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Periodic Monitoring Report for Sandia Watershed, August 13–August 31, 2007

Los Alamos
NATIONAL LABORATORY
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Prepared by the Environmental Programs Directorate

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EXECUTIVE SUMMARY

The purpose of this report is to provide the results of the periodic monitoring event (PME) conducted by Los Alamos National Laboratory in the Sandia Watershed. This periodic monitoring event for Sandia Watershed was conducted pursuant to the "Interim Facility-Wide Groundwater Monitoring Plan," prepared under the Compliance Order on Consent.

The PME documented in this report occurred from August 13 to 31, 2007. This event included sampling of groundwater wells or well ports, springs, and base-flow stations.

Water samples obtained from various locations during this PME were analyzed for target analyte list metals, volatile organic compounds, semivolatile organic compounds, cyanide, pesticides, polychlorinated biphenyls, high explosives, radionuclides, low-level tritium, general inorganic chemicals, perchlorate, stable isotopes, and field parameters (alkalinity, dissolved oxygen, pH, specific conductance, temperature, and turbidity).

No results from surface-water samples reported from prior PMEs from Sandia Canyon exceeded screening levels; however, two results from surface-water samples collected during this PME from Sandia Canyon were near or exceeded screening levels. Aluminum exceeded the New Mexico aquatic chronic standard, while selenium was present at 4.4 µg/L, just below the 5 µg/L screening value.

No results from groundwater samples reported from prior PMEs from Sandia Canyon exceeded screening levels; however, two results from groundwater samples collected during this PME from Sandia Canyon exceeded screening levels. Iron and manganese concentrations in alluvial groundwater both exceeded screening levels at SCA-1.

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Acronyms and Abbreviations

AK	acceptable knowledge
AOC	area of concern
BCG	Biota Concentration Guide (DOE)
bgs	below ground surface
C	cancer (risk type)
Consent Order	Compliance Order on Consent
DCG	Derived Concentration Guidelines (DOE)
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)
ENV	Environmental Protection
EPA	Environmental Protection Agency (U.S.)
HE	high explosive
IDW	investigation-derived waste
IFGMP	Interim Facility-Wide Groundwater Monitoring Plan
LANL	Los Alamos National Laboratory
LLW	low-level radioactive waste
MCL	maximum contaminant level (EPA)
MDL	method detection limit
N	noncancer (risk type)
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NOI	notice of intent
NTU	nephelometric turbidity unit
PCB	polychlorinated biphenyl
PME	periodic monitoring event
PMR	periodic monitoring report
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RLWTF	Radioactive Liquid Waste Treatment Facility
RPF	Records Processing Facility
SAA	satellite accumulation area

SERF	Sanitary Effluent Reclamation Facility
SOP	standard operating procedure
SU	standard unit
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWSC	Sanitary Wastewater Systems Consolidated [Plant]
TA	technical area
TSD	treatment, storage, or disposal
VOC	volatile organic compound
WCSF	waste characterization strategy
WPF	waste profile form

1.0 INTRODUCTION

This report provides documentation of quarterly groundwater and surface-water monitoring conducted by Los Alamos National Laboratory (LANL or the Laboratory) in the Sandia Watershed pursuant to the "Interim Facility-Wide Groundwater Monitoring Plan" (IFGMP) (LANL 2006, 094043), prepared under the Compliance Order on Consent (Consent Order). The quarterly periodic monitoring event (PME) reported here occurred from August 13 to 31, 2007. This event included sampling at groundwater wells or ports, springs, and base-flow stations.

The Consent Order identifies New Mexico Water Quality Control Commission (NMWQCC) groundwater standards, including alternative abatement standards and U.S. Environmental Protection Agency (EPA) drinking water maximum contaminant levels (MCLs), as cleanup levels for groundwater when corrective action is implemented. NMWQCC groundwater standards, MCLs, and EPA tap water screening levels are used as screening levels for monitoring data and are provided in this report.

