DOE Oversight Bureau, New Mexico Environment Department

Groundwater Monitoring at Sandia National Laboratories/New Mexico Mixed Waste Landfill

Conducted by the
New Mexico Environment Department DOE Oversight Bureau
for FFY 2017 Q-3

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Final Report

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The purpose of this communication is to transmit groundwater quality data collected by the New Mexico Environment Department DOE Oversight Bureau from Mixed Waste Landfill during the third quarter of Federal Fiscal Year 2017.

Acknowledgment:

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Introduction

The New Mexico Environment Department (NMED) DOE Oversight Bureau (DOE-OB or Bureau) has compiled and assessed groundwater data collected during May 2017. The Bureau collected groundwater samples from Mixed Waste Landfill (MWL) groundwater monitoring wells MWL-BW2 (plus duplicate), MWL-MW7, MWL-MW8 and MWL-MW9. Split samples were collected using standard Sandia National Laboratories/New Mexico (SNL/NM) sampling procedures and equipment in accordance with the MWL Long-Term Monitoring and Maintenance Plan (LTMMP), Appendix F (Groundwater Sampling and Analysis Plan). Samples were analyzed for total metals plus uranium, volatile organic compounds (VOCs), gamma emitting isotopes, gross alpha and gross beta, radon, and tritium. The Bureau used ALS Environmental Laboratory located in Fort Collins, Colorado to analyze and report data results from samples collected at MWL. ALS Environmental is an independent analytical laboratory under contract with the NMED. No sample concentrations exceeded established U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs) or trigger levels listed in the LTMMP.

Data Assessment

All groundwater samples were collected and analyzed in accordance with U.S. EPA protocols. Data results are compared to applicable MCLs established by the U.S. EPA National Primary Drinking Water Regulations (40 CFR 141), National Primary Drinking Water Standards, EPA, July 2002. Sample results are also compared to Mixed Waste Landfill Groundwater Monitoring Trigger Levels in Table 5.2.4-1 of the SNL/NM Environmental Restoration Operations LTMMP for the MWL, March 2012.

Under the current LTMMP, SNL/NM is required to collect samples from MWL monitoring wells MWL-BW2, MWL-MW7, MWL-MW8 and MWL-MW9. Samples are analyzed for LTMMP list VOCs, metals (Cd, Cr, Ni, and U), gamma emitting isotopes, gross alpha and beta, radon and tritium. See Table-A below for LTMMP listed analytes and trigger levels.

Results

Analytical results for total target analyte list (TAL) metals plus uranium are presented in Table-1. Metals concentrations for total uranium, cadmium, chromium, and nickel were below established MCLs and LTMMP trigger levels; all other metals concentrations were below established MCLs. In accordance with the MWL LTMMP, SNL/NM only analyzes groundwater samples for the metals uranium (total), cadmium, chromium, and nickel.

Table-2 summarizes the laboratory method detection limits (MDLs) for the LTMMP listed VOCs. No compounds were detected above their MDLs.

Analytical results for radionuclides are listed in Table-3 and used to screen for potential radiological contamination. Gross alpha activity ranged from 6.2 pCi/L at MWL-MW9 to 7.5 pCi/L at MWL-BW2 duplicate. Radon-222 activity ranged from 140 pCi/L at MWL-MW8 to 420 pCi/L at MWL-MW9. These results were below the LTMMP trigger level of 15 pCi/L for gross alpha and 1000 pCi/L for radon, respectively. Tritium was not detected in any samples. All radionuclide results were below established EPA MCLs and MWL LTMMP trigger levels, and consistent with previous monitoring results.

Conclusion

Groundwater samples were collected from four (4) monitoring wells during this semi-annual sampling event at the MWL. Samples collected by the Bureau and analyzed by ALS Environmental reported concentrations of metals, VOCs and radionuclides below established EPA MCLs and SNL/NM trigger levels listed in the LTMMP.

The DOE-OB will continue to monitor groundwater quality at MWL semi-annually and make the data reports available to the public.

References

Sandia National Laboratories, New Mexico. Annual Groundwater Monitoring Report, Calendar Year 2015.

Sandia National Laboratories, New Mexico Environmental Restoration Operations. Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill, March 2012.

U.S. EPA National Primary Drinking Water Regulations (40 CFR 141), National Primary Drinking Water Standards, EPA, July 2002.

