

General

ENTER



Environmental Protection Division
Water Quality & RCRA Group (ENV-RCRA)
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Date: October 13, 2009
Refer To: ENV-RCRA-09-184
LAUR: 09-06087

Mr. William Olson, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2250
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Mr. James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo park Drive East, Building 1
Santa Fe, NM 87505

Dear Mr. Olson and Mr. Bearzi:

SUBJECT: REQUEST FOR A VARIANCE FROM THE NOI DECISION TREE

In accordance with the terms of the Order on Consent (Consent Order), Los Alamos National Laboratory (the Laboratory) is actively constructing new groundwater monitoring wells across the facility. Drilling fluids and development water produced during well construction are characterized for compliance with the requirements of the NMED-approved *Notice of Intent (NOI) Decision Tree for the Land Application of Drilling, Development, Rehabilitation, and Sampling Purge Water* (Enclosure 1). Drilling fluids and development water meeting the *NOI Decision Tree* requirements are land applied in accordance with the Laboratory's quality plans and procedures. The Laboratory has determined that water produced during the construction of 11 monitoring wells does not meet all of the *NOI Decision Tree* water quality criteria for land application. The Laboratory requests NMED approval for a one-time variance from the *NOI Decision Tree* water quality criteria for 13 batches of drilling fluids and development water produced from these 11 wells.

As shown in Tables 1.0 and 2.0, 13 discrete batches of drilling fluids and development water currently being stored in lined pits or tanks do not meet all of the numeric water quality criteria required for land application under in the *NOI Decision Tree—Decision Point D6*. Contaminants exceeding the water quality criteria for land application are:

- aluminum, iron, and lead;
- fluoride and total dissolved solids; and
- acrolein, methylene chloride, phenol, and bis(2-ethylhexyl)phthalate.



Table 1.0. Contaminants in Drilling and Development Water Exceeding *NOI Decision Tree* Criteria.

Well Name	Al Result (ppb)	Fe Result (ppb)	F Result (ppm)	Pb Result (ppb)	TDS Result (ppb)	Acrolein Result (ppb)	Methylene Chloride Result (ppb)	Phenol Result (ppb)	DEHP ² Result (ppb)
PCI-2 development water		7690							
R-37 Pit #2 drilling fluids									17.3
R-37 Pit #3 drilling fluids									23.2
R-38 drilling fluids	35600	26800		19.1					
R-41 drilling fluids	28400	6950			1520	11	42.2		
R-42 drilling fluids	26100	19800			1590				
R-43 drilling fluids	46900	39000		17.6				4.83	
R-44 drilling fluids	32400	16100							
R-45 drilling fluids	28300	19600				9.26			
R-46 drilling fluids	33100	28000							
R-49 drilling fluids	56100	21100		19.1		5.62			30.2
R-49 development water		1260							
R-53i drilling fluids	13400	2710	1.73	24					
<i>NOI Decision Tree Limits¹</i>	4500	900	1.44	13.5	900	0.038	4.5	4.5	5.4

Notes:

¹90% of the NMWQCC 3103 standard, SDWA MCL, or EPA Region 6 HHMSSL per *NOI Decision Tree*, Decision Point D6.

²bis(2-ethylhexyl)phthalate (CAS#117-81-7)

Table 2.0. Well Location Information and Volumes of Drilling and Development Water in Storage.

Well Name	Well Type	Water Type	Watershed	Depth to Groundwater (ft)	Estimated Volume (gal)
PCI-2	intermediate	development	Pueblo	512	8,000
R-37 Pit #2	regional	drilling	Canada del Buey	900	7,000
R-37 Pit #3	regional	drilling	Canada del Buey	900	50,000
R-38	regional	drilling	Canada del Buey	810	12,000
R-41	regional	drilling	Canada del Buey	960	12,000
R-42	regional	drilling	Mortandad	920	12,000
R-43	regional	drilling	Sandia	510	12,000
R-44	regional	drilling	Mortandad	880	12,000
R-45	regional	drilling	Mortandad	870	10,000
R-46	regional	drilling	Mortandad	1330	10,000
R-49	regional	drilling	Pajarito	830	10,000
R-49	regional	development	Pajarito	830	60,000
R-53i	intermediate	drilling	Los Alamos	600	10,000

Enclosure 2.0 contains data tables listing all *NOI Decision Tree--Decision Point D6* water quality criteria detected in the 13 batches of drilling fluid and development water. Representative samples were collected from the drilling fluids and development water in storage and submitted

for full-suite analysis. The drilling fluids and development water are not managed as hazardous waste because the Laboratory's due diligence effort indicates that the potentially listed constituents do not originate from a listed source (i.e., a listed process or spill or disposal of the unused/unspent chemical).

Only those analytical results classified as detections by the analytical laboratory are presented in Enclosure 1.0. Those detections exceeding the *NOI Decision Tree—Decision Point D6* water quality criteria and alluvial groundwater background concentrations, as defined in the Laboratory's *Groundwater Background Investigation Report* (EP-2006-1078, February 2007), are highlighted.

The Laboratory requests a one-time variance, applicable only to the 13 batches of drilling fluids and development water referenced in this letter, from the *NOI Decision Tree—Decision Point D6* water quality criteria. If approved, the listed drilling fluids and development water will be land applied in accordance with the Laboratory's quality plans and procedures (ENV-RCRA-QP-010.1, *Land Application of Groundwater*).

Please contact me at (505) 667-7969 if you have questions regarding this request.

