February 2023
EM2023-0019

Well R-58 Maintenance Report

N3B Los Alamos

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Responsible program director:

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Printed Name	Signature	Title	Organization	Date

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1.0 INTRODUCTION

This report presents the well maintenance activities performed in 2022 at well R-58. The primary objective of the report is to document the well maintenance activities and the current sampling system configuration in well R-58. This work was conducted as prescribed in the October 2022 "Field Implementation Plan for Repair of Wells R-40, R-44, R-49, R-58 and CdV-16-1(i)", which is included as Appendix A. No exceptions to the implementation plan were noted. Sampling system details for R-58 are presented in Figure 1.0-1.

1.1 Background

Well R-58 was installed between September 28 and November 5, 2015, to augment the existing network to better define Royal Demolition Explosive (RDX [hexahydro-1,3,5-trinitro-1,3,5-triazine]) contamination flow paths downgradient of potential contaminant breakthrough locations for S-Site and Fishladder Canyons. Secondary objectives were to identify and establish water levels in perched-intermediate aquifers, if present, and to collect samples of drill cuttings for lithologic description.

The R-58 borehole was drilled to a total depth of 1378.4 ft below ground surface (bgs). A monitoring well was installed with a screened interval between 1257 and 1277.3 ft bgs within dacite breccia. The depth to water of 1238.3 ft bgs was recorded on November 6, 2015, after well installation.

The dedicated sampling system for R-58 was installed between January 9 and 15, 2016. The pumping system utilized an environmentally retrofitted 4-in. 5-horsepower (hp) Grundfos submersible pump set in a shroud near the top of the screened interval. The pump column was constructed of 1-in. threaded/coupled passivated stainless-steel pipe. One 1-in. stainless-steel check valve was installed at the top of the lowermost pipe joint above the pump shroud to provide redundancy to the built-in check valve in the top of the pump body.

A weep valve was installed at the bottom of the uppermost pipe joint to protect the pump column from freezing. To measure water levels in the well, two 1-in. inside diameter (I.D.) schedule 80 polyvinyl chloride (PVC) pipes were installed to sufficient depth to set a dedicated transducer and to provide access for manual water-level measurements. The PVC transducer tubes are equipped with 9-in. sections of 0.010-in. slot screen with a threaded end cap on the bottom of each tube. An In-Situ, Inc., Level TROLL 500 30-psig transducer was installed in one of the PVC tubes to monitor the water level in the well's screened interval. Detailed information on the installation and completion of R-58 is provided in the "Completion Report for Regional Aquifer Well R-58" (LANL 2016).

During sampling attempts in recent years, the original submersible pump previously required on-off cycling to get water to the surface. However, the well has not been sampled since 2020. During a subsequent internal Tech2 Solutions investigation of several pump panels on June 8, 2022, the pump failed to deliver groundwater to the surface. This investigation identified no problems with the pump's electrical panel wiring and suggested that a mechanical issue, such as a broken shaft, may be responsible for the failure of the pump to lift water to the surface.

Maintenance and redevelopment at R-58 occurred between November 9 and December 13, 2022. Activities included inspection of the condition of sampling system components, video logging the well casing and screen, redevelopment of the well screen, replacement of the existing pump with a new submersible pump (Grundfos model 10S50-930, 5 hp), reinstallation of the sampling system, replacement of the weep valve, and installation of a check valve in the pump column. It appears the original pump and motor may have been located too high in the column, resulting in cavitation and pump starvation.

No internal forensic inspection of the pump and motor was performed as part of the well maintenance activity at R-58. The new pump and motor were installed lower in the column.

The new submersible pump was tested following reinstallation of the sampling system and performed in accordance with its specifications.

2.0 REMOVAL OF SAMPLING SYSTEM

The transducer was removed from R-58 by Groundwater Monitoring Program personnel before mobilization on November 8, 2022. A pump hoist was used to remove the sampling system on November 9 and 10, 2022.

3.0 REDEVELOPMENT OF WELL SCREEN

The initial borehole video survey of November 10, 2022, indicated the screened interval was generally clean with limited buildup of material or a film on one side of the lower half of the screened interval. The well was redeveloped between November 11 and December 13, 2022. The screened interval was brushed and bailed to remove the thin growth along one side. The brushing tool consisted of a 5-in.-diameter nylon brush attached to a cable sand line. The brush was raised and lowered through the well screen. Subsequent bailing of the well yielded no groundwater or sediment. A temporary 10-hp, 4-in. Grundfos submersible pump was installed in the well following brushing of the well screen to purge groundwater and sediment. Two attempts at pumping (at 7 and 5 gallons per minute [gpm], respectively) were suspended after 10 min because of pump cavitation from well drawdown. A total of 120 gal. of groundwater was purged from the well during the initial pumping attempts. A single, 15-ft pipe was added to the pump column and 386 gal. of groundwater was purged from the well (30 min at 6 gpm and 15 min at 12 gpm) with no observed cavitation. The replacement sampling pump, a 5-hp Grundfos model 10S50-930, and an additional 10-ft pipe in the pump column were installed in the well for the final phase of redevelopment between December 5 and December 13, 2022. The well was pumped for approximately 1 hr on December 13 and discharged approximately 200 gal. of groundwater.

Borehole video logging was conducted before and after the well development activities. Table 3.0-1 summarizes the video logging runs, and Appendix B includes DVDs of the video logging.

4.0 REINSTALLATION OF SAMPLING SYSTEM

The replacement pump for the sampling system is a submersible Grundfos model 10S50-930, 5-hp pump. The pump is set in a stainless-steel pump shroud and attached to the pump column consisting of a threaded and coupled 1-in. I.D. stainless-steel pipe. The R-58 sampling system was decontaminated before reinstallation in the well between December 5 and December 6, 2022. A weep valve was installed at 29.3 ft bgs to protect the pump column from freezing. The two strings of 1-in. I.D. schedule 80 PVC tubing were banded to the pump column every 10 ft. The PVC transducer tubes are equipped with 9-in. sections of 0.010-in. slot screens with threaded end caps on the bottom. On December 13, 2022, the replacement pump was tested and performed in accordance with its specifications. A standing groundwater elevation of 1240.5 bgs was measured by sounder. An In-Situ Level TROLL 500 30-psig transducer was installed in one of the PVC tubes to monitor the groundwater level in the well.

5.0 PURGE VOLUME ESTIMATES AND GROUNDWATER QUALITY PARAMETERS

One casing volume (CV) of water in well R-58, based on a groundwater elevation of 1238.3 ft bgs, a water column of 49.4 ft above the bottom of the sump, and a 5-in. I.D. stainless-steel well casing, is approximately 50.4 gal. The water volume in the 1-in. stainless-steel drop pipe from the surface to the pump shroud intake is approximately 52.5 gal. Three CVs plus the drop pipe volume is about 203.7 gal. At a pumping rate of 4 gpm, the time required to purge three CVs plus the drop pipe volume before sampling is estimated at 51 min.

During the pumping stage of well redevelopment, pH, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductivity in µS/cm, and turbidity were measured using a flow-through cell connected to the discharge pipe. During well redevelopment, pH varied from 8.26 to 8.47 and temperature ranged from 12.5°C to 19.9°C. DO concentrations varied from 4.13 to 5.49 mg/L. ORP values varied from 127.0 mV to 157.0 mV. The pH/ORP sensor used to determine ORP values consisted of a silver/silver chloride reference electrode and platinum reference junction. Specific conductivity ranged from 199.0 µS/cm to 203.5 µS/cm, and turbidity values varied from 1.6 to 42.9 nephelometric turbidity units (NTU). The final parameters at the end of well redevelopment were pH of 8.45, temperature of 19.5ºC, DO of 5.43 mg/L, ORP of 157.0 mV, specific conductivity of 201.9 µS/cm, and turbidity of 1.6 NTU.

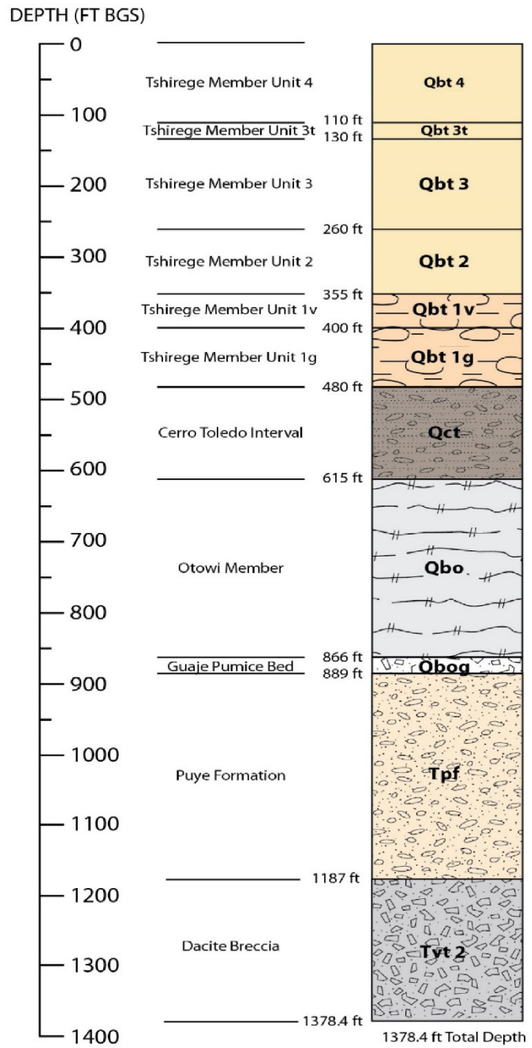
Table 5.0-1 shows field parameters and purge volumes measured during final stage of well redevelopment on December 13, 2022.

