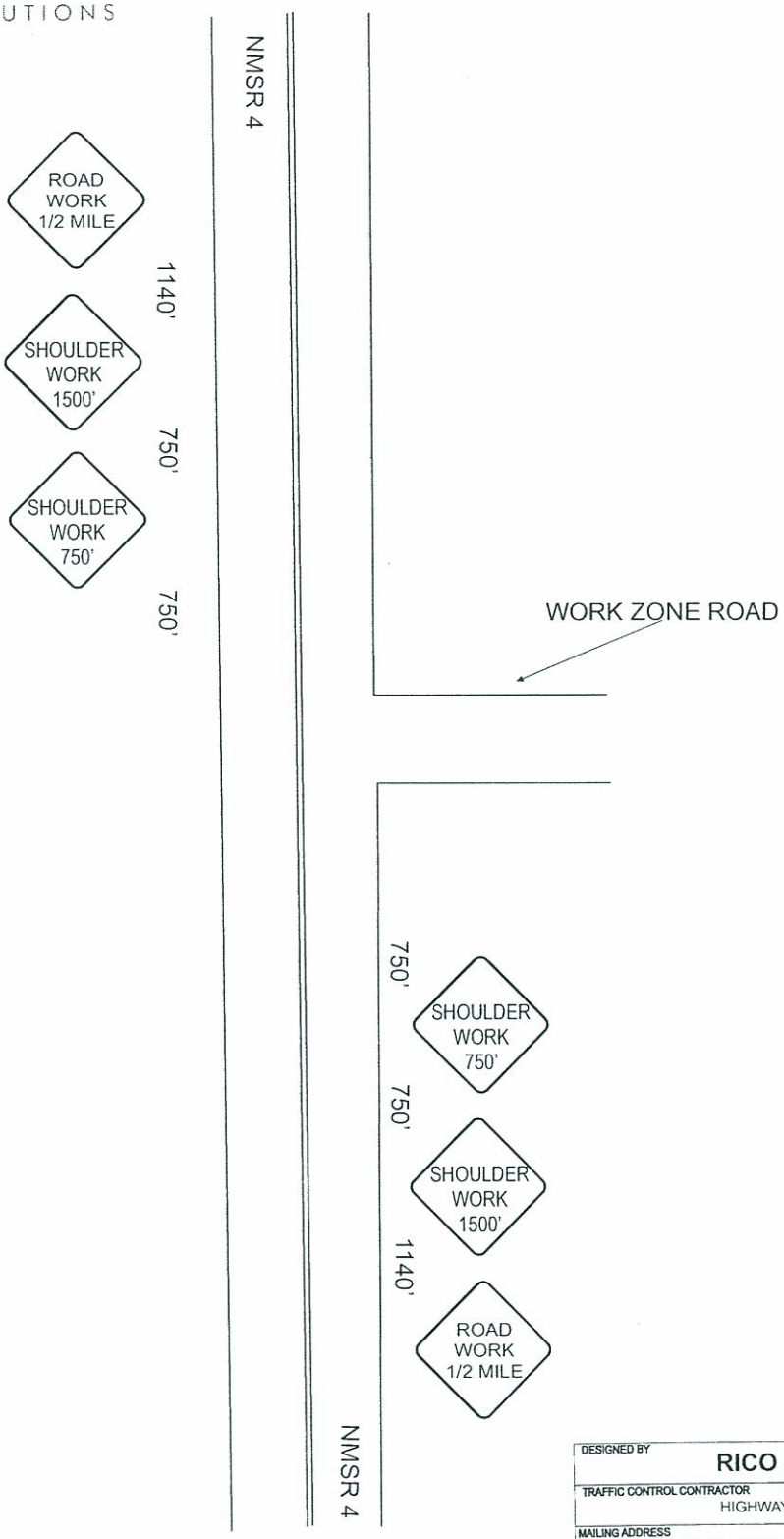
Governor's Signature — Date: 6/24/05

APPENDIX C
TRAFFIC CONTROL PLAN

KLEINFELDER INC.

Highway Supply LLC

TRAFFIC CONTROL SOLUTIONS



NOTE: TYPICAL SHOULDER WORK SET UP / NOT TO SCALE

DESIGNED BY RICO ARMIJO

TRAFFIC CONTROL CONTRACTOR HIGHWAY SUPPLY LLC

MAILING ADDRESS 6221 CHAPPELL RD NE

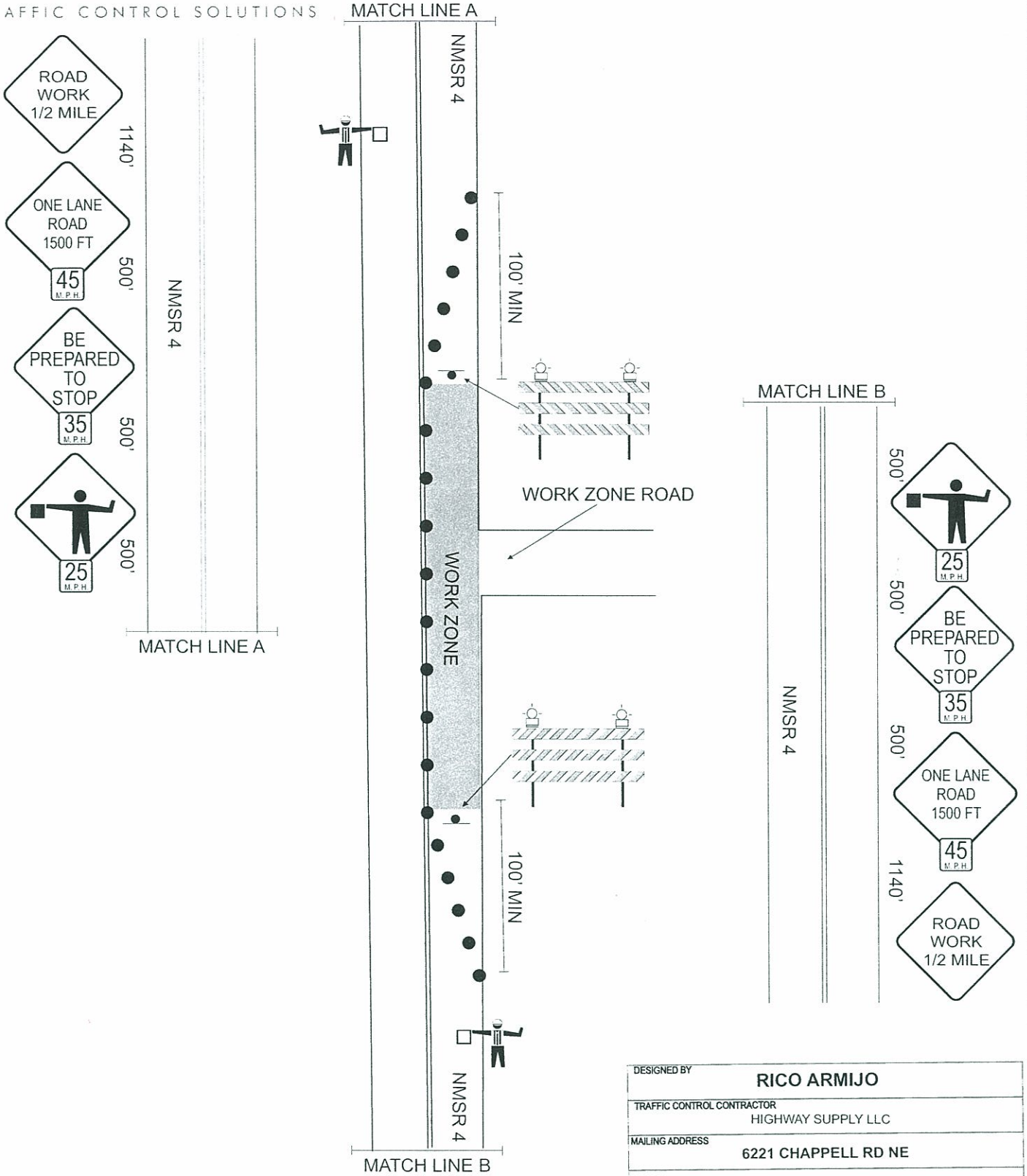
ALBUQUERQUE NM 87113

Phone 505-345-8295 FAX 505-345-0546 TOLL FREE NUMBER 1-800-333-7064

KLEINFELDER INC.

Highway Supply LLC

TRAFFIC CONTROL SOLUTIONS



NOTE: TYPICAL SHOULDER WORK SET UP / NOT TO SCALE

DESIGNED BY: RICO ARMIJO

TRAFFIC CONTROL CONTRACTOR: HIGHWAY SUPPLY LLC

MAILING ADDRESS: 6221 CHAPPELL RD NE

ALBUQUERQUE NM 87113

Phone: 505-345-8295 FAX: 505-345-0546 TOLL FREE NUMBER: 1-800-333-7064

APPENDIX D
MATERIAL SAFETY DATA SHEETS

AQUAGEL GOLD SEAL®

Premium Untreated Sodium Bentonite

Description

AQUAGEL GOLD SEAL is a premium, high-yielding Wyoming sodium bentonite that contains no polymer additives or chemical treatments of any kind. AQUAGEL GOLD SEAL is a 200 mesh dry-powdered clay that can be added directly to fresh water or freshwater drilling fluids. AQUAGEL GOLD SEAL functions as a viscosifier and filtrate reducer in freshwater drilling fluids.

Applications/Functions

- Viscosify freshwater drilling fluids
- Reduce filtration by forming a thin filter cake with low permeability
- Improves hole cleaning capabilities
- Promote hole stability in poorly consolidated formations

Advantages

- Naturally-occurring clay mineral without chemical additives
- ANSI/NSF Standard 60 certified
- Ideal for geotechnical drilling and environmental monitoring well drilling applications
- Develops gel structure for cuttings suspension
- Quality controlled and manufactured to exceed API Specification 13A, section 5
- Filter cake easily removed from formation by the back flow
- Provides lubricity in drilling fluids

Typical Properties

Appearance	Variable-colored powder (gray to tan)
Bulk density, lb/ft^3	68 to 72 (as packaged)

Rev 6/2001 IDP 003

Recommended Treatment

Mix slowly through a jet mixer or sift slowly into the vortex of a high-speed stirrer.

Approximate Amounts of AQUAGEL GOLD SEAL® Added to Fresh Water or to Freshwater Drilling Fluids			
Application/Desired Result			
Added to Fresh Water	**lb/100 gal**	**lb/bbl***	**kg/m^3**
Under normal drilling conditions	30-50	13-22	35-60
To stabilize caving formations	60-80	25-35	70-100
To stop circulation loss	70-95	30-40	85-110
Added to Freshwater Mud	**lb/100 gal**	**lb/bbl***	**kg/m^3**
Under normal drilling conditions	10-25	4-10	11-28
To stabilize caving formations	20-45	9-18	25-50
To aid in control of lost circulation	25-50	10-20	28-56

- 1 bbl = 42 U.S. gallons

Packaging

AQUAGEL GOLD SEAL premium bentonite is packaged in 50-lb (22.7 kg) or 100-lb (45.4 kg) multiwall paper bags.

Availability

AQUAGEL GOLD SEAL can be purchased through any Baroid Industrial Drilling Products Distributor. To locate the Baroid IDP distributor nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products,
A Product and Service Line of Halliburton Energy Services, Inc.
3000 N. Sam Houston Pkwy. E.
Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

EZ-MUD®

Polymer Emulsion

Description

EZ-MUD, a liquid polymer emulsion containing partially hydrolyzed polyacrylamide/polyacrylate (PHPA) copolymer, is used primarily as a borehole stabilizer to prevent reactive shale and clay from swelling and sloughing. EZ-MUD is also added to low-solids drilling fluids to increase lubricity, fluid viscosity, and to improve carrying capacity of air/foam injection fluids.

Applications/Functions

- Stabilize reactive shale and clay formations
- Improve borehole stability
- Enhance slurry rheological properties
- Alleviate mud rings, bit balling and booting-off in clay formations
- Reduce drill pipe torque and pumping pressure
- Minimize rod chatter in diamond core drilling
- Create "stiff-foam" and maintain foam integrity
- Flocculate non-reactive solids in reserve pit at low concentrations

Advantages

- Mixes easily with minimum shear in fresh water
- Provides effective clay and shale stabilization with lower viscosity
- Imparts high degree of lubricity
- Non-fermenting
- Breaks down chemically with bleach (sodium hypochlorite)
- ANSI/NSF Standard 60 Certified

Typical Properties

Appearance	Thick, opaque white liquid
Density	8.5 lb/gal (1.02 g/cm^3)
pH (1 quart per 100 gallons water)	8.5
Flash point, PMCC °F, °C	>200 (>93.3)
Thermal stability, °F, °C	250 (121)

Rev. 6/2001 · IDP 008

Recommended Treatment

Approximate Amounts of EZ-MUD® Added to Drilling Fluid System			
Drilling Application/Desired Property	**Quarts/ 100 gal**	**Pints/bbl**	**Liters/m^3**
Added to fresh water (To formulate a clay-free drilling fluid)			
• To stabilize reactive clay and shale	0.5 - 2.0	0.5 - 1.75	1.25 - 5.0
• To retard rod vibration, reduce torque and pumping pressure	1.0 - 2.0	1.0 - 1.75	2.5 - 5.0
Added to QUIK-GEL® or BORE-GEL™ Drilling Fluids			
• To retard reactive shale and clay and enhance lubricity	0.5 - 1.0	0.5 - 1.0	1.25 - 2.5
Added to injection liquid in air/foam drilling applications			
• To improve foam performance and hole conditions	0.5 - 1.0	0.5 - 1.0	1.25 - 2.5

Notes:

- Make-up water used to mix EZ-MUD should meet the following quality:
  total chloride less than 1500 ppm (mg/L)
  total hardness less than 150 ppm as calcium
  total chlorine less than 50 ppm
  water pH between 8.5-9.5
- Reduce total hardness of make-up water by adding soda ash (sodium carbonate) at 0.5 to 1 pound per 100 gallons (0.6 - 1.2 kg/m^3) of make-up water.
- EZ-MUD can be chemically broken down with liquid bleach in regular household concentration (5% sodium hypochlorite). Use one gallon of liquid bleach per 100 gallons (10 liters/m^3) of fluid formulated with EZ-MUD. Do not use perfumed liquid bleach or solid calcium hypochlorite.