Sincerely,



Bob Beers
Water Quality & RCRA Group

Enclosures: a/s

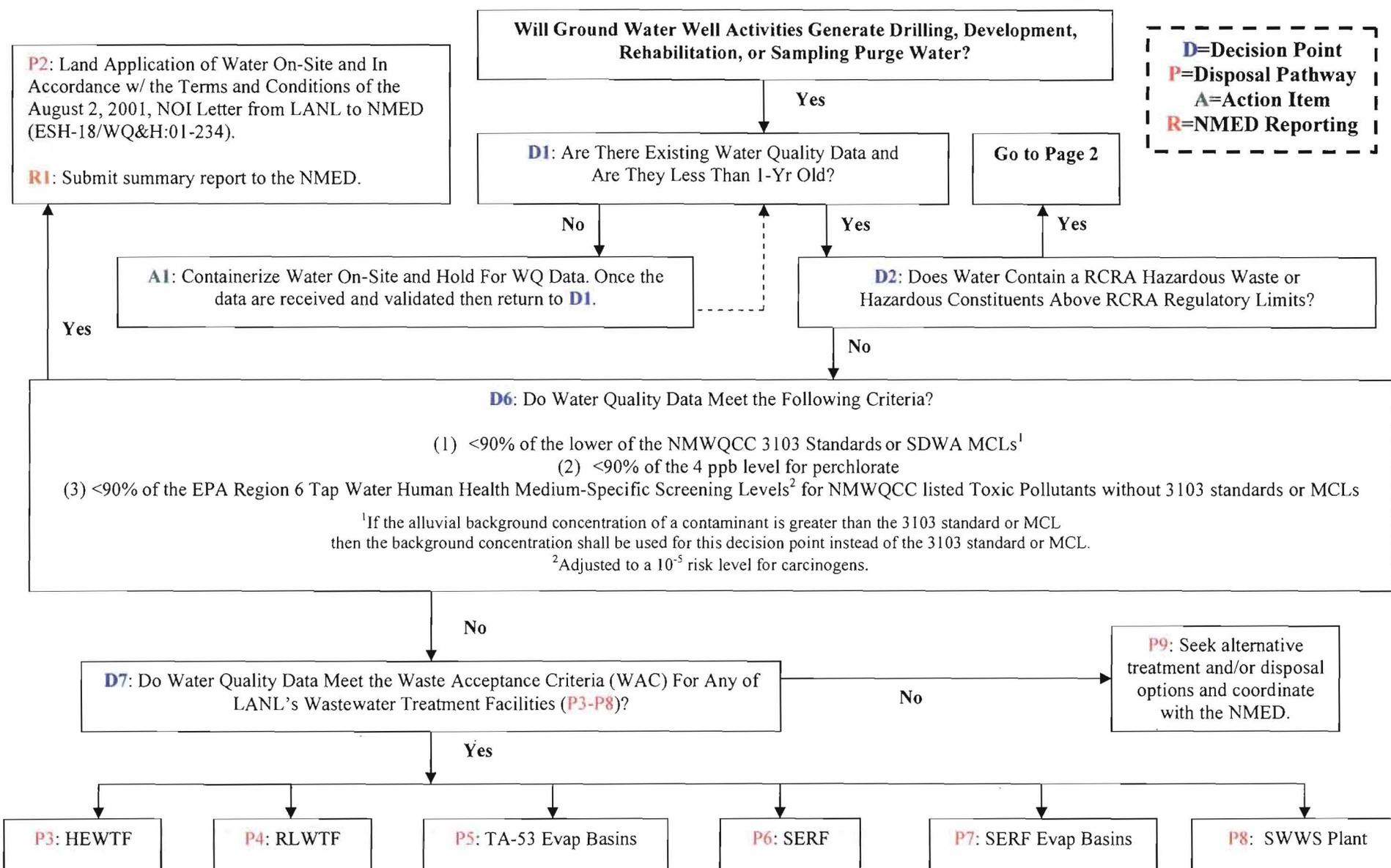
Cy: Glenn Saums, NMED/SWQB, Santa Fe, NM, w/enc.
Gene Turner, LASO-EO, w/enc., A316
Hai Shen, LASO-EO, w/enc., A316
Steve Yanicak, LASO-GOV, M894
Michael B. Mallory, PADOPS, w/o enc., A102
Chris Cantwell, ADESHQ, w/o enc., K491
Danny Katzman, ADEP-PM, w/o enc., M992
Tim Goering, ADEP-PM, w/o enc., M992
Mike Alexander, ADEP-PM, w/enc., K497
Mike Saladen, ENV-RCRA, w/enc., K490
Jocelyn Buckley, ENV-RCRA, w/enc., K490
Paul Huber, LWSP, w/o enc., M992
Matt Riggs, LWSP, w/o enc., M992
Mark C. Everett, WES-RS, w/enc., M992
ENV-DO File, w/o enc., J978
ENV-RCRA, File, w/enc., K490
IRM-RMMSO, w/enc., A150