6.0 SUMMARY

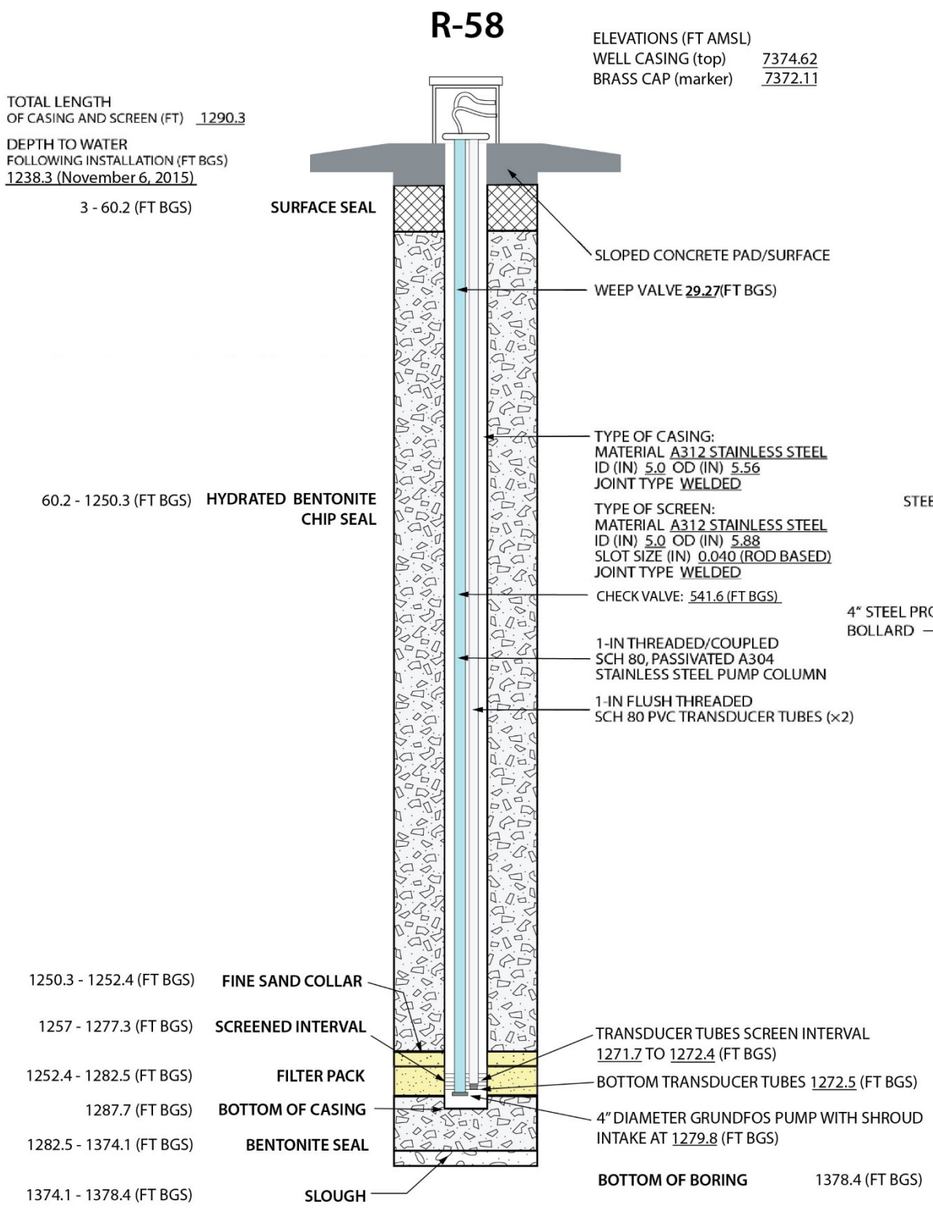
The 2022 well maintenance event at well R-58 was successful and the well has been returned to service as part of the Interim Facility-Wide Groundwater Monitoring Program at Los Alamos National Laboratory. The as-built schematic of the sampling system presented in Figure 1.0-1 should be utilized as a reference for future groundwater monitoring activities at well R-58.

7.0 REFERENCE

LANL (Los Alamos National Laboratory), April 2016. “Completion Report for Regional Aquifer Well R-58,” Los Alamos National Laboratory document LA-UR-16-21912, Los Alamos, New Mexico. (LANL 2016)

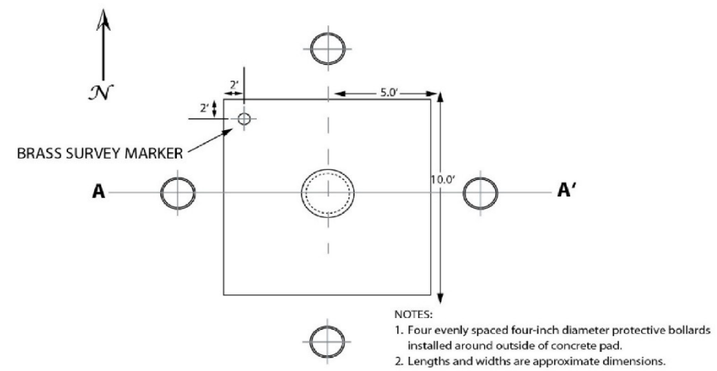


BOREHOLE LITHOLOGY

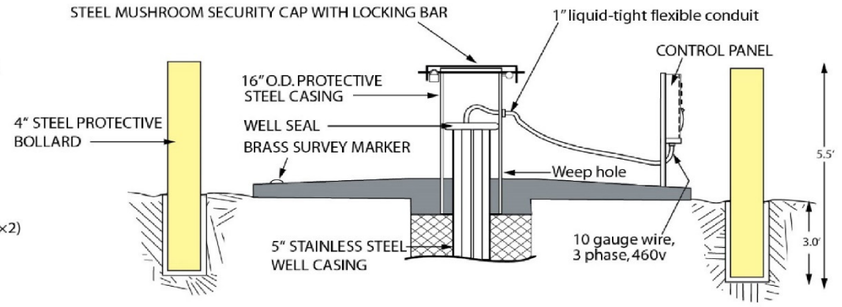


WELL COMPLETION DETAILS

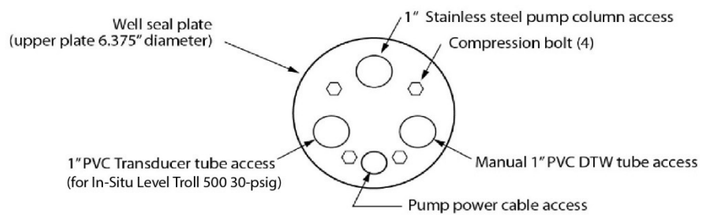
As built not to scale



PLAN VIEW-SURFACE COMPLETION



WELL HEAD DETAILS
SECTION A-A'



Pump column and PVC tube (2) access holes 1.375" diameter

PLAN VIEW-WELL SEAL

Figure 1.0-1 Monitoring well R-58 as-built diagram with borehole lithology and technical well completion details

Table 3.0-1
R-58 Video Logging Runs

Date	Depth Interval	Description
11/10/2022	Ground surface to 1286 ft bgs	Laboratory video log run in the completed well casing
11/18/2022	Ground surface to 1286 ft bgs	Laboratory video log run in the completed well casing

Table 5.0-1
Purge Volumes and Field Parameters Measured
during R-58 Well Development on December 13, 2022

Time	pH	Temp (°C)	DO (mg/L)	ORP (mV)	Specific Conductivity (µS/cm)	Turbidity (NTU)	Purge Volume between Samples (gal.)	Cumulative Purge Volume (gal.)	Flow Rate (gal./min)
1145	8.47	12.5	4.13	129.9	199.0	42.9	20.5	20.5	4.1
1150	8.26	16.9	5.31	127.0	202.5	19	20.5	41	4.1
1155	8.39	18.2	5.44	127.4	203.0	8.15	20	61	4.0
1200	8.42	18.6	5.49	131.4	203.5	5.45	20	81	4.0
1205	8.42	19.3	5.27	134.7	203.2	4.55	20.5	101.5	4.1
1210	8.46	19.3	5.35	139.5	202.9	3.69	20.5	122	4.1
1215	8.47	19.6	5.38	143.4	202.4	2.51	20.5	142.5	4.1
1220	8.45	19.9	5.39	148.9	202.5	1.8	20	162.5	4.0
1225	8.45	19.8	5.43	152.7	202.2	1.82	20.5	183	4.1
1230	8.45	19.5	5.43	157.0	201.9	1.6	20.5	203.5	4.1

Appendix A

Field Implementation Plan for Repair of Wells R-40, R-44, R-49, R-58 and CdV-16-1(i)

Field Implementation Plan for Repair of Wells R-40, R-44, R-49, R-58 and CdV-16-1(i)

October 2022

Primary N3B Representative:

Printed Name	Signature	Title	Organization	Date
Sherry Gaddy	Sherry Gaddy	Program Manager	N3B	10/11/2022

Layne Christensen Company Representative

Printed Name	Signature	Title	Organization	Date
Alex Gustafson		Project Manager	Layne	10/20/2022

October 2022

Field Implementation Plan for Repair of Wells R-40, R-44, R-49, R-58 and CdV-16-1(i)

N3B Los Alamos

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ACRONYM LIST

DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Remediation
ES&H	Environment, Safety and Health
FIP	field implementation plan
FTL	field team leader
IDW	Investigation derived waste
IWCP	integrated work control process
LANL	Los Alamos National Laboratory
LIC	liquid inflation chamber
NMED	New Mexico Environmental Department
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
OM	operations manager
PLY	Pajarito Laydown Yard
POD	plan of the day
PPRR	Project Plan and Readiness Review
PVC	polyvinyl chloride
QA	quality assurance
RCT	radiological control technician
RLM	responsible line manager
SMO	sample management office
SOM	shift operations manager
SOP	standard operating procedure
SSEH&SP	site-specific environmental health and safety plan
SWPPP	Stormwater Pollution Prevention Plan
STR	subcontract technical representative
T&E	threatened and endangered
T2S	Tech2Solutions
VFD	Variable Frequency Drive
WCSF	Waste Characterization Strategy Form

1.0 INTRODUCTION

1.1 Background

Newport News Nuclear BWXT – Los Alamos, LLC (N3B) via Tech2Solutions (T2S) has contracted with Layne Christensen Company (Layne) to perform well repair activities of existing monitoring wells at Los Alamos National Laboratory (LANL), Los Alamos County, New Mexico (Figure 1). All work will be performed in accordance with the following:

- The IWCP for Well Repair of R-40, R-44, R-49, R-58 and CdV-16-1(i)
- The statement of work and technical specifications for Well Repair (Statement of Work)

This Field Implementation Plan (FIP) provides technical guidance for field activities associated with the Los Alamos National Laboratory (LANL) well repair project at monitoring wells R-40, R-44, R-49, R-58 and CdV-16-1(i), located in Los Alamos, New Mexico, as shown in Figure 1, Well Location Map.

The activities associated with the project include mobilization/demobilization of equipment, decontamination of equipment/tools, pressure leak testing, removal/assembly of plumbing between wellhead and manifold, pump system removal, packer removal/installation, swabbing/bailing, aquifer testing, collection of water quality parameters and water samples, video logging, reinstallation and testing of pump system.

As-built well diagrams and technical notes for the referenced wells are presented in Figures 2 through 10.

Project staff, health and safety are also discussed in this document.

1.2 Objectives

This FIP outlines the objectives for evaluation of nitrogen leaks and rehabilitation of Baski sampling systems in wells R-40, R-44 and R-49 and removal and replacement of pumping systems in wells R-58 and CdV-16-1(i) and well redevelopment at each well.

2.0 ORGANIZATIONAL STRUCTURE

This project is a joint effort of Newport News Nuclear BWXT (N3B), its subcontractor Tech2 Solutions and second-tier subcontractor Layne Christensen Company (Layne). An organizational chart is presented in Table 1.

2.1 N3B Project Management Team

The management team includes the Water Program Director, Program Manager, Project Manager, Environmental, Safety and Health (ES&H) Manager, Quality Assurance (QA) Manager, Procurement Manager, and ancillary staff to support and assist in all areas of the project. The management team will provide project management, prepare reports and deliverables, provide field support and oversight of repair tasks, and manage waste streams and sample analyses.

The ES&H Manager will provide ES&H assistance in accordance with Exhibit F of the request for proposal and the integrated work control process documents (IWCPs) and site-specific environmental, health and safety plan (SSEH&SP). Water Program field team leaders (FTLs) are trained as ES&H and QA representatives to provide ES&H and QA field oversight.

