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CHARACTERIZATION OF SEPTIC AND DRAIN SYSTEM RELEASES

AT SANDIA NATIONAL LABORATORIES, NEW MEXICO

by

M.R. Sanders and R.B. Galloway

CDM Federal Programs Corporation and Sandia National Laboratories

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Sandia National Laboratories/New Mexico (SNL/NM), located in Albuquerque, New Mexico, is operated by the Lockheed Martin Corporation, a prime contractor to the U.S. Department of Energy (DOE). SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other research and development activities since 1945. The SNL/NM Environmental Restoration (ER) Project is tasked with performing the assessment and remediation of environmental releases resulting from the almost 50 years of engineering development and testing activities.

Operable Unit 1295, Septic Tanks and Drainfields, includes inactive septic and drain systems at 23 separate ER sites that were listed as Solid Waste Management Units (SWMUs) in the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments (HSWA) Module Permit. These sites were identified, based on process histories and interviews with facility personnel, as the subset of all SNL/NM septic and drain systems that had the highest potential for releases of hazardous and radioactive wastes into the environment. An additional 101 septic and drain systems not currently classified as SWMUs also have been identified as needing future characterization.

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Sanitary and process wastes from activities at many SNL/NM test facilities were discharged to septic and drain systems. These systems typically consisted of septic tanks connected to drainfields or seepage pits, or of French drains, drywells or surface outfalls that received waste water discharges. Potential constituents of concern (COCs) include volatile and semivolatile organic compounds (VOCs and SVOCs), heavy metals, photoprocessing wastes, explosives residue, radionuclides, and other contaminants. All ER site septic and drain systems are now inactive; effluent from active facilities is now directed to the sanitary sewer system.

The climate at SNL/NM is typical of a high desert plateau, with wide temperature extremes and rainfall ranging between 8 and 12 inches in a typical year. Elevations at SNL/NM range from about 5,300 to 8,000 feet above mean sea level. The vadose zone beneath most of the sites consists of a thick package of unconsolidated alluvial fan deposits derived from the Manzanita Mountains which bound the east side of SNL/NM. Depth to groundwater ranges from approximately 200 to 500 feet below ground surface (bgs) at the majority of the sites.

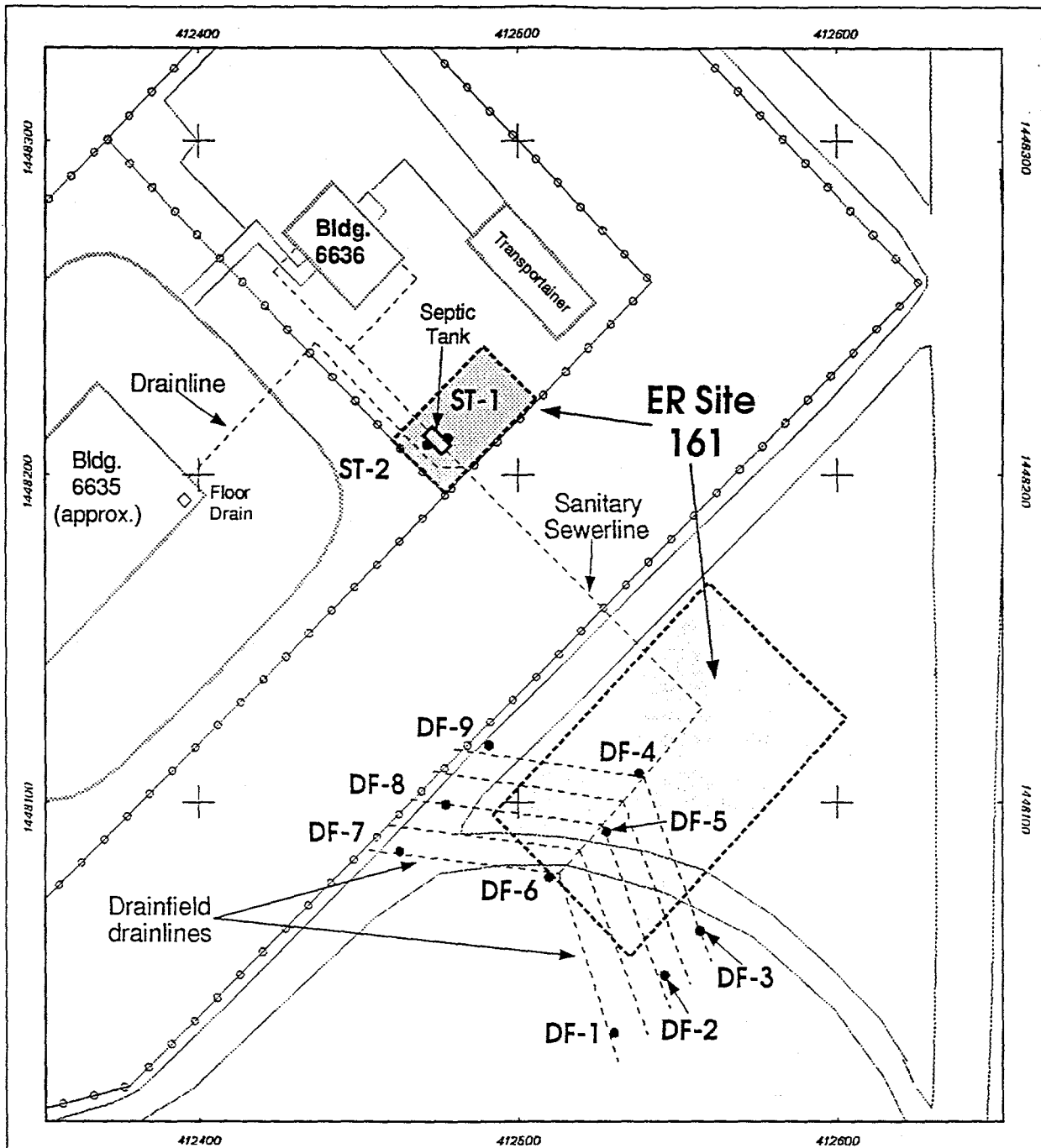
Initial site screening activities included interviewing personnel familiar with the history and nature of activities at the various facilities, and sampling septic tank contents to identify the most likely COCs at each site. A phased assessment approach (described in a RCRA Facility Investigation Work Plan approved by the U.S. Environmental Protection Agency (EPA) and the New Mexico Environment Department [NMED]) was designed to quickly eliminate sites where COCs were not present, and to assess the nature and extent of contamination at sites where significant COC concentrations were identified.