This report presents the following information:

- general background information on the watershed
- the watershed conceptual model
- field-measurement monitoring results
- water-quality monitoring results
- results of the screening analysis (comparing the PME results with screening levels and results from previous reports)
- summary based on the data and the screening analysis

Data that were not reported in the previous PMR because of delays caused by data validation and San Ildefonso Pueblo review are now included in Appendix D. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with U.S. Department of Energy (DOE) policy.

1.1 Background

Sandia Watershed is located within the central part of the Laboratory. Sandia Canyon heads on Laboratory property within Technical Area (TA) 03 at an elevation of approximately 7300 ft and trends east-southeast across the Laboratory, Bandelier National Monument, and San Ildefonso Pueblo. Sandia Canyon empties into the Rio Grande in White Rock Canyon at an elevation of 5450 ft.

The area of the Sandia Watershed is approximately 5.5 mi^2. Perennial stream flow and saturated alluvial aquifer conditions occur in the upper and middle portions of the canyon system because of sanitary wastewater and cooling tower discharges to the canyon from operating facilities. A wetland of approximately 7 acres has developed as a result of the wastewater and cooling tower discharges. Polychlorinated biphenyls (PCBs) have been detected in sediment samples obtained from the wetland area, and mercury has been detected in surface-water samples. Sandia Spring is the only known perennial spring in the watershed and is located in lower Sandia Canyon.

Technical areas located in the Sandia Watershed include TA-03, -20, -53, -60, -61, and -72. Approximately 264 solid waste management units (SWMUs) and areas of concern (AOCs) are located

within these technical areas. The types of SWMUs and AOCs vary from industrial outfalls to open-detonation firing sites.

1.2 Conceptual Model

The conceptual model for the Sandia Watershed is presented in Appendix A of this document.

2.0 SCOPE OF ACTIVITIES

The PME for the Sandia Watershed was conducted pursuant to the 2007 IFGMP. Table 2.0-1 provides the location name, sample collection date, port name, port depth, screened interval, top and bottom screen depths, base flow or water level, and the water-level method for each of the monitored locations. These locations are spatially represented in Figure 2.0-1.

3.0 MONITORING RESULTS

3.1 Methods and Procedures

All methods and procedures used to perform the field activities associated with the PME are documented in the 2007 IFGMP.

3.2 Field Parameter Results

Appendix B contains the field parameter results for the PME and the previous three PMEs.

3.3 Water-Level Observations

The periodic monitoring water-level data for this event and the previous three monitoring events are located in Appendix C. For wells equipped with transducers, the reported water level is the water-level measurement taken earliest on the day of sampling. All manual measurements are reported at the time immediately before sampling. The water-level measurements taken during this PME are shown graphically in Figure 3.3-1.

3.4 Deviations from Planned Scope

Table 3.4-1 describes the deviations from the planned scope of the PME.

4.0 ANALYTICAL DATA RESULTS

4.1 Methods and Procedures

All methods and procedures used to perform the analytical activities of the PME are documented in the 2007 IFGMP.

4.2 Analytical Data

Appendix D presents the analytical data from the PME presented in this report and the analytical data from the last three sampling events immediately before the August sampling event. The screening levels

with which the results are compared are shown in Table 4.2-1. The analytical laboratory reports (including chains of custody, etc.) are in Appendix G.

Appendix D contains all data obtained during the PME (i.e., all data that have been independently reviewed for conformance with Laboratory requirements), with the following constraints.