2.2 N3B Field Team

During the repair activities, there will be one full-time, on-site, Field Team Lead (FTL), who will act as site manager, ES&H representative, and QA representative. The FTL will maintain field notes detailing daily site activities including standby and documenting sample system installation. The FTL will also be responsible for, but not limited to, conducting daily safety meetings, compiling and submitting daily field reports, review and approval of Layne daily field reports, and collecting/documenting groundwater samples. A list of relevant standard operating procedures (SOPs) for the field project is presented in Table 2. The FTL will serve as a point of contact in conjunction with other field staff. Other on-site support personnel may be added to the field team as needed.

2.3 Well Repair Subcontractor

The Layne field team shall include a qualified pump hoist operator and additional personnel needed to safely and efficiently carry out planned activities. Other qualified staff or subcontracted service providers may be added as necessary to ensure all project requirements are met.

Layne personnel must be U.S. citizens, badged and trained before being approved for field work. Training has been outlined in a training matrix and supplied to Layne. Work crews must be of sufficient size to safely and effectively conduct the planned work, or the FTL on duty will pause/stop work until adequate manpower is present.

As the well repair subcontractor, Layne will support N3B with site safety and quality assurance at all times. All field staff are empowered to pause/stop work in accordance with N3B procedures.

Layne will ensure that equipment is appropriate for the goals of the field project and in proper working order, and that daily logs are maintained. In addition, Layne will support Water Program staff in video logging of the wells, as specified below.

3.0 FIELD ACTIVITIES

Field activities typically will include the following:

- Mobilization/demobilization
- pressure leak testing of packer inflation system
- removal/assembly of plumbing between wellhead and manifold
- pump system or Baski packer removal and reinstallation of new equipment
- video logging
- well redevelopment activities
- reinstallation and testing of the pumping system

The table below indicates the general tasks to be completed at each well site:

Well Number	Repair Tasks
R-40	Evaluate Baski sampling system and replace Baski packer, as needed
R-44	Evaluate Baski sampling system and replace Baski packer, as needed
R-49	Evaluate Baski sampling system and replace Baski packer, as needed
R-58	Replace sampling system pump
CdV-16-1(i)	Replace sampling system pump

The Exhibit A, statement of work, for well repair tasks will be used to guide field operations and ensure all objectives are met.

3.1 Readiness

N3B will coordinate readiness activities.

N3B will coordinate or be responsible for the following:

- Quality Management – Provide review of Layne's Quality Program for compliance and train field personnel to T2S 512.00.01, Rev. 0 "Project Quality Implementation Plan" before field operations.
- ES&H – Coordinate with Layne for their assistance in preparing the IWCP and in reviewing the SSEH&SP. Review training records for health and safety needs.
- Waste Characterization Strategy Form (WCSF) – Prepare plan, acquire required containers, and provide waste sampling criteria.
- Training Requirements – Define requirements and review all field staff records for completeness.
- Stormwater Pollution Prevention Plan (SWPPP) – Prepare or review SWPPP, if applicable, and implement engineered features to minimize impacts from storm water at drill site.
- Project Plan & Readiness Review (PPRR) – Compile all relevant documentation and determine resolutions for issues associated with the National Environmental Policy Act cultural resources and threatened and endangered (T&E) species.
- Spark and Flame Permit – Obtain and verify permit before all spark and flame producing operations.
- Training and Badges – Provide training and badges for all proposed field staff.
- Location of Potable Water Source – Define source, see 3.4 Mobilization
- Requests for Plan of the Day (POD) – Coordinate with Environmental Remediation (ER Ops) Operations staff regarding schedule of activities.
- Access Keys and Radios – Obtain keys and radios for field team.
- Inspections – Define items/tasks to be inspected and coordinate schedule for qualified inspections (e.g., rig inspection, electrical systems, sampling and pumping system assembly).
- Radiological Services – Coordinate schedule with radiological control technicians (RCTs) for the documentation and screening of incoming equipment and at final demobilization of equipment.
- Water Hauling – Provide potable water from J-stand, to be transported to sites by Layne for decontamination, as needed. Contaminated water to be stored temporarily in poly tanks at the site for WCSF sampling, waste characterization and disposition.

Layne will coordinate, or cooperate with the following:

- Assure that all personnel are U.S. citizens and are trained to applicable corporate ES&H and QA standards
- Assist N3B staff with IWCP and SSEH&SP preparation and review, and make all personnel available for LANL/N3B-required training and badging

- Provide hoist rig maintenance records and conduct a robust equipment inspection before delivery to LANL
- Assist N3B in inspection of rig and equipment at the Pajarito Laydown Yard, and provide decontamination of rig and equipment, before mobilization to well sites
- Assist N3B in inspection of rig and equipment at rig up inspection at each well site

3.2 Equipment

Well repair tasks will be facilitated with a pump hoist rig provided by Layne, with suitable auxiliary equipment including, but not limited to, air compressors, water truck/rig tender, forklifts, and manlift, as needed. Light plants will be provided by Layne, in case of work during night shifts, and be sufficient for adequate well pad lighting as verified by N3B light surveys.

This pump hoist will perform well redevelopment, installation of temporary pump systems for aquifer testing, and installation of the dedicated sampling system.

Material approvals and receipt inspections will be conducted by both Layne and N3B for all items, including initial inspection of rig and equipment when mobilized to LANL, any new wire rope and other hoist rigging delivered to site after mobilization.

Layne will be responsible for delivery of all fuel necessary for equipment operation to the well sites for R-40, R-44 and R-49 and to the Pajarito Laydown Yard (PLY). Fuel deliveries to wells R-58 and CdV-16-1(i), both of which are located in the Weapons Facility Operations (WFO) at Technical Area TA-16, will be coordinated with Triad. The placement of an aboveground storage tank on-site is allowed, with placement on secondary containment. No more than 1320 gals of fuel will be allowed at well sites R-40, R-44 and R-49 site at any time, excluding vehicle fuel tanks, to avoid application of spill prevention control and countermeasure (SPCC) rules.

3.3 Waste Collection

Investigation-derived waste (IDW) will be managed in accordance with standard operating procedure (SOP) N3B-EP-SOP-10021, “Characterization and Management of Environmental Program Waste.” This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environmental Department (NMED) regulations, Department of Energy (DOE) orders, and N3B requirements. The primary waste streams will include development water, purge water generated during redevelopment, decontamination water, and contact waste. Details are located in the WCSFs for the individual wells.

3.4 Mobilization

Equipment and supplies for the completion of the project will be staged at each work site in an organized and secure manner. Surplus and/or inactive equipment and supplies may be stored at the PLY located at the northwest corner of Pajarito Road and New Mexico State Road 4. Access to the laydown yard is through a locked gate and is limited to the hours of 7 a.m. to 7 p.m. unless prior authorization is granted.

Mobilization to each site will consist of transporting and setting up equipment at the well site and will include the following:

- Mobilize pump hoist rig, trailers, support vehicles, materials, and tools to the well site.
- Set up pump hoist rig, trailers, support vehicles and tools at the location.
- Complete pump hoist rig up inspection.

- Review scope of work and project-specific health and safety issues with crew.
- Complete all required training for all personnel.
- Obtain Environmental Remediation (ER) Responsible Line Manager (RLM)/ Operations Manager's (OM) authorization through the Plan-of the-Day (POD), including rig inspection and Integrated Work Control Process form (IWCP) review.

Site access routes have been established for all sites. The water source for the project will be the J-stand located on Eniwetok Drive, adjacent to building number 60-0287.

Since no soil disturbance exceeding one acre per site is expected, no SWPPP is required. In the event pad repairs or snow removal are required during repair operations, Layne will support N3B ER Crafts crews in these operations. If snow removal is necessary, N3B will maintain access to the well pad, and Layne will be responsible for clearing snow from the pad. Layne will ensure that work areas will always be kept free of ice to maintain safe working conditions.

Decontamination of any pumping system components that will be placed downhole during well repair and redevelopment (including packer, drop pipe, APVs, pump, pump shroud, liquid inflation chamber (LIC), etc.) will be hot water/steam pressure rinsed, washed with non-phosphatic Alconox® or Liquinox® detergent, hot water/pressure rinsed again, then wrapped in plastic after air drying prior to the start of repair and redevelopment activities. Decontamination water will be containerized in 55-gal drums or poly-tanks, properly labeled, and stored on-site for characterization and disposal. For water quality testing, it is anticipated that samples would be collected directly from a spigot mounted at the wellhead.

Decontamination of sample tools will be performed with a wire brush followed by spraying with Fantastik® and wiping clean with paper towels. If bailers are used for collecting groundwater samples, they will be washed with Liquinox® detergent and potable water and rinsed with deionized water before sample collection. The deionized water would be provided by N3B.

3.5 Planned Repair Tasks at Well Sites

Wells R-40, R-44 and R-49 - Baski Sampling System Evaluation and Packer Replacement

At each of these wells, all of which are 5-inch inside diameter (ID) dual-screen monitoring wells with Baski sampling and pumping systems in place, Layne Christensen will perform pressurized leak tests with nitrogen and troubleshoot pneumatic fittings for inflation lines for the inflatable packer, and upper and lower access port valves at the wellhead.

Upon confirmation that the apparent pressure leak is downhole, Layne will begin removing the sampling system from the well, performing pressure testing of all fittings at each stage. If it is determined that the existing packer is the source of the leak, a new packer will be prepared for installation in the well. The packer is provided by N3B.

Upon removal of the complete sampling system, Layne will provide access and assist T2S crew for video logging.

Layne will reinstall the sampling system, consisting of the existing pump, pump shroud, upper and lower access port valves (APVs), liquid inflation chamber (LIC), new packer, 1-inch diameter pump column pipe and two 1-inch PVC gauge tubes. Existing PVC gauge tubes and 1-inch-diameter stainless steel pump column will be evaluated and reinstalled or replaced, depending on condition .Layne, under FTL

oversight, will assist with inspection of the existing drop pipe for wear, erosion, thread damage, etc. Damaged pipe will be replaced as-needed prior to re-installation

Replacement PVC gauge tubes and pump column pipe will be provided by N3B.

The existing pump power cable will be evaluated by Layne, under FTL oversight, and replaced, depending on condition. N3B will provide the replacement cable. Electrical terminations/splices to the pump motor will be made by N3B craft electricians or by Subcontractor's N3B-approved licensed electricians offsite. Electrical terminations in the electrical panel will be made by N3B craft electricians.

With reinstallation of the system, Layne will install new stainless steel inflation/actuation lines and new nylon tubing line for pump shroud air vent, all secured with new stainless steel banding and buckles, and new stainless steel screens for lower zone gauge tube modification. The inflation/action lines, tubing, banding, buckles and stainless steel screens will be provided by N3B.

Layne will conduct pressure leak tests at all inflation line fittings as re-installation of the system proceeds, including at surface prior to start of installation.

Once the sampling system is installed, 200% of the calculated cross flow volume may be pumped from the affected screen. The cross flow times include from the time the packer was deflated after the last aquifer test was completed until the temporary packer is installed, and from the time the temporary packer is deflated until the permanent packer is inflated.

All waste water from deconning, purging, bailing and surging during repair and redevelopment activities must be collected in poly-tanks stored at the sites.