Packaging

EZ-MUD is packaged in 5-gal (19-liter) and 1-gal (3.8-liter) plastic containers.

Availability

EZ-MUD can be purchased through any Baroid Industrial Drilling Products Distributor. To locate the Baroid IDP distributor nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products,
A Product and Service Line of Halliburton Energy Services, Inc.
3000 N. Sam Houston Pkwy. E.
Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

PAC™-L

Modified Natural Cellulosic Polymer

Description

PAC-L, modified natural cellulosic polymer, provides filtration control in most water-based drilling fluids without substantially increasing viscosity. PAC-L, when added to a QUIK-GEL® or BORE-GEL™ slurry, yields a drilling mud system suitable for drilling in sandy formation. PAC-L can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured into drill string directly.

Applications/Functions

- Provide filtration control in fresh or brackish water-based drilling fluids
- Reduce fluid loss without significantly increasing fluid viscosity
- Encapsulate shale to prevent swelling and disintegration
- Promote borehole stability in water sensitive formations
- Minimize rod chatter, rotational torque and circulating pressure
- Improve hole cleaning and core recovery

Advantages

- Effective in fresh water, salt water and brackish water-based drilling fluids
- Effective in small quantities for filtration control
- Non-fermenting
- Compatible with other Baroid drilling fluid additives
- Resistant to harsh environments and contaminants

Typical Properties

Appearance	White, free-flowing powder
pH (1% aqueous solution)	7.75

Recommended Treatment

- Using a Venturi Mixer, or into vortex of a high-speed stirrer, add slowly and uniformly to the entire circulating system.

Rev. 6/2001 · IDP 059

Recommended Treatment

Approximate Amounts of PAC™-L Added to Water Based Fluids		
Desired Condition/Result		
Added to fresh or salt water	**lb/100 gal**	**kg/m^3**
• To stabilize water sensitive formation	3 – 7	4 – 8.5
• To reduce torque and lower circulating pressure	0.5 - 2	0.6 – 2.4
Added to QUIK-GEL® slurry (25 lb/100 gallons) or (30 kilograms per m^3)	**lb/100 gal**	**kg/m^3**
• To reduce filtration rate and improve borehole stability	0.5 - 2.0	0.6 – 2.4
Added to BORE-GEL™ slurry (35 lb/100 gallons) or (42 kilograms per m^3)	**lb/100 gal**	**kg/m^3**
• To reduce filtration rate and improve borehole stability	0.5 – 2.0	0.6 – 2.4

Note:
Very salty waters may require twice as much PAC-L as fresh water. Preferably, PAC-L should be mixed in fresh water before it is added to very salty water.

Packaging

PAC-L is packaged in 50-lb (22.7 kg) bags.

Availability

PAC-L can be purchased through any Baroid Industrial Drilling Products Distributor. To locate the Baroid IDP distributor nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products
A Product and Service Line of Halliburton Energy Services, Inc.
3000 N. Sam Houston Pkwy. E.
Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

HALLIBURTON

MATERIAL SAFETY DATA SHEET

PAC®-L

Revision Date: 10/17/2001

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: PAC®-L
Synonyms: None
Chemical Family: Carbohydrate
Application: Fluid Loss Additive

Manufacturer/Supplier
Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251

Telephone: (281) 871-4000
Emergency Telephone: (800) 666-9260 or (713) 676-3000

Prepared By
Product Stewardship
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substance	Weight Percent (%)	ACGIH TLV-TWA	OSHA PEL-TWA
Cellulose derivative	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview
May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation
If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin
Wash with soap and water. Get medical attention if irritation persists.

Eyes
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion
Under normal conditions, first aid procedures are not required.

Notes to Physician
Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	430
Flash Point/Range (C):	221
Flash Point Method:	Not Determined
Autoignition Temperature (F):	752
Autoignition Temperature (C):	400
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards
Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings:	Health 0, Flammability 0, Reactivity 0
HMIS Ratings:	Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures
Avoid creating and breathing dust.

Environmental Precautionary Measures
None known.

Procedure for Cleaning/Absorption
Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions
Avoid creating or inhaling dust. Avoid dust accumulations. Slippery when wet.

Storage Information
Store away from oxidizers. Store in a dry location. Product has a shelf life of 12 months

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls
A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection
Not normally needed. But if significant exposures are possible then the following respirator is recommended. Dust/mist respirator. (95%)

Hand Protection
Normal work gloves.

Skin Protection
Normal work coveralls.

Eye Protection
Wear safety glasses or goggles to protect against exposure.

Other Precautions
None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White to off white
Odor:	Odorless
pH:	6.5-9 (1% solution)
Specific Gravity @ 20 C (Water=1):	1.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	40-55
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Forms gel
Solubility in Solvents (g/100ml):	Not Determined
Solubility in Sea Water (g/100ml):	Forms gel
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C	

(centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid
None known.

Incompatibility (Materials to Avoid)
Strong oxidizers.

Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

Additional Guidelines
Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure
Eye or skin contact, inhalation.

Inhalation
May cause mild respiratory irritation.

Skin Contact
May cause mild skin irritation.

Eye Contact
May cause mild eye irritation.

Ingestion
None known

Aggravated Medical Conditions
None known.

Chronic Effects/Carcinogenicity
No data available to indicate product or components present at greater than 1% are chronic health hazards.

Other Information
None known.

Toxicity Tests

Oral Toxicity:	LD50: 1260 mg/kg (Rat)
Dermal Toxicity:	Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity
Not determined

Genotoxicity: Not determined

Reproductive/Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)
Not determined

Persistence/Degradability
Readily biodegradable

Bio-accumulation
Not Determined

Ecotoxicological Information
Acute Fish Toxicity:
TLM96: > 500 mg/l (Golden orfe)
Acute Crustaceans Toxicity:
Not determined
Acute Algae Toxicity:
Not determined

Chemical Fate Information
Not determined

Other Information
Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method
Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging
Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Not restricted

Canadian TDG

Not restricted

ADR

Not restricted

Air Transportation

ICAO/IATA

Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory
All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances
Not applicable

EPA SARA (311,312) Hazard Class
None

EPA SARA (313) Chemicals
This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity For This Product
Not applicable.

EPA RCRA Hazardous Waste Classification
If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65
All components listed do not apply to the California Proposition 65 Regulation.

MA Right-to-Know Law
Does not apply.

NJ Right-to-Know Law
Does not apply.

PA Right-to-Know Law
Does not apply.

Canadian Regulations

Canadian DSL Inventory
All components listed on inventory.

WHMIS Hazard Class
Non-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Product Stewardship at 1-580-251-4335.

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

QUIK-FOAM®

High Performance Foaming Agent

Description

QUIK-FOAM, a proprietary blend of alcohol ethoxy sulfates (AES) which are biodegradable, is an effective foaming agent. QUIK-FOAM can be added to fresh, brine, or brackish water for air/foam, air/gel-foam, or mist drilling applications.

Applications/Functions

- Enhance the rate of cuttings removal
- Increase the ability of lifting large volumes of water
- Improve hole-cleaning capability of the airstream
- Reduce the sticking tendencies of wet clays, thereby eliminating mud rings and wall packing
- Reduce erosion of poorly consolidated formations
- Provide a technique for drilling in zones with lost circulation
- Increase borehole stability
- Reduce air-volume requirement
- Suppress dust during air drilling operation

Advantages

- ANSI/NSF Standard 60 Certified
- High quality, high expansion foam with a consistency similar to shaving foam
- High stability with excellent retention time
- Versatile and compatible with various types of make-up water
- Readily undergoes primary and ultimate (>99%) biodegradation
- Proven product for multi-discipline application

Typical Properties

Appearance	Light yellow, transparent liquid
Specific gravity	1.03
pH (0.5% solution)	7.1
Flash point, PMCC °F, °C	82, (28)
Pour point, °F, °C	0, (-18)

Rev. 6/2001 · IDP 010

Recommended Treatment

Approximate Amounts of QUIK-FOAM® Added to Injection Water			
Application	**Amount/100 gal**	**Amount/bbl**	**Liters/m^3**
Dry-air drilling (as a dust suppressant)	0.5 - 1 pints	0.2 - 0.5 pints	0.5 - 1.5
Mud-mist drilling in sticky clays	1 - 2 quarts	1 - 2 pints	2.5 - 5
Foam and gel-foam drilling	0.5 - 2 gallons	1.5 - 7 pints	5 - 20
As a slug to clean the annulus	1 pint*	0.5 pints*	0.5**

* in drill pipe, followed by 3 to 5 gallons of water; ** followed by 20 liters of water

Note:

Close product container immediately after use to avoid gelation of remaining QUIK-FOAM.

Product Make-ups for Air Drilling Injection Slurries				
Main Ingredient of Injection Slurry	**Water (gallons)**	**QUIK-GEL® viscosifier (pounds)**	**QUIK-TROL® polymer (pounds)**	**QUIK-FOAM foaming agent (% by volume)**
Foam Drilling System	100	...	...	0.02 - 3.0
Mixing/Injection Procedure Add QUIK-FOAM to injection water. Inject into the air stream at a rate necessary to maintain hole stability and penetration rate. Increase amount of QUIK-FOAM as required to compensate for downhole water dilution				
Firm-Foam Drilling System	100	...	0.5 - 1	0.1 - 2.0
Mixing/Injection Procedure Mix polymer with water before adding QUIK-FOAM. 1-2 pints of EZ MUD® may be used as a substitute for QUIK-TROL. Inject into the air stream at a rate necessary to maintain hole stability and penetration rate.				
Mud-Mist Drilling System	100	25	...	0.3 - 1.0
Mixing/Injection Procedure Mix viscosifier with water before adding QUIK-FOAM. Inject into the air stream at a rate necessary to maintain hole stability and penetration rate. Resulting viscosity is 32-40 sec/qt as measured by Marsh Funnel.				
Gel-Foam Drilling System	100	12 - 15	1	0.3 - 1.0
Mixing/Injection Procedure Mix viscosifier and polymer with water before adding QUIK-FOAM. Inject into the air stream at a rate necessary to maintain hole stability and penetration rate. Resulting viscosity is 32-40 sec/qt as measured by Marsh Funnel.				

Note:

In some states, it is illegal to discharge any foreign substance into the water shed due to potential contamination of ground water. After use, the foam mixture must be localized in an earthen pit or some type of containment and allowed to biodegrade naturally.

Packaging QUIK-FOAM® is packaged in 5-gal (19-liter) plastic containers or in 55-gal (208 liter) drums.

Availability QUIK-FOAM can be purchased through any Baroid Industrial Drilling Products Distributor. To locate the Baroid IDP distributor nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products,
A Product and Service Line of Halliburton Energy Services, Inc.
3000 N. Sam Houston Pkwy E.
Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

1. PRODUCT AND COMPANY IDENTIFICATION

Product Code	00379
Trade Name	QUIK-FOAM®
Generic Description	SURFACTANT BLEND
Manufacturer/Supplier	Baroid
Address	P.O. Box 1675 Houston, TX 77251
Phone Number	(281) 871-5900
Emergency Phone Number	(281) 871-5900
Chemtrec Number	(800) 424-9300
MSDS first issued	12 March 1999
MSDS data revised	

2. COMPOSITION/INFORMATION ON THE COMPONENTS

Hazardous Components in Preparation for US

Component Name	Codes	Concentration
ISOPROPYL ALCOHOL	67-63-0	13.00 - 15.00
ETHANOL	64-17-5	4.00 - 5.00

3. HAZARD IDENTIFICATION

Routes of Entry	- Eye contact - Ingestion - Inhalation - Skin contact
Carcinogenic Status	Not considered carcinogenic by NTP, IARC, and OSHA.
Target Organs	- Eye - Lung - Skin - Central Nervous System - Liver - Kidney
Health Effects - Eyes	Liquid, mist or vapor may cause slight transient irritation. Serious damage may result if treatment is delayed.
Health Effects - Skin	Material will cause irritation. Repeated or prolonged contact may produce defatting of the skin leading to irritation and dermatitis.
Health Effects - Ingestion	A large dose may have the following effects: - irritation of mouth, throat and digestive tract - damage to the central nervous system - liver damage - kidney damage
Health Effects - Inhalation	Exposure to vapor may have the following effects: - irritation of nose, throat and respiratory tract

4. FIRST AID MEASURES

First Aid - Eyes	Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention immediately.
First Aid - Skin	Wash skin thoroughly with soap and water. Contaminated clothing should be washed or dry-cleaned before re-use.
First Aid - Ingestion	Wash out mouth with water. Induce vomiting. Obtain medical attention immediately.
First Aid - Inhalation	Remove from exposure. If there is difficulty in breathing, give oxygen. If breathing stops or shows signs of failing, give artificial respiration. Obtain medical attention.