Table-A
Mixed Waste Landfill Groundwater Monitoring Trigger Levels

Groundwater Monitoring Parameters	Final Trigger Levels (µg/L)[a]	Trigger Level Source[a]	2011 Laboratory Reporting Limits	
			Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)
EPA Method 8260 Volatile Organic Compounds				
1,1,1-Trichloroethane (1,1,1-TCA)	15	25% NMED WQCC MAC	0.325	1
1,1,2,2-Tetrachloroethane	5	50% NMED WQCC MAC	0.25	1
1,1,2-Trichloroethane[b]	2.5	50% EPA MCL	0.25	1
1,1-Dichloroethane	12.5	50% NMED WQCC MAC	0.3	1
1,1-Dichloroethene	2.5	50% NMED WQCC MAC	0.3	1
1,2-Dichloroethane	2.5	50% EPA MCL	0.25	1
1,2-Dichloropropane	2.5	50% EPA MCL	0.25	1
2-Butanone (methyl ethyl ketone)[b]	1,225	25% EPA RSL	1.25	5
2-Hexanone	17	50% EPA RSL	1.25	5
4-methyl-, 2-Pentanone (Methyl isobutyl ketone)[b]	250	25% EPA RSL	1.25	5
Acetone[b]	3,000	25% EPA RSL	1.25 – 5.0	5.0 – 15.0
Benzene	2.5	50% EPA MCL	0.30 – 1.0	1.0 – 3.0
Bromodichloromethane	0.6	50% NMED SL	0.25	1
Bromoform	4.0	50% EPA RSL	0.25	1
Bromomethane	3.5	50% EPA RSL	0.3	1
Carbon disulfide	180	25% EPA RSL	1.25	5
Carbon tetrachloride	2.5	50% EPA MCL	0.3	1
Chlorobenzene	25	25% EPA MCL	0.25	1
Chloroethane (ethyl chloride)	5,250	25% EPA RSL	0.3	1
Chloroform	25	25% NMED WQCC MAC	0.25	1
Chloromethane	47	25% NMED SL	0.3	1
Dibromochloromethane	0.75	50% NMED SL	0.3	1
Ethyl benzene	175	25% EPA MCL	0.25	1
Methylene chloride	3[c]	60% EPA MCL	3	10
Styrene	25	25% EPA MCL	0.25	1
Tetrachloroethene (PCE)	2.5	50% EPA MCL	0.3	1
Toluene[b]	187.5	25% NMED WQCC MAC	0.25 – 1.0	1
Trichloroethene (TCE)	2.5	50% EPA MCL	0.25	1
Vinyl acetate	103	25% EPA RSL	1.5 – 5.0	5
Vinyl chloride	0.5	50% NMED WQCC MAC	0.5	1
Xylene	155	25% NMED WQCC MAC	0.3	1
cis-1,2-Dichloroethene	17.5	25% EPA MCL	0.3	1
cis-1,3-Dichloropropene (1,3-Dichloropropene)	2.2	50% NMED SL	0.25	1
trans-1,2-Dichloroethene	25	25% EPA MCL	0.3	1
trans-1,3-Dichloropropene (1,3-Dichloropropene)	2.2	50% NMED SL	0.25	1
Dichlorodifluoromethane	47.5	25% EPA RSL	0.3	1
Metals with Trigger Levels				
Uranium (total)	15	50% EPA MCL	0.05	0.2
Chromium (total)	43	NMED-approved background concentration	2.5	10
Cadmium	2.5	50% of EPA MCL	0.11	1
Nickel	50	25% of NMED WQCC standard of 0.2 mg/L	0.5	2

Table-A (Concluded)
Mixed Waste Landfill Groundwater Monitoring Trigger Levels

Groundwater Monitoring Parameters	Final Trigger Levels [a]	Trigger Level Source[a]	2011 Laboratory Reporting Limits	
			Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)
Radiological Constituents with Trigger Levels				
Tritium	4 mrem/yr	EPA MCL	—[b]	—[b]
Radon	1,000 pCi/L	No Regulatory Standard	—[b]	—[b]
Gross Alpha Activity	15 pCi/L[e]	EPA MCL	—[b]	—[b]
Gross Beta Activity	4 mrem/yr	EPA MCL	—[b]	—[b]