Well R-58 – Pump Replacement

At well R-58, a 5-inch ID monitoring well with a 4-inch pumping system in place, Layne will remove the existing pumping system and assist with video logging of well by T2S. Expect potential separation of the pump from the motor, broken shaft, etc.

Layne will then perform brushing of screen interval followed by surging and will bail the well until visible clarity of water improves. If requested, Layne will assist in collection of water samples during the bailing period. Layne will then redevelop the screen interval with jetting as directed by T2S.

Layne will then reinstall the sampling system with new environmentally retrofitted 5 HP pump and motor, including shroud and two 1-inch PVC gauge tubes. Existing PVC gauge tubes and 1-inch-diameter stainless steel pump column will be evaluated and reinstalled or replaced, depending on condition. Layne, under FTL oversight, will assist with inspection of the existing drop pipe for wear, erosion, thread damage, etc. Damaged pipe will be replaced as-needed prior to re-installation

The existing pump power cable will be evaluated by Layne, under oversight of the FTL, and replaced, depending on condition. N3B will provide the replacement cable. Electrical terminations/splices to the pump motor will be made by N3B craft electricians or by Subcontractor's N3B-approved licensed electricians offsite. Electrical terminations in the electrical panel will be made by N3B craft electricians.

Layne will then perform functional testing of the pump. The pump, pump motor, shroud and replacement PVC gauge tubes and pump column pipe will be provided by N3B.

All waste water from deconning, purging, bailing and surging during repair and redevelopment activities must be collected in poly-tanks stored at the site.

Well CdV-16-1(i) – Pump Replacement

At well CdV-16-1(i), a 4.5-inch ID monitoring well with a 4-inch pumping system in place, Layne will remove the existing pumping system and assist with video logging of well by T2S. Foot valve is holding so the pull will be wet. Take precautions based on ambient temperature to protect crew and work area (footing, collection of water as required).

Layne will then perform brushing of screen interval followed by surging and will bail the well until visible clarity of water improves. If requested, Layne will assist in collection of water samples during the bailing period. Layne will then redevelop the screen interval with jetting as directed by T2S.

Layne will then reinstall the sampling system with new environmentally retrofitted 5 HP pump and motor, including shroud and two 1-inch PVC gauge tubes. Existing PVC gauge tubes and 1-inch-diameter stainless steel pump column will be evaluated and reinstalled or replaced, depending on condition. Layne, under FTL oversight, will assist with inspection of the existing drop pipe for wear, erosion, thread damage, etc. Damaged pipe will be replaced as-needed prior to re-installation.

The existing pump power cable will be evaluated by Layne, under FTL oversight, and replaced, depending on condition. N3B will provide the replacement cable. Electrical terminations/splices to the pump motor will be made by N3B craft electricians or by Subcontractor's N3B-approved licensed electricians offsite. Electrical terminations in the electrical panel will be made by N3B craft electricians.

Layne will then perform functional testing of the pump. The pump, pump motor, shroud and replacement PVC gauge tubes and pump column pipe will be provided by N3B.

All waste water from deconning, purging, bailing and surging during repair and redevelopment activities must be collected in poly-tanks stored at the site.

3.6 Demobilization

Demobilization activities will include:

- Loading and removal of the equipment.
- Removal of the pump hoist rig and support vehicles from the site.
- Staging and securing of IDW for future disposition.
- Removal of municipal waste (e.g. materials packaging).
- Final site cleanup of all materials used during well repair activities.

The N3B subcontract technical representative (STR) and shift operations manager (SOM) will inspect the sites prior to final demobilization of the drill crew. Final demobilization of the drill crew will not be permitted until the condition of the sites are acceptable to the STR and SOM.

4.0 REPORTING

Updated as-built diagram and technical notes will be prepared within 30 calendar days of project completion. Technical notes will include dates and descriptions of project activities.

Table 1
Key Team Personnel Roles and Responsibilities

Name	Role	Responsibilities
Ryan Flynn	Water Program Director	Responsible for the successful execution of the project
Amanda White	Water Program Deputy Director	Responsible for the successful execution of the project in support of the Director
Sherry Gaddy	Drilling Program Manager (PgM)	Leadership for overall drilling and well repair program
Phil Walkup	Project Manager (PM)	Responsible for monitoring and documenting the subcontractor's day-to-day performance, providing day-to-day oversight, and assuring work is performed in a safe manner. Project and field management, N3B interaction, subcontractor coordination, IWCP and ES&H compliance
Thomas Klepfer	Back-up Project Manager (PM)	Responsible as above as needed
Jeffrey Richeson	Subcontract Technical Representative (STR)	Responsible to the Project Manager for monitoring and documenting the subcontractor's day-to-day performance, communications, procurement support, providing day-to-day oversight, IWCP and ES&H compliance
Christina Rampley	N3B/T2S Procurement Manager	Responsible for solicitation, negotiation, award, and administration of subcontracts and has overall commercial responsibility for subcontracts
Kenneth Hoffman	ES&H Oversight	Primary contact for ES&H oversight, ESH Professional
Al Medina	Quality Control Manager	Primary contact for N3B QA oversight
Ken Wright Karen Warren Chris Harper Isaiah Sedillo Alicia Lopez	FTL/PIC	Field management, subcontractor coordination, IWCP and ES&H compliance, ESH & QA site Representative
Adam Zimmerman	Waste Coordinator	Lead for waste generation and management oversight
Charles Smith	Layne Drilling Manager	Project and field management, N3B interaction, budget, resource commitments, subcontractor coordination, IWCP and ES&H compliance
Alex Gustafson	Layne Project Manager	Project and field management, budget and resource commitments, subcontractor coordination and ES&H compliance
Joshua Walsh Jody Woods	Layne Field Supervisors	Project and field management, N3B interaction, subcontractor coordination, IWCP and ES&H compliance
Hunter Clement	Layne Safety Specialist	Responsible for Layne corporate ES&H programs, site visits and 24/7 on-call oversight
Steve Maze	N3B Operations Manager	Facility Operations and Security Management/Coordination. Authorizes and approves project work release
Ralph Rupp	N3B Shift Operations Manager (SOM)	Responsible for authorization and coordination of field operations

Table 2
Project-Specific Procedures, Standing Orders, and SOPs

Procedure #	Title
N3B-AP-ER-1002	Environmental Remediation (ER) Field Work Requirements
N3B-P101-1	Ergonomics
N3B-P101-4	Forklifts and Powered Industrial Trucks
N3B-P101-6	Personal Protection Equipment
N3B-P101-7	Vehicle and Pedestrian Safety
N3B-P101-13	Electrical Safety Program
N3B-P101-18	Procedure for Pause/Stop Work
N3B-P101-26	Welding, Cutting, and Other Spark- or Flame-Producing Operations
N3B-P101-34	Pressure Safety
N3B-P330-9	Suspect/Counterfeit Items
N3B-SO-ER-0006	Access Restrictions in Canada del Buey
N3B-SO-ER-0024	ER Protocols During Migratory Bird Season
N3B-SO-ER-0026	ER Requirements for Opening New Empty Metal Drums
N3B-SO-ER-0032	Event or Injury Reporting Requirements for Pre-Job Briefing and Tailgate Meeting Forms
N3B-SOP-ER-2002	Field Decontamination of Equipment
N3B-SOP-ER-3001	Manual Groundwater Level Measurements
N3B-SOP-ER-3003	Groundwater Sampling
N3B-SOP-ER-6001	Pressure Transducer Installation, Removal and Maintenance
N3B-SOP-ER-6002	Well Development
N3B-SOP-ER-6003	Pneumatic Leak Testing of Packer - GW Water Sampling Equip
N3B-SOP-ER-6004	Borehole Camera and Geophysical Logging System Use
N3B-SOP-ER-6007	Packer Pressure Monitoring and Maintenance
N3B-GDE-ER-6011	GW Well Double Screen Sampling System - Install-Test
N3B-SOP-SDM-1100	Sample Containers, Preservation, and Field Quality Control
N3B-SOP-SDM-1101	Sample Control and Field Documentation
N3B-SOP-SDM-1102	Sample Receiving and Shipping by the N3B Sample Management Office
UI-PROC-64-00-125-R4	Fire Hydrant Operation and Non-emergency Use