4. FIRST AID MEASURES

Advice to Physicians	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Extinguishing Media	Keep containers and surroundings cool with water spray. Use water spray, foam, dry chemical or carbon dioxide.
Special Hazards of Product	Flammable liquid, can release vapors that form flammable mixtures at temperatures at or above the flashpoint.
Protective Equipment for Fire-Fighting	Wear full protective clothing and self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Spill Procedures	Contain and absorb using earth, sand or other inert material. Transfer into suitable containers for recovery or disposal. Spills will create a fire hazard.
Personal Precautions	Wear appropriate protective clothing. Wear respiratory protection.
Environmental Precautions	MODERATELY TOXIC TO FISH. DO NOT USE, SPILL OR DISCARD WHERE IT MAY LEACH, SPILL OR RUN OFF INTO WATERWAYS. Prevent the material from entering drains or water courses. Notify authorities if spill has entered water course or sewer or has contaminated soil or vegetation.

7. HANDLING AND STORAGE

Handling	Use in well ventilated area. Avoid inhaling vapor Avoid contact with eyes, skin and clothing. Keep container tightly closed when not in use.
Storage	Store away from sources of heat or ignition. Storage area should be: - cool - dry - well ventilated - out of direct sunlight - away from incompatible materials

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Standards

ISOPROPYL ALCOHOL	ACGIH: TLV 400ppm 8h TWA.
ETHANOL	UK EH40: OES 1000ppm (1900mg/m3) 8h TWA. ACGIH: TLV 1000ppm (1880mg/m3) 8h TWA. A4 - not classifiable as a human carcinogen. OSHA: PEL 1000ppm (1900mg/m3) 8h TWA.
Engineering Control Measures	Exposure to this material may be controlled in a number of ways. The measures appropriate for a particular worksite depend on how the material is used and on the potential for exposure.
Respiratory Protection	Respiratory protection if there is a risk of exposure to high vapor concentrations.
Hand Protection	Chemical resistant gloves

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection	Chemical goggles.
Body Protection	Wear: - long sleeves
Protection During Application	During application, adequate ventilation must be provided.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Color	Light Yellow
Odor	Alcoholic
pH	Range between 7.3 to 7.8.
Specific Gravity	1.02
Flash Point (PMCC) (°C/F)	27-32/80-90
Explosion Limits (%)	Not determined.
Density	8.5 lbs/gal
Solubility in Water	Completely soluble

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Conditions to Avoid	- High temperatures
Materials to Avoid	- Oxidizing agents - Strong bases
Hazardous Polymerization	Will not occur.
Hazardous Decomposition Products	Incomplete combustion will generate: - oxides of carbon - short chain hydrocarbons - oxides of sulfur - ammonia

11. TOXICOLOGICAL INFORMATION

Acute Toxicity	Acute toxic effects are unlikely to occur in practice because of the warning provided by irritant effects.

12. ECOLOGICAL INFORMATION

Mobility	No relevant studies identified.
Persistence/Degradability	The product is readily biodegradable.
Bio-accumulation	Product is not expected to bioaccumulate.
Ecotoxicity	The product is rated as moderately toxic to aquatic species.

13. DISPOSAL

Product Disposal	Dispose of in accordance with all applicable local and national regulations.
Container Disposal	Labels should not be removed from containers until they have been cleaned. Dispose of containers with care. Containers should be cleaned by appropriate methods and then re-used or disposed of by landfill or incineration as appropriate. Contaminated

13. DISPOSAL

containers must not be re-used. Do not cut, puncture or weld on or near to the container.

14. TRANSPORT INFORMATION

DOT CFR 172.101 Data	Not Regulated
UN Proper Shipping Name	Flammable liquid, n.o.s.
UN Class	Flammable
UN Number	1993
UN Packaging Group	III
IATA - Proper Shipping Name	Flammable liquid, N.O.S.
IATA - Class	3
IATA - Packaging Group	III

15. REGULATORY INFORMATION

TSCA Listed	Yes.
MA Right To Know Law	Listed.
PA Right To Know Law	Listed
NJ Right to Know Law	Listed
California Proposition 65	This product does not contain materials which the State of California has found to cause cancer, birth defects or other reproductive harm.
SARA Title III Sect. 302 (EHS)	Not listed.
SARA Title III Sect. 311/312 Categorization	Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard Flammable
SARA Title III Sect. 313	This product does not contain a chemical which is listed in Section 313 at or above de deminis concentrations.

16. OTHER INFORMATION

NFPA Ratings

NFPA Code for Health 1
NFPA Code for Flammability 3
NFPA Code for Reactivity 0

Abbreviations

® Registered trademark of Halliburton Energy Services Inc.
(TM) Trademark of Halliburton Energy Services
N/A: Denotes no applicable information found or available
CAS#: Chemical Abstracts Service Number
ACGIH: American Conference of Governmental Industrial Hygienists
OSHA: Occupational Safety and Health Administration
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
STEL: Short Term Exposure Limit
NTP: National Toxicology Program
IARC: International Agency for Research on Cancer
R: Risk
S: Safety
LC50: Lethal Concentration 50%

16. OTHER INFORMATION

LD50: Lethal Dose 50%
BOD: Biological Oxygen Demand
KoC: Soil Organic Carbon Partition Coefficient

Prepared By: Environmental Services

All information recommendations and suggestions herein concerning our product are based on tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantees, expressed or implied, is made by Baroid as to the effects of such use, the results to be obtained, or the safety and toxicity of the product nor does Baroid assume any liability arising from the use, by others, of the product referred to herein. Nor is the information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

APPENDIX E
WASTE CHARACTERIZATION STRATEGY FORM

Waste Characterization Strategy Form

Project Title	**CY 2005 Characterization Wells**
Operating Unit #	**NA**
PRS #	**Bayo Canyon (C-00-004), Pueblo Canyon (C-00-005), Los Alamos Canyon (C-00-006), Pajarito Canyon (C-00-011), Sandia Canyon (C-00-007), and Water Canyon (C-00-016)**
Activity Type	**Regional and Intermediate Groundwater Well Installation and Characterization Sampling**
Field Team Leader	**Danny Katzman**
Waste Management Coordinator	**Victor Garde**
Completed by	**Tom Benson**
Date	**July 5, 2005**

Description of activities:
The waste-generating activities addressed in this WCSF consist of the installation (i.e., drilling, gathering screening samples, well development, and initial well testing). of seven regional aquifer wells and five intermediate wells. The wells will be installed at Los Alamos National Laboratory (LANL or the Laboratory) and on adjacent land during the CY05 drilling campaign. These wells are intended to provide hydrogeologic and water quality data for intermediate and regional groundwater in the vicinity of potential contaminant sources in Bayo, Pueblo, Los Alamos, Pajarito, Sandia, and Water Canyons. These data will be used with similar data collected from other wells in the area to improve the conceptual model for geology, hydrology, and chemistry and will constrain the nature and extent of contamination in these canyons.

The locations of the 12 wells are shown in Figure 1. A brief description of each well follows:

Regional Well R-3 will be installed in Pueblo Canyon. It will be drilled to a total depth of 1500 ft, and will target the zone(s) within the regional aquifer that contain the nitrate, perchlorate, and tritium contaminants that have been detected in Municipal Well O-1. R-3 will provide information about the contaminant transport pathways from surface sources to the regional aquifer and will measure the hydrologic parameters and water quality in saturated zone(s).

Regional Wells R-10 and R-10a will be installed in Sandia Canyon, on San Ildefonso Pueblo land. Well R-10 is required by the March 1, 2005 Compliance Order on Consent (Consent Order) and the work plan for Sandia Canyon and Cañada del Buey. R-10 is the deeper of the two wells; it will be drilled to a total depth of 1165 ft. Well R-10a will be drilled to a total depth of 765 ft. The wells are intended to bound the extent of contaminants detected in R-12 and further refine the understanding of the effects of pumping in the Buckman well field. R-10 is primarily a hydrology well and will penetrate to depths that are sufficient for identifying hydraulic responses to pumping at the Buckman well field. R-10a is primarily a monitoring well designed to collect water quality data near the top of the regional aquifer. The R-10 well pair will also test the conceptual model of contaminant transport from lower Pueblo Canyon to springs in the vicinity of White Rock.

Regional Well R-16a will be installed in Cañada del Buey, north of Pajarito Canyon, and will be drilled to a total depth of 700 ft. R-16a will replace screen 1 in R-16, which is blocked by drill casing that could not be extracted during well construction. The original purpose of R-16 was to determine the water table and vertical gradients for the regional aquifer near the Rio Grande and to serve as a monitoring point between Technical Area (TA) 54 and the Rio Grande. R-16 also was intended to determine the relationship between the regional water table and springs in White Rock Canyon.

Regional Well R-17 will be installed in Pajarito Canyon, near its confluence with Twomile Canyon and downstream of the flood retention structure. It will be drilled to a total depth of 1350 ft. R-17 is required by the Consent Order, and will provide information on perched and regional aquifer groundwater in the west-central part of the Laboratory.

Regional Well R-24 will be installed in Bayo Canyon, east of the former TA-10. R-24 will be drilled to a total depth of 840 ft, and will be used to determine if perched intermediate water occurs beneath Bayo Canyon and to evaluate water quality at the top of the regional aquifer.

Regional Well R-27 will be installed in Water Canyon, about 1 mi below the confluence of Cañon de Valle and Water Canyon. R-27 will be drilled to a total depth of 1100 ft, and will provide information about water quality in intermediate perched zones and in the regional aquifer in Water Canyon.

Intermediate Well LAOI-3.2a will be drilled to the original target horizon in the Puye Formation as Well LAOI-3.2 to determine if a second perched groundwater zone is present. It will be located in Los Alamos Canyon and drilled to a total depth of 300 ft. This well will help define the lateral extent of the deeper perched groundwater found in the Puye Formation at Wells Otowi-4 (O-4) and R-6i.

Intermediate Well LAOI-7 will define the western extent of perched groundwater found in basalt at Wells R-9/R-9i. Well LAOI-7 will also help define the eastern extent of contaminant migration through the vadose zone in Los Alamos Canyon. It will be drilled to a total depth of 350 ft.

Intermediate well LADP-5 will be located in DP Canyon and designed to determine the western extent of tritium-, nitrate-, and perchlorate-bearing perched groundwater that was recently identified in Well R-6i. It will be drilled to a total depth of 650 ft.

Intermediate Well R-23i will be installed in Pajarito Canyon to sample possible intermediate perched groundwater that was encountered while drilling the R-23 regional aquifer well. It will be drilled to a total depth of 700 ft.

Intermediate well CdV-16-2(i)r is a re-drill of well CdV-16-2(i) because of dry conditions at well screens. It will be installed on the mesa south of Cañon de Valle, and drilled to a total depth of 900 ft. The contractor will attempt to recover casing for a limited period, and the DOE will refurbish and reuse the casing if it is successfully recovered.

Waste Characterization Strategy Form

Characterization Strategy:

The following waste streams are anticipated:

- 1-Borehole Cuttings
- 2- Drilling Fluids and Development Water
- 3-Spent Personal Protective Equipment (PPE) and sampling supplies (contact waste)
- 4- Municipal Solid Waste (MSW)
- 5- Petroleum-Contaminated Soil (PCS)(potential)
- 6- Petroleum-Contaminated Absorbent Material (potential)

Waste # 1: Borehole Cuttings

Waste type: Core and drill cuttings generated during drilling through the surface, vadose zone, perched aquifers and regional aquifer. The drill cuttings are not expected to be contaminated by radionuclides or chemicals other than those present in drilling additives (See Attachment 1).

Anticipated Regulatory Status: Non-hazardous, non-radioactive, solid waste.

Characterization Approach: The cuttings will be characterized through a combination of acceptable knowledge (AK) from core sample results and direct waste sampling. The specific procedures for characterization of the cuttings are provided in Attachment 2 and Enclosures 4 and 5 within the attachment. LANL RCTs will perform radiological screening on all samples collected.

Storage and Disposal Method: The cuttings will be contained in a lined cuttings pit staging area within the project-controlled area, pending review of analytical results by the Waste Management Coordinator to determine final waste characterization. It is expected that these cuttings will be left in place in the drill pit or used as fill in site restoration or road maintenance. If the cuttings do not meet the criteria for on-site re-use, a plan for disposal will be developed on a case-by-case basis, as provided in Attachment 2.

Waste # 2: Drilling Fluids and Development Water

Waste Type: Groundwater from well drilling and development activities.

Anticipated Regulatory Status: Non- hazardous, non-radioactive, solid waste.

Characterization Approach: All water that is purged during the drilling and development of wells will be containerized, sampled, and evaluated for compliance with the appropriate standards (See Attachment 2 and Enclosures 1 – 3 within the attachment).The drilling fluids will be characterized by existing data from direct sampling of the containerized fluids and AK from the drilling additives (Attachment 1). Representative waste characterization samples will be collected with as short of a turn around time as is possible to minimize storage time.

Storage and Disposal Method: The anticipated storage method will be the lined cuttings pit.

Groundwater from the drilling and development of the perched zones, the regional aquifer and the associated drilling fluids will be segregated by zone, as is practicable. The anticipated staging of the drilling fluids and development water will be in the cuttings pit and in 3,000 to 21,000-gallon tanks as needed.