[a]All trigger levels reviewed and updated in February 2012 and are based upon current EPA (November 2011) RSLs for Tap Water, EPA (May 2009) MCLs, NMED WQCC (2002) MACs for Tap Water, and NMED (February 2012) SLs for Tap Water. Percentage of standard/screening level based upon NMED guidance (Bearzi October 2008a).
[b]Common laboratory contaminants specified in EPA (November 1992) technical guidance.
[c]Methylene chloride trigger level is adjusted to 60% of the EPA (May 2009) MCL, which is the analytical laboratory method detection limit.
[d]Critical level and minimum detectable activity for all radiological analyses vary greatly but are below the associated trigger level.
[e]Gross alpha activity data corrected for naturally occurring uranium in accordance with 40 CFR Parts 9, 141, and 142, Table I-4.

— = Not applicable.
µg/L = Micrograms per liter.
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
MAC = Maximum Allowable Concentration.
MCL = Maximum Contaminant Level.
mg/L = Milligram(s) per liter.
mrem/yr = Millirem per year.
NMED = New Mexico Environment Department.
pCi/L = Picocurie(s) per liter.
RSL = Regional Screening Level.
SL = Tap Water Screening Level.
WQCC = Water Quality Control Commission.

Table-1
Groundwater Quality Results: Total Target Analyte List Metals plus Uranium
SNL/NM Mixed Waste Landfill
New Mexico Environment Department DOE Oversight Bureau
May 2017

Monitoring Well/ Sample Date	Analyte	Result (mg/L)	EPA MCL (mg/L)	LTMMP Trigger Level (mg/L)	Laboratory Detection Limit (mg/L)	Method Detection Limit (mg/L)	Laboratory Qualifier	Analytical Method
MWL-BW2 2-May-17	Aluminum	0.06	NE	NE	0.1	0.014	J	SW-846:6020
	Antimony	0.0003	0.006	NE	0.001	0.0003	U	SW-846:6020
	Arsenic	0.0006	0.01	NE	0.002	0.0006	U	SW-846:6020
	Barium	0.11	2	NE	0.005	0.0018		SW-846:6020
	Beryllium	0.00015	0.004	NE	0.0005	0.00015	U	SW-846:6020
	Cadmium	0.0006	0.005	0.0025	0.002	0.0006	U	SW-846:6020
	Calcium	67	NE	NE	1	0.3		SW-846:6020
	Chromium	0.003	0.1	0.043	0.01	0.003	U	SW-846:6020
	Cobalt	0.0015	NE	NE	0.005	0.0015	U	SW-846:6020
	Copper	0.006	NE	NE	0.02	0.006	U	SW-846:6020
	Iron	0.1	NE	NE	0.1	0.03		SW-846:6020
	Lead	0.00085	NE	NE	0.002	0.00085	U	SW-846:6020
	Magnesium	21	NE	NE	0.1	0.03		SW-846:6020
	Manganese	0.0099	NE	NE	0.005	0.0015		SW-846:6020
	Mercury	0.00006	0.002	NE	0.0001	0.00006	U	SW-846:7470A
	Nickel	0.011	NE	0.05	0.02	0.011	U	SW-846:6020
	Potassium	4.3	NE	NE	1	0.3		SW-846:6020
	Selenium	0.0035	0.05	NE	0.01	0.0035	U	SW-846:6020
	Silver	0.00015	NE	NE	0.0005	0.00015	U	SW-846:6020
	Sodium	55	NE	NE	1	0.3		SW-846:6020
	Thallium	0.000084	0.002	NE	0.0001	0.000084	U	SW-846:6020
	Uranium	0.0064	0.03	0.015	0.0001	0.00003		SW-846:6020
	Vanadium	0.0047	NE	NE	0.005	0.0015	J	SW-846:6020
	Zinc	0.048	NE	NE	0.1	0.048	U	SW-846:6020

J = the reported value was obtained from a reading that was less than the Quantitation Limit but greater than or equal to the Method Detection Limit (MDL).

