



ESHID-602199

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Date: **FEB 27 2017**
Symbol: EPC-DO: 17-066
LA-UR: 17-20603
Locates Action No.: U1601822

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

**Subject: Quarterly Report – 2016 Quarter 4, Discharge Permit DP-1835,
Class V Underground Injection Control Wells**

Dear Ms. Hunter:

On August 31, 2016, the New Mexico Environment Department (NMED) issued a Discharge Permit (DP) 1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through up to six Class V Underground Injection-Control (UIC) wells. Pursuant to Condition No. 10 of the above-referenced discharge permit, DOE/LANS are required to submit quarterly reports for the previous quarter to document:

- 1. Influent and discharge volumes from the treatment systems;*
- 2. Quarterly groundwater and treated effluent sampling results; and*
- 3. Operations/Maintenance activities.*

Pursuant to Condition Nos. 11, 12, and 13 of the above-referenced permit, the quarterly reports shall also contain general information, performance information, and monitoring data of treated effluent from each ion-exchange (IX) treatment system, respectively. During the 2016 October 1st through December 31st (Quarter 4) reporting period, discharge of treated groundwater to the regional aquifer was initiated under DP-1835. This treated discharge was initiated at two of the UIC wells: CrIN-4 and CrIN-5. The Quarterly Report – 2016 Quarter 4 (Enclosure 1) provides the information required under DP-1835 for this reporting period.

Ms. Michelle Hunter
EPC-DO: 17-066

- 2 -

Please contact William J. Foley by telephone at (505) 665-8423 or by email at bfoley@lanl.gov if you have questions regarding this information.

Sincerely,



John C. Bretzke
Division Leader
Environmental Protection & Compliance
Los Alamos National Security LLC

Advised for
J. Bretzke
21/5/2017

Sincerely,



Cheryl L. Rodriguez
Program Manager, FPD-II
Environmental Management
Los Alamos Field Office

JCB/CLR/MTS/WJF:am

Enclosures:

- (1) Quarterly Report for Discharge of Treated Water to Regional Aquifer – 2016 Quarter 4, DP-1835
- (2) Treated Effluent Analytical Results Summary Table – 2016 Quarter 4, DP-1835
- (3) Groundwater Elevation Contour Map – 2016 Quarter 4, DP-1835
- (4) Groundwater Monitoring Wells Analytical Results Summary Table – 2016 Quarter 4, DP-1835
- (5) CrIN-4, CrIN-5, IX Treatment Unit CTUA, and Distribution Piping Initial Mechanical Integrity Test Notification
- (6) Groundwater Extraction and Treated Groundwater Injection Summary Tables – 2016 Quarter 4, DP-1835
- (7) Facility Layout Map – 2016 Quarter 4, DP-1835

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Santa Fe, NM 87502

GROUND WATER

FEB 27 2017

BUREAU

**Subject: Quarterly Report – 2016 Quarter 4, Discharge Permit DP-1835,
Class V Underground Injection Control Wells**

Dear Ms. Hunter:

On August 31, 2016, the New Mexico Environment Department (NMED) issued a Discharge Permit (DP) 1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through up to six Class V Underground Injection-Control (UIC) wells. Pursuant to Condition No. 10 of the above-referenced discharge permit, DOE/LANS are required to submit quarterly reports for the previous quarter to document:

1. *Influent and discharge volumes from the treatment systems;*
2. *Quarterly groundwater and treated effluent sampling results; and*
3. *Operations/Maintenance activities.*

Pursuant to Condition Nos. 11, 12, and 13 of the above-referenced permit, the quarterly reports shall also contain general information, performance information, and monitoring data of treated effluent from each ion-exchange (IX) treatment system, respectively. During the 2016 October 1st through December 31st (Quarter 4) reporting period, discharge of treated groundwater to the regional aquifer was initiated under DP-1835. This treated discharge was initiated at two of the UIC wells: CrIN-4 and CrIN-5. The Quarterly Report – 2016 Quarter 4 (Enclosure 1) provides the information required under DP-1835 for this reporting period.

ENCLOSURE 1

**Quarterly Report for Discharge of
Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835**

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

Introduction. On August 31, 2016, the New Mexico Environment Department (NMED) issued Discharge Permit (DP) 1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through up to six Class V underground injection-control (UIC) wells. Pursuant to Condition No. 10 of the above-referenced discharge permit, DOE/LANS are required to submit quarterly reports.

During the 2016 October 1 through December 31 (Quarter 4) reporting period, discharge of treated groundwater to the regional aquifer was initiated under DP-1835. This treated discharge was initiated at two of the UIC wells: CrIN-4 and CrIN-5. Treated discharge originated from extraction well CrEX-1 and was treated with treatment unit (CTU) CTUA.

Condition No. 10 of DP-1835 required DOE/LANS to submit a quarterly report to NMED by March 1 for the October 1 – December 31 discharge period. Several conditions within the permit identify information to be submitted in the quarterly report. The following information, with condition references, are required in the quarterly report:

- 1. Influent and discharge volumes for the ion exchange (IX) treatment systems (Condition No. 10);*
- 2. Quarterly treated effluent sampling results from each IX treatment system (Condition Nos. 10 and 13);*
- 3. Quarterly depth to groundwater and groundwater quality sampling results (Condition Nos. 10 and 14);*
- 4. Any operations/maintenance activities performed (Condition No. 10);*
- 5. Any periodic test of mechanical integrity conducted (Condition No. 11);*
- 6. Any replacement of primary or secondary IX vessels or associated treatment system infrastructures (Condition No. 11);*
- 7. Any well work-overs conducted (Condition No. 11);*
- 8. Any additional operational changes with the potential to markedly affect the discharge (Condition No. 11);*
- 9. Monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each UIC well (Condition No. 12);*
- 10. Totalized monthly volume of treated effluent transferred to each UIC well (Condition No. 12);*
- 11. Monthly average, maximum, and minimum values of injection water level (pressure head above static level for each UIC well (Condition No. 12);*
- 12. Daily volume injected at each UIC well (Condition No. 12);*
- 13. Daily volume pumped from each extraction well (Condition No. 12);*
- 14. Facility layout map (Condition No. 12);*
- 15. Groundwater Elevation Contour Map (Condition No. 15)*

Each of the above requirements is addressed in this report and referenced enclosures.