If analytical results are below the NOI criteria described in Attachment 1, as expected, then the drilling and development waters will be discharged in accordance with Attachment 1 and the approved NOI conditions. If analytical results for any of the waters exceed NOI criteria, then those liquids will be profiled for treatment or disposal at the appropriate facility.

Waste # 3: Spent PPE and Sampling Supplies (Contact Waste)

Waste type: Spent PPE (gloves, coveralls, etc.), sampling supplies (plastic baggies, and sampling jars), decontamination trash (paper towels, plastic sheeting, brushes, etc.) and plastic sheeting from secondary containment that contacts potentially contaminated environmental media or equipment.

Anticipated Regulatory Status: Non-hazardous, non-radioactive, solid waste.

Characterization Approach: Characterization of this waste will be based on AK; i.e., analytical results from waste steams #1 and #2.

Storage and Disposal Method: The anticipated storage method will be 30 or 55-gallon drums. If analytical results for waste streams #1 and #2 determine the environmental media to be acceptable for onsite reuse or NOI discharge, then this waste stream will be disposed as non-hazardous, non-radioactive solid waste. If any of the environmental media is determined to be low-level radioactive or hazardous, then the contact waste will be managed accordingly.

Waste # 4: Municipal Solid Waste (MSW)

Waste type: MSW will consist of non-contact trash and debris.

Anticipated Regulatory Status: MSW.

Characterization Approach: MSW will be characterized based on acceptable knowledge. MSW will be segregated from all other waste streams.

Storage and Disposal Method: It is anticipated that the waste will be stored in a plastic-lined trash container, and then disposed of at a New Mexico solid waste landfill.

Waste # 5: Petroleum-Contaminated Soil (PCS) (Potential)

Waste Type: PCS from the release of commercial products such as hydraulic fluid, motor oil, unleaded gasoline, or diesel fuel. This waste stream would only be generated in the event of an accidental release, such as the rupture of a hydraulic hose.

Anticipated Regulatory Status: New Mexico Special Waste (NMSW) based on the Material Safety Data Sheet (MSDS) for the released product.

Characterization Approach: The PCS will be characterized based on the MSDS for the product and direct waste characterization sampling. LANL RCTs will conduct radiological surveys on all PCS.

Storage and Disposal Method: It is anticipated that the waste will be stored in 55-gallon drums, staged in a designated NMSW storage area, and disposed of offsite at an NMSW-permitted facility.

Waste # 6: Absorbent Material (Potential) and PPE

Waste Type: Absorbent material includes pads, paper towels, or other material used to contain released commercial products considered to be NMSW. This waste stream would only be generated in the event of an accidental release, such as the rupture of a hydraulic hose or spill of drilling additives.

Anticipated Regulatory Status: NMSW based on the MSDS for the released product.

Characterization Approach: The absorbent material will be characterized based on the MSDS for the released product and direct waste characterization sampling. LANL RCTs will conduct radiological surveys on all absorbent material.

Storage and Disposal Method: It is anticipated that the waste will be stored in 55-gallon drums in a designated NMSW storage area, and disposed of offsite at a NMSW-permitted facility.

Waste Characterization Strategy Form

CHARACTERIZATION TABLE

WASTE DESCRIPTION	Waste #1- Borehole Cuttings	Waste #2- Drilling and Development Water	Waste #3 Spent PPE and Sampling Supplies	Waste #4 - Municipal Solid Waste
Volume (estimate)	**390 cy**	**100,000 gal per regional well, 50,000 gal per intermediate well**	**1 cy per location**	**1 cy per location**
Packaging	lined cutting pit	line cutting pit or tanks	30 or 55 gal drums	lined trash container
Regulatory classification				
Solid	X	X	X	X
RCRA				
TSCA				
New Mexico Special				
CHARACTERIZATION METHOD				
AK: Existing Data/Documentation	X	**Attachment 1**		
AK: from Site Characterization			**Wastes 1&2**	
Direct Sampling of Containerized Waste	X	X		
ANALYTICAL TESTING				
Volatile Organic Constituents EPA 8260-B	X	X		
Semivolatiles EPA 8270-C	X	X		
Organic Pesticides EPA 8081-A				
Organic Herbicides EPA 8151-A				
PCBs EPA 8082	X			
Total Metals EPA 6010-B	X	X		
Total Cyanide EPA 9012-A				
High Explosives Constituents EPA 8330	X*	X*		
Asbestos				
TPH EPA 8015				
TCLP Metals (EPA 1311/6010-B)	X			
TCLP Organics (EPA 1311/8260 & 1311/8270)	X			
TCLP Pest. & Herb. (EPA 1311/8081/1311/8151-A)				
Gross Alpha (alpha counting)	X	X		
Gross Beta (beta counting)	X	X		
Gross Gamma (gamma counting)	X	X		
Tritium (liquid scintillation)	X	X		
Gamma spectroscopy	X			
Isotopic plutonium (chem. Separation/alpha spec.)	X	X		
Isotopic uranium (chem. Separation/alpha spec.)	X	X		
Total uranium (6020 ICPMS)	X	X		
Strontium-90 (beta proportional	X	X		

counting)				
Americium-241 (chem. separation/alpha spec.)	X	X		
Waste Profile Form #	TBD	TBD		

* - FOR WELLS R-17, R-27, AND CDV-16-2(I)R ONLY.

CHARACTERIZATION TABLE (CONTINUED)

WASTE DESCRIPTION	Waste #5- Petroleum-Contaminated Soil	Waste #6 - Absorbent Material and PPE		
Volume (estimate)	**2 55-gal drums per well location**	**2 55-gal drums per well location**		
Packaging	55 gal drums	55 gal drums		
Regulatory classification				
Solid				
RCRA				
TSCA				
New Mexico Special	**X**	**X**		
CHARACTERIZATION METHOD				
AK: Existing Data/Documentation	**MSDS**	**MSDS**		
AK: from Site Characterization				
Direct Sampling of Containerized Waste	**X**	**X**		
ANALYTICAL TESTING				
Volatile Organic Constituents EPA 8260-B				
Semivolatiles EPA 8270-C				
Organic Pesticides EPA 8081-A				
Organic Herbicides EPA 8151-A				
PCBs EPA 8082				
Total Metals EPA 6010-B				
Total Cyanide EPA 9012-A				
High Explosives Constituents EPA 8330				
Asbestos				
TPH EPA 8015	**X** (GRO & DRO)	**X** (GRO & DRO)		
TCLP Metals (EPA 1311/6010-B)				
TCLP Organics (EPA 1311/8260 & 1311/8270)				
TCLP Pest. & Herb. (EPA 1311/8081/1311/8151-A)				
Gross Alpha (alpha counting)				
Gross Beta (beta counting)				
Gross Gamma (gamma counting)				
Tritium (liquid scintillation)				
Gamma spectroscopy				
Isotopic plutonium (chem. Separation/alpha spec.)				
Isotopic uranium (chem. Separation/alpha spec.)				
Total uranium (6020 ICPMS)				
Strontium-90 (beta proportional counting)				

Americium-241 (chem. separation/alpha spec.)				
Waste Profile Form #				

SIGNATURES	DATE
Project Leader (Print name and then sign below.) Tom Whitacre	
Regulatory Compliance Focus Area representative (Print name and then sign below.) Kelly VanDerpoel	
ER Waste Management Coordinator (Print name and then sign below.) Leonard Trujillo	
Waste Services representative (Print name and then sign below.) Michelle Coriz	

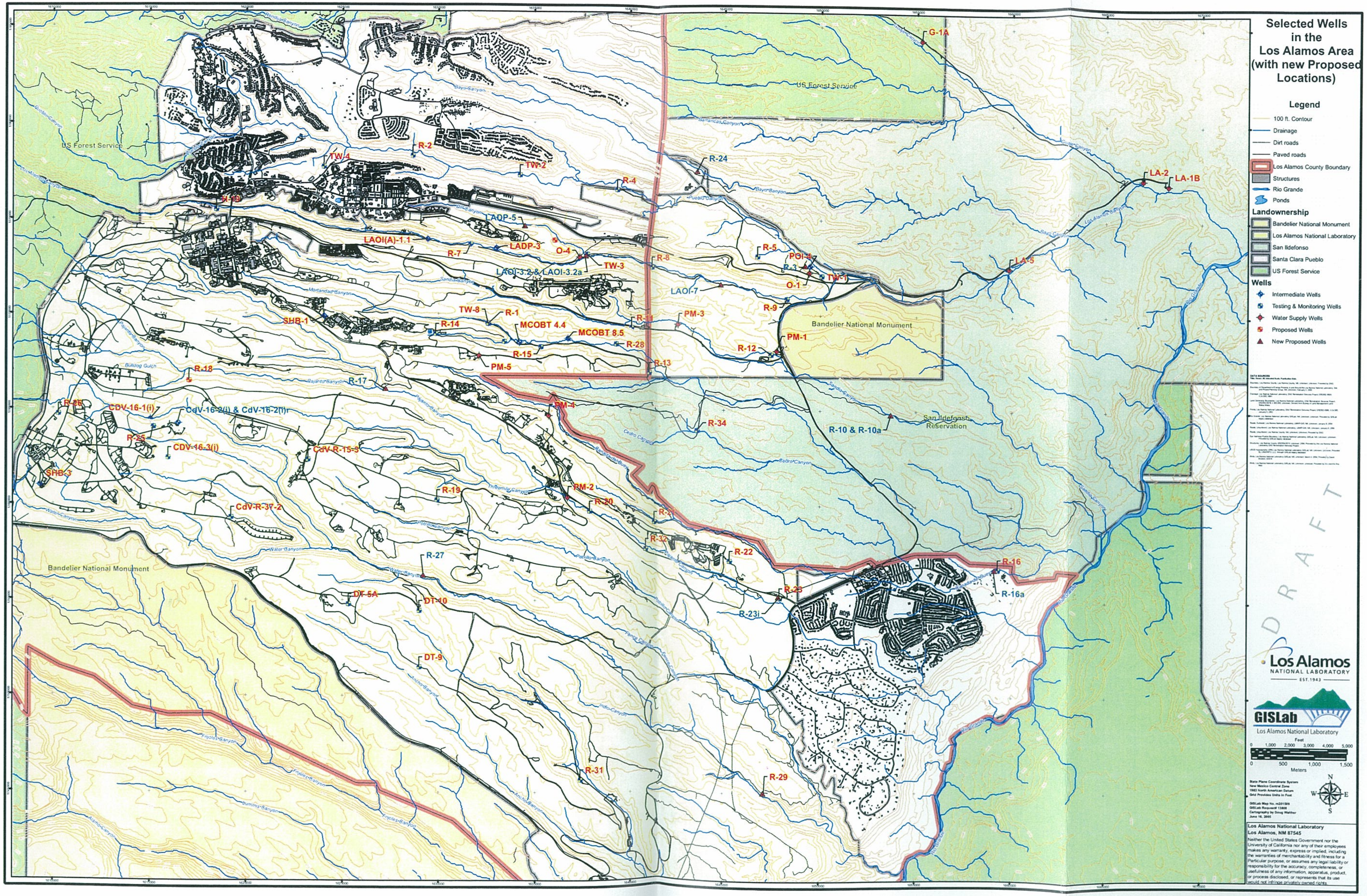
ER-SOP-01.10, R1	Los Alamos Environmental Restoration Project

Attachment 1

List of Commercial Products

The following commercial products may be used during the regional and intermediate well drilling. Based on a review of the MSDSs, each product is recommended to be managed per LIR404-00-04, section 9.7, as either a Municipal Solid Waste (not environmentally threatening) or as a New Mexico Special Waste (potentially environmentally threatening), if released on-site or disposed of.