LTMMP = Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan

NE = Not Established

U = the analyte was analyzed for but not detected

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Monitoring Well/ Sample Date	Analyte	Result (mg/L)	EPA MCL (mg/L)	LTMMP Trigger Level (mg/L)	Laboratory Detection Limit (mg/L)	Method Detection Limit (mg/L)	Laboratory Qualifier	Analytical Method
MWL-BW2 2-May-17 DUP	Aluminum	0.064	NE	NE	0.1	0.014	J	SW-846:6020
	Antimony	0.0003	0.006	NE	0.001	0.0003	U	SW-846:6020
	Arsenic	0.0006	0.01	NE	0.002	0.0006	U	SW-846:6020
	Barium	0.11	2	NE	0.005	0.0018		SW-846:6020
	Beryllium	0.00015	0.004	NE	0.0005	0.00015	U	SW-846:6020
	Cadmium	0.0006	0.005	0.0025	0.002	0.0006	U	SW-846:6020
	Calcium	68	NE	NE	1	0.3		SW-846:6020
	Chromium	0.003	0.1	0.043	0.01	0.003	U	SW-846:6020
	Cobalt	0.0015	NE	NE	0.005	0.0015	U	SW-846:6020
	Copper	0.006	NE	NE	0.02	0.006	U	SW-846:6020
	Iron	0.095	NE	NE	0.1	0.03	J	SW-846:6020
	Lead	0.00085	NE	NE	0.002	0.00085	U	SW-846:6020
	Magnesium	21	NE	NE	0.1	0.03		SW-846:6020
	Manganese	0.01	NE	NE	0.005	0.0015		SW-846:6020
	Mercury	0.00006	0.002	NE	0.0001	0.00006	U	SW-846:7470A
	Nickel	0.011	NE	0.05	0.02	0.011	U	SW-846:6020
	Potassium	4.3	NE	NE	1	0.3		SW-846:6020
	Selenium	0.0035	0.05	NE	0.01	0.0035	U	SW-846:6020
	Silver	0.00015	NE	NE	0.0005	0.00015	U	SW-846:6020
	Sodium	56	NE	NE	1	0.3		SW-846:6020
	Thallium	0.000084	0.002	NE	0.0001	0.000084	U	SW-846:6020
	Uranium	0.0065	0.03	0.015	0.0001	0.00003		SW-846:6020
	Vanadium	0.005	NE	NE	0.005	0.0015	J	SW-846:6020
	Zinc	0.048	NE	NE	0.1	0.048	U	SW-846:6020

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May 2017

Monitoring Well/ Sample Date	Analyte	Result (mg/L)	EPA MCL (mg/L)	LTMMP Trigger Level (mg/L)	Laboratory Detection Limit (mg/L)	Method Detection Limit (mg/L)	Laboratory Qualifier	Analytical Method
MWL-MW7 4-May-17	Aluminum	0.014	NE	NE	0.1	0.014	U	SW-846:6020
	Antimony	0.0003	0.006	NE	0.001	0.0003	U	SW-846:6020
	Arsenic	0.0015	0.01	NE	0.002	0.0006	J	SW-846:6020
	Barium	0.1	2	NE	0.005	0.0018		SW-846:6020
	Beryllium	0.00015	0.004	NE	0.0005	0.00015	U	SW-846:6020
	Cadmium	0.0006	0.005	0.0025	0.002	0.0006	U	SW-846:6020
	Calcium	56	NE	NE	1	0.3		SW-846:6020
	Chromium	0.003	0.1	0.043	0.01	0.003	U	SW-846:6020
	Cobalt	0.0015	NE	NE	0.005	0.0015	U	SW-846:6020
	Copper	0.006	NE	NE	0.02	0.006	U	SW-846:6020
	Iron	0.03	NE	NE	0.1	0.03	U	SW-846:6020
	Lead	0.00085	NE	NE	0.002	0.00085	U	SW-846:6020
	Magnesium	18	NE	NE	0.1	0.03		SW-846:6020
	Manganese	0.0015	NE	NE	0.005	0.0015	U	SW-846:6020
	Mercury	0.00006	0.002	NE	0.0001	0.00006	U	SW-846:7470A
	Nickel	0.011	NE	0.05	0.02	0.011	U	SW-846:6020
	Potassium	4.9	NE	NE	1	0.3		SW-846:6020
	Selenium	0.0035	0.05	NE	0.01	0.0035	U	SW-846:6020
	Silver	0.00015	NE	NE	0.0005	0.00015	U	SW-846:6020
	Sodium	46	NE	NE	1	0.3		SW-846:6020
	Thallium	0.000084	0.002	NE	0.0001	0.000084	U	SW-846:6020
	Uranium	0.0074	0.03	0.015	0.0001	0.00003		SW-846:6020
	Vanadium	0.007	NE	NE	0.005	0.0015		SW-846:6020
	Zinc	0.048	NE	NE	0.1	0.048	U	SW-846:6020