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

Requirement 1: Influent and discharge volumes for the IX treatment system. Table 1 provides the influent and discharge volumes for ion-exchange (IX) treatment systems during the fourth quarter of 2016 for activities completed under DP-1835. As previously identified, injection only occurred at UIC wells CrIN-4 and CrIN-5 during the quarter. Treated discharge originated from extraction well CrEX-1 and was treated with treatment unit CTUA.

**Table 1. Total Influent and Discharge Volumes
for IX Treatment Systems – 2016 Quarter 4**

Treatment Unit	Influent Volume¹ (gal)	Effluent Volume (gal)	Difference² (%)
CTUA	665,267	732,651	-10
CTUB	N/A	N/A	N/A
CTUC	N/A	N/A	N/A

Notes:

N/A = Treatment unit did not treat any groundwater that was subsequently injected during the quarter.

¹ Values are based on metered CrEX-1 effluent volumes from December 1 and 7 calibration and totalizer volumes beginning December 14.

² Individual flow meter accurate to $\pm 5\%$.

Requirement 2: Quarterly treated effluent sampling results from each IX treatment system. Treated effluent analytical results from samples collected during 2016 Quarter 4 for activities completed under DP-1835 are summarized in Enclosure 2. No results for total chromium, nitrate-nitrogen (NO₃-N), perchlorate, sulfate, total dissolved solids, fluoride, or chloride exceeded 90% of the numeric standards of 20.6.2.3103 New Mexico Administrative Code (NMAC) or 90% of the numeric standards established for tap water in Table A-1 for constituents not listed in 20.6.2.3103 NMAC. These values for chromium, nitrate-nitrogen (NO₃-N), perchlorate, sulfate, total dissolved solids, fluoride, or chloride are 45 µg/L, 9 mg/L, 12.4 µg/L, 540 mg/L, 900 mg/L, 1.44 mg/L, and 225 mg/L, respectively.

Requirement 3: Quarterly depth to groundwater and groundwater quality sampling results. Table 2 provides the quarterly groundwater elevation measurements. Enclosure 3 provides a groundwater elevation contour map and an explanation of how this map was generated.

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

**Table 2. Groundwater Elevations Summary
for Groundwater Monitoring Wells – 2016 Quarter 4**

Monitoring Well	Groundwater Elevation¹ (ft)
CrCH-1	5834.66
CrCH-2 S1	5831.54
CrCH-2 S2	5831.67
CrCH-3	5833.95
CrCH-4	5836.89
CrCH-5	5835.17
R-11	5833.09
R-13	5831.14
R-43 S1	5835.17
R-43 S2	5834.42
R-44 S1	5831.96
R-44 S2	5831.62
R-45 S1	5831.81
R-45 S2	5831.76
R-50 S1	5832.7
R-50 S2	5832.03
R-61 S1	5834.98
R-61 S2	5835.08
R-62	5838.72
SIMR-2 ²	-

Notes

¹Groundwater elevations provided based on
October 19 daily average values from transducers.

²Data has been collected but is unavailable at the time
of this report's preparation in accordance with the
Memorandum of Agreement between Pueblo de
San Ildefonso and DOE/LANS. This data will be
presented in the next quarterly report.

Quarterly groundwater analytical results from samples collected during 2016 Quarter 4 for the monitoring wells listed in Condition No. 14 are summarized in Table 3. Additional summary data related to these samples are provided in Enclosure 4.

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

Table 3. Summary Table of Analytical Results for Groundwater Monitoring Wells
2016 Quarter 4

Location	Sample Date	Analyte						
		Chloride (mg/L)	Perchlorate (µg/L)	Chromium (µg/L)	Fluoride (mg/L)	Nitrate-Nitrite as Nitrogen (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
R-11	11/16/2016	4.36	0.797	16.1	0.31	5.19	10.6	241
R-13	11/7/2016	2.46	0.4	4.17	0.227	0.744	3.43	70.0
R-43 S1	11/14/2016	8.35	0.885	167	0.302	5.19	16.6	170
R-43 S2	11/14/2016	5.73	0.838	14.1	0.278	3.48	8.26	144
R-44 S1	11/7/2016	2.34	0.415	14.1	0.242	1.09	3.22	85.7
R-44 S2	11/7/2016	2.34	0.334	6.8	0.299	0.69	3.33	82.9
R-45 S1	11/17/2016	5.25	0.612	42.3	0.237	2.88	8.17	231
R-45 S2	11/17/2016	4.02	0.446	20	0.303	0.823	4.78	194
R-50 S1	11/18/2016	8.41	0.589	117	0.241	1.79	12.0	181
R-50 S2	11/18/2016	2.09	0.325	4.35	0.282	0.47	2.56	184
R-62	11/16/2016	10.6	0.799	200	0.12	1.41	19.6	220
SIMR-2 ¹	N/A	-	-	-	-	-	-	-

N/A Not Available

¹Data has been collected but is unavailable at the time of this report's preparation in accordance with the Memorandum of Agreement between Pueblo de San Ildefonso and DOE/LANS. This data will be presented in the next quarterly report.