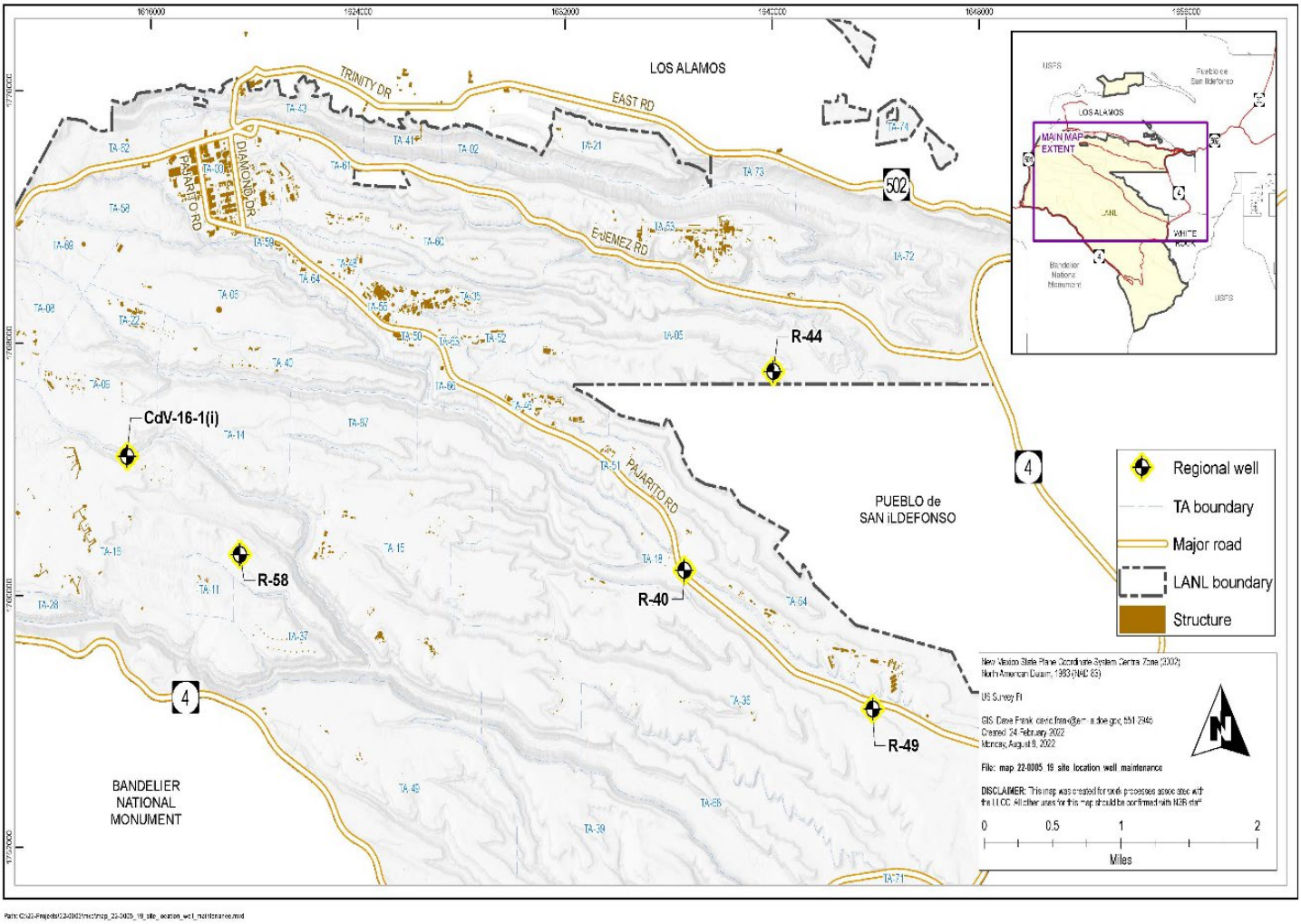


Figure 1 - Well Location Map

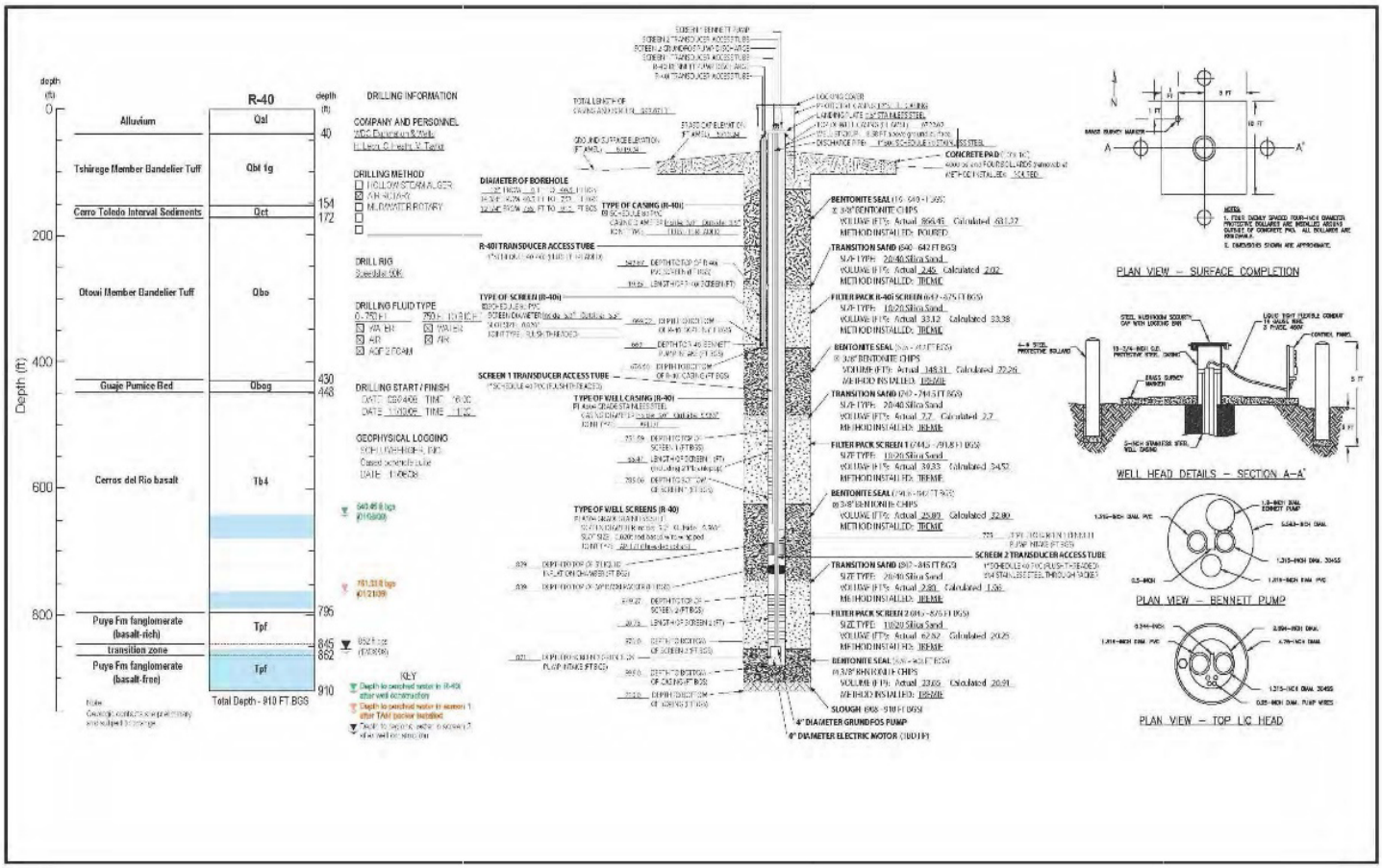


Figure 2 - R-40 As-Built Completion Schematic

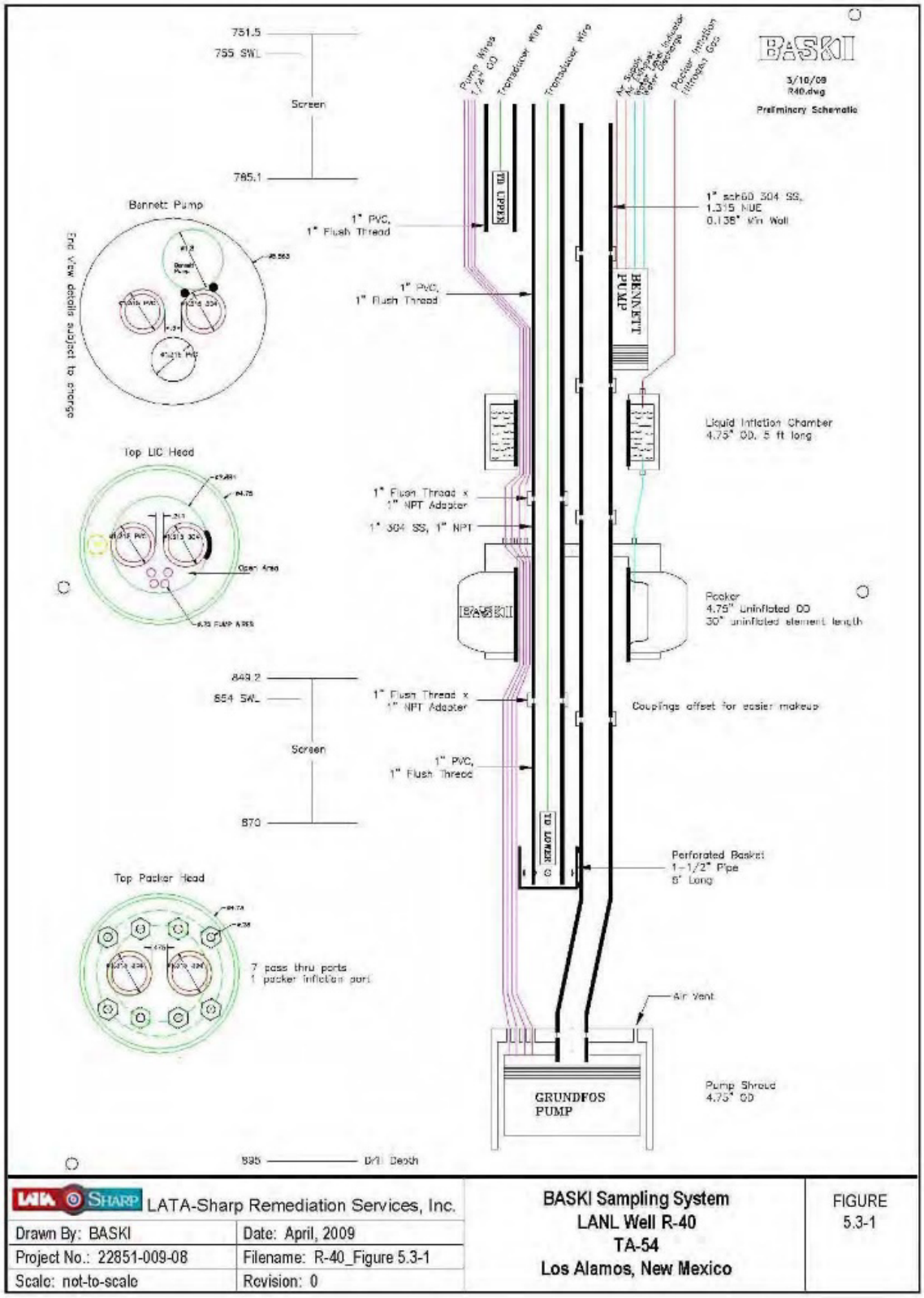


Figure 3 - R-40 Baski Sampling System

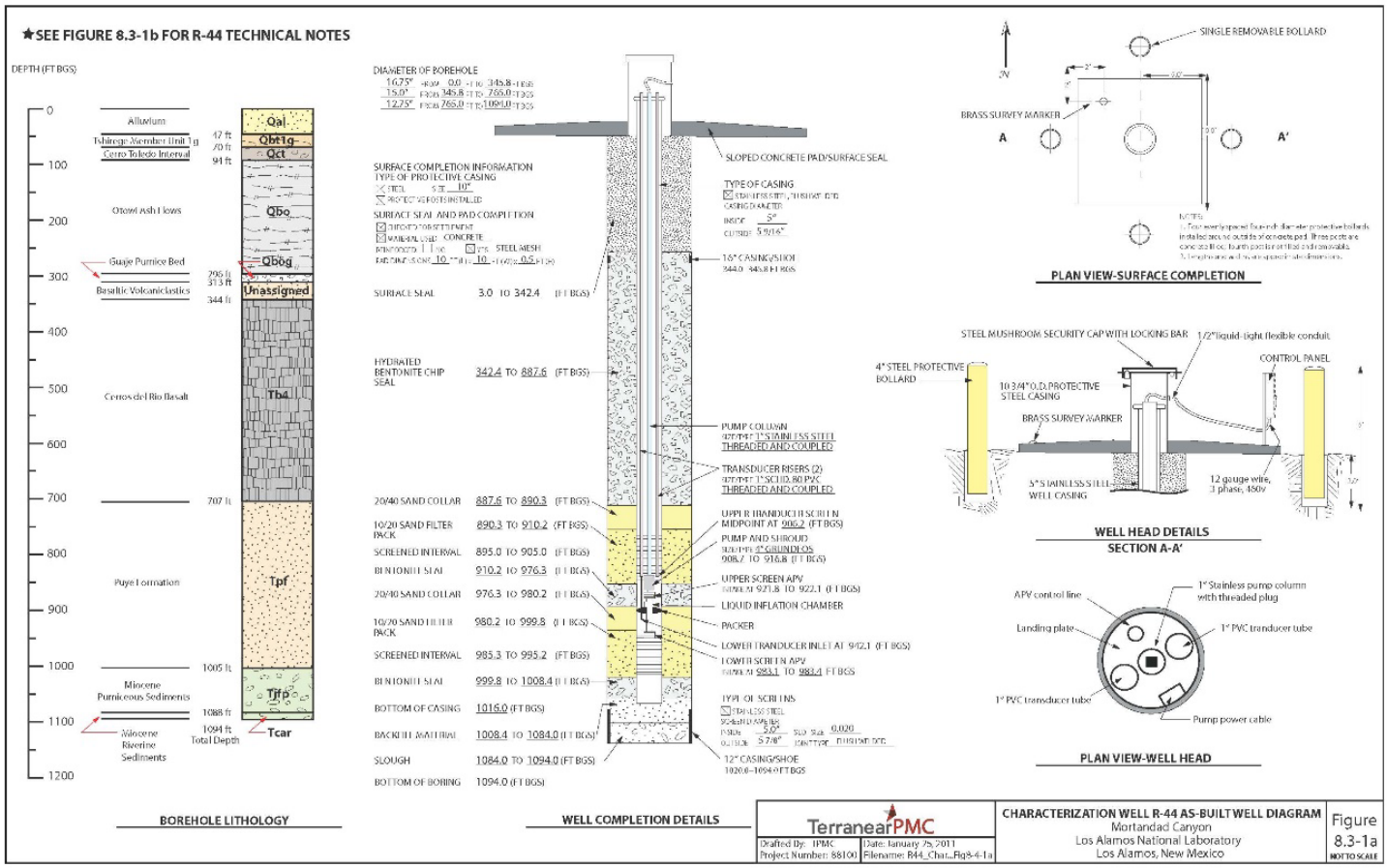
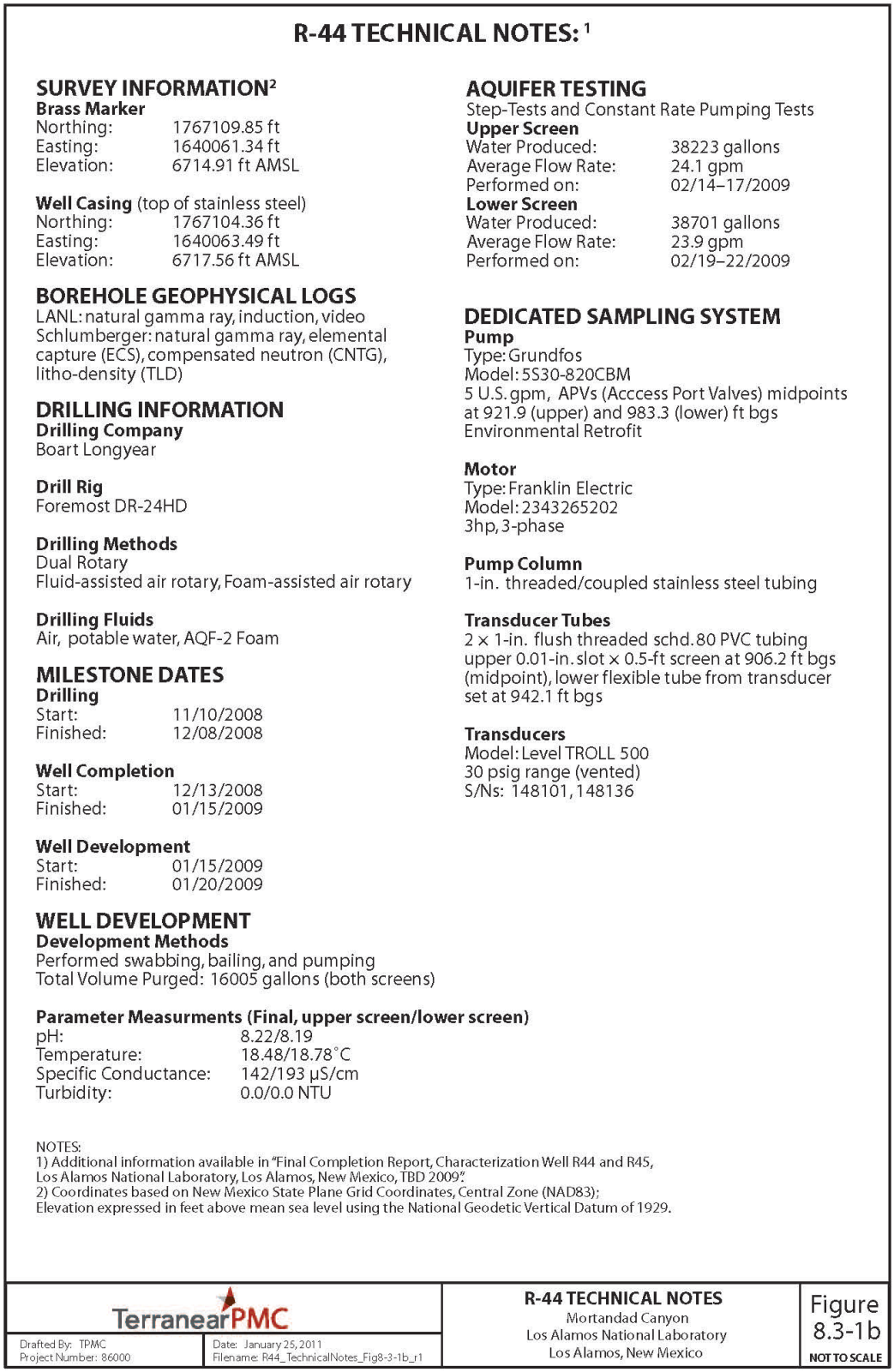


Figure 4 - R-44 As-Built Well Diagram



R-44 TECHNICAL NOTES: [1]

SURVEY INFORMATION[2]

Brass Marker

Northing:	1767109.85 ft
Easting:	1640061.34 ft
Elevation:	6714.91 ft AMSL

Well Casing (top of stainless steel)

Northing:	1767104.36 ft
Easting:	1640063.49 ft
Elevation:	6717.56 ft AMSL

BOREHOLE GEOPHYSICAL LOGS

LANL: natural gamma ray, induction, video
Schlumberger: natural gamma ray, elemental capture (ECS), compensated neutron (CNTG), litho-density (TLD)

DRILLING INFORMATION

Drilling Company
Boart Longyear

Drill Rig
Foremost DR-24HD

Drilling Methods
Dual Rotary
Fluid-assisted air rotary, Foam-assisted air rotary

Drilling Fluids
Air, potable water, AQF-2 Foam

MILESTONE DATES

Drilling

Start:	11/10/2008
Finished:	12/08/2008

Well Completion

Start:	12/13/2008
Finished:	01/15/2009

Well Development

Start:	01/15/2009
Finished:	01/20/2009

WELL DEVELOPMENT

Development Methods
Performed swabbing, bailing, and pumping
Total Volume Purged: 16005 gallons (both screens)