- All data
    - ❖ Data that are R-qualified (rejected because of noncompliance regarding quality control [QC] acceptance criteria) during independent validation are considered "not detected" but are still reported. Analytical laboratory QC results including matrix spike and matrix spike duplicates are not included in the data set.
- Radionuclides
    - ❖ All low-detection-limit tritium data are reported. Results greater than 3 times the 1 standard deviation total propagated analytical uncertainty (or 3σ) are considered to be detections.
    - ❖ Americium-241 and uranium-235 are reported only by chemical separation alpha spectroscopy. No gamma spectroscopy results are presented for these analytes.
    - ❖ Only cesium-137, colbalt-60, neptunium-237, potassium-40, and sodium-22 are reported (or analyzed) for the gamma spectroscopy suite.
    - ❖ Otherwise, all detections are reported at all locations, that is, results without a laboratory qualifier of U or X (abbreviations that indicate that the analyte was not detected).
- Nonradionuclides
    - ❖ All results, excluding nondetections, are reported. Field duplicates, reanalyses, field blanks, trip blanks, equipment blanks, and different analytical methods are also reported.

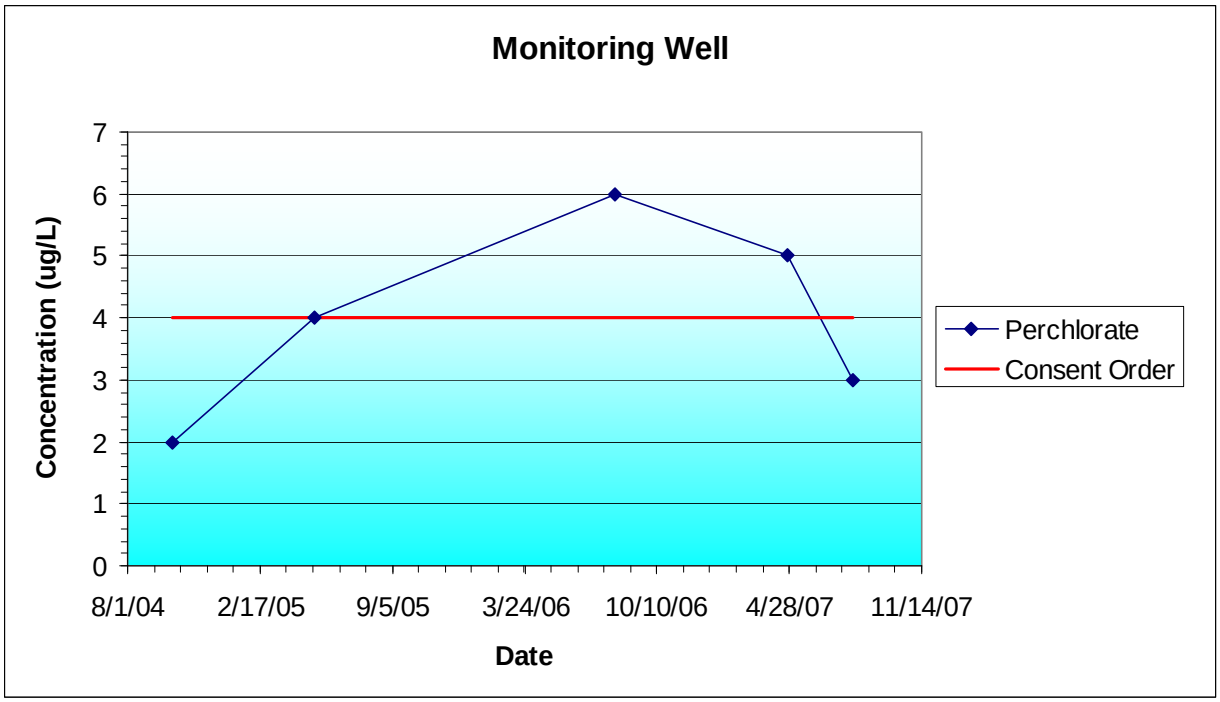
The screening levels applied to all media are listed in Table 4.2-1. Table 4.2-1 indicates the type of screening level and its source.

Data for PMRs are evaluated using the following screening process.