Requirement 4: Any operations/maintenance activities performed. Initial injection of treated groundwater occurred on December 1 at both CrIN-4 and CrIN-5. In accordance with Condition 3, DOE/LANS submitted documentation demonstrating mechanical integrity of the distribution piping and UIC wells for treatment unit CTUA, CrIN-4, and CrIN-5. Enclosure 5 contains the submittal letters for this documentation. Before discharge to CrIN-4 and CrIN-5, DOE/LANS submitted written notification of the initial injection date to NMED in accordance with Condition 4 (Enclosure 5). Before the initial discharge from treatment unit CTUA to CrIN-4 and CrIN-5, DOE/LANS submitted written documentation that the treatment system achieved levels less than 90% of the standards in accordance with Condition 5. Enclosure 5 contains the submittal letter of this documentation.

On December 1, 2016, injection of treated groundwater was completed to ensure the system was operational, collect initial calibration data, and obtain initial performance data. After performance data were reviewed, additional calibration was completed and both calibration and performance data collected on December 7. After reviewing this information, injection recommenced on December 14 at both CrIN-4 and CrIN-5 to allow overall system calibration under the current configuration. Because of (1) the Laboratory closure between December 24, 2016, and January 2, 2017 and (2) treatment system/underground injection system was just coming online, injection stopped on December 21 as a precautionary measure. Injection restarted on January 5.

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

Requirement 5: Any periodic test of mechanical integrity conducted. Periodic testing of mechanical integrity was not conducted during 2016 Quarter 4. As previously indicated, DOE/LANS submitted documentation demonstrating initial mechanical integrity of the distribution piping and UIC wells for treatment unit CTUA, CrIN-4, and CrIN-5. In accordance with Condition No. 3 the next required integrity test of these items will occur within 5 yr of the initial test unless an UIC well is reconfigured. In this scenario, a mechanical integrity test before reinjection of treated effluent at that well will be completed pursuant to Condition No. 3.

Requirement 6: Any replacement of primary or secondary IX vessels or associated treatment system infrastructures. Replacement of primary or secondary IX vessels associated with treatment unit CTUA did not occur during 2016 Quarter 4.

Requirement 7: Any well work-overs conducted. Well work-overs did not occur during 2016 Quarter 4.

Requirement 8: Any additional operational changes with the potential to markedly affect the discharge. As identified under Requirement 3 above, initial injection of treated ground water occurred on December 1 at both CrIN-4 and CrIN-5, with additional injection occurring again on December 7 and between December 14 and December 21. No additional operational changes occurred during the reporting period.

Requirement 9: Monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each UIC well. Table 4 provides the monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each well in December 2016. These data are not provided for October or November because injection of treated groundwater did not occur during these months.

Table 4. Flows and Volumes of Treated Effluent Injected – December 2016

UIC Well	Flow rate (gpm)			Volume (gal)		
	Average	Maximum	Minimum	Average	Maximum	Minimum
CrIN-1 ¹	N/A	N/A	N/A	N/A	N/A	N/A
CrIN-2 ¹	N/A	N/A	N/A	N/A	N/A	N/A
CrIN-3 ¹	N/A	N/A	N/A	N/A	N/A	N/A
CrIN-4 ²	37.7	40.2	33.1	48,952	95,018	5,161
CrIN-5 ²	30.6	33.7	26.2	34,112	63,277	4,460
CrIN-6 ³	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

N/A = Treated groundwater not injected during the month at this location.

¹ UIC well constructed, but connections not completed/approved to begin injection of treated groundwater.

² Values are based on metered CTUA effluent volumes from December 1 and 7 calibration and totalizer volumes beginning December 14.

³ UIC well not constructed at end of quarter.

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

Requirement 10: Totalized monthly volume of treated effluent transferred to each UIC well. Table 5 provides totalized monthly volumes of treated effluent transferred to each well. As previously identified, injection only occurred at UIC wells CrIN-4 and CrIN-5 during the quarter.

Table 5. Totalized Monthly Volumes Injected by Well – 2016 Quarter 4

UIC Well	October (gal.)	November (gal.)	December (gal.)
CrIN-1 ¹	N/A	N/A	N/A
CrIN-2 ¹	N/A	N/A	N/A
CrIN-3 ¹	N/A	N/A	N/A
CrIN-4 ²	N/A	N/A	391,618
CrIN-5 ²	N/A	N/A	272,893
CrIN-6 ³	N/A	N/A	N/A

Notes:

N/A = Treated groundwater not injected during the quarter at this location.

¹ UIC well constructed, but connections not completed/approved to begin injection of treated groundwater.

² Values are based on metered CTUA effluent volumes from December 1 and 7 calibration and totalizer volumes beginning December 14.

³ UIC well not constructed at end of quarter.

Requirement 11: Monthly average, maximum, and minimum values of injection water level (pressure) head above static level for each UIC well. Table 6 provides the monthly average, maximum, and minimum values for injection water level above static level for each UIC well. As previously indicated, injection only occurred at UIC wells CrIN-4 and CrIN-5 during the quarter.