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MWL-MW8 8-May-17	Aluminum	0.023	NE	NE	0.1	0.014	J	SW-846:6020
	Antimony	0.0003	0.006	NE	0.001	0.0003	U	SW-846:6020
	Arsenic	0.0006	0.01	NE	0.002	0.0006	U	SW-846:6020
	Barium	0.13	2	NE	0.005	0.0018		SW-846:6020
	Beryllium	0.00015	0.004	NE	0.0005	0.00015	U	SW-846:6020
	Cadmium	0.0006	0.005	0.0025	0.002	0.0006	U	SW-846:6020
	Calcium	58	NE	NE	1	0.3		SW-846:6020
	Chromium	0.003	0.1	0.043	0.01	0.003	U	SW-846:6020
	Cobalt	0.0015	NE	NE	0.005	0.0015	U	SW-846:6020
	Copper	0.006	NE	NE	0.02	0.006	U	SW-846:6020
	Iron	0.03	NE	NE	0.1	0.03	U	SW-846:6020
	Lead	0.00085	NE	NE	0.002	0.00085	U	SW-846:6020
	Magnesium	19	NE	NE	0.1	0.03		SW-846:6020
	Manganese	0.027	NE	NE	0.005	0.0015		SW-846:6020
	Mercury	0.00006	0.002	NE	0.0001	0.00006	U	SW-846:7470A
	Nickel	0.011	NE	0.05	0.02	0.011	U	SW-846:6020
	Potassium	5.3	NE	NE	1	0.3		SW-846:6020
	Selenium	0.0035	0.05	NE	0.01	0.0035	U	SW-846:6020
	Silver	0.00015	NE	NE	0.0005	0.00015	U	SW-846:6020
	Sodium	48	NE	NE	1	0.3		SW-846:6020
	Thallium	0.000084	0.002	NE	0.0001	0.000084	U	SW-846:6020
	Uranium	0.0072	0.03	0.015	0.0001	0.00003		SW-846:6020
	Vanadium	0.0021	NE	NE	0.005	0.0015	J	SW-846:6020
	Zinc	0.048	NE	NE	0.1	0.048	U	SW-846:6020

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New Mexico Environment Department DOE Oversight Bureau
May 2017

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MWL-MW9 3-May-17	Aluminum	0.014	NE	NE	0.1	0.014	J	SW-846:6020
	Antimony	0.0003	0.006	NE	0.001	0.0003	U	SW-846:6020
	Arsenic	0.0035	0.01	NE	0.002	0.0006		SW-846:6020
	Barium	0.091	2	NE	0.005	0.0018		SW-846:6020
	Beryllium	0.00015	0.004	NE	0.0005	0.00015	U	SW-846:6020
	Cadmium	0.0006	0.005	0.0025	0.002	0.0006	U	SW-846:6020
	Calcium	56	NE	NE	1	0.3		SW-846:6020
	Chromium	0.003	0.1	0.043	0.01	0.003	U	SW-846:6020
	Cobalt	0.0015	NE	NE	0.005	0.0015	U	SW-846:6020
	Copper	0.006	NE	NE	0.02	0.006	U	SW-846:6020
	Iron	0.03	NE	NE	0.1	0.03	U	SW-846:6020
	Lead	0.00085	NE	NE	0.002	0.00085	U	SW-846:6020
	Magnesium	18	NE	NE	0.1	0.03		SW-846:6020
	Manganese	0.0018	NE	NE	0.005	0.0015	J	SW-846:6020
	Mercury	0.00006	0.002	NE	0.0001	0.00006	U	SW-846:7470A
	Nickel	0.011	NE	0.05	0.02	0.011	U	SW-846:6020
	Potassium	4.9	NE	NE	1	0.3		SW-846:6020
	Selenium	0.0035	0.05	NE	0.01	0.0035	U	SW-846:6020
	Silver	0.00015	NE	NE	0.0005	0.00015	U	SW-846:6020
	Sodium	46	NE	NE	1	0.3		SW-846:6020
	Thallium	0.000084	0.002	NE	0.0001	0.000084	U	SW-846:6020
	Uranium	0.009	0.03	0.015	0.0001	0.00003		SW-846:6020
	Vanadium	0.009	NE	NE	0.005	0.0015		SW-846:6020
	Zinc	0.048	NE	NE	0.1	0.048	U	SW-846:6020