The first phase of field characterization activities, completed in 1994, included surface radiation, geophysical, and passive soil-gas surveys around the most likely release points; backhoe excavation to locate buried septic system units and components; and additional sampling of residual liquid and sludge in septic tanks. The second characterization phase, completed in early 1995, consisted of collecting subsurface soil samples with GeoprobeTM drilling and sampling equipment. The attached sample ER site map shows a typical arrangement of boreholes used to characterize subsurface soil next to septic tanks and in drainfields. Soil samples were collected from one or two sampling intervals in each borehole at depths to 32 feet bgs. Both Global Positioning System (GPS) and conventional surveying techniques were used to map borehole locations once sampling was completed

Soil samples from each of the sites were typically analyzed for VOCs, SVOCs, RCRA metals, and selected radionuclides by both commercial and SNL/NM analytical laboratories. Sample analytical results were compiled into data summary tables (example attached) for inclusion in reports to regulators. As shown on the attached table, concentrations of COCs detected in soil samples were compared to SNL/NM site-specific background concentrations, proposed 40 CFR part 264 Subpart S, or other relevant risk-based action levels. If no action level was available for a particular COC detected at a concentration above background, then a risk assessment using established EPA methodology was completed to determine if the constituent posed an unacceptable threat to human health or the environment.

In general, relatively low levels of organic and inorganic hazardous constituents and radioactive materials were detected in residual septic tank contents, although VOC and metal concentrations as high as 2,200 and 372 milligrams per kilogram (mg/kg) respectively were detected in individual samples. Also, metal and uranium isotope concentrations were in general significantly higher in sludge than in liquid from the same tank. Analytical results of the soil-gas survey and soil sampling indicate that COCs were not released to or are not present in the environment in concentrations above background or action levels at all but one of the sites where samples were collected. At one location, up to 1,430 mg/kg of high explosive residue was detected in subsurface soils near an explosives machining facility; additional sampling is planned to determine the extent of contamination in soils at this site.

Residual septic tank contents were removed and the systems were formally closed in late 1995 and early 1996. No Further Action (NFA) proposals for the sites are being prepared and submitted to EPA and NMED for approval. As of December 1996, one of these NFA proposals had been approved by the regulators.



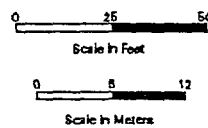
Legend

- Boring Location
- Fences
- KAFB Roads
- ▬ Buildings
- - - Sanitary Sewerline, Drainfield drainlines
- ▬ Septic Tank
- ▭ ER Site 161

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1983 North American Horizontal Datum, 1929 North American Vertical Datum

DRAFT
Unclassified
1:600



Sample: ER Site Map
Sandia National Laboratories,
New Mexico

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Example of a Typical Analytical Data Summary Table Summarizing RCRA Metals and Hexavalent Chromium in Soil Samples Collected at a Septic System ER Site