ENCLOSURE 1

Enclosure 1

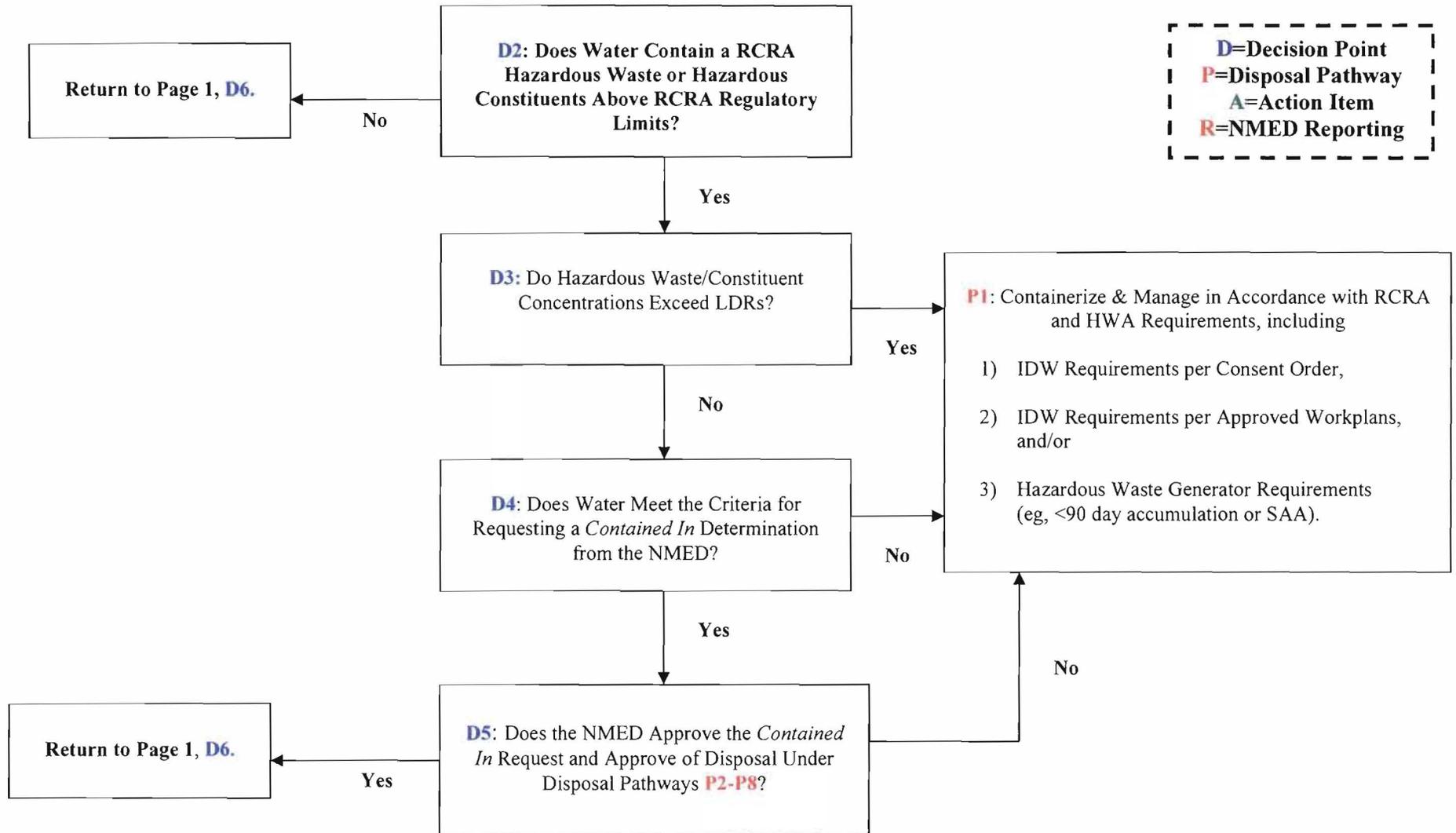
NOI Decision Tree

Drilling, Development, Rehabilitation, and Sampling Purge Water—Revised 7/26/06



Enclosure 1

*NOI Decision Tree
Drilling, Development, Rehabilitation, and Sampling Purge Water—Revised 7/26/06*



ENCLOSURE 2

Enclosure 2

Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water

All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
PCI-2_development water	Chloride	3.04	mg/L	250	225		pass
PCI-2_development water	Fluoride	0.286	mg/L	1.6	1.44		pass
PCI-2_development water	Sulfate	6.58	mg/L	600	540		pass
PCI-2_development water	Arsenic	3.19	ug/L	10	9		pass
PCI-2_development water	Barium	87.4	ug/L	1000	900		pass
PCI-2_development water	Chromium	4.6	ug/L	50	45		pass
PCI-2_development water	Copper	3.98	ug/L	1000	900		pass
PCI-2_development water	Iron	7690	ug/L	1000	900	823	FAIL
PCI-2_development water	Lead	2.45	ug/L	15	13.5		pass
PCI-2_development water	Manganese	80.7	ug/L	200	180		pass
PCI-2_development water	Molybdenum	3.24	ug/L	1000	900		pass
PCI-2_development water	Nickel	3.48	ug/L	200	180		pass
PCI-2_development water	Uranium	1.4	ug/L	30	27		pass
PCI-2_development water	Zinc	28.9	ug/L	10000	9000		pass
PCI-2_development water	Perchlorate	0.272	ug/L	4	3.6		pass
PCI-2_development water	Bis(2-ethylhexyl)phthalate	4	ug/L	6	5.4		pass
PCI-2_development water	Toluene	1.14	ug/L	750	675		pass
PCI-2_development water	Nitrate-Nitrite as N	0.0142	mg/L	10	9		pass
PCI-2_development water	pH	7.68		between 6 and 9			pass
PCI-2_development water	TDS	146	mg/L	1000	900		pass

¹Los Alamos National Laboratory, Groundwater Background Investigation Report, Revision 2 (EP2006-1078, February 2007)

Enclosure 2

Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water
 All Detections from Characterization Sampling