Parameter Measurments (Final, upper screen/lower screen)

pH:	8.22/8.19
Temperature:	18.48/18.78°C
Specific Conductance:	142/193 µS/cm
Turbidity:	0.0/0.0 NTU

AQUIFER TESTING

Step-Tests and Constant Rate Pumping Tests

Upper Screen

Water Produced:	38223 gallons
Average Flow Rate:	24.1 gpm
Performed on:	02/14–17/2009

Lower Screen

Water Produced:	38701 gallons
Average Flow Rate:	23.9 gpm
Performed on:	02/19–22/2009

DEDICATED SAMPLING SYSTEM

Pump
Type: Grundfos
Model: 5S30-820CBM
5 U.S. gpm, APVs (Acccess Port Valves) midpoints at 921.9 (upper) and 983.3 (lower) ft bgs
Environmental Retrofit

Motor
Type: Franklin Electric
Model: 2343265202
3hp, 3-phase

Pump Column
1-in. threaded/coupled stainless steel tubing

Transducer Tubes
2 x 1-in. flush threaded schd. 80 PVC tubing upper 0.01-in. slot x 0.5-ft screen at 906.2 ft bgs (midpoint), lower flexible tube from transducer set at 942.1 ft bgs

Transducers
Model: Level TROLL 500
30 psig range (vented)
S/Ns: 148101, 148136

NOTES:
1) Additional information available in "Final Completion Report, Characterization Well R44 and R45, Los Alamos National Laboratory, Los Alamos, New Mexico, TBD 2009".
2) Coordinates based on New Mexico State Plane Grid Coordinates, Central Zone (NAD83); Elevation expressed in feet above mean sea level using the National Geodetic Vertical Datum of 1929.