Table 6. Water Level Values Above Static Level by UIC Well – 2016 Quarter 4

UIC Well	October			November			December		
	Average (ft)	Maximum (ft)	Minimum (ft)	Average (ft)	Maximum (ft)	Minimum (ft)	Average (ft)	Maximum (ft)	Minimum (ft)
CrIN-1 ¹	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CrIN-2 ¹	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CrIN-3 ¹	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CrIN-4	N/A	N/A	N/A	N/A	N/A	N/A	0.7	2.6	0.2
CrIN-5	N/A	N/A	N/A	N/A	N/A	N/A	3.3	4.9	2.3
CrIN-6 ²	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

N/A = Treated groundwater not injected during the month at this location.

¹ UIC well constructed, but connections not completed/approved to begin injection of treated groundwater.

² UIC well not constructed at end of quarter.

ENCLOSURE 1
Quarterly Report for Discharge of Treated Water to Regional Aquifer –
2016 Quarter 4, DP-1835

Requirement 12: Daily volume injected at each UIC well. Daily volumes of treated groundwater injected at CrIN-4 and CrIN-5 during 2016 Quarter 4 are provided in Enclosure 6.

Requirement 13: Daily volume pumped from each extraction well. Daily volumes of groundwater pumped from CrEX-1 during Quarter 4, which was subsequently injected at CrIN-4 and CrIN-5, are provided in Enclosure 6. Groundwater pumped from CrEX-1 before December 1, 2016, was treated and land-applied under Discharge Permit DP-1793 Work Plan 3.

Requirement 14: Facility layout map. The facility layout map for 2016 Quarter 4 showing the location and number of each well is provided in Enclosure 7.

Requirement 15: Groundwater Elevation Contour Map. Enclosure 3 provides the groundwater elevation contour map and an explanation of how this map was generated.

ENCLOSURE 2

**Treated Effluent Analytical
Results Summary Table –
2016 Quarter 4, DP-1835**

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017

Table E2-1
Treated Effluent Analytical Results Summary Table - 2016 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CTUA	CTUA-17-128875	12/19/16	Bromide	0.137	mg/L	J	Y	F	EPA:300.0	0.2
CTUA	CTUA-17-128881	12/13/16	Bromide	0.0717	mg/L	J	Y	F	EPA:300.0	0.2
CTUA	CTUA-17-128877	12/07/16	Bromide	0.067	mg/L	U	N	F	EPA:300.0	0.2
CTUA	CTUA-17-128880	12/01/16	Bromide	0.067	mg/L	U	N	F	EPA:300.0	0.2
CTUA	CTUA-17-128875	12/19/16	Chloride	18.3	mg/L		Y	F	EPA:300.0	1
CTUA	CTUA-17-128881	12/13/16	Chloride	52.3	mg/L		Y	F	EPA:300.0	2
CTUA	CTUA-17-128877	12/07/16	Chloride	48.1	mg/L		Y	F	EPA:300.0	2
CTUA	CTUA-17-128880	12/01/16	Chloride	47.5	mg/L		Y	F	EPA:300.0	2
CTUA	CTUA-17-128875	12/19/16	Chromium	3	ug/L	U	N	F	SW-846:6020	10
CTUA	CTUA-17-128881	12/13/16	Chromium	7.32	ug/L	J	Y	F	SW-846:6020	10
CTUA	CTUA-17-128877	12/07/16	Chromium	3	ug/L	U	N	F	SW-846:6020	10
CTUA	CTUA-17-128880	12/01/16	Chromium	3	ug/L	U	N	F	SW-846:6020	10
CTUA	CTUA-17-128875	12/19/16	Fluoride	0.275	mg/L		Y	F	EPA:300.0	0.1
CTUA	CTUA-17-128881	12/13/16	Fluoride	0.257	mg/L		Y	F	EPA:300.0	0.1
CTUA	CTUA-17-128877	12/07/16	Fluoride	0.239	mg/L		Y	F	EPA:300.0	0.1
CTUA	CTUA-17-128880	12/01/16	Fluoride	0.108	mg/L		Y	F	EPA:300.0	0.1
CTUA	CTUA-17-128875	12/19/16	Nitrate-Nitrite as Nitrogen	2.34	mg/L		Y	F	EPA:353.2	0.5
CTUA	CTUA-17-128881	12/13/16	Nitrate-Nitrite as Nitrogen	1.33	mg/L		Y	F	EPA:353.2	0.05
CTUA	CTUA-17-128877	12/07/16	Nitrate-Nitrite as Nitrogen	1.13	mg/L		Y	F	EPA:353.2	0.05
CTUA	CTUA-17-128880	12/01/16	Nitrate-Nitrite as Nitrogen	1.28	mg/L		Y	F	EPA:353.2	0.05
CTUA	CTUA-17-128875	12/19/16	Perchlorate	0.167	ug/L	J	Y	F	SW-846:6850	0.2
CTUA	CTUA-17-128881	12/13/16	Perchlorate	0.167	ug/L	J	Y	F	SW-846:6850	0.2
CTUA	CTUA-17-128877	12/07/16	Perchlorate	0.117	ug/L	J	Y	F	SW-846:6850	0.2
CTUA	CTUA-17-128880	12/01/16	Perchlorate	0.158	ug/L	J	Y	F	SW-846:6850	0.2
CTUA	CTUA-17-128875	12/19/16	Sulfate	11.9	mg/L		Y	F	EPA:300.0	0.4
CTUA	CTUA-17-128881	12/13/16	Sulfate	12.8	mg/L		Y	F	EPA:300.0	0.4
CTUA	CTUA-17-128877	12/07/16	Sulfate	10.5	mg/L		Y	F	EPA:300.0	0.4

Table E2-1
Treated Effluent Analytical Results Summary Table - 2016 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CTUA	CTUA-17-128880	12/01/16	Sulfate	11.7	mg/L		Y	F	EPA:300.0	0.4
CTUA	CTUA-17-128875	12/19/16	Total Dissolved Solids	183	mg/L		Y	F	EPA:160.1	14.3
CTUA	CTUA-17-128881	12/13/16	Total Dissolved Solids	251	mg/L		Y	F	EPA:160.1	14.3
CTUA	CTUA-17-128877	12/07/16	Total Dissolved Solids	219	mg/L		Y	F	EPA:160.1	14.3
CTUA	CTUA-17-128880	12/01/16	Total Dissolved Solids	221	mg/L		Y	F	EPA:160.1	14.3

Notes:

J - in the lab qualifier comment means the analyte is classified as estimated.