	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-37_pit 2_drilling fluids	TDS	350	mg/L	1000	900		pass
R-37_pit 2_drilling fluids	Chloride	13.4	mg/L	250	225		pass
R-37_pit 2_drilling fluids	Fluoride	1.1	mg/L	1.6	1.44		pass
R-37_pit 2_drilling fluids	Sulfate	62.1	mg/L	600	540		pass
R-37_pit 2_drilling fluids	Nitrate-Nitrite as N	0.09	mg/L	10	9		pass
R-37_pit 2_drilling fluids	Radium-226	0.82	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-37_pit 2_drilling fluids	Aluminum	469	ug/L	5000	4500		pass
R-37_pit 2_drilling fluids	Barium	36.1	ug/L	1000	900		pass
R-37_pit 2_drilling fluids	Cobalt	9.39	ug/L	50	45		pass
R-37_pit 2_drilling fluids	Copper	16.9	ug/L	1000	900		pass
R-37_pit 2_drilling fluids	Iron	462	ug/L	1000	900		pass
R-37_pit 2_drilling fluids	Manganese	1130	ug/L	200	180	4530	pass
R-37_pit 2_drilling fluids	Zinc	27.9	ug/L	10000	9000		pass
R-37_pit 2_drilling fluids	Antimony	0.727	ug/L	6	5.4		pass
R-37_pit 2_drilling fluids	Chromium	1.86	ug/L	50	45		pass
R-37_pit 2_drilling fluids	Molybdenum	166	ug/L	1000	900		pass
R-37_pit 2_drilling fluids	Nickel	45.8	ug/L	200	180		pass
R-37_pit 2_drilling fluids	Thallium	0.468	ug/L	2	1.8		pass
R-37_pit 2_drilling fluids	Uranium	3.04	ug/L	30	27		pass
R-37_pit 2_drilling fluids	Perchlorate	0.107	ug/L	4	3.6		pass
R-37_pit 2_drilling fluids	Bis(2-ethylhexyl)phthalate	17.3	ug/L	6	5.4		FAIL

¹Los Alamos National Laboratory, Groundwater Background Investigation Report, Revision 2 (EP2006-1078, February 2007)

Enclosure 2

Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water

All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90% of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-37_pit 3_drilling fluids	Chloride	8.02	mg/L	250	225		pass
R-37_pit 3_drilling fluids	Fluoride	1.14	mg/L	1.6	1.44		pass
R-37_pit 3_drilling fluids	Sulfate	18.6	mg/L	600	540		pass
R-37_pit 3_drilling fluids	Radium-226	0.72	pCi/L	5	4.5		pass
R-37_pit 3_drilling fluids	Radium-228	1.71	pCi/L	5	4.5		pass
R-37_pit 3_drilling fluids	Aluminum	321	ug/L	5000	4500		pass
R-37_pit 3_drilling fluids	Barium	80.1	ug/L	1000	900		pass
R-37_pit 3_drilling fluids	Boron	43.9	ug/L	750	675		pass
R-37_pit 3_drilling fluids	Chromium	4.37	ug/L	50	45		pass
R-37_pit 3_drilling fluids	Copper	11.8	ug/L	1000	900		pass
R-37_pit 3_drilling fluids	Iron	487	ug/L	1000	900		pass
R-37_pit 3_drilling fluids	Lead	0.532	ug/L	15	13.5		pass
R-37_pit 3_drilling fluids	Manganese	436	ug/L	200	180	4530	pass
R-37_pit 3_drilling fluids	Molybdenum	32.1	ug/L	1000	900		pass
R-37_pit 3_drilling fluids	Nickel	3.13	ug/L	200	180		pass
R-37_pit 3_drilling fluids	Thallium	0.605	ug/L	2	1.8		pass
R-37_pit 3_drilling fluids	Uranium	1.96	ug/L	30	27		pass
R-37_pit 3_drilling fluids	Heptachlor	0.00946	ug/L	0.4	0.36		pass
R-37_pit 3_drilling fluids	Bis(2-ethylhexyl)phthalate	23.2	ug/L	6	5.4		FAIL
R-37_pit 3_drilling fluids	Di-n-butylphthalate	32.3	ug/L	3650	3285		pass
R-37_pit 3_drilling fluids	Nitrate-Nitrite as N	0.126	mg/L	10	9		pass
R-37_pit 3_drilling fluids	pH	7.79	SU	between 6 and 9			pass
R-37_pit 3_drilling fluids	TDS	838	mg/L	1000	900		pass

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Enclosure 2

Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water

All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-38_drilling fluids	Chloride	8.53	mg/L	250	225		pass
R-38_drilling fluids	Fluoride	1.12	mg/L	1.6	1.44		pass
R-38_drilling fluids	Sulfate	14.2	mg/L	600	540		pass
R-38_drilling fluids	Radium-226	0.801	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-38_drilling fluids	Radium-228	1.33	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-38_drilling fluids	Aluminum	35600	ug/L	5000	4500	1492	FAIL
R-38_drilling fluids	Antimony	1.43	ug/L	6	5.4		pass
R-38_drilling fluids	Arsenic	5.1	ug/L	10	9		pass
R-38_drilling fluids	Barium	755	ug/L	1000	900		pass
R-38_drilling fluids	Beryllium	1.35	ug/L	4	3.6		pass
R-38_drilling fluids	Boron	57.3	ug/L	750	675		pass
R-38_drilling fluids	Cadmium	1	ug/L	5	4.5		pass
R-38_drilling fluids	Chromium	33.7	ug/L	50	45		pass
R-38_drilling fluids	Cobalt	16.3	ug/L	50	45		pass
R-38_drilling fluids	Copper	28.4	ug/L	1000	900		pass
R-38_drilling fluids	Iron	26800	ug/L	1000	900	823	FAIL
R-38_drilling fluids	Lead	19.1	ug/L	15	13.5	0.56	FAIL
R-38_drilling fluids	Manganese	2690	ug/L	200	180	4530	pass
R-38_drilling fluids	Molybdenum	51	ug/L	1000	900		pass
R-38_drilling fluids	Nickel	46.2	ug/L	200	180		pass
R-38_drilling fluids	Silver	0.285	ug/L	50	45		pass
R-38_drilling fluids	Thallium	0.85	ug/L	2	1.8		pass
R-38_drilling fluids	Uranium	5.53	ug/L	30	27		pass
R-38_drilling fluids	Zinc	90.6	ug/L	10000	9000		pass
R-38_drilling fluids	Perchlorate	0.461	ug/L	4	3.6		pass
R-38_drilling fluids	Cyanide (Total)	16.6	ug/L	200	180		pass
R-38_drilling fluids	Nitrate-Nitrite as N	0.111	mg/L	10	9		pass
R-38_drilling fluids	pH	8.16	SU	between 6 and 9			pass
R-38_drilling fluids	TDS	812	mg/L	1000	900		pass