Figure 5 - R-44 Technical Notes

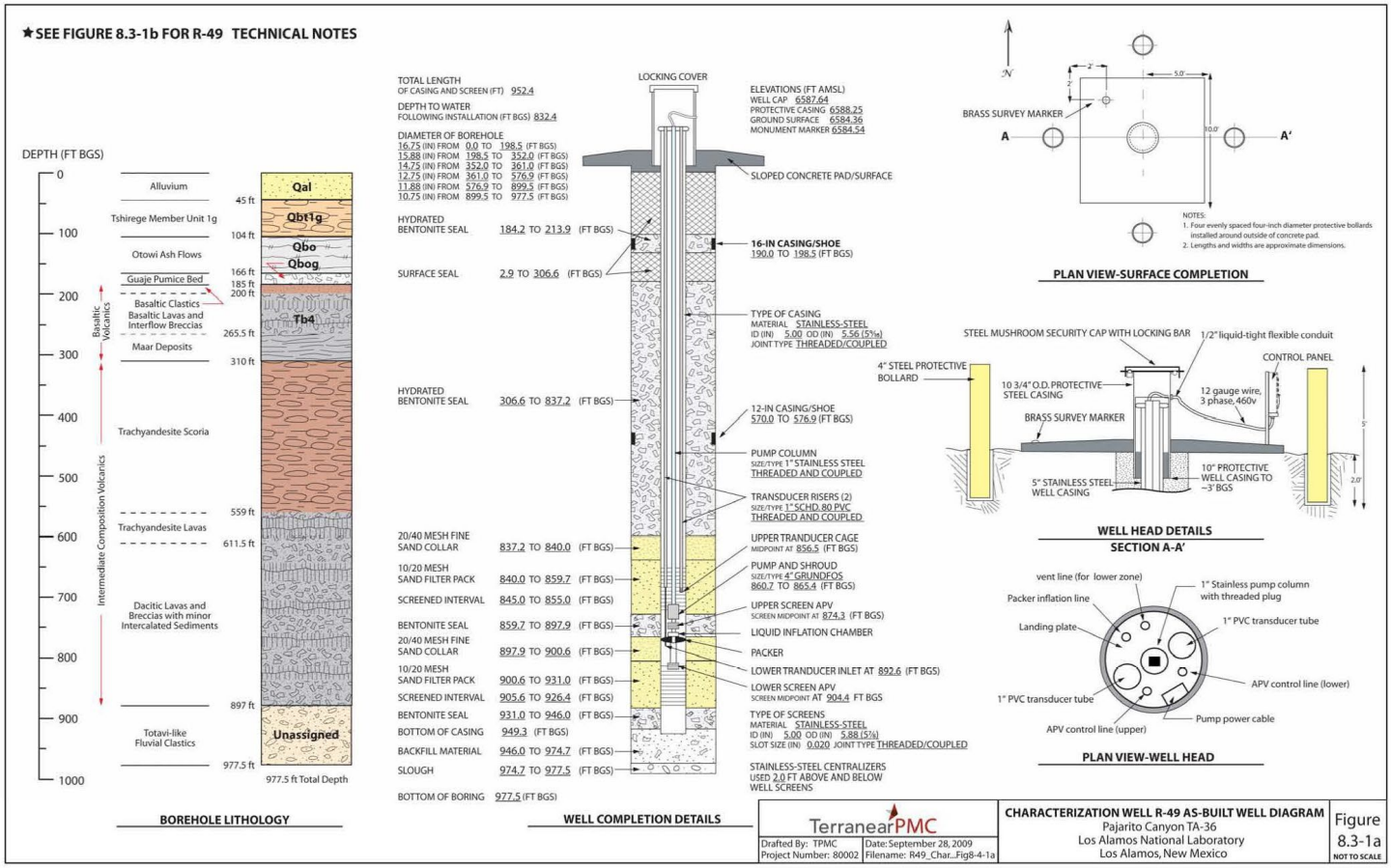
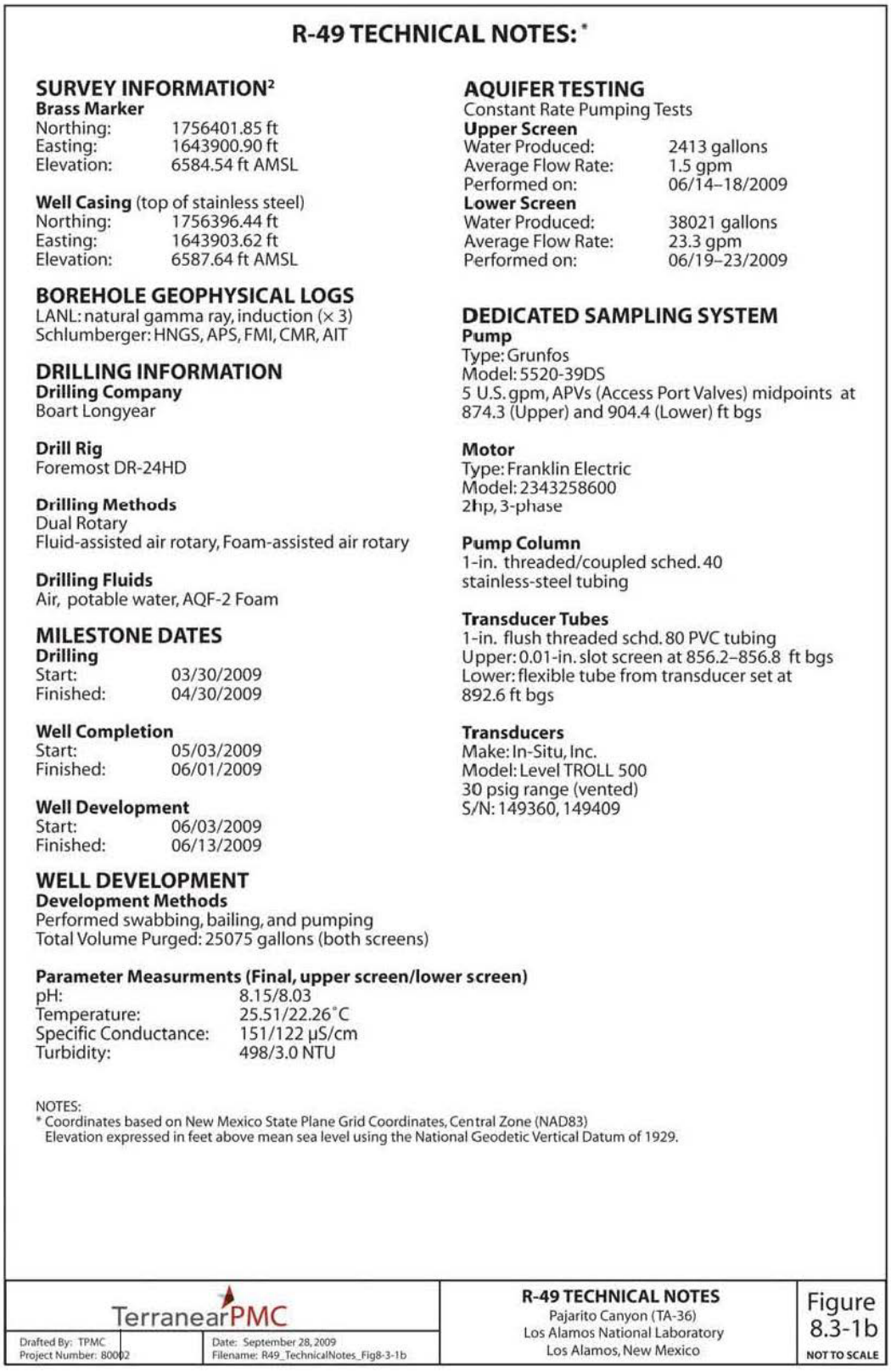


Figure 6 - R-49 As-Built Well Diagram



R-49 TECHNICAL NOTES: *

SURVEY INFORMATION[2]

Brass Marker

Northing:	1756401.85 ft
Easting:	1643900.90 ft
Elevation:	6584.54 ft AMSL

Well Casing (top of stainless steel)

Northing:	1756396.44 ft
Easting:	1643903.62 ft
Elevation:	6587.64 ft AMSL

BOREHOLE GEOPHYSICAL LOGS

LANL: natural gamma ray, induction (× 3)
Schlumberger: HNGS, APS, FMI, CMR, AIT

DRILLING INFORMATION

Drilling Company
Boart Longyear

Drill Rig
Foremost DR-24HD

Drilling Methods
Dual Rotary
Fluid-assisted air rotary, Foam-assisted air rotary

Drilling Fluids
Air, potable water, AQF-2 Foam

MILESTONE DATES

Drilling

Start:	03/30/2009
Finished:	04/30/2009

Well Completion

Start:	05/03/2009
Finished:	06/01/2009

Well Development

Start:	06/03/2009
Finished:	06/13/2009

WELL DEVELOPMENT

Development Methods
Performed swabbing, bailing, and pumping
Total Volume Purged: 25075 gallons (both screens)

Parameter Measurments (Final, upper screen/lower screen)

pH:	8.15/8.03
Temperature:	25.51/22.26°C
Specific Conductance:	151/122 µS/cm
Turbidity:	498/3.0 NTU

AQUIFER TESTING

Constant Rate Pumping Tests

Upper Screen

Water Produced:	2413 gallons
Average Flow Rate:	1.5 gpm
Performed on:	06/14–18/2009

Lower Screen

Water Produced:	38021 gallons
Average Flow Rate:	23.3 gpm
Performed on:	06/19–23/2009

DEDICATED SAMPLING SYSTEM

Pump
Type: Grunfos
Model: 5520-39DS
5 U.S. gpm, APVs (Access Port Valves) midpoints at 874.3 (Upper) and 904.4 (Lower) ft bgs

Motor
Type: Franklin Electric
Model: 2343258600
2hp, 3-phase

Pump Column
1-in. threaded/coupled sched. 40 stainless-steel tubing

Transducer Tubes
1-in. flush threaded schd. 80 PVC tubing
Upper: 0.01-in. slot screen at 856.2–856.8 ft bgs
Lower: flexible tube from transducer set at 892.6 ft bgs

Transducers
Make: In-Situ, Inc.
Model: Level TROLL 500
30 psig range (vented)
S/N: 149360, 149409

NOTES:
* Coordinates based on New Mexico State Plane Grid Coordinates, Central Zone (NAD83)
Elevation expressed in feet above mean sea level using the National Geodetic Vertical Datum of 1929.

TerranearPMC
Drafted By: TPMC
Project Number: 80002
Date: September 28, 2009
Filename: R49_TechnicalNotes_Fig8-3-1b

R-49 TECHNICAL NOTES
Pajarito Canyon (TA-36)
Los Alamos National Laboratory
Los Alamos, New Mexico