- Surface-water and groundwater perchlorate data were compared with the screening level of 4 µg/L established in Section VIII.A.1.a of the Consent Order. Surface-water sample results were compared with all surface-water standards without consideration of the designated use for the particular reach. The NMWQCC groundwater standards apply to the dissolved (filtered) portion of specified contaminants; however, the standards for mercury, organic compounds, and nonaqueous phase liquids apply to the total unfiltered concentrations of the contaminants.
- As required by the Consent Order, EPA Region 6 tap water screening levels are used for constituents having no other regulatory standard and for which toxicological information is published. For these screening levels, the tables indicate a risk type of C (cancer) or N (noncancer). For the cancer risk type, the risk levels are for 10^{-6} excess cancer risk. The Consent Order specifies screening with these values at a risk level of 10^{-5} (rather than 10^{-6}) excess cancer risk. Therefore, data must exceed the 10^{-6} screening values by a factor of 10 or more to be above a risk level of 10^{-5} excess cancer risk.
- The analytical results for radioactivity are compared to DOE Biota Concentration Guide (BCG) for surface water and Derived Concentration Guides (DCG) for groundwater.

Tables E-1 through E-9 (Appendix E) show all values for perchlorate, radioactivity, organic compounds, and all values greater than half the lowest applicable screening level values for metals and general inorganic compounds.

Analytical results are presented graphically in Figures 4.2-1. Figures 4.2-1 contains diagrams displaying a series of select analytes. An example of a diagram displaying perchlorate concentration is shown below.



Perchlorate concentration

The analytes displayed in Figure 4.2-1 were selected from data acquired during the PMEs and were chosen for display on Figure 4.2-1 because of their historical presence in groundwater in this watershed. Radionuclides are not shown on the diagrams. The solid red lines, when shown, depict applicable screening levels. Note that some screening levels may exceed the highest concentration displayed and may not appear on the diagram. Screening-level values are in Tables E-1 through E-9 in Appendix E.

A summary of the results from comparing the surface-water analytical data with screening levels is shown in Tables E-1 through E-4 (Appendix E).

A summary of the results comparing the groundwater analytical data with screening levels is shown in Tables E-5 through E-9 (Appendix E). Graphical representations of select groundwater analytical results (section 4.2) are shown in Figure 4.2-1.

Tables 4.2-2 and 4.2-3 show surface-water and groundwater analytical results (by hydrogeologic zone for a specific analytical suite) that are above a screening level. Multiple detections of a particular constituent at a location are counted as one result. For example, if aluminum is detected above a screening level in both a primary sample and a field duplicate, the detection is counted as one result.

4.2.1 Surface Water (Base Flow)

4.2.1.1 Previously Unreported Results

None of the results reported from prior sampling events were measured above screening levels in surface water samples.

4.2.1.2 Results from the August 2007 PME

The estimated aluminum concentration at Middle Sandia Canyon at terminus of persistent base flow of 97 µg/L was above the New Mexico aquatic life chronic standard of 87 µg/L. This station is located in the perennial reach of Sandia Canyon, so the New Mexico aquatic life chronic standard applies. Similar values were measured in two of four samples collected during the past year; the other two samples were nondetections at an MDL of 68 µg/L.

The unfiltered selenium concentration at South Fork of Sandia Canyon at E122 of 4.4 µg/L was just below the New Mexico aquatic life chronic standard (at 100 mg hardness) of 5 µg/L, which applies in this perennial reach. Similar or higher values (i.e., above the screening level) were measured in five other samples during the previous 15 months, although 3 of the 10 total results were below the MDL of 2.5 µg/L. All the detections were estimated values. The estimated concentrations in some filtered samples were even higher than unfiltered results during that period.

No other compounds were measured above screening levels in surface-water samples.

4.2.2 Groundwater

4.2.2.1 Previously Unreported Results

None of the results reported from prior sampling events were measured above screening levels in groundwater samples.

4.2.2.2 Results from the August 2007 PME

The filtered iron and manganese results at alluvial well SCA-1 were above the respective NMWQCC groundwater standards (applicable domestic water supply) of 1000 µg/L and 200 µg/L. The results were 2150 µg/L and 1380 µg/L. Filtered iron and manganese concentrations have increased to a factor of 4 and nearly 3, respectively, during the past 10 months.