Municipal Solid Waste	New Mexico Special Waste
Aqua-Clear PFD (anionic polyacrylamide)	Diesel Fuel
Aquagel Gold Seal (bentonite & silica)	Hydraulic Oil
Attack Foam (surfactant, hexylene glycol)	Quik Foam (only as pure product, flammable liquid, n.o.s.)
Barolift	Radiator Fluid/Antifreeze (ethylene glycol)
EZ Mud (Polyacrylamide/copolymer emulsion diluted with water)	
Liqui-Trol (cellulose polymer)	
N-Seal	
PAC-L (cellulose)	
Quik Foam (diluted with water)	
Quick-Gel (bentonite & silica)	
RV Antifreeze (propylene glycol)	
SDI Defoamer (silicone)	
Soda Ash (sodium carbonate)	



Selected Wells in the Los Alamos Area (with new Proposed Locations)
Legend
100 ft. Contour
Drainage
Dirt roads
Paved roads
Los Alamos County Boundary
Structures
Rio Grande
Ponds
Landownership
Bandelier National Monument
Los Alamos National Laboratory
San Ildefonso
Santa Clara Pueblo
US Forest Service
Wells
Intermediate Wells
Testing & Monitoring Wells
Water Supply Wells
Proposed Wells
New Proposed Wells
Los Alamos National Laboratory
EST. 1943
GISLab
Los Alamos National Laboratory
Feet
0 1,000 2,000 3,000 4,000 5,000
0 500 1,000 1,500
Meters
State Plane Coordinate System
New Mexico Central Zone
1983 North American Datum
Grid Provides Units in Feet
GISLab Map No. m201509
GISLab Request# 13808
Cartography by Doug Walther
June 16, 2005
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W
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Los Alamos National Laboratory
Los Alamos, NM 87545
Neither the United States Government nor the University of California nor any of their employees makes any warranty, express or implied, including the warranties of merchantability and fitness for a Particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.
DRAFT
US Forest Service
Bandelier National Monument
San Ildefonso Reservation
G-1A
R-2
TW-1
TW-2
R-24
R-4
LA-2
LA-1B
LADP-5
LAOI(A)-1.1
LADP-3
O-4
R-7
TW-3
LAOI-3.2 & LAOI-3.2a
R-5
POI-4
O-1
R-8
LAOI-7
LA-5
R-9
PM-3
PM-1
R-12
SHB-1
TW-8
R-1
R-14
MCOBT 4.4
MCOBT 8.5
R-28
R-15
PM-5
R-13
R-18
R-17
PM-4
R-34
R-10 & R-10a
CDV-16-1(i)
CdV-16-2(i) & CdV-16-2(i)r
R-25
CDV-16-3(i)
CdV-R-15-3
SHB-3
R-19
PM-2
R-20
CdV-R-37-2
R-32
R-22
R-27
R-16
R-16a
DT-5A
DT-10
R-23
R-23i
DT-9
R-31
R-29

Los Alamos
NATIONAL LABORATORY
EST. 1943

Los Alamos National Laboratory/University of California
Environmental Stewardship (ENV)
Environmental Remediation & Surveillance (ERS), MS M992
Los Alamos, New Mexico 87545
(505) 667-0808/FAX (505) 665-4747

National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-7203/FAX (505) 665-4504

Date: June 28, 2005
Refer To: ER2005-0421

Mr. John Young
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

SUBJECT: **REQUEST FOR APPROVAL OF CHARACTERIZATION AND DISPOSAL METHODS FOR INVESTIGATION-DERIVED WASTE FROM 2005 GROUNDWATER WELLS AND BOREHOLES CONSTRUCTED AT LOS ALAMOS NATIONAL LABORATORY**

Dear Mr. Young:

The purpose of this letter is to request approval of standard characterization and disposal methods relative to investigation-derived waste (IDW) from construction of the intermediate and regional aquifer wells and boreholes at Los Alamos National Laboratory (the Laboratory). Approval by the New Mexico Environment Department (NMED) is required under Consent Order Section IX.B.5, "Collection and Management of Investigation Derived Waste" prior to removal of IDW from temporary storage areas. Because handling of IDW is often subject to time constraints, advance approval by NMED of standard methods will help facilitate timely characterization and appropriate disposal of IDW as work is performed under the Consent Order.

Approval of IDW management methods is typically accomplished through submittal of work plans, or in the case of routine groundwater monitoring, through submittal of the Interim Facility –Wide Groundwater Monitoring Plan. However, approval of IDW methods for well and borehole construction is necessary because some wells scheduled in the near term are being constructed in advance of work plan approval. Specifically, a list of wells to be constructed in calendar year 2005 was submitted to NMED on March 29, 2005. Well construction activities addressed in this proposal are those performed prior to well completion and are not included in the IDW management plan for the Interim Facility-Wide Groundwater Monitoring Plan; these activities include drilling, gathering screening samples, and initial well testing.

Standard IDW methods are proposed for characterization and discharge of IDW liquids, and characterization and management of IDW solids, from construction of wells and boreholes. The standard methods are not new, comply with established guidance, and

are described in the enclosed set of letters dating back to 2001. These letters provide method details; a brief summary of the standard methods follows:

- **Characterization and discharge of IDW liquids from construction of wells and boreholes.** Water produced from the drilling, development, and sampling of wells constructed since 2002 has been discharged under a Notice of Intent (NOI) approved by the NMED dated August 7, 2002 (Enclosure 1). All conditions of the existing NOI will be applied to future wells and borehole construction activities. Water that is purged during the drilling and development of wells and boreholes will be containerized, sampled, and evaluated for compliance with NM WQCC Regulation 3103 ground water standards and applicable RCRA regulatory limits before any discharge occurs. Decisions regarding the discharge of drilling and development water will be made in accordance with the "Workplan NOI Decision Tree," revised July 15, 2002 (Enclosure 2), and in coordination with the NMED. And finally, drilling and development water approved for discharge will be applied to the land surface or used for dust suppression on access roads or the drill site in accordance with the terms and conditions of the existing NOI, described in the August 2, 2001 letter from the Laboratory to NMED (Enclosure 3).

- **Characterization and management of IDW solids from construction of wells and boreholes.** A standard method for characterization and management of solids, primarily drill cuttings for canyons wells and boreholes, was established by letter dated November 18, 2004 (Enclosure 4). This standard method is consistent with past practice and documentation (Enclosures 4 and 5). Drill cuttings are analyzed for hazardous constituents according to EPA standard methods. Analysis results are compared to New Mexico Soil Screening Levels, Revision 2, February 2004. If no exceedences exist, the cuttings are used on site, (e.g. left in place in the drill pit, or used as fill in site restoration or road maintenance). If an exceedence exists, a plan for disposal is developed on a case-by-case basis consistent with applicable requirements.

The procedures for evaluation and comparison to existent standards for both liquids and solids associated with this work will ensure that subsequent management will be protective of human health and the environment.

This letter is intended to provide sufficient documentation for the general standard methods for IDW management related to construction of wells and boreholes. Well construction work for
2005 is currently scheduled to begin the week of July 11. Please review this proposal and provide a timely response approving the standard methods for managing IDW liquids and solids from borehole and well construction activities. Please contact Tom Whitacre at (505) 665-5042, or Danny Katzman at (505) 667-6333 with any questions.

Sincerely,

David McInroy, Deputy Program Director
Environmental Remediation & Surveillance
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Office

MJ/ds

Enclosures: 1) Response to Notice of Intent to Discharge for Los Alamos National Laboratory's Hydrogeologic Workplan Wells, August 7, 2002
2) Notice of Intent to Discharge, Hydrogeologic Workplan Wells, July 16, 2002
3) Notice of Intent to Discharge, Hydrogeologic Workplan Wells, August 2, 2001
4) Management of Drill Cuttings from Wells and Boreholes Constructed Under Canyons Workplans, November 18, 2004
5) Management of Drill Cuttings From Hydrogeologic Workplan Wells (R-Wells), January 22, 2003

Cy:(w/enc)
J. Dewart, ENV-ERS, MS M992
J. McCann, ENV-ECR, MS M992
D. Katzman, ENV-ECR, MS M992
K. VanDerpoel, ENV-SWRC, MS M992
S. Pearson, ENV-WQH, MS M992
B. Beers, ENV-WQH, MS K497
M. Johansen, EM, LASO, MS A316
T. Whitacre, OPM, LASO, MS A316
P. Reneau, ENV-ECR, MS M992
D. Gregory, LASO, MS A316
B. Rich, ADO, MS A104
J. Kieling, NMED-HWB
M. Leavitt, NMED-SWQB
L. King, EPA Region 6
D. Pepe, NMED-OB
ENV-ECR File, MS M992
RPF, MS M707

Cy:(w/o enclosure)
D. McInroy, ENV-ERS, MS M992
A. Dorries, ENV-ECR, MS M992

Mr. Christopher F. Vick
Ground Water Quality Bureau
New Mexico Environment Department
P O Box 26110
Santa Fe, NM 87502

Ms. Cindy Padilla
Solid Waste Bureau
New Mexico Environment Department
PO Box 26110
Santa Fe, New Mexico 87502

ENCLOSURE 1

State of New Mexico
ENVIRONMENT DEPARTMENT
Ground Water Quality Bureau
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2918 phone
(505) 827-2965 fax

GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

August 7, 2002

Steven Rae, Group Leader
Water Quality & Hydrology Group
Los Alamos National Laboratory
P.O. Box 1663, MS K497
RRES-WQH: 02-273
Los Alamos, New Mexico 87545

RE: Response to Notice of Intent to Discharge for Los Alamos National Laboratory's Hydrogeologic Workplan Wells

Dear Mr. Rae:

The New Mexico Environment Department (NMED), Ground Water Quality Bureau (GWQB) has reviewed your notices of intent, dated July 16, 2002, and August 2, 2001, for the discharge of up to 96,000 gallons per day (gpd) of drilling and development water, and 1,500 gpd of sampling purge water from 23 regional aquifer wells described under Los Alamos National Laboratory's Hydrogeologic Workplan. The wells will be drilled at various locations throughout T18N, T19N, R5E, R6E,and R7E, Los Alamos County. The notices of intent satisfy the requirements of Section 20.6.2.1201 NMAC of the Water Quality Control Commission (WQCC) Regulations.

Based on the presently available information in your notices of intent, a discharge plan is not being required for this discharge as long as the discharge is as described in the notices of intent. The decision to discharge must follow the guidelines specified in the Workplan NOI Decision Tree (Figure 1, Revised 07/15/02). The Ground Water Quality Bureau has concluded that if the guidelines specified in the NOI are met, then the proposed discharge will not adversely impact ground water, and a discharge plan will not be required. However, if the results of the analysis of drilling water, development water, or sampling purge water exceed the Section 20.6.2.3103 NMAC WQCC ground water standards or applicable RCRA regulatory limits, then disposal must be coordinated with NMED on a site specific basis.

The exempt discharge is briefly described as follows: A maximum of 96,000 gpd of drilling water and development water, and a maximum of 1,500 gpd of sampling purge water from 23 regional aquifer wells will be land applied with a portable sprinkler system, or applied to the access roads and

well site for dust suppression. Prior to discharge, the drilling water and development water will be sampled and analyzed to determine compliance with Section 20.6.2.3103 NMAC WQCC ground water standards and applicable RCRA regulatory limits.

Although a discharge plan is not being required for this discharge at this time, you are not relieved of liability should your operation result in actual pollution of surface or ground waters. Further, this decision by the NMED does not relieve you of your responsibility to comply with any other applicable federal, state, and/or local laws and regulations, such as zoning requirements, plumbing codes and nuisance ordinances.

If at some time in the future you intend to change the amount, the character, the screening process, or the location of your discharge so that it will not be as described, or if observation or monitoring shows that the discharge is not as described, you must file a new notice of intent with the Ground Water Pollution Prevention Section (GWPPS).

If you have any questions, please contact either Curt Frischkorn of the GWPPS staff at 827-0078 or Maura Hanning, Program Manager of the GWPPS at 827-2945.

Sincerely,

Marcy Leavitt, Chief
Ground Water Quality Bureau

ML:CSF/csf

xc: Bob Beers, Water Quality and Hydrology Group, Los Alamos National Laboratory, P.O. Box 1663, MS K497, RRES-WQH: 02-273, Los Alamos, New Mexico 87545
Courte Voorhees, District Manager, NMED District II
John Young, Hazardous Waste Bureau, NMED, P.O. Box 26110, Santa Fe, NM 87502
NOI File

ENCLOSURE 2

Los Alamos
NATIONAL LABORATORY

Risk Reduction & Environmental Stewardship Division
Water Quality & Hydrology Group (RRES-WQH)
PO Box 1663, MS K497
Los Alamos, New Mexico 87545
(505) 667-7969/Fax: (505) 665-9344

Date: July 16, 2002
Refer to: RRES-WQH: 02-273

Mr. Curt Frischkorn
Pollution Prevention Section
Ground Water Quality Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502

SUBJECT: NOTICE OF INTENT TO DISCHARGE, HYDROGEOLOGIC WORKPLAN WELLS

Dear Mr. Frischkorn:

At our July 11, 2002, meeting at your Santa Fe office (Attendees: Mike Saladen (RRES-WQH), Roy Bohn (RRES-R), Bob Beers (RRES-WQH), John Young (NMED-HWB), and Curt Frischkorn (NMED-GWQB)), we reviewed the Notice of Intent to Discharge (NOI) submitted by Los Alamos National Laboratory to your agency on August 2, 2001, for the Hydrogeologic Workplan Wells. In addition to our general review of the NOI, we discussed the Laboratory's immediate need to discharge approximately 50,000 gallons of containerized drilling fluid from Hydrogeologic Workplan Well R-14. I have addressed both of these topics below.

It was my understanding from our July 11th meeting that both you and Mr. Young were satisfied with the Laboratory's NOI for the Hydrogeologic Workplan Wells with the exception of the NOI Decision Tree (Figure 1.0). Per your request, attached is a revised NOI Decision Tree that incorporates a reference to applicable RCRA regulatory limits' into the decision process. In addition, it was also my understanding that your agency would not require a ground water discharge plan for the discharge of drilling fluid, development water, and purge water from Hydrogeologic Workplan Wells as long as all discharges were compliant with the terms and conditions of the NOI.

In addition to our general discussions about the Hydrogeologic Workplan NOI, we discussed the discharge of approximately 50,000 gallons of containerized drilling fluid produced during the drilling of Hydrogeologic Workplan Well R-14. Per your request, please find the following enclosed water quality data and Material Safety Data Sheets (MSDSs) for the drilling fluid produced from R-14.

Water Quality Data. Attachment 1.0 contains water quality data (metals, general chemistry, SVOA, VOA, perchlorate, nitrate, and tritium) for the approximately 50,000 gallons of containerized drilling fluid produced during the drilling of R-14. It should be noted that the data table titled, "ER Water Samples" contains analytical results from two samples, GW14-02-46382 and GW14-02-46383, submitted for metals analysis. These samples were collected from the upper and lower portion of the storage tanks, respectively. Both samples were filtered prior to analysis.