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Table-2
Groundwater Quality Results: Method Detection Limits for VOCs (EPA Method 8260B)
SNL/NM Mixed Waste Landfill
New Mexico Environment Department DOE Oversight Bureau
May 2017

Analyte	MDL (µg/L)
Acetone	3
Benzene	0.32
Bromodichloromethane	0.35
Bromoform	0.34
Bromomethane	0.3
Butanone[2-]	3
Carbon Disulfide	0.3
Carbon Tetrachloride	0.32
Chlorobenzene	0.3
Chlorodibromomethane	0.35
Chloroethane	0.32
Chloroform	0.3
Chloromethane	0.3
Dichlorodifluoromethane	0.32
Dichloroethane[1,1-]	0.3
Dichloroethane[1,2-]	0.3
Dichloroethene[1,1-]	0.3
Dichloroethene[cis-1,2-]	0.33
Dichloroethene[trans-1,2-]	0.33
Dichloropropane[1,2-]	0.3
Dichloropropene[cis-1,3-]	0.33
Dichloropropene[trans-1,3-]	0.33
Ethylbenzene	0.31
Hexanone[2-]	3
Methyl-2-pentanone[4-]	3
Methylene Chloride	0.3
Styrene	0.32
Tetrachloroethane[1,1,2,2-]	0.3
Tetrachloroethene	0.3
Toluene	0.31
Trichloroethane[1,1,1-]	0.3
Trichloroethane[1,1,2-]	0.3
Trichloroethene	0.31
Vinyl acetate	0.78
Vinyl Chloride	0.31
Xylene (Total)	

Table-3
Groundwater Quality Results: Gross Alpha, Gross Beta, Gamma Emitting Isotopes, Radon and Tritium
SNL/NM Mixed Waste Landfill
New Mexico Environment Department DOE Oversight Bureau
May 2017

Monitoring Well/ Sample Date	Analyte	Activity[a] (pCi/L)			EPA MCL	LTMMP Trigger Level	MDA (pCi/L)	Laboratory Qualifier	Analytical Method
MWL-BW2 2-May-17	Actinium-228	6.5	±	5.6	NE	NE	19	U	EPA:901.1
	Americium-241	-6.8	±	14	NE	NE	48	U	EPA:901.1
	Beryllium-7	-5.1	±	12	NE	NE	40	U	EPA:901.1
	Bismuth-212	18	±	20	NE	NE	67	U	EPA:901.1
	Bismuth-214	5.8	±	6.1	NE	NE	20	U	EPA:901.1
	Cesium-134	-0.34	±	1.4	NE	NE	4.8	U	EPA:901.1
	Cesium-137	-2.6	±	1.4	NE	NE	4.8	U	EPA:901.1
	Cobalt-60	0.82	±	1.5	NE	NE	5.2	U	EPA:901.1
	Gross alpha	6.6	±	0.7	15 pCi/L	15 pCi/L	1		EPA:900
	Gross beta	4.6	±	0.63	4 mrem/yr	4 mrem/yr	1.6		EPA:900
	Iodine-131	11	±	4.3	NE	NE	14	U	EPA:901.1
	Lead-212	7.6	±	2.1	NE	NE	6.7		EPA:901.1
	Lead-214	4.6	±	3	NE	NE	9.7	U	EPA:901.1
	Potassium-40	-26	±	49	NE	NE	170	U	EPA:901.1
	Protactinium-234m	-160	±	250	NE	NE	860	U	EPA:901.1
	Rn-222	390	±	55	NE	1000 pCi/L	35		Rn222
	Sodium-22	-0.52	±	1.5	NE	NE	5.1	U	EPA:901.1
	Thallium-208	2.5	±	1.5	NE	NE	4.8	U	EPA:901.1
	Thorium-234	8	±	41	NE	NE	140	U	EPA:901.1
	Tritium	-79	±	110	4 mrem/yr	4 mrem/yr	360	U	EPA:906.0

LTMMP = Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan

NE = Not Established

U = Result is less than the sample specific Minimum Detectable Activity (MDA).