U - in the lab qualifier column means analyte is classified as not detected.

N - in the detect flag column means the analyte was undetected.

Y - in the detect flag column means the analyte was detected.

F - filtered.

ENCLOSURE 3

**Groundwater Elevation Contour Map –
2016 Quarter 4, DP-1835**

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017

ENCLOSURE 3

Explanation of groundwater elevation contour map. The regional aquifer beneath Los Alamos National Laboratory (LANL) is a complex hydrogeological system. The top of the aquifer is predominantly under phreatic (water-table) conditions, including in the area of the chromium plume beneath Mortandad Canyon. Groundwater flow directions and fluxes that control contaminant transport in the aquifer are generally dictated by the shape of the regional water table. The general shape of the regional water table beneath Pajarito Plateau is predominantly controlled by the areas of regional recharge to the west (the flanks of Sierra de los Valles and the Pajarito fault zone) and discharge to the east (the Rio Grande and the White Rock Canyon Springs). At more local scales such as the chromium site, the structure of the regional phreatic flow is also expected to be influenced by (1) local infiltration zones (e.g., beneath canyons); (2) heterogeneity and anisotropy in the aquifer properties; and (3) discharge zones (municipal water-supply wells, springs, and extraction wells within the chromium project area).

At the chromium site, the water-table elevations vary in time as a result of transient effects that include (1) extraction-well pumping in the chromium project area from extraction wells, i.e., CrEX-3 (more dominant), and (2) pumping of Los Alamos County's water-supply wells (substantially less dominant). Furthermore, a long-term water decline of about 0.5-1 ft/yr is observed in the regional water levels throughout the aquifer beneath the Pajarito Plateau. The decline might be caused by long-term changes in the aquifer recharge and discharge conditions.

Because of the long-term declines and pumping transients described above, the water-level data and the respective water-table maps are time dependent and representative of specific periods of time. This water-table map uses the average water-level data for November 2016. The averaged water levels are computed for the well screens near the water table in the chromium project area. Well screens deeper in the aquifer ($> \sim 75$ ft) such as R-35a, R-44 Screen 2 and R-45 Screen 2 are not included in the analysis. The actual water levels applied in the contouring process are shown next to each well in Figure E3-1.

The process of water-table contouring is theoretically constrained by conformity rules: (1) the contour lines should be perpendicular to the flowpaths and (2) the length and the width of the flownet cells formed by the contour lines between two adjacent flowpaths should have the same ratios. These rules are theoretically valid only for the case of two-dimensional (lateral) groundwater flow in a uniform, isotropic aquifer with no recharge/discharge sources within flownet cells. Deviations from the conformity rules are caused by three-dimensional flow effects, aquifer heterogeneity and anisotropy as well as groundwater recharge/discharge wells/zones. This water table map, Figure E3-1, is contoured by attempting to satisfy the following goals simultaneously: (1) to match the water-level data at the monitoring wells, (2) to generally preserve flownet conformity, (3) to account for pumping effects, and (4) to account for conceptual models of groundwater flow in the regional aquifer. The contouring is performed using a combination of manual and automated techniques; the automated contouring is done using the Minimum Curvature Surface method.

The water-level data suggests that the water table is quite flat in the area of the chromium plume. The low gradient in this area may be related to: (1) the relatively high permeability of Puye Formation and Miocene pumiceous sediments, (2) anisotropy of the regional aquifer, (3) localized aquifer recharge along the canyons above the regional aquifer, (4) faults or other lineaments that affect regional-scale hydraulic conductivity, and (5) nearby water-supply pumping. In the latter case, the flattening of the gradients may be caused by a local cone of