¹Los Alamos National Laboratory, Groundwater Background Investigation Report, Revision 2 (EP2006-1078, February 2007)

Enclosure 2

Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water

All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-41_drilling fluids	Chloride	0.981	mg/L	250	225		pass
R-41_drilling fluids	Fluoride	0.142	mg/L	1.6	1.44		pass
R-41_drilling fluids	Sulfate	2.22	mg/L	600	540		pass
R-41_drilling fluids	Radium-226	1.45	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-41_drilling fluids	Radium-228	1.41	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-41_drilling fluids	Aluminum	28400	ug/L	5000	4500	1492	FAIL
R-41_drilling fluids	Antimony	1.1	ug/L	6	5.4		pass
R-41_drilling fluids	Barium	478	ug/L	1000	900		pass
R-41_drilling fluids	Cadmium	0.2	ug/L	5	4.5		pass
R-41_drilling fluids	Chromium	13.2	ug/L	50	45		pass
R-41_drilling fluids	Cobalt	4.8	ug/L	50	45		pass
R-41_drilling fluids	Copper	38.2	ug/L	1000	900		pass
R-41_drilling fluids	Iron	6950	ug/L	1000	900	823	FAIL
R-41_drilling fluids	Lead	4.2	ug/L	15	13.5		pass
R-41_drilling fluids	Manganese	552	ug/L	200	180	4530	pass
R-41_drilling fluids	Mercury	0.67	ug/L	2	1.8		pass
R-41_drilling fluids	Molybdenum	127	ug/L	1000	900		pass
R-41_drilling fluids	Nickel	16.9	ug/L	200	180		pass
R-41_drilling fluids	Thallium	0.38	ug/L	2	1.8		pass
R-41_drilling fluids	Uranium	6.1	ug/L	30	27		pass
R-41_drilling fluids	Zinc	22	ug/L	10000	9000		pass
R-41_drilling fluids	Perchlorate	0.584	ug/L	4	3.6		pass
R-41_drilling fluids	Bis(2-ethylhexyl)phthalate	3.31	ug/L	6	5.4		pass
R-41_drilling fluids	Dimethyl Phthalate	34.4	ug/L	365000	328500		pass
R-41_drilling fluids	Di-n-butylphthalate	12.7	ug/L	3650	3285		pass
R-41_drilling fluids	Acrolein	11	ug/L	0.042	0.038		FAIL
R-41_drilling fluids	Chloroform	9.36	ug/L	80	72		pass
R-41_drilling fluids	Methylene Chloride	42.2	ug/L	5	4.5		FAIL
R-41_drilling fluids	Toluene	0.289	ug/L	750	675		pass
R-41_drilling fluids	Cyanide (Total)	34.8	ug/L	200	180		pass
R-41_drilling fluids	pH	8.11	SU	between 6 and 9			pass
R-41_drilling fluids	TDS	1520	mg/L	1000	900	127	FAIL

¹Los Alamos National Laboratory, Groundwater Background Investigation Report, Revision 2 (EP2006-1078, February 2007)

Enclosure 2

Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water

All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-42-drilling fluids	Chloride	10.6	mg/L	250	225		PASS
R-42-drilling fluids	Fluoride	0.49	mg/L	1.6	1.44		PASS
R-42-drilling fluids	Sulfate	26.5	mg/L	600	540		PASS
R-42-drilling fluids	Radium-226	1.05	pCi/L	5 pCi/L	4.5 pCi/L		PASS
R-42-drilling fluids	Aluminum	26100	ug/L	5000	4500	1492	FAIL
R-42-drilling fluids	Antimony	2.4	ug/L	6	5.4		PASS
R-42-drilling fluids	Barium	498	ug/L	1000	900		PASS
R-42-drilling fluids	Boron	66.1	ug/L	750	675		PASS
R-42-drilling fluids	Chromium	42.2	ug/L	50	45		PASS
R-42-drilling fluids	Cobalt	7.5	ug/L	50	45		PASS
R-42-drilling fluids	Copper	39.3	ug/L	1000	900		PASS
R-42-drilling fluids	Iron	19800	ug/L	1000	900	823	FAIL
R-42-drilling fluids	Lead	10.7	ug/L	15	13.5		PASS
R-42-drilling fluids	Manganese	598	ug/L	200	180	4530	PASS
R-42-drilling fluids	Molybdenum	138	ug/L	1000	900		PASS
R-42-drilling fluids	Nickel	24.9	ug/L	200	180		PASS
R-42-drilling fluids	Silver	0.31	ug/L	50	45		PASS
R-42-drilling fluids	Thallium	0.63	ug/L	2	1.8		PASS
R-42-drilling fluids	Uranium	3.8	ug/L	30	27		PASS
R-42-drilling fluids	Zinc	91	ug/L	10000	900		PASS
R-42-drilling fluids	Perchlorate	0.49	ug/L	4	3.6		PASS
R-42-drilling fluids	Dichlorobenzene[1,2-]	0.339	ug/L	600	540		PASS
R-42-drilling fluids	Naphthalene	3.45	ug/L	6.2	5.6		PASS
R-42-drilling fluids	Nitrate-Nitrite as N	0.087	mg/L	10	9		PASS
R-42-drilling fluids	pH	8.39	SU	6 to 9			PASS
R-42-drilling fluids	TDS	1590	mg/L	1000	900	127	FAIL