[a] Negative numbers indicate the sample count or result was less than the instrument background; result is below the Minimum Detectable Activity (MDA).

Table-3
Groundwater Quality Results: Gross Alpha, Gross Beta, Gamma Emitting Isotopes, Radon and Tritium
SNL/NM Mixed Waste Landfill
New Mexico Environment Department DOE Oversight Bureau
May 2017

Monitoring Well/ Sample Date	Analyte	Activity[a] (pCi/L)			EPA MCL	LTMMP Trigger Level	MDA (pCi/L)	Laboratory Qualifier	Analytical Method
MWL-BW2 2-May-17 DUP	Actinium-228	-1.1	±	11	NE	NE	36	U	EPA:901.1
	Americium-241	-27	±	32	NE	NE	110	U	EPA:901.1
	Beryllium-7	-7.4	±	11	NE	NE	38	U	EPA:901.1
	Bismuth-212	26	±	19	NE	NE	62	U	EPA:901.1
	Bismuth-214	13	±	4.6	NE	NE	19	U	EPA:901.1
	Cesium-134	-3.3	±	1.4	NE	NE	4.8	U	EPA:901.1
	Cesium-137	-1.2	±	1.2	NE	NE	4.3	U	EPA:901.1
	Cobalt-60	1.5	±	1.4	NE	NE	4.7	U	EPA:901.1
	Gross alpha	7.5	±	0.78	15 pCi/L	15 pCi/L	1.1		EPA:900
	Gross beta	4	±	0.59	4 mrem/yr	4 mrem/yr	1.6		EPA:900
	Iodine-131	1.9	±	4	NE	NE	13	U	EPA:901.1
	Lead-212	-0.66	±	4.8	NE	NE	16	U	EPA:901.1
	Lead-214	0.46	±	5.5	NE	NE	18	U	EPA:901.1
	Potassium-40	-20	±	36	NE	NE	120	U	EPA:901.1
	Protactinium-234m	290	±	210	NE	NE	700	U	EPA:901.1
	Rn-222	410	±	57	NE	1000 pCi/L	36		Rn222
	Sodium-22	-3.7	±	1.5	NE	NE	5.3	U	EPA:901.1
	Thallium-208	4.4	±	1.4	NE	NE	4.6	U	EPA:901.1
	Thorium-234	23	±	49	NE	NE	160	U	EPA:901.1
	Tritium	-65	±	110	4 mrem/yr	4 mrem/yr	370	U	EPA:906.0

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MWL-MW7 4-May-17	Actinium-228	25	±	5.6	NE	NE	17		EPA:901.1
	Americium-241	-69	±	50	NE	NE	170	U	EPA:901.1
	Beryllium-7	-1.5	±	12	NE	NE	40	U	EPA:901.1
	Bismuth-212	22	±	20	NE	NE	67	U	EPA:901.1
	Bismuth-214	11	±	6	NE	NE	20	U	EPA:901.1
	Cesium-134	-2	±	2.4	NE	NE	8.1	U	EPA:901.1
	Cesium-137	-0.96	±	1.3	NE	NE	4.6	U	EPA:901.1
	Cobalt-60	-3.9	±	1.6	NE	NE	5.7	U	EPA:901.1
	Gross alpha	7	±	0.75	15 pCi/L	15 pCi/L	1.1		EPA:900
	Gross beta	7.5	±	0.78	4 mrem/yr	4 mrem/yr	1.5		EPA:900
	Iodine-131	4.5	±	3.3	NE	NE	11	U	EPA:901.1
	Lead-212	0.94	±	4.5	NE	NE	15	U	EPA:901.1
	Lead-214	1.2	±	6.4	NE	NE	21	U	EPA:901.1
	Potassium-40	13	±	43	NE	NE	140	U	EPA:901.1
	Protactinium-234m	-120	±	240	NE	NE	830	U	EPA:901.1
	Rn-222	170	±	33	NE	1000 pCi/L	36		Rn222
	Sodium-22	0.024	±	1.5	NE	NE	5	U	EPA:901.1
	Thallium-208	5.2	±	1.5	NE	NE	4.7		EPA:901.1
	Thorium-234	75	±	71	NE	NE	240	U	EPA:901.1
	Tritium	170	±	100	4 mrem/yr	4 mrem/yr	330	U	EPA:906.0