The approximately 50,000 gallons of containerized drilling fluid from R-14 is compliant with New Mexico Water Quality Control Commission (NM WQCC) Regulation 3103 ground water standards with the exception of the following three contaminants:

Contaminant	Max. Result (mg/L)	Min. Result (mg/L)	WQCC ground water standard (mg/L)
Al	42.0	7.69	5.0
Fe	9.25	1.51	1.0
Mn	0.36	0.13	0.2

With the exception of acetone, no VOA or SVOA compounds were detected in R-14 drilling fluids. Acetone, detected at 1.6 mg/L, is present as a byproduct of the drilling additives. No perchlorate or tritium were detected in the R-14 drilling fluid at concentrations greater than analytical laboratory's Method Detection Limits (MDLs). Nitrate/nitrite (as N) was detected at 0.56 mg/L.

MSDS Information. Attachment 2.0 contains Material Safety Data Sheets (MSDSs) for the drilling fluid additives used in the top 1068 feet of the R-14 borehole including the formulation quantities for each product.

The Laboratory requests your agency's permission to discharge the approximately 50,000 gallons of drilling fluid from R-14 in accordance with the August 2, 2001, NOI. Please call me at (505) 667-6969 or Roy Bohn of the Laboratory's Environmental Restoration Project (RRES-R) at (505) 665-5138 if additional information is required.

Sincerely,

Bob Beers
Water Quality & Hydrology Group

BB/am

Attachments: a/s

Cy: M. Leavitt, NMED/GWQB, Santa Fe, New Mexico, w/att.
J. Davis, NMED/SWQB, Santa Fe, New Mexico, w/att.
J. Bearzi, NMED/HWB, Santa Fe, New Mexico, w/att.
J. Young, NMED/HWB, Santa Fe, New Mexico, w/att.
J. Vozella, DOE/OLASO, w/att., MS A316
G. Turner, DOE/OLASO, w/att., MS A316
B. Stine, ADO, w/att., MS A104
B. Ramsey, RRES-DO, w/o att., MS J591
K. Hargis, RRES-DO, w/o att., MS J591
D. Stavert, RRES-EP, w/att., MS J978
S. Rae, RRES-WQH, w/att., MS K497
C. Nylander, RRES-DO, w/att., MS K497
D. Rogers, RRES-WQH, w/o att., MS K497
M. Saladen, RRES-WQH, w/att., MS K497
R. Bohn, RRES-R, w/att., MS M992
D. McInroy, RRES-R, w/o att., MS M992
RRES-WQH File, w/att., MS K497
IM-5, w/att., MS A150

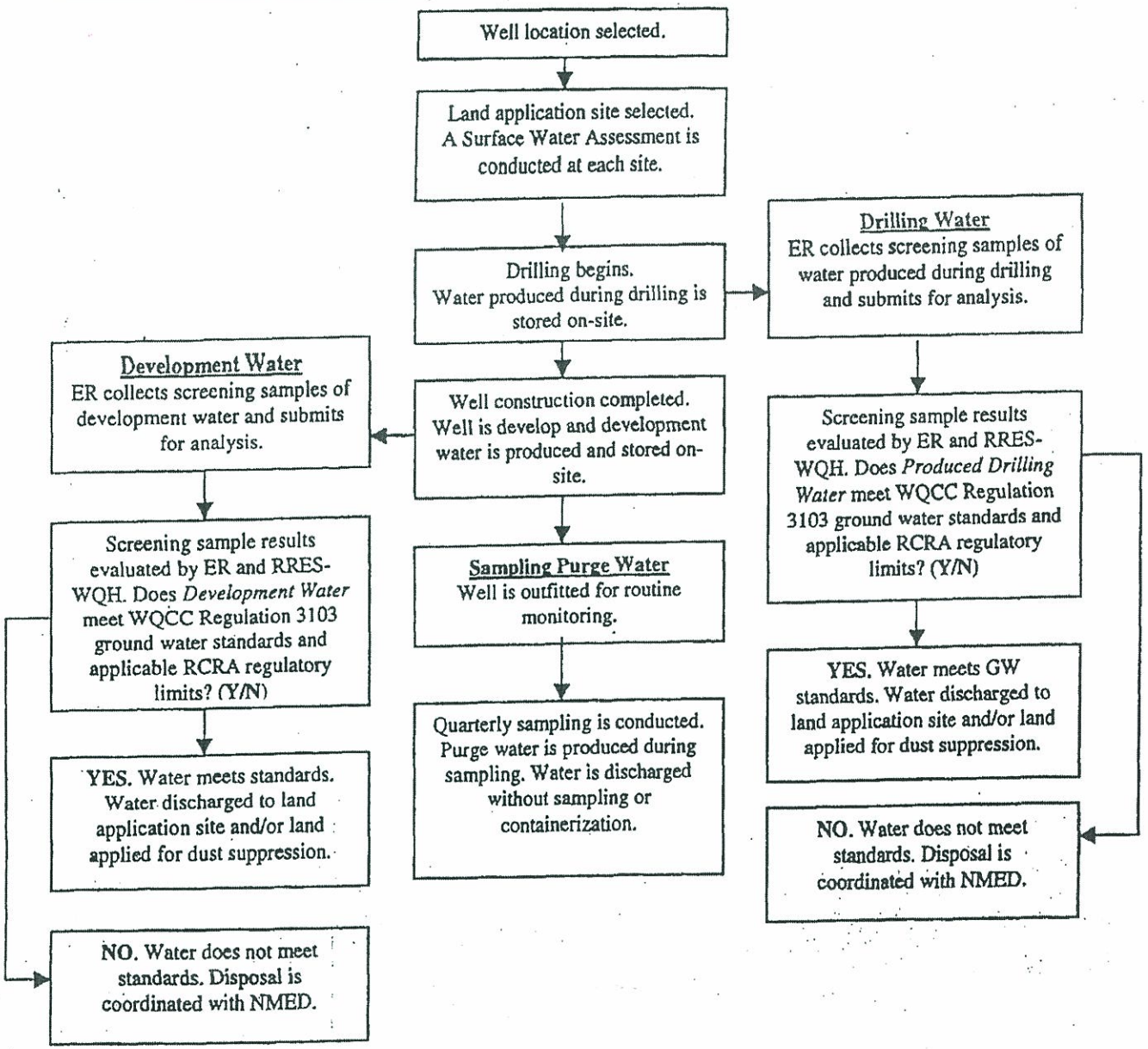

Figure 1.0. Workplan NOI Decision Tree

ENCLOSURE 3

Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Date: August 2, 2001
In Reply Refer To: ESH-18/WQ&H:01-234
Mail Stop: K497
Telephone: (505) 665-1859

Mr. John Young
Hazardous Materials Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502

Ms. Phyllis Bustamante
Ground Water Quality Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502

SUBJECT: NOTICE OF INTENT TO DISCHARGE, HYDROGEOLOGIC WORKPLAN WELLS

Dear Mr. Young and Ms. Bustamante:

Please find the enclosed Notice of Intent to Discharge (NOI) covering the discharge of drilling, development and sample purge water from the proposed regional aquifer wells described under Los Alamos National Laboratory's Hydrogeologic Workplan. This NOI is being submitted for your review and approval pursuant to Section 1201 of the New Mexico Water Quality Control Regulations. Since April, 1996, the Laboratory has submitted nine individual NOI's for each regional aquifer well constructed under the Workplan. As many as 23 additional regional aquifer wells have been proposed for construction over the next four years.

As an alternative to individual NOIs, the Laboratory is proposing that a single NOI be utilized for all discharges from regional aquifer wells constructed under the Workplan. It is the Laboratory's intent to improve coordination and administration of the NOI process for both the NMED and the Laboratory by eliminating the redundancy of individual NOIs for each well.

Thank you for your consideration of this request. Please call Bob Beers of the Laboratory's Water Quality and Hydrology Group at (505) 667-7969 if additional information would be helpful.

Sincerely,

Steven Rae,
Group Leader
Water Quality and Hydrology Group

SR:BB/tml

Enclosures: a/s

Cy: B. Lucas, NMED/SWQB, Santa Fe, New Mexico, w/enc.
S. Yanicak, NMED/DOE/OB, w/enc., MS J993
J. Vozella, DOE/LAAO, w/enc., MS A316
M. Johansen, DOE/LAAO, w/enc., MS A316
D. McInroy, E-ER, w/enc., MS M992
R. Bohn, E-ER, w/enc., MS M992
D. Erickson, ESH-DO, w/enc., MS K491
L. McAtee, ESH-DO, w/enc., MK K491
C. Nylander, ESH-18, w/enc., MS K 497
M. Saladen, ESH-18, w/enc., MS K497
B. Beers, ESH-18, w/enc., MS K497
H. Decker, ESH-18, w/enc., MS K497
WQ&H File, w/enc., MS K497
IM-5, w/enc., MS A150

NOTICE OF INTENT TO DISCHARGE
WATER PRODUCED DURING THE INSTALLATION AND MONITORING OF HYDROGEOLOGIC WORKPLAN WELLS

Introduction

In March 1998, NMED approved a comprehensive hydrogeologic characterization work plan for Los Alamos National Laboratory (Laboratory). The Hydrogeologic Workplan (LANL 1998) proposes a multiyear drilling and hydrogeologic analysis program to characterize the Pajarito Plateau and to assess the potential for groundwater contamination from waste disposal operations. The goal of the project is to develop greater understanding of the geology, groundwater flow, and geochemistry beneath the 43-square-mile Laboratory area and to assess any impacts that Laboratory activities may have had on groundwater quality. The Hydrogeologic Workplan (Workplan) will result in an enhanced understanding of the Laboratory's groundwater setting and an improved ability to ensure adequate groundwater monitoring. The centerpiece of the Workplan is the proposed installation of as many as 32 regional aquifer wells.

Beginning with well R-9 in April 1996, the Laboratory has submitted a Notice of Intent to Discharge (NOI) for each Workplan well prior to installation. Table 1.0 below presents a summary of the wells completed to date, the date that the NOI was submitted for each well, and the ESH-18 file number for each respective NOI.

Table 1.0. Completed Hydrogeologic Workplan Wells.

Well Name	Completion Date	Watershed	Type of Well	Date of NOI	NOI File No.
R-25	Feb-99	Water/Valle	regional	7/7/98	98-0227
R-9	Sept-99	LA/Pueblo	regional	4/3/96	96-0189
R-15	Sept-99	Mortandad	regional	6/25/99	99-0245
R-12	Jan-00	Sandia	regional	3/27/98	98-0106
R-31	Feb-00	Ancho	regional	5/18/99	99-0165
R-19	Mar-00	Pajarito	regional	1/25/00	00-0019
R-22	Dec-00	Pajarito	regional	12/12/00	00-0412
R-7	Mar-01	LA/Pueblo	regional	2/29/00	00-0063
R-5	June-01	Pueblo	regional	4/10/01	01-0112

For the remaining Workplan wells, the Laboratory proposes to utilize a single, Generic NOI. That is, in lieu of submitting individuals NOIs for each well, as was previously conducted, this NOI is being submitted to comprehensively cover all discharges from regional aquifer wells constructed under the Workplan. It is currently estimated that R-well construction will be completed by 2005.

1. **Name and address of facility making the discharge.**
Los Alamos National Laboratory
P.O. Box 1663
Los Alamos, New Mexico 87545

2. **Location of the discharge.**
See attached Map 1.0 for the location of all completed and proposed Hydrogeologic Workplan (Workplan) wells. As prescribed in Standard Operating Procedure (SOP) 2.01, *Surface Water Assessment/Erosion Matrix*, the land application area will be located on the generally flat canyon bottom outside of the active channel. An assessment will be conducted at each proposed land application site prior to discharge.

3. **The means of discharge. (to Lagoon, Flowing stream, Water course, Arroyo, Septic tank, other).**
All water produced during the drilling and development of Workplan wells will be containerized, sampled, and evaluated for compliance with NM WQCC Regulation 3103 ground water standards before any discharge occurs. See attached Figure 1.0, *Workplan NOI Decision Tree*, for further information on the sequence of activities conducted prior to a discharge of water to the environment.

Once it has been confirmed by the ER Project and ESH-18 that the containerized water is compliant with NM WQCC Regulation 3103 ground water standards then the water will be either (1) applied to the surface of the land in the vicinity of the well, or (2) applied to the well site or access roads for dust suppression. Land application will be conducted using the following means:

1. Aluminum piping with sprinkler heads will serve as the conduit for the discharge. A typical installation will consist of two separate piping runs, each approximately 250 feet long with 5 sprinkler heads on each run. Piping runs will be situated to prevent any overlap of spray. Sprinkler heads will be adjusted to maximize evaporation.

2. Each sprinkler head has a discharge rate of approximately 16 gallons per minute; ten sprinkler heads will discharge approximately 160 gallons per minute. Therefore, a typical system would have a design capacity of approximately 9,600 gallons per hour, weather and soil conditions permitting.

3. Land application will be conducted for 8 to 10 hours a day. The discharge will be monitored routinely during the hours of operation to (1) ensure that no ponding or run-off is occurring, (2) to inspect any BMP's installed on the application site, and (3) to inspect for leaks in the system or malfunctioning sprinkler heads.

4. If at any time the land application site shows signs of ponding or run-off, all discharge operations will be immediately halted. The site will be evaluated for the need of any additional BMP's and the discharge will not start again until the site has returned to an appropriate condition (i.e., no standing water or visible run-off).

The alternative method of land application is for dust suppression at the drilling site and on access roads serving the drilling site. A water truck will apply water used for dust suppression. A second alternate means of disposal would be discharge to one of the Laboratory's three wastewater treatment facilities (High Explosive Wastewater Treatment Facility, Sanitary Wastewater Systems Facility, Radioactive Liquid Wastewater Treatment Facility) if the quality of the water meets the treatment facility's Waste Acceptance Criteria (WAC) and the treatment facility has adequate capacity available.