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Request for a Variance from the NOI Decision Tree for the Land Application of Drilling and Development Water

All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-43 drilling fluids	Phenol	4.83	ug/L	5	4.5		FAIL
R-43 drilling fluids	Chloride	13.5	mg/L	250	225		pass
R-43 drilling fluids	Fluoride	0.664	mg/L	1.6	1.44		pass
R-43 drilling fluids	Sulfate	50.9	mg/L	600	540		pass
R-43 drilling fluids	Radium-226	0.922	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-43 drilling fluids	Radium-228	2.82	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-43 drilling fluids	Aluminum	46900	ug/L	5000	4500	1492	FAIL
R-43 drilling fluids	Arsenic	1.5	ug/L	10	9		pass
R-43 drilling fluids	Barium	249	ug/L	1000	900		pass
R-43 drilling fluids	Beryllium	1.5	ug/L	4	3.6		pass
R-43 drilling fluids	Boron	53.1	ug/L	750	675		pass
R-43 drilling fluids	Cadmium	0.34	ug/L	5	4.5		pass
R-43 drilling fluids	Chromium	15.6	ug/L	50	45		pass
R-43 drilling fluids	Cobalt	11.8	ug/L	50	45		pass
R-43 drilling fluids	Copper	46.5	ug/L	1000	900		pass
R-43 drilling fluids	Iron	39000	ug/L	1000	900	823	FAIL
R-43 drilling fluids	Lead	17.6	ug/L	15	13.5	0.56	FAIL
R-43 drilling fluids	Manganese	659	ug/L	200	180	4530	pass
R-43 drilling fluids	Molybdenum	109	ug/L	1000	900		pass
R-43 drilling fluids	Nickel	15.2	ug/L	200	180		pass
R-43 drilling fluids	Selenium	1.4	ug/L	50	45		pass
R-43 drilling fluids	Thallium	0.73	ug/L	2	1.8		pass
R-43 drilling fluids	Uranium	3.4	ug/L	30	27		pass
R-43 drilling fluids	Zinc	143	ug/L	10000	9000		pass
R-43 drilling fluids	Aroclor-1254	0.26	ug/L	0.5	0.45		pass
R-43 drilling fluids	Perchlorate	0.58	ug/L	4	3.6		pass
R-43 drilling fluids	pH	8.25	SU	between 6 and 9			pass
R-43 drilling fluids	TDS	627	mg/L	1000	9000		pass

¹Los Alamos National Laboratory, Groundwater Background Investigation Report, Revision 2 (EP2006-1078, February 2007)

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All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-44 drilling fluids	Chloride	7.2	mg/L	250	225		pass
R-44 drilling fluids	Fluoride	1.36	mg/L	1.6	1.44		pass
R-44 drilling fluids	Sulfate	12.1	mg/L	600	540		pass
R-44 drilling fluids	Radium-226	1.51	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-44 drilling fluids	Radium-228	1.11	pCi/L	5 pCi/L	4.5 pCi/L		pass
R-44 drilling fluids	Aluminum	32400	ug/L	5000	4500	1492	FAIL
R-44 drilling fluids	Arsenic	3.8	ug/L	10	9		pass
R-44 drilling fluids	Barium	539	ug/L	1000	900		pass
R-44 drilling fluids	Boron	72.7	ug/L	750	675		pass
R-44 drilling fluids	Cadmium	0.3	ug/L	5	4.5		pass
R-44 drilling fluids	Chromium	30	ug/L	50	45		pass
R-44 drilling fluids	Cobalt	9.3	ug/L	50	45		pass
R-44 drilling fluids	Copper	48.7	ug/L	1000	900		pass
R-44 drilling fluids	Iron	16100	ug/L	1000	900	823	FAIL
R-44 drilling fluids	Lead	9.7	ug/L	15	13.5		pass
R-44 drilling fluids	Manganese	543	ug/L	200	180	4530	pass
R-44 drilling fluids	Molybdenum	82.7	ug/L	1000	900		pass
R-44 drilling fluids	Nickel	29.4	ug/L	200	180		pass
R-44 drilling fluids	Silver	0.25	ug/L	50	45		pass
R-44 drilling fluids	Thallium	0.41	ug/L	2	1.8		pass
R-44 drilling fluids	Uranium	4.9	ug/L	30	27		pass
R-44 drilling fluids	Zinc	72.8	ug/L	10000	9000		pass
R-44 drilling fluids	Perchlorate	0.458	ug/L	4	3.6		pass
R-44 drilling fluids	Chloroform	0.419	ug/L	80	72		pass
R-44 drilling fluids	Naphthalene	0.421	ug/L	6.2	5.6		pass
R-44 drilling fluids	Toluene	2.62	ug/L	750	675		pass
R-44 drilling fluids	pH	7.86	SU	between 6 and 9			pass
R-44 drilling fluids	TDS	900	mg/L	1000	900		pass