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Groundwater Quality Results: Gross Alpha, Gross Beta, Gamma Emitting Isotopes, Radon and Tritium
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Monitoring Well/ Sample Date	Analyte	Activity[a] (pCi/L)			EPA MCL	LTMMP Trigger Level	MDA (pCi/L)	Laboratory Qualifier	Analytical Method
MWL-MW8 8-May-17	Actinium-228	9.3	±	4.5	NE	NE	20	U	EPA:901.1
	Americium-241	8.4	±	15	NE	NE	51	U	EPA:901.1
	Beryllium-7	-3.3	±	12	NE	NE	41	U	EPA:901.1
	Bismuth-212	25	±	22	NE	NE	73	U	EPA:901.1
	Bismuth-214	3	±	7.5	NE	NE	25	U	EPA:901.1
	Cesium-134	-3.6	±	1.7	NE	NE	5.9	U	EPA:901.1
	Cesium-137	0.31	±	1.5	NE	NE	5.2	U	EPA:901.1
	Cobalt-60	1.3	±	2	NE	NE	6.7	U	EPA:901.1
	Gross alpha	6.3	±	0.74	15 pCi/L	15 pCi/L	1.3		EPA:900
	Gross beta	7.2	±	0.78	4 mrem/yr	4 mrem/yr	1.6		EPA:900
	Iodine-131	2	±	2.6	NE	NE	8.8	U	EPA:901.1
	Lead-212	1.6	±	4.2	NE	NE	14	U	EPA:901.1
	Lead-214	15	±	4.9	NE	NE	16	U	EPA:901.1
	Potassium-40	-39	±	47	NE	NE	160	U	EPA:901.1
	Protactinium-234m	280	±	280	NE	NE	950	U	EPA:901.1
	Rn-222	140	±	35	NE	1000 pCi/L	45		Rn222
	Sodium-22	-1.5	±	1.9	NE	NE	6.7	U	EPA:901.1
	Thallium-208	3.9	±	1.7	NE	NE	5.4	U	EPA:901.1
	Thorium-234	-23	±	45	NE	NE	150	U	EPA:901.1
	Tritium	-27	±	98	4 mrem/yr	4 mrem/yr	330	U	EPA:906.0

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MWL-MW9 3-May-17	Actinium-228	7.3	±	12	NE	NE	41	U	EPA:901.1
	Americium-241	-9.7	±	12	NE	NE	40	U	EPA:901.1
	Beryllium-7	23	±	12	NE	NE	40	U	EPA:901.1
	Bismuth-212	12	±	22	NE	NE	72	U	EPA:901.1
	Bismuth-214	11	±	9	NE	NE	29	U	EPA:901.1
	Cesium-134	2.2	±	2.1	NE	NE	6.9	U	EPA:901.1
	Cesium-137	-1.5	±	1.5	NE	NE	5.1	U	EPA:901.1
	Cobalt-60	1.2	±	1.7	NE	NE	5.9	U	EPA:901.1
	Gross alpha	6.2	±	0.67	15 pCi/L	15 pCi/L	1		EPA:900
	Gross beta	6.3	±	0.66	4 mrem/yr	4 mrem/yr	1.3		EPA:900
	Iodine-131	1.4	±	3.5	NE	NE	12	U	EPA:901.1
	Lead-212	-0.89	±	4.1	NE	NE	14	U	EPA:901.1
	Lead-214	15	±	6.2	NE	NE	20	U	EPA:901.1
	Potassium-40	-34	±	42	NE	NE	140	U	EPA:901.1
	Protactinium-234m	68	±	270	NE	NE	910	U	EPA:901.1
	Rn-222	420	±	56	NE	1000 pCi/L	30		Rn222
	Sodium-22	2.2	±	1.7	NE	NE	5.7	U	EPA:901.1
	Thallium-208	5.6	±	1.5	NE	NE	4.7		EPA:901.1
	Thorium-234	-4.8	±	42	NE	NE	140	U	EPA:901.1
	Tritium	-180	±	96	4 mrem/yr	4 mrem/yr	330	U	EPA:906.0

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