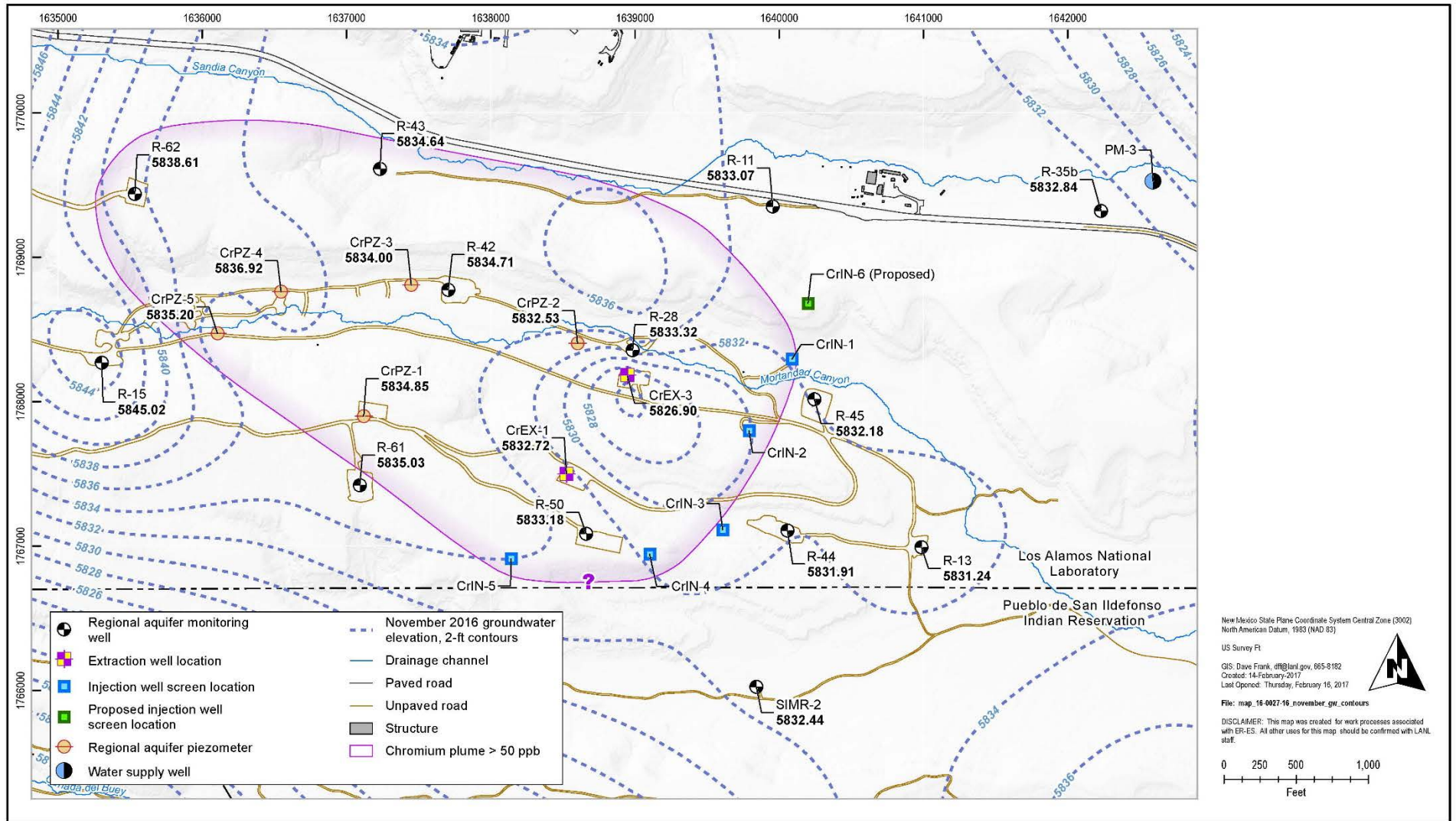
ENCLOSURE 3

depression because of pumping from production wells upgradient from this area (at PM-5 and O-4). However, the transients in the water levels observed at the nearby monitoring wells (e.g., R-28, R-11, R-36, R-35b, R-42, R-43, and R-50) do not appear to be substantially affected by the water-supply pumping at the nearby production wells (PM-3, PM-5, PM-2, PM-4, and O-4) (LANL 2009, 107453).

The shape of the water table appears to show the effect of groundwater extraction at CrEX-3. CrEX-3 was pumped during the first two weeks of November 2016. CrEX-1 was pumped in October 2016, but was not pumping in November. The influence of CrEX-1 pumping is potentially not seen in the November 2016 water table because of the relatively fast water-level recovery after pumping was terminated. The injection wells (CrIN) at the chromium site were not used in the contouring process because reliable water-level data from these wells were not available for November 2016. It is important to note that the water level data from the piezometers is somewhat preliminary and future analyses may affect the interpretation.

ENCLOSURE 3

Figure E3-1. Groundwater Elevation Contour Map – 2016 Quarter 4, DP-1835



ENCLOSURE 4

**Groundwater Monitoring Wells
Analytical Results Summary Table –
2016 Quarter 4, DP-1835**

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017

Table E4-1
Groundwater Monitoring Wells Analytical Results Summary Table - 2016 Quarter 4, DP1835