4. **The estimated concentration of contaminants (if any) in the discharge.**
The concentrations of contaminants in the discharge are expected to be equivalent to the concentrations of contaminants in the aquifer(s) penetrated during installation of the borehole. The quality of groundwater beneath the Laboratory is characterized and documented annually in the Laboratory's *Environmental Surveillance Report.* The *Environmental Surveillance Report* for 1999 is available on the World Wide Web at the following address: http://lib-www.lanl.gov/pubs/la-13775.htm. The *Environmental Surveillance Report* for 2000 is scheduled for release in October 2001.

In addition to the extensive characterization data available from the annual *Environmental Surveillance Reports*, each new Workplan well will also be sampled for specific contaminants of concern. Analyte lists will be prepared on a well-by-well basis. As identified in Figure 1.0, these results will be used to determine compliance with NM WQCC Regulation 3103 ground water standards prior to the commencement of land application. Analytical results will be submitted to the NMED as soon as they are available for release.

5. **The type of operation from which the discharge is derived**
All of the wells referenced in this NOI are part of the Hydrogeologic Characterization Program undertaken by Los Alamos National Laboratory in order to better understand the geologic and hydrologic characteristics of the regional aquifer, intermediate perched zones, and intercalated unsaturated zones at the Laboratory. The discharges from each well are produced from the following three sources:

1. Drilling Water. During well drilling, water is produced from two sources:
   - Small quantities of drilling additives (e.g., EZ Mud™, Quick Foam™) are mixed with potable water and used during the drilling process to improve efficiency. Material Safety Data Sheets (MSDS) are available for these products upon request.
   - Groundwater (alluvial, intermediate, and regional) encountered as the borehole penetrates water-bearing strata.

   Between 20,000 and 125,000 gallons of drilling water will be produced during the drilling of each Workplan regional aquifer well.

In addition to above drilling additives, there is the possibility that drilling mud may be used in the construction of certain Workplan wells. Drilling mud, such as Quick-Gel™, is commonly used during the drilling of wells to: (1) lift cuttings out of the hole, (2) cool the drill bit, and (3) support the walls of the borehole in unconsolidated formations. Drilling fluids containing drilling mud will be isolated in a designated holding tank where the solids will be settled and the water can be decanted. Settled solids will be disposed of at an approved disposal site. Decanted water will be sampled and land applied if compliant with NM WQCC Regulation 3103. Ground Water Standards.

2. **Development Water.** Following well construction, the well is developed to remove any fine material that may be blocking the wells screens or ports. This water is essentially ground water with the potential for small, deminimus, quantities of drilling additives. Between 20,000 and 125,000 gallons of well development water will be produced during the drilling of each Workplan regional aquifer well.

3. **Sampling Purge Water.** Once well construction is complete, each well will be routinely sampled. During sample collection it is necessary to purge the well prior to collecting a sample to ensure that the water sampled is representative of the ground water in the aquifer. Between 100 and 1,500 gallons of water will be produced during each sampling event. Since the volumes of sampling purge water are small and the source is exclusively ground water, it will be directly discharged to the land surface without sampling or containerization. In addition, no sprinkler system will be used during the discharge of sampling purge water. All discharges will be directed away from any surface water.

6. **The estimated flow to be discharged per day.**
The daily discharge volumes from the land application of drilling and well development water are estimated to be as much as 96,000 gallons per day. Routine well sampling is expected to generate as much as 1,500 gallons of purge water per sampling event. Daily discharge volumes are dependent on the capacity of the soil, weather conditions, and equipment considerations.

7. **The estimated depth to Groundwater.** Depth to the regional aquifer varies from 700 to 1200 feet.

Signed: _____ Date: Aug 2, 2001
Steven Rae, Group Leader, ESH-18

Signed: _____ Date: 8/2/01
Julie Canepa, Program Manager, ER Project

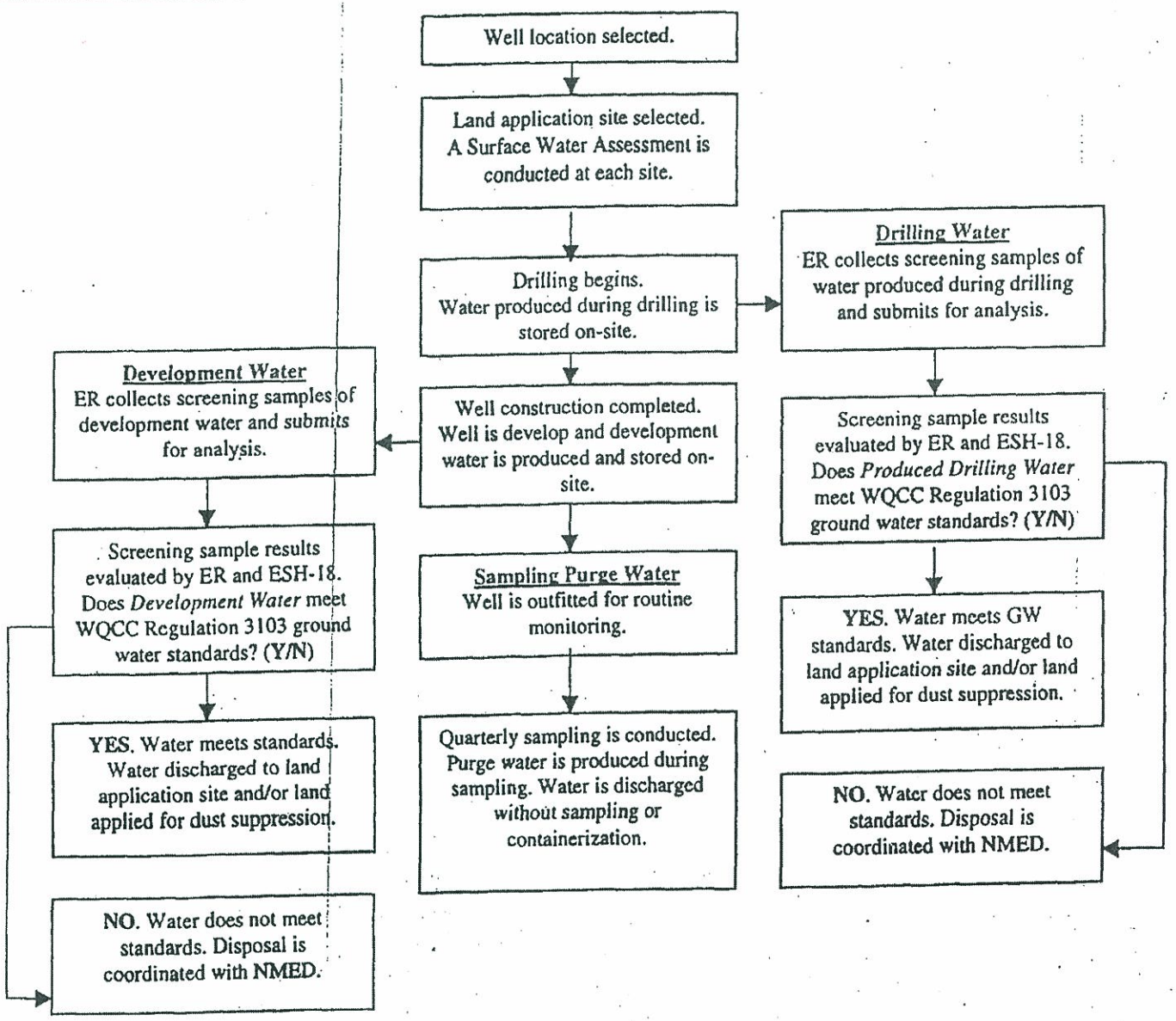

Figure 1.0. Workplan NOI Decision Tree

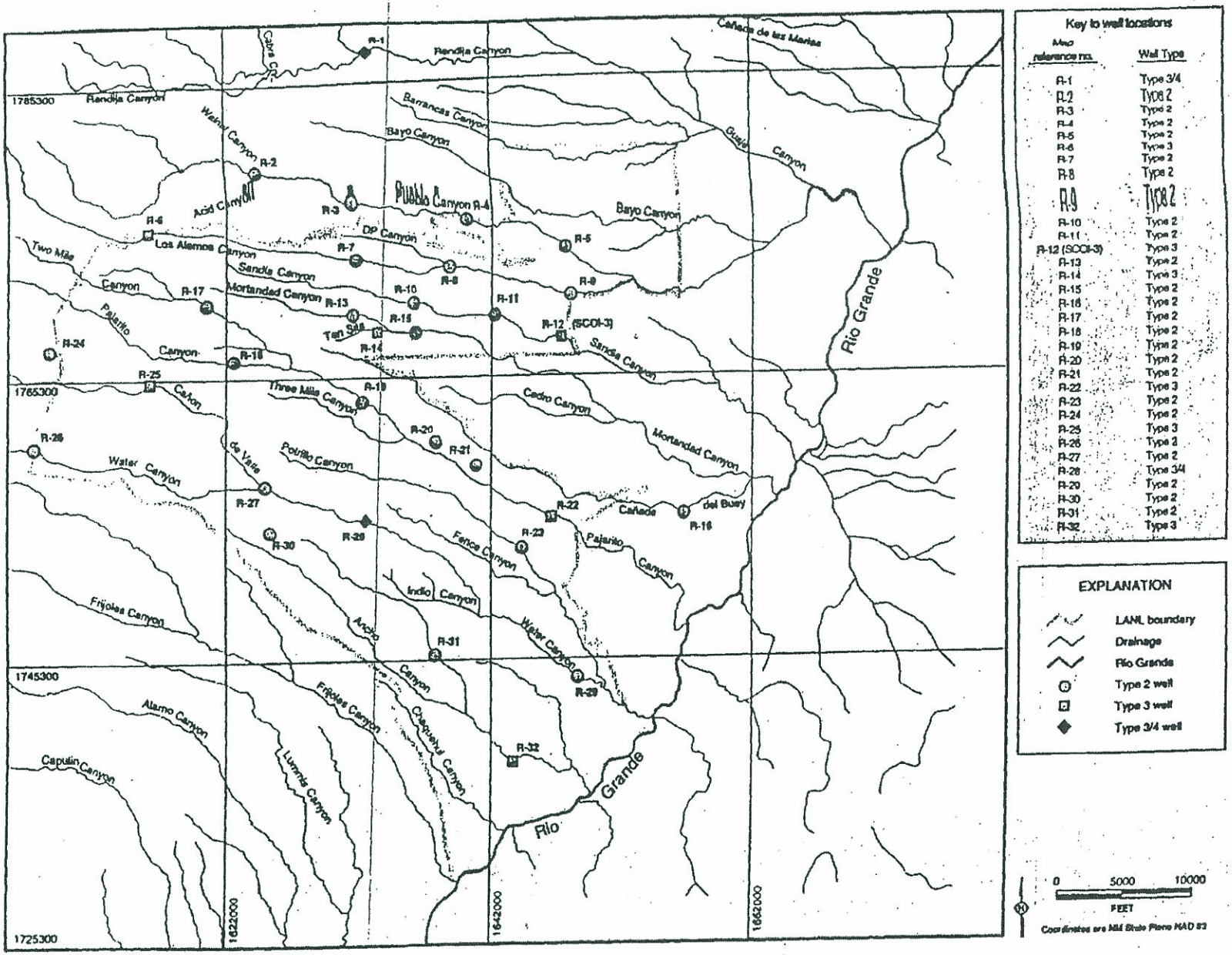

Figure 4-2. Proposed regional aquifer well locations.

ENCLOSURE 4

DEPARTMENT OF ENERGY
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

NOV 1 8 2004

CERTIFIED MAIL/RETURN RECEIPT

Mr. John Young, Corrective Action Project Leader
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

Ms. Cindy Padilla
Bureau Chief
NMED-Solid Waste Bureau
P.O. Box 26110
Santa Fe, NM 87502

Subject: Management of Drill Cuttings from Wells and Boreholes Constructed Under Canyons Workplans

Dear Mr. Young and Ms. Padilla:

The topic of drill cuttings was discussed on a site visit by NMED staff on Friday, November 5, 2004. The purpose of this letter is to document a standard practice for management of drill cuttings of regional and intermediate wells at the Los Alamos National Laboratory (LANL) as well as boreholes drilled under Canyons Work Plans. Currently, numerous wells and boreholes are being drilled at LANL under the Mortandad Canyon Groundwater Work Plan, which did not contain a description of drill cuttings management. This letter provides NMED with documentation for these wells and boreholes as well as any other wells and boreholes drilled in the near future for canyons investigation purposes.

The drill cuttings management practice outlined below is consistent with past practice and past documentation (see enclosed letter dated January 22, 2003) and is also consistent with negotiations to date on this subject associated with the draft Consent Order (Order) for Hazardous Waste Bureau regulated activities. We understand that in the future the NMED will require documentation of such practices in work plans submitted under the Order.

The standard drill cuttings management practice is as follows:

- Before restoration of a drilling site, drill cuttings will be analyzed for hazardous waste constituents to include organics (EPA 8260-B and 8270-C), total inorganics (EPA 6010-B), and where appropriate, high explosives (EPA 8330) and PCBs (EPA 8082). TCLP analysis may be performed based on knowledge of the area being investigated. Review of the analytical data will consist of comparing the drill cuttings analytical data to the human health soil screening levels (SSL) from the New Mexico Environment Department (NMED) Soil Screening Levels, Revision 2 (February 2004). If available, analytical results from core samples may be used in lieu of sampling drill cuttings. Results will be included in reports to NMED as required and analytical data packages will be retained by the DOE and made available upon request.