Figure 8.3-1b
NOT TO SCALE

Figure 7 - R-49 Technical Notes

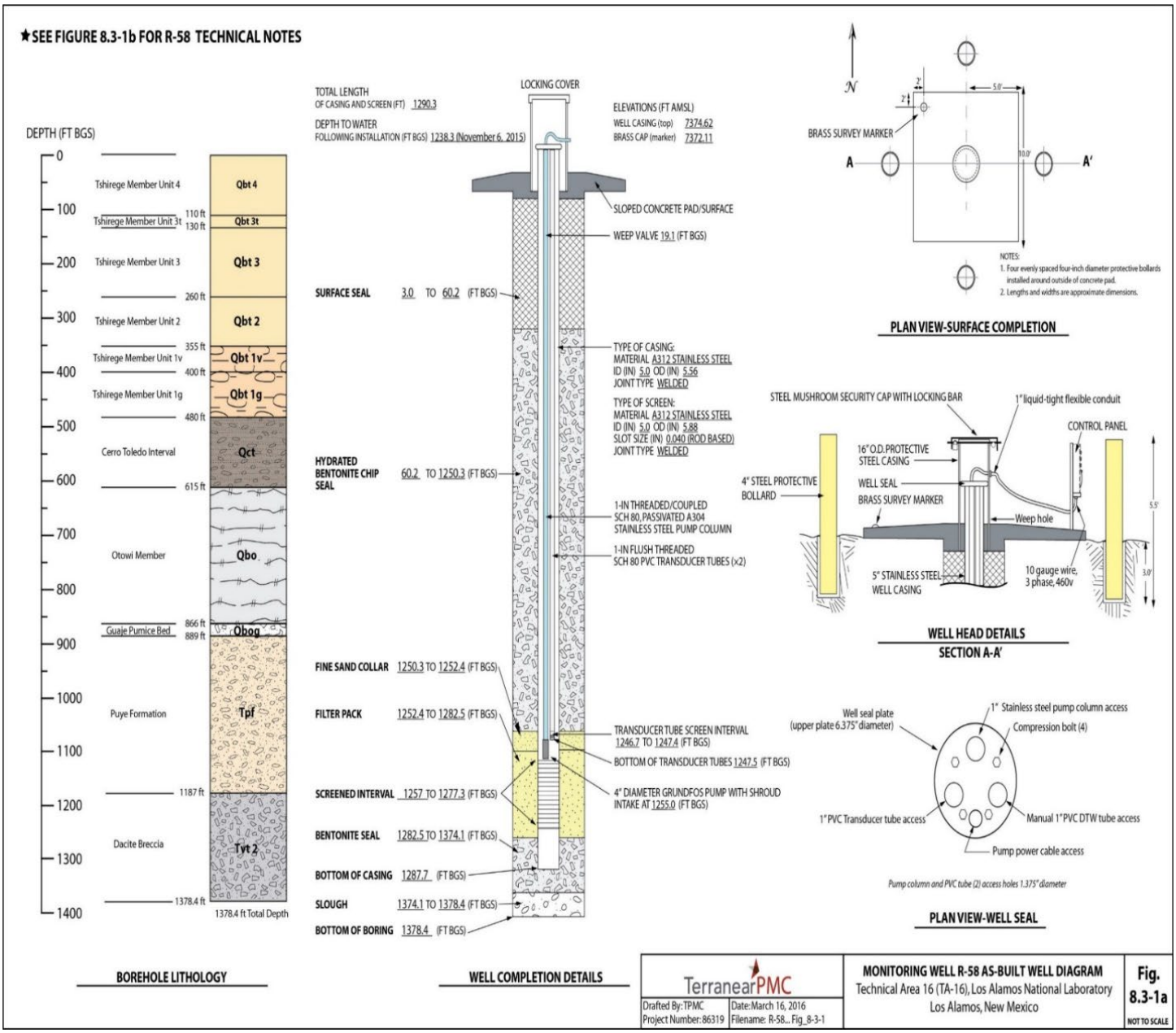
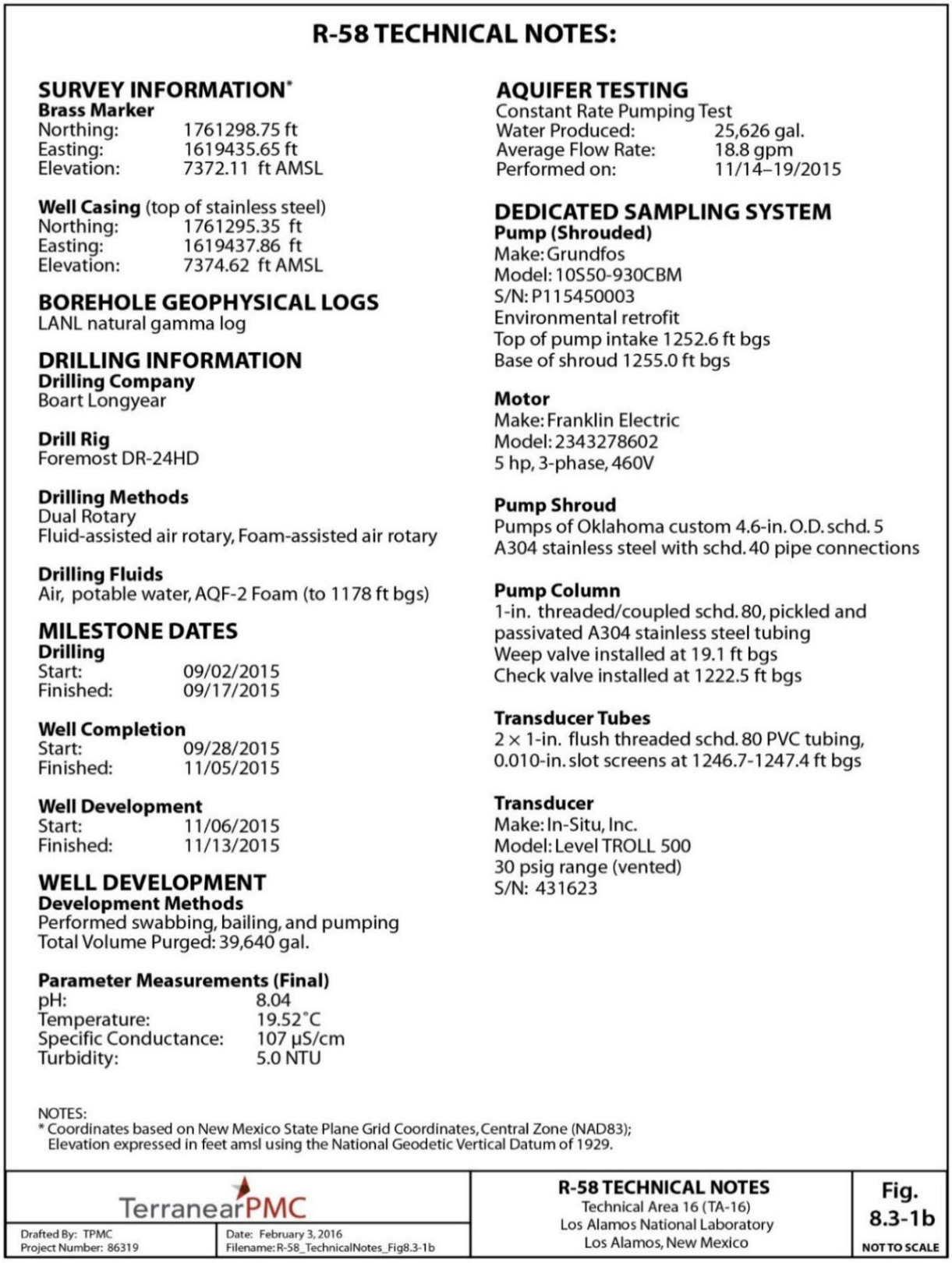


Figure 8 - R-58 As-built Diagram



R-58 TECHNICAL NOTES:

SURVEY INFORMATION*
Brass Marker
Northing: 1761298.75 ft
Easting: 1619435.65 ft
Elevation: 7372.11 ft AMSL

Well Casing (top of stainless steel)
Northing: 1761295.35 ft
Easting: 1619437.86 ft
Elevation: 7374.62 ft AMSL

BOREHOLE GEOPHYSICAL LOGS
LANL natural gamma log

DRILLING INFORMATION
Drilling Company
Boart Longyear

Drill Rig
Foremost DR-24HD

Drilling Methods
Dual Rotary
Fluid-assisted air rotary, Foam-assisted air rotary

Drilling Fluids
Air, potable water, AQF-2 Foam (to 1178 ft bgs)

MILESTONE DATES
Drilling
Start: 09/02/2015
Finished: 09/17/2015

Well Completion
Start: 09/28/2015
Finished: 11/05/2015

Well Development
Start: 11/06/2015
Finished: 11/13/2015

WELL DEVELOPMENT
Development Methods
Performed swabbing, bailing, and pumping
Total Volume Purged: 39,640 gal.

Parameter Measurements (Final)
pH: 8.04
Temperature: 19.52˚C
Specific Conductance: 107 µS/cm
Turbidity: 5.0 NTU

AQUIFER TESTING
Constant Rate Pumping Test
Water Produced: 25,626 gal.
Average Flow Rate: 18.8 gpm
Performed on: 11/14–19/2015

DEDICATED SAMPLING SYSTEM
Pump (Shrouded)
Make: Grundfos
Model: 10S50-930CBM
S/N: P115450003
Environmental retrofit
Top of pump intake 1252.6 ft bgs
Base of shroud 1255.0 ft bgs

Motor
Make: Franklin Electric
Model: 2343278602
5 hp, 3-phase, 460V

Pump Shroud
Pumps of Oklahoma custom 4.6-in. O.D. schd. 5 A304 stainless steel with schd. 40 pipe connections

Pump Column
1-in. threaded/coupled schd. 80, pickled and passivated A304 stainless steel tubing
Weep valve installed at 19.1 ft bgs
Check valve installed at 1222.5 ft bgs

Transducer Tubes
2 × 1-in. flush threaded schd. 80 PVC tubing, 0.010-in. slot screens at 1246.7-1247.4 ft bgs

Transducer
Make: In-Situ, Inc.
Model: Level TROLL 500
30 psig range (vented)
S/N: 431623

NOTES:
* Coordinates based on New Mexico State Plane Grid Coordinates, Central Zone (NAD83); Elevation expressed in feet amsl using the National Geodetic Vertical Datum of 1929.

TerranearPMC
Drafted By: TPMC
Project Number: 86319
Date: February 3, 2016
Filename: R-58_TechnicalNotes_Fig8.3-1b

R-58 TECHNICAL NOTES
Technical Area 16 (TA-16)
Los Alamos National Laboratory
Los Alamos, New Mexico

Fig. 8.3-1b
NOT TO SCALE

Figure 9 - R-58 Technical Notes

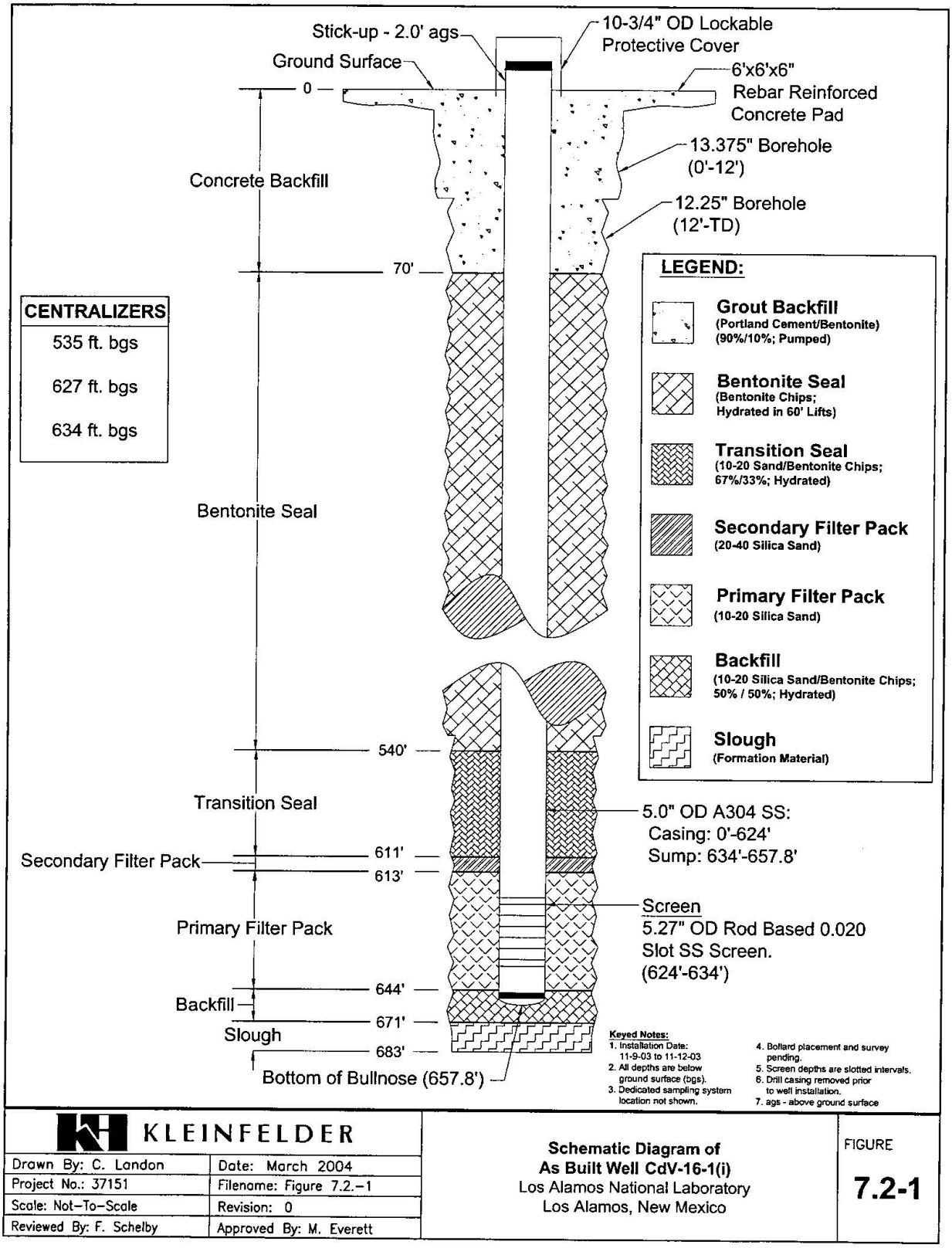


Figure 10 - CdV16-1(i) Schematic Diagram of As-Built Well

Appendix B

Borehole Video Logging
(on DVD included with this document)