The filtered chromium concentrations in alluvial well SCA-1 and regional well R-11 were 32 µg/L and 31 µg/L, compared with the NMWQCC groundwater standard of 50 µg/L. In the past year, the chromium concentrations in SCA-1 have been below 10 µg/L. Since 2005, chromium concentrations in R-11 have increased from 17 µg/L.

Two PCBs, Aroclor-1260 and Aroclor-1254, were found near the detection limit at SCA-1. This is the second detection of Aroclor-1260 in two total sample events and the first detection of Aroclor-1254.

No other compounds were measured above screening levels in groundwater samples.

4.3 Sampling Program Modifications

No modifications to the periodic monitoring sampling for the Sandia Watershed are proposed at this time.

5.0 INVESTIGATION-DERIVED WASTE

Appendix F discusses the management of wastes produced during this PME and contains the waste management records for waste streams generated during the sampling events.

6.0 SUMMARY

6.1 Monitoring Results

An evaluation of the field parameter monitoring results presented in Appendix B and subsequent monitoring events will be provided in the annual update to the IFGMP.

6.2 Analytical Results

6.2.1 Surface Water (Base Flow)

6.2.1.1 Previously Unreported Results

Overall, no results from surface-water samples reported from prior PMEs from Sandia Canyon exceeded screening levels.

6.2.1.2 Results from the August 2007 PME

Overall, two results from surface-water samples collected during this PME from Sandia Canyon were near or exceeded screening levels (Table 4.2-2).

6.2.2 Groundwater

6.2.2.1 Previously Unreported Results

Overall, no results from groundwater samples reported from prior PMEs from Sandia Canyon exceeded screening levels.

6.2.2.2 Results from the August 2007 PME

Overall, two results from groundwater samples collected during this PME from Sandia Canyon exceeded screening levels (Table 4.2-2).

6.3 Data Gaps

A summary of the field parameter gaps encountered during the PME are in Table 3.4-1. The table provides detailed accounts of sampling event deviations.

7.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), July 2006. "Interim Facility-Wide Groundwater Monitoring Plan, Revision 1.1," Los Alamos National Laboratory document LA-UR-06-4975, Los Alamos, New Mexico. (LANL 2006, 094043)

11x17

Figure 2.0-1 Watershed monitoring locations

11x17

Figure 3.3-1 Groundwater-level measurements

11x17

Figure 4.2-1 Analytical results

Table 2.0-1
Monitoring Locations and General Information

Location	Sample Collection Date	Port Name	Port ID	Port Depth (ft)	Screened Interval (ft)	Top Screen Depth (ft)	Bottom Screen Depth (ft)	Base Flow (ft^3/s)	Groundwater Elevation (ft above msl)[a]	Water-Level Method
Base Flow										
Middle Sandia Canyon at terminus of persistent base flow	21-Aug-07	n/a[b]	n/a	n/a	n/a	n/a	n/a	~0.009	n/a	n/a
Sandia below Wetlands	22-Aug-07	n/a	n/a	n/a	n/a	n/a	n/a	na[c]	n/a	n/a
South Fork of Sandia Canyon at E122	21-Aug-07	n/a	n/a	n/a	n/a	n/a	n/a	0.02	n/a	n/a
Alluvial										
SCA-1	30-Aug-07	Single Completion	7981	1.3	0.6	1.3	1.9	n/a	7211.2	Transducer
SCA-2	23-Aug-07	Single Completion	7991	10.3	4.7	10.3	15	n/a	Dry[d]	n/a
SCA-3	23-Aug-07	Single Completion	8001	27.6	4.4	27.6	32	n/a	Dry	n/a
SCA-4	15-Aug-07	Single Completion	8011	37	4.5	37	41.5	n/a	Dry	n/a
SCA-5	15-Aug-07	Single Completion	8021	55	9.4	55	64.4	n/a	Dry	n/a
Intermediate										
SCI-1	22-Aug-07	Single Completion	8211	358.4	19.5	358.4	377.9	n/a	6366.71	Manual
SCO-1	17-Aug-07	Single Completion	5841	9.3	10	9.3	19.3	n/a	Dry	n/a
SCO-2	17-Aug-07	Single Completion	5851	9.4	10	9.4	19.4	n/a	Dry	n/a