Top of Sample Interval						RCRA Metals, Methods 6010 and 7471										Other Metals:	
Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location	Sample Interval (fbgs)	As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag	Cr ⁶⁺ Method 7196	Units		
Drainfield Soil and QA Samples:																	
018826-2	Soil	Field	12/13/94	DF-1	10	4.3	86.8	ND	6.5	ND	ND	ND	0.4 J	ND	mg/kg		
018827-2	Soil	Field	12/13/94	DF-1	20	2.9	39.1	ND	8.7	3.6 J	ND	ND	ND	ND	mg/kg		
018828-2	Soil	Field	12/13/94	DF-2	10	2.6	67.8	ND	5.6	3.7 J	ND	ND	ND	ND	mg/kg		
018829-2	Soil	Field	12/13/94	DF-2	20	2.8	87.4	ND	14.1	5.2	ND	ND	ND	ND	mg/kg		
018830-2	Soil	Field	12/14/94	DF-3	10	2.2	62.8	ND	8.3	ND	ND	ND	ND	ND	mg/kg		
018840-2	Soil	Field	12/14/94	DF-3	20	2.6	172	ND	9.3	4.6 J	ND	ND	ND	ND	mg/kg		
018824-2	Soil	Field	12/13/94	DF-4	10	2.5	88	0.53	9.4	4.5 J	ND	ND	40.8	ND	mg/kg		
018825-2	Soil	Field	12/13/94	DF-4	20	2.8	162	ND	9.9	4 J	ND	ND	10.5	ND	mg/kg		
018822-2	Soil	Field	12/12/94	DF-5	10	1.8	60.2	ND	14.2	3.9 J	ND	ND	13.3	ND	mg/kg		
018823-2	Soil	Field	12/13/94	DF-5	20	2.7	84.3	ND	8.8	4.4 J	ND	ND	1.3	ND	mg/kg		
018821-2	Soil	Field	12/12/94	DF-6	10	2.6	81.1	ND	7.5	ND	ND	ND	24.6	ND	mg/kg		
018839-2	Soil	Field	12/14/94	DF-6	20	3	104	ND	22	10.3	ND	ND	ND	ND	mg/kg		
018832-2	Soil	Field	12/14/94	DF-7	10	2.4	107	ND	12.5	4 J	ND	ND	ND	ND	mg/kg		
018834-2	Soil	Dupl.	12/14/94	DFD-7	10	2	60	ND	6.9	ND	ND	ND	ND	ND	mg/kg		
018833-2	Soil	Field	12/14/94	DF-7	20	3.2	144	ND	13.6	5.5	ND	ND	ND	ND	mg/kg		
018835-2	Soil	Field	12/14/94	DF-8	10	2	56.3	ND	5.5	ND	ND	ND	ND	ND	mg/kg		
018836-2	Soil	Field	12/14/94	DF-8	20	1.6	56.3	ND	5.5	ND	ND	ND	ND	ND	mg/kg		
018837-2	Soil	Field	12/14/94	DF-9	10	2.8	42.8	ND	6.7	ND	ND	ND	ND	ND	mg/kg		
018838-2	Soil	Field	12/14/94	DF-9	20	2.6	113	ND	10.3	4.8 J	ND	ND	ND	ND	mg/kg		
Septic Tank Soil and QA Samples:																	
018842-2	Soil	Field	12/19/94	ST-1	7.5	2.6	101	ND	5	5.1	ND	ND	ND	ND	mg/kg		
018843-2	Soil	Dupl.	12/19/94	STD-1	7.5	2.3	64.5	ND	6.2	ND	ND	ND	ND	ND	mg/kg		
018841-2	Soil	Field	12/19/94	ST-2	7.5	2.2	85.2	ND	9.3	ND	ND	ND	4.4	ND	mg/kg		
018844-3.4	Water	EB	12/19/94	Site 161	NA	ND	ND	ND	ND	ND	ND	ND	ND	NS	mg/L		
Laboratory Reporting Limit For Soil						1	1	0.5	1	5	0.1	0.5	1	0.05 - 0.1	mg/kg		
Laboratory Reporting Limit For Water						0.01	0.01	0.005	0.01	0.003	0.0002	0.005	0.01	0.01	mg/L		
Number of SNL/NM Background Soil Sample Analyses						15	727	1,740	647	536	1,724	2,134	2,302	393	NA		
SNL/NM Soil Background Range						2.1-7.9	0.5-495	0.0027-6.2	0.5-31.4	0.75-103	0.0001-0.68	0.037-17.2	0.0016-8.7	0.02-<2.5	mg/kg		
SNL/NM Soil Background UTL or 95th Percentile						7	214	0.9	15.9	11.8	<0.1	<1.0	<1.0	<2.5	mg/kg		
Proposed Subpart S Action Level For Soil						0.50	6,000	80	80,000 *	400 **	20	400	400	400 *	mg/kg		

Notes:

As = Arsenic
Ba = Barium
Be = Beryllium
Cd = Cadmium
Cr = Chromium
Cr⁶⁺ = Hexavalent chromium
Pb = Lead
Hg = Mercury
Se = Selenium
Ag = Silver

Dupl. = Duplicate soil sample
EB = Equipment rinseate blank
fbgs = Feet below ground surface
J = Result is detected below the reporting limit or is an estimated concentration.
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
NA = Not applicable
ND = Not detected
UTL = Upper Tolerance Limit

* 80,000 mg/kg is for Cr³⁺ only. For Cr⁶⁺, proposed Subpart S action level is 400 mg/kg.
** No proposed Subpart S action level for lead in soil, EPA proposed action level for lead.