Sample	Location ID	Sample Date	Parameter Name	Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CASA-17-127290	R-11	11-16-2016	Chloride	4.36	mg/L		Y	Y	EPA:300.0	0.2
CASA-17-127290	R-11	11-16-2016	Perchlorate	0.797	ug/L		Y	Y	SW-846:6850	0.2
CASA-17-127290	R-11	11-16-2016	Chromium	16.1	ug/L		Y	Y	SW-846:6020	10.0
CASA-17-127290	R-11	11-16-2016	Fluoride	0.31	mg/L		Y	Y	EPA:300.0	0.1
CASA-17-127290	R-11	11-16-2016	Nitrate-Nitrite as Nitrogen	5.19	mg/L		Y	Y	EPA:353.2	0.5
CASA-17-127290	R-11	11-16-2016	Sulfate	10.6	mg/L		Y	Y	EPA:300.0	0.4
CASA-17-127290	R-11	11-16-2016	Total Dissolved Solids	241	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127245	R-13	11-07-2016	Chloride	2.46	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127245	R-13	11-07-2016	Perchlorate	0.4	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127245	R-13	11-07-2016	Chromium	4.17	ug/L	J	Y	Y	SW-846:6020	10.0
CAMO-17-127245	R-13	11-07-2016	Fluoride	0.227	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127245	R-13	11-07-2016	Nitrate-Nitrite as Nitrogen	0.744	mg/L		Y	Y	EPA:353.2	0.05
CAMO-17-127245	R-13	11-07-2016	Sulfate	3.43	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127245	R-13	11-07-2016	Total Dissolved Solids	70.0	mg/L		Y	Y	EPA:160.1	14.3
CASA-17-127294	R-43 S1	11-14-2016	Chloride	8.35	mg/L		Y	Y	EPA:300.0	0.2
CASA-17-127294	R-43 S1	11-14-2016	Perchlorate	0.885	ug/L		Y	Y	SW-846:6850	0.2
CASA-17-127294	R-43 S1	11-14-2016	Chromium	167	ug/L		Y	Y	SW-846:6020	10.0
CASA-17-127294	R-43 S1	11-14-2016	Fluoride	0.302	mg/L		Y	Y	EPA:300.0	0.1
CASA-17-127294	R-43 S1	11-14-2016	Nitrate-Nitrite as Nitrogen	5.19	mg/L		Y	Y	EPA:353.2	0.5
CASA-17-127294	R-43 S1	11-14-2016	Sulfate	16.6	mg/L		Y	Y	EPA:300.0	0.4
CASA-17-127294	R-43 S1	11-14-2016	Total Dissolved Solids	170	mg/L		Y	Y	EPA:160.1	14.3
CASA-17-127295	R-43 S2	11-14-2016	Chloride	5.73	mg/L		Y	Y	EPA:300.0	0.2
CASA-17-127295	R-43 S2	11-14-2016	Perchlorate	0.838	ug/L		Y	Y	SW-846:6850	0.2
CASA-17-127295	R-43 S2	11-14-2016	Chromium	14.1	ug/L		Y	Y	SW-846:6020	10.0
CASA-17-127295	R-43 S2	11-14-2016	Fluoride	0.278	mg/L		Y	Y	EPA:300.0	0.1
CASA-17-127295	R-43 S2	11-14-2016	Nitrate-Nitrite as Nitrogen	3.48	mg/L		Y	Y	EPA:353.2	0.25
CASA-17-127295	R-43 S2	11-14-2016	Sulfate	8.26	mg/L		Y	Y	EPA:300.0	0.4

Table E4-1
Groundwater Monitoring Wells Analytical Results Summary Table - 2016 Quarter 4, DP1835

Sample	Location ID	Sample Date	Parameter Name	Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CASA-17-127295	R-43 S2	11-14-2016	Total Dissolved Solids	144	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127252	R-44 S1	11-07-2016	Chloride	2.34	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127252	R-44 S1	11-07-2016	Perchlorate	0.415	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127252	R-44 S1	11-07-2016	Chromium	14.1	ug/L		Y	Y	SW-846:6020	10.0
CAMO-17-127252	R-44 S1	11-07-2016	Fluoride	0.242	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127252	R-44 S1	11-07-2016	Nitrate-Nitrite as Nitrogen	1.09	mg/L		Y	Y	EPA:353.2	0.05
CAMO-17-127252	R-44 S1	11-07-2016	Sulfate	3.22	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127252	R-44 S1	11-07-2016	Total Dissolved Solids	85.7	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127253	R-44 S2	11-07-2016	Chloride	2.34	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127253	R-44 S2	11-07-2016	Perchlorate	0.334	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127253	R-44 S2	11-07-2016	Chromium	6.8	ug/L	J	Y	Y	SW-846:6020	10.0
CAMO-17-127253	R-44 S2	11-07-2016	Fluoride	0.299	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127253	R-44 S2	11-07-2016	Nitrate-Nitrite as Nitrogen	0.69	mg/L		Y	Y	EPA:353.2	0.05
CAMO-17-127253	R-44 S2	11-07-2016	Sulfate	3.33	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127253	R-44 S2	11-07-2016	Total Dissolved Solids	82.9	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127254	R-45 S1	11-17-2016	Chloride	5.25	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127254	R-45 S1	11-17-2016	Perchlorate	0.612	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127254	R-45 S1	11-17-2016	Chromium	42.3	ug/L		Y	Y	SW-846:6020	10.0
CAMO-17-127254	R-45 S1	11-17-2016	Fluoride	0.237	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127254	R-45 S1	11-17-2016	Nitrate-Nitrite as Nitrogen	2.88	mg/L		Y	Y	EPA:353.2	0.5
CAMO-17-127254	R-45 S1	11-17-2016	Sulfate	8.17	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127254	R-45 S1	11-17-2016	Total Dissolved Solids	231	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127255	R-45 S2	11-17-2016	Chloride	4.02	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127255	R-45 S2	11-17-2016	Perchlorate	0.446	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127255	R-45 S2	11-17-2016	Chromium	20	ug/L		Y	Y	SW-846:6020	10.0
CAMO-17-127255	R-45 S2	11-17-2016	Fluoride	0.303	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127255	R-45 S2	11-17-2016	Nitrate-Nitrite as Nitrogen	0.823	mg/L		Y	Y	EPA:353.2	0.05

Table E4-1
Groundwater Monitoring Wells Analytical Results Summary Table - 2016 Quarter 4, DP1835