- If analytical results demonstrate that the cuttings do not contain hazardous waste constituent concentrations exceeding soil screening levels, then the cuttings will be used during site restoration. Specifically, the drill pit liner will be removed and the cuttings will be retained in place within the drill pit. The cuttings may also be spread and recontoured on the drill site or roads in a manner that does not change existing drainage patterns or surface runoff patterns.
- If analytical results demonstrate that the cuttings contain constituent concentrations exceeding soil screening levels, then these results shall be provided to the NMED in writing along with a proposed disposal plan consistent with applicable requirements.
- DOE will also assess cuttings for radionuclide concentrations to determine appropriate disposition of cuttings relative to radionuclides. When available, radionuclide analysis results will be provided to NMED under the voluntary agreement for sharing radionuclide data.

This letter is intended to provide sufficient documentation of a standard practice for drill cuttings management for canyons wells and boreholes. We are currently implementing this practice based on previous correspondence and discussions with NMED. If further documentation, or any change to the standard practice is needed, please contact Tom Whitacre at (505) 665-5042, or Danny Katzman at (505) 667-6333.

Sincerely,

EM:3MJ-003

Mathew P. Johansen
Groundwater Program
Compliance Manager

Enclosure:
January 2003 letter titled Management of Drill Cuttings from Hydrogeologic Workplan Wells (R-wells) from Mr. Charles Nylander and Mr. Mat Johansen to Mr. John Young and Mr. Butch Tongate.

cc w/ enclosure:
C. Hules,
NMED-Solid Waste Bureau
P.O. Box 26110
Santa Fe, NM 87502

cc w/o enclosure:
J. Ordaz, EM, LASO
G. Turner, EM, LASO
T. Whitacre, EM, LASO
S. Yanicak, NMED-DOE OB, MS-J993
D. Katzman, EES-9, LANL, MS-D452
J. McCann, RRES-WQH, LANL, MS-M 992
S. Pearson, RRES-WQH, LANL, MS-M992
T. Grieggs, RRES-SWRC, LANL, MS-K490
S. Rae, LANL, RRES-WQH, LANL, MS-K497

ENCLOSURE 5

Los Alamos National Laboratory/University of California
Risk Reduction & Environmental Stewardship (RRES)
Groundwater Protection Program (GPP), MS M992
Los Alamos, New Mexico 87545
(505) 665-4681/FAX (505) 665-4747

National Nuclear Security Administration
Los Alamos Area Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-7203/FAX (505) 665-4504

Date: January 22, 2003
Refer to: RRES-GPP:03-006

Mr. John Young, Corrective Action Project Leader
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

Butch Tongate
Bureau Chief
NMED-Solid Waste Bureau
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: MANAGEMENT OF DRILL CUTTINGS FROM HYDROGEOLOGIC WORKPLAN WELLS (R-WELLS)

Dear Messrs. Young and Tongate:

The purpose of this letter is to inform the New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB) and Solid Waste Bureau (NMED-SWB) that the Los Alamos National Laboratory (LANL) will use the cuttings from the drilling of regional aquifer wells for restoration of the drilling site upon completion of drilling activities. The decision to use the cuttings for this purpose is supported by the information included below.

LANL will remove the drill pit liner and leave the cuttings in place as fill for the drill pit upon completion of drilling activities. The drill pits will then be filled to ground level with original site material. The sites will be revegetated and appropriate Best Management Practices will be put in place to prevent erosion. This practice has been used successfully at LANL at all previous regional well drill sites. Unlike previous wells, however, R-Wells 14, 16, 20, 23 and 32 were drilled using drilling fluids, and residuals remain in the cuttings. The attachment to this letter includes data demonstrating that the residuals in the cuttings do not constitute a waste management concern.

Management of the cuttings as part of site restoration is appropriate because the analytical results for the cuttings are consistent with that of purged water being discharged to the ground, per the conditions of Notices of Intent (NOIs) approved by the NMED-Groundwater Bureau (GWB) for R-Wells 14, 16, 20, 23, and 32. The analytes detected in wet cuttings from R-Wells 14 and 32, the minimum, maximum, and mean values, soil geochemical background values, screening levels, and TCLP regulatory limits are shown in the attachment. The screening levels are from "NMED Soil Screening Levels," Revision 1.0, December 18, 2000, with the exception of acetone, 4-methyl-2-pentanone, n-propylbenzene, and 1,2,4-trimethylbenzene, which are Environmental Protection Agency (EPA) screening levels. ESLs are from the ECORISK database, version 1-5, September 2002. Analytes are compared to background values, where available. If background values are unavailable,

analytes are compared to the screening levels. The comparison of mean values of analytical results for the cuttings to screening levels illustrates that concentrations are well below the appropriate human health or ecological screening level.

The wet cuttings from R-Wells 14 and 32 were analyzed for radionuclides, organics, high explosives, PCBs, total inorganics, and TCLP inorganics. Of the radionuclides analyzed, only tritium was higher than background, but it did not exceed the screening level. No organics exceeded the screening levels, and no high explosives or PCBs were detected. Of the inorganics analyzed, only magnesium, nickel, and, sodium, were higher than background. Of these inorganics, screening levels exist for iron and nickel, and they were not exceeded. The TCLP analytical results indicate that there are no hazardous characteristic waste issues associated with the metals present in the cuttings. The TCLP analytical results for metals shown in the attachment do not approach any of the TCLP regulatory limits. Based on these results, LANL believes that use of the cuttings on site is an acceptable management practice and that the cuttings do not warrant off-site disposal as a solid/industrial waste.

Based on the concentrations and potential sources of organics in the cuttings, LANL believes there are no hazardous waste issues associated with the organics present. The organic compound detected at the highest level in the wet cuttings was acetone, which is often a false positive for isopropyl alcohol, a major constituent of Quik Foam. The presence of acetone as a false positive for isopropyl alcohol has been identified in several characterization wells where Quik Foam has been used.

The data provided for R-Wells 14 and 32 are representative of cuttings data from the other three wells, R-16, 20, and 23. Data for cuttings from those wells will be provided when available, which is anticipated to be in late January 2003. In addition to the five wells included in this request, LANL wishes to establish the use of drill cuttings for site restoration as an accepted management practice for all future R-Well drilling projects, provided that the analytical results for the cuttings remain consistent with the results presented in this request.

LANL believes that managing the drill cuttings on site would allow for site restoration that is both protective of human health and the environment and cost effective. LANL will begin site restoration activities by the end of this month, so please contact us by January 31, 2003 if you have concerns; otherwise, we will proceed with management of the cuttings as described herein. If you have any questions, please contact myself at (505) 665-4681 or Mat Johansen at (505) 665-5046.

Sincerely,

Charles L. Nylander

Charles Nylander, Program Manager
Groundwater Protection Program
Los Alamos National Laboratory

Sincerely,

Mat Johansen

Mat Johansen, Groundwater Program
Program Compliance Manager
National Nuclear Security Admin.
Office of Los Alamos Site Operations

CN/MJ/kmv/th

Enclosure: Attachment – Analytes Detected in Wet Cuttings for Regional Wells R-14 and 32

Cy (w/enc.):
R. Bohn, RRES-R, MS M992
A. Dye, RRES-SWRC, MS K490
H. Granzow, RRES-GPP, MS M992
T. Grieggs, RRES-SWRC, MS K490
K. Hargis, RRES-DO, MS J591
J. McCann, RRES-WQH, MS M992
D. McInroy, RRES-R, MS M992
C. Nylander, RRES-GPP, MS M992
S. Pearson, RRES-WQH, MS M992
N. Quintana, RRES-R, MS M992
S. Rae, RRES-WQH, MS K497
B. Ramsey, RRES-DO, MS J591
D. Stavert, RRES-DO, MS J591
K. VanDerpoel, RRES-SWRC, MS M992
D. Woittie, LC-ESH, MS A187
B. Enz, OLASO, MS A316
M. Johansen, OLASO, MS A316
T. Taylor, OLASO, MS A316
E. Trollinger, OLASO, MS A316
G. Turner, OLASO, MS A316
J. Vozella, OLASO, MS A316
T. Whitacre, OLASO, MS A316
J. Bearzi, NMED-HWB
D. Cobrain, NMED-HWB
C. Cooper, NMED-HWB
J. Kieling, NMED-HWB
C. Will, NMED-HWB
J. Young, NMED-HWB (extra copy)
J. Davis, NMED-SWB
M. Leavitt, NMED- SWQB
J. Parker, NMED-OB
S. Yanicak, NMED-DOE OB, MS J993
L, King, EPA Region 6 (2 copies)
RRES-GPP File, MS M992
RRES-RPF, MS M992 (ER2003-0050)

Attachment

Analytes Detected in Wet Cuttings for Wells (R-14, R-32)

Detected Analyte	Minimum Value	Maximum Value	Mean Value	Soil Geochemical Background Value	Screening Action Levels	Ecological Screening Levels	TCLP Regulatory Limit
Radionuclides (pCi/g):							
Am-241 (alpha spec)	0	0	0	0.013	NA	NA	NA
Cs-137 (gamma spec)	0	0	0	1.65	NA	NA	NA
Pu-238 (alpha spec)	0	0	0	0.023	NA	NA	NA
Pu-239 (alpha spec)	0	0	0	0.054	NA	NA	NA
Sr-90 (proportional counting)	0	0	0	1.31	NA	NA	NA
Tritium (liquid scintillation)	0.035	31.860	10.6	0.17 (Qbt 3)*	880	36,000	NA
Th-232 (gamma spec)	0	1.25	0.417	2.33	NA	NA	NA
U-234 (alpha spec)	1.10	1.28	1.19	2.58	NA	NA	NA
U-235 (alpha spec)	0	0.073	0.037	0.2	NA	NA	NA
U-238 (alpha spec)	1.13	1.23	1.19	2.29	NA	NA	NA
Organics (EPA 8260-B & 8270-C, mg/kg):							
Acetone (isopropyl alcohol)	2.9	17.6	14.7	Unavailable	1,600	3.8	NA
Benzene	0	0.010	0.002	Unavailable	6.4	55	0.5 mg/L
Bromomethane	0	0.620	0.160	Unavailable	3.7	NA	NA
Chloroform	0	0.0078	0.0018	Unavailable	0.38	28	6 mg/L
Chloromethane	0	0.0079	0.0026	Unavailable	12.0	NA	NA
Ethylbenzene	0	0.015	0.003	Unavailable	68	NA	NA
4-Methyl-2-pentanone	0	0.033	0.007	Unavailable	780	NA	NA
Methylene chloride	0	0.710	0.162	Unavailable	8.9	7.1	NA
n-Propylbenzene	0	0.0065	0.001	Unavailable	140	NA	NA
Toluene	0	0.510	0.138	Unavailable	180	70	NA
1,2,4-Trimethylbenzene	0	0.038	0.008	Unavailable	52	NA	NA
Xylenes (total)	0	0.064	0.013	Unavailable	63	5.4	NA
High Explosives (EPA 8330, mg/kg) :							
No compounds were detected.							
PCBs (EPA 8082, mg/kg):							
No compounds were detected.							
Total Inorganics (EPA 6010-B, mg/kg):							
Aluminum	1.93	9,670	3,228	29,200	NA	NA	NA
Antimony	0	0.066	0.023	0.83	NA	NA	NA
Arsenic	0.005	1.57	0.528	8.17	NA	NA	NA
Barium	0.018	61.3	20.5	295	NA	NA	NA
Beryllium	0	0.333	0.111	1.83	NA	NA	NA
Cadmium	0	0.285	0.095	0.40	NA	NA	NA
Calcium	45.2	9,370	3,392	6,120	NA	NA	NA
Chromium	0.0034	29.7	10.2	19.3	NA	NA	NA
Cobalt	0	15.9	5.3	8.64	NA	NA	NA
Copper	0.008	24.3	8.1	14.7	NA	NA	NA
Iron	0	28,170	9,390	21,500	23,000	NA	NA
Lead	0	2.69	0.898	22.3	NA	NA	NA
Magnesium	0.08	14,390	4,800	4,610	NA	NA	NA
Manganese	0	501	167.3	671	NA	NA	NA
Mercury	0	0.0011	0.0004	0.1	NA	NA	NA
Nickel	0.004	48.1	16.0	15.4	1,500	NA	NA
Potassium	37.3	733	390.8	3,460	NA	NA	NA
Selenium	0	1.75	0.59	1.52	NA	NA	NA
Silver	0	0.084	0.028	1	NA	NA	NA
Sodium	227	2,620	1,260	915	NA	NA	NA
Thallium	0	0.107	0.036	0.73	NA	NA	NA
Vanadium	0	54.8	18.3	39.6	NA	NA	NA
Zinc	0	42	14.0	48.8	NA	NA	NA
TCLP Inorganics (EPA 1311/6010-B, mg/L):							
Arsenic	0	0	0	NA	NA	NA	5
Barium	0.152	0.241		NA	NA	NA	100
Cadmium	0	0	0	NA	NA	NA	1
Chromium	0	0.0169		NA	NA	NA	5
Lead	0	0.003		NA	NA	NA	5
Mercury	0	0	0	NA	NA	NA	0.2
Selenium	0	0	0	NA	NA	NA	1
Silver	0	0	0	NA	NA	NA	5

* Background value is calculated from Bandelier Tuff unit 3 (Qbt 3) value of 0.3 pCi/mL at 18.5% moisture concentration.