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All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-45 drilling fluids	Chloride	4.71	mg/L	250	225		pass
R-45 drilling fluids	Fluoride	1.32	mg/L	1.6	1.44		pass
R-45 drilling fluids	Sulfate	12.4	mg/L	600	540		pass
R-45 drilling fluids	Radium-226	1.45	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-45 drilling fluids	Radium-228	1.07	pCi/L	5pCi/l	4.5 pCi/L		pass
R-45 drilling fluids	Aluminum	28300	ug/L	5000	4500	1492	FAIL
R-45 drilling fluids	Barium	285	ug/L	1000	900		pass
R-45 drilling fluids	Beryllium	1.3	ug/L	4	3.6		pass
R-45 drilling fluids	Boron	29.4	ug/L	750	675		pass
R-45 drilling fluids	Cadmium	0.17	ug/L	5	4.5		pass
R-45 drilling fluids	Chromium	7.1	ug/L	50	45		pass
R-45 drilling fluids	Cobalt	13.5	ug/L	50	45		pass
R-45 drilling fluids	Copper	42	ug/L	1000	900		pass
R-45 drilling fluids	Iron	19600	ug/L	1000	900	823	FAIL
R-45 drilling fluids	Lead	4.2	ug/L	15	13.5		pass
R-45 drilling fluids	Manganese	426	ug/L	200	180	4530	pass
R-45 drilling fluids	Molybdenum	39.9	ug/L	1000	900		pass
R-45 drilling fluids	Nickel	8.3	ug/L	200	180		pass
R-45 drilling fluids	Thallium	0.55	ug/L	2	1.8		pass
R-45 drilling fluids	Uranium	4.5	ug/L	30	27		pass
R-45 drilling fluids	Zinc	47.9	ug/L	10000	9000		pass
R-45 drilling fluids	Perchlorate	0.281	ug/L	4	3.6		pass
R-45 drilling fluids	Acrolein	9.26	ug/L	0.042	0.038		FAIL
R-45 drilling fluids	Chloromethane	0.379	ug/L	187.7	168.9		pass
R-45 drilling fluids	pH	7.99	SU	between 6 and 9			pass
R-45 drilling fluids	TDS	574	mg/L	1000	900		pass

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All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-46_drilling fluids	Chloride	9.01	mg/L	250	225		pass
R-46_drilling fluids	Fluoride	1.22	mg/L	1.6	1.44		pass
R-46_drilling fluids	Sulfate	23.3	mg/L	600	540		pass
R-46_drilling fluids	Radium-226	1.51	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-46_drilling fluids	Radium-228	1.72	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-46_drilling fluids	Aluminum	33100	ug/L	5000	4500	1492	FAIL
R-46_drilling fluids	Barium	866	ug/L	1000	900		pass
R-46_drilling fluids	Beryllium	1.2	ug/L	4	3.6		pass
R-46_drilling fluids	Chromium	29.8	ug/L	50	45		pass
R-46_drilling fluids	Cobalt	6.7	ug/L	50	45		pass
R-46_drilling fluids	Copper	44.8	ug/L	1000	900		pass
R-46_drilling fluids	Iron	28000	ug/L	1000	900	823	FAIL
R-46_drilling fluids	Lead	12.6	ug/L	15	13.5		pass
R-46_drilling fluids	Manganese	765	ug/L	200	180	4530	pass
R-46_drilling fluids	Molybdenum	173	ug/L	1000	900		pass
R-46_drilling fluids	Nickel	20.9	ug/L	200	180		pass
R-46_drilling fluids	Silver	0.23	ug/L	50	45		pass
R-46_drilling fluids	Thallium	0.61	ug/L	2	1.8		pass
R-46_drilling fluids	Uranium	5	ug/L	30	27		pass
R-46_drilling fluids	Zinc	45.8	ug/L	10000	9000		pass
R-46_drilling fluids	Perchlorate	0.435	ug/L	4	3.6		pass
R-46_drilling fluids	Chlordane[gamma-]	0.00653	ug/L	2	1.8		pass
R-46_drilling fluids	Chloromethane	0.864	ug/L	187.7	168.9		pass
R-46_drilling fluids	Tetrachloroethene	4.34	ug/L	5	4.5		pass
R-46_drilling fluids	Toluene	9.5	ug/L	750	675		pass
R-46_drilling fluids	Trichloroethene	2.46	ug/L	5	4.5		pass
R-46_drilling fluids	pH	7.91	SU	between 6 and 9			pass
R-46_drilling fluids	TDS	482	mg/L	1000	900		pass