Sample	Location ID	Sample Date	Parameter Name	Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-17-127255	R-45 S2	11-17-2016	Sulfate	4.78	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127255	R-45 S2	11-17-2016	Total Dissolved Solids	194	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127257	R-50 S1	11-18-2016	Chloride	8.41	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127257	R-50 S1	11-18-2016	Perchlorate	0.589	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127257	R-50 S1	11-18-2016	Chromium	117	ug/L		Y	Y	SW-846:6020	10.0
CAMO-17-127257	R-50 S1	11-18-2016	Fluoride	0.241	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127257	R-50 S1	11-18-2016	Nitrate-Nitrite as Nitrogen	1.79	mg/L		Y	Y	EPA:353.2	0.25
CAMO-17-127257	R-50 S1	11-18-2016	Sulfate	12.0	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127257	R-50 S1	11-18-2016	Total Dissolved Solids	181	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127258	R-50 S2	11-18-2016	Chloride	2.09	mg/L		Y	Y	EPA:300.0	0.2
CAMO-17-127258	R-50 S2	11-18-2016	Perchlorate	0.325	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127258	R-50 S2	11-18-2016	Chromium	4.35	ug/L	J	Y	Y	SW-846:6020	10.0
CAMO-17-127258	R-50 S2	11-18-2016	Fluoride	0.282	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127258	R-50 S2	11-18-2016	Nitrate-Nitrite as Nitrogen	0.47	mg/L		Y	Y	EPA:353.2	0.05
CAMO-17-127258	R-50 S2	11-18-2016	Sulfate	2.56	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127258	R-50 S2	11-18-2016	Total Dissolved Solids	184	mg/L		Y	Y	EPA:160.1	14.3
CAMO-17-127260	R-62	11-16-2016	Chloride	10.6	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127260	R-62	11-16-2016	Perchlorate	0.799	ug/L		Y	Y	SW-846:6850	0.2
CAMO-17-127260	R-62	11-16-2016	Chromium	200	ug/L		Y	Y	SW-846:6020	10.0
CAMO-17-127260	R-62	11-16-2016	Fluoride	0.12	mg/L		Y	Y	EPA:300.0	0.1
CAMO-17-127260	R-62	11-16-2016	Nitrate-Nitrite as Nitrogen	1.41	mg/L		Y	Y	EPA:353.2	0.25
CAMO-17-127260	R-62	11-16-2016	Sulfate	19.6	mg/L		Y	Y	EPA:300.0	0.4
CAMO-17-127260	R-62	11-16-2016	Total Dissolved Solids	220	mg/L		Y	Y	EPA:160.1	14.3
-	SIMR-2 ¹	-	Perchlorate	-	-	-	-	-	-	-
-	SIMR-2 ¹	-	Chromium	-	-	-	-	-	-	-
-	SIMR-2 ¹	-	Fluoride	-	-	-	-	-	-	-
-	SIMR-2 ¹	-	Nitrate-Nitrite as Nitrogen	-	-	-	-	-	-	-

Table E4-1
Groundwater Monitoring Wells Analytical Results Summary Table - 2016 Quarter 4, DP1835

Sample	Location ID	Sample Date	Parameter Name	Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
-	SIMR-2 ¹	-	Sulfate	-	-	-	-	-	-	-
-	SIMR-2 ¹	-	Total Dissolved Solids	-	-	-	-	-	-	-

Notes:

¹ Data has been collected but is unavailable at the time of this report's preparation in accordance with the Memorandum of Agreement between Pueblo de San Ildefonso and DOE/LANS. This data will be presented in the next quarterly report.

J - in the lab qualifier comment means the analyte is classified as estimated.

Y - in the detect flag column means the analyte was detected.

Y - in the filtered column means the sample was filtered.

ENCLOSURE 5

**CrIN-4, CrIN-5, IX Treatment Unit CTUA, and
Distribution Piping Initial Mechanical
Integrity Test Notification**

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017



***Environmental Protection & Compliance Division
Environmental Compliance Programs (EPC-CP)***
PO Box 1663, K490
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***Environmental Management
Los Alamos Field Office, A316***
3747 West Jemez Road
Los Alamos, New Mexico, 87544
(505) 665-5820/Fax (505) 606-2132

Date: **NOV 10 2016**
Symbol: EPC-DO-16-341
LA-UR: 16-28427
Locates Action No.: U1601822

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Ms. Hunter:

SUBJECT: Mechanical Integrity Testing of Injection Wells CrIN-4 and CrIN-5, Discharge Permit DP-1835, Class V Underground Injection Control Wells

In accordance with Condition No. 3 of Discharge Permit DP-1835, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) are submitting mechanical integrity test methods for review and approval by the New Mexico Environment Department for the Chromium Pipeline and Infrastructure Project. The methods for ensuring injection well integrity are described below. Supporting information is provided in Enclosures 1 and 2.

1. **Well-Casing Construction.** Critical to well casing integrity is the quality of the welded joints. The integrity of welded joints is demonstrated through compliance with Los Alamos National Laboratory (LANL) Welding Standards. Welders must be certified by performance qualification testing at the LANL test facility. Ten percent of all welded joints are inspected by a qualified LANL Welding Inspector during well-casing construction.

Ms. Michelle Hunter
EPC-DO-16-341

- 2 -

2. **Video Logging.** Downhole video logging was conducted at all existing injection wells (CrIN-1 through CrIN-5). The principal reasons for video logging new wells are to (1) ensure the physical integrity and placement of casings and screens and (2) establish a baseline for future evaluations. The video logs are collected following well development and aquifer testing. Generally, they are a final check of the physical construction of the well. The condition and set depths of the well casing and screen are inspected. Also available from these videos are static water level, water clarity, condition of the filter pack behind the screen, casing joint condition, and any unusual condition in the sump space. Additional video logging may be performed if an injection/pumping system is removed from the well. The original video log will be used as a comparison to evaluate conditions that may affect water well performance, such as mineral encrustation or biofouling within the well screen interval.

Enclosure 1 contains video logs (on CD) of injections wells CrIN-4 and CrIN-5. Video logs of additional injections wells will be provided as the wells are completed.

3. **Column Pipe.** The column pipe for the injection wells is a spline-lock coupling design manufactured by Johnson