Table 2.0-1 (continued)

Location	Sample Collection Date	Port Name	Port ID	Port Depth (ft)	Screened Interval (ft)	Top Screen Depth (ft)	Bottom Screen Depth (ft)	Base Flow (ft^3/s)	Groundwater Elevation (ft above msl)[a]	Water-Level Method
Regional										
R-10	15-Aug-07	P1A	6381	874	23	874	897	n/a	5710.28	Manual
R-10	15-Aug-07	P2A	6391	1042	23	1042	1065	n/a	5707.15	Manual
R-10a	15-Aug-07	Single Completion	6371	690	10	690	700	n/a	5740.41	Manual
R-11	17-Aug-07	Single Completion	5531	855	22.9	855	877.9	n/a	5838.43	Manual
R-35a	30-Aug-07	Single Completion	8331	1013	49.1	1013.1	1062.2	n/a	5821.42	Manual
R-35b	29-Aug-07	Single Completion	8351	825.4	23.1	825.4	848.5	n/a	5836.82	Manual

[a] msl = Mean sea level.

[b] n/a = Not applicable.

[c] na = Not available.

[d] See Table 3.4-1 for explanation.

Table 3.4-1
Observations and Deviations

Location	Deviation	Cause	Comments
SCA-2, SCA-3	No data are included in this report for these locations.	The locations were not sampled on 08/23/07 because they were dry.	Locations will be checked again during next scheduled sampling round.
SCA-4, SCA-5	No data are included in this report for these locations.	The locations were not sampled on 08/15/07 because they were dry.	Locations will be checked again during next scheduled sampling round.
SCO-1, SCO-2	No data are included in this report for these locations.	The locations were not sampled on 08/17/07 because they were dry.	Locations will be checked again during next scheduled sampling round.

Table 4.2-1
Cleanup Standards, Risk-Based Screening Levels, and Risk-Based Cleanup Levels for Groundwater and Surface Water at Los Alamos National Laboratory

Standard Type	Groundwater	Surface Water
DOE BCG	n/a[a]	x[b]
DOE 100 mrem Public Dose DCG	x	n/a
DOE 4 mrem Drinking Water DCG	x	n/a
EPA MCL	x	n/a
EPA Region 6 Tap Water Screening Level	x	n/a
New Mexico Environmental Improvement Board Radiation Protection Standards	x	x
NMWQCC Fisheries Standards Chronic	n/a	x
NMWQCC Fisheries Standards Chronic, Hardness = 100 mg/L	n/a	x
NMWQCC Groundwater Standard	x	n/a
NMWQCC Livestock Watering Standard	n/a	x
NMWQCC Wildlife Habitat Standard	n/a	x
NMWQCC Human Health Standard Ephemeral	n/a	x
NMWQCC Human Health Standard Perennial	n/a	x

[a] n/a = Not applicable.

[b] x = Standard applied to data screen for this report.

Table 4.2-2
Results above Screening Levels for Groundwater and Surface Water

Location	Date	Analyte	Result	Units	Screening Level	Screening Level Type
Surface Water						
Middle Sandia Canyon at terminus of persistent base flow	08/21/07	Al	97.5	µg/L	87	NM Aquatic Chronic
South Fork of Sandia Canyon at E122	08/21/07	Se	4.4	µg/L	5	NM Aquatic Chronic
Alluvial Groundwater						
SCA-1	08/30/07	Fe	2150	µg/L	1000	NMWQCC
SCA-1	08/30/07	Mn	1380	µg/L	200	NMWQCC

Note: Multiple detections of a particular constituent at a location are counted as one result.