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All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-49_drilling fluids	Chloride	7.78	mg/L	250	225		pass
R-49_drilling fluids	Fluoride	0.754	mg/L	1.6	1.44		pass
R-49_drilling fluids	Sulfate	15.7	mg/L	600	540		pass
R-49_drilling fluids	Radium-226	0.996	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-49_drilling fluids	Radium-228	1.2	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-49_drilling fluids	Aluminum	56100	ug/L	5000	4500	1492	FAIL
R-49_drilling fluids	Antimony	1.7	ug/L	6	5.4		pass
R-49_drilling fluids	Arsenic	3.14	ug/L	10	9		pass
R-49_drilling fluids	Barium	561	ug/L	1000	900		pass
R-49_drilling fluids	Beryllium	2.84	ug/L	4	3.6		pass
R-49_drilling fluids	Boron	57.3	ug/L	750	675		pass
R-49_drilling fluids	Cadmium	0.587	ug/L	5	4.5		pass
R-49_drilling fluids	Chromium	18.2	ug/L	50	45		pass
R-49_drilling fluids	Cobalt	7.5	ug/L	50	45		pass
R-49_drilling fluids	Copper	28.4	ug/L	1000	900		pass
R-49_drilling fluids	Iron	21100	ug/L	1000	900	823	FAIL
R-49_drilling fluids	Lead	19.1	ug/L	15	13.5	0.56	FAIL
R-49_drilling fluids	Manganese	407	ug/L	200	180	4530	pass
R-49_drilling fluids	Molybdenum	67.1	ug/L	1000	900		pass
R-49_drilling fluids	Nickel	14	ug/L	200	180		pass
R-49_drilling fluids	Uranium	10.8	ug/L	30	27		pass
R-49_drilling fluids	Zinc	97.1	ug/L	10000	9000		pass
R-49_drilling fluids	Perchlorate	0.436	ug/L	4	3.6		pass
R-49_drilling fluids	Bis(2-ethylhexyl)phthalate	30.2	ug/L	6	5.4		FAIL
R-49_drilling fluids	Acrolein	5.62	ug/L	0.042	0.038		FAIL
R-49_drilling fluids	Chloromethane	0.457	ug/L	187.7	168.9		pass
R-49_drilling fluids	pH	7.72	SU	between 6 and 9			pass
R-49_drilling fluids	TDS	718	mg/L	1000	900		pass

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All Detections from Characterization Sampling

Location Name	Analyte Description	Units	Lab Result	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-49_development water	Chloride	mg/L	2.61	250	225		pass
R-49_development water	Fluoride	mg/L	0.311	1.6	1.44		pass
R-49_development water	Sulfate	mg/L	7.94	600	540		pass
R-49_development water	Aluminum	ug/L	901	5000	4500		pass
R-49_development water	Barium	ug/L	72.7	1000	900		pass
R-49_development water	Iron	ug/L	1260	1000	900	823	FAIL
R-49_development water	Lead	ug/L	0.587	15	13.5		pass
R-49_development water	Manganese	ug/L	9.99	200	180		pass
R-49_development water	Molybdenum	ug/L	1.77	1000	900		pass
R-49_development water	Nickel	ug/L	0.988	200	180		pass
R-49_development water	Thallium	ug/L	0.343	200	180		pass
R-49_development water	Uranium	ug/L	1.03	30	27		pass
R-49_development water	Zinc	ug/L	7.68	10000	9000		pass
R-49_development water	Perchlorate	ug/L	0.326	4	3.6		pass
R-49_development water	Chloromethane	ug/L	0.491	187.7	168.9		pass
R-49_development water	Nitrate-Nitrite as Nitrogen	mg/L	0.499	10	9		pass
R-49_development water	pH	SU	8.04	between 6 and 9			pass
R-49_development water	Total Dissolved Solids	mg/L	147	1000	900		pass

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All Detections from Characterization Sampling

Location Name	Analyte Description	Lab Result	Units	Standard	90 % of Standard	GWBI alluvial background concentration ¹	Pass/Fail
R-53i_drilling fluids	Chloride	18.6	mg/L	250	225		pass
R-53i_drilling fluids	Fluoride	1.73	mg/L	1.6	1.44	0.1	FAIL
R-53i_drilling fluids	Sulfate	20.6	mg/L	600	540		pass
R-53i_drilling fluids	Radium-226	0.748	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-53i_drilling fluids	Radium-228	0.778	pCi/L	5 pCi/l	4.5 pCi/L		pass
R-53i_drilling fluids	Aluminum	13400	ug/L	5000	4500	1492	FAIL
R-53i_drilling fluids	Antimony	0.92	ug/L	6	5.4		pass
R-53i_drilling fluids	Barium	111	ug/L	1000	900		pass
R-53i_drilling fluids	Beryllium	2	ug/L	4	3.6		pass
R-53i_drilling fluids	Boron	72.6	ug/L	750	675		pass
R-53i_drilling fluids	Cadmium	0.45	ug/L	5	4.5		pass
R-53i_drilling fluids	Chromium	12.9	ug/L	50	45		pass
R-53i_drilling fluids	Copper	7.7	ug/L	1000	900		pass
R-53i_drilling fluids	Iron	2710	ug/L	1000	900	823	FAIL
R-53i_drilling fluids	Lead	24	ug/L	15	13.5	0.56	FAIL
R-53i_drilling fluids	Manganese	345	ug/L	200	180	4530	pass
R-53i_drilling fluids	Molybdenum	96.6	ug/L	1000	900		pass
R-53i_drilling fluids	Nickel	3.6	ug/L	200	180		pass
R-53i_drilling fluids	Selenium	1.2	ug/L	50	45		pass
R-53i_drilling fluids	Silver	0.21	ug/L	50	45		pass
R-53i_drilling fluids	Thallium	0.37	ug/L	2	1.8		pass
R-53i_drilling fluids	Uranium	3	ug/L	30	27		pass
R-53i_drilling fluids	Zinc	77.5	ug/L	10000	9000		pass
R-53i_drilling fluids	Perchlorate	0.57	ug/L	4	3.6		pass
R-53i_drilling fluids	Toluene	0.459	ug/L	750	675		pass
R-53i_drilling fluids	Nitrate-Nitrite as N	0.378	mg/L	10	9		pass
R-53i_drilling fluids	pH	9.0	SU	between 6-9			pass
R-53i_drilling fluids	TDS	308	mg/L	1000	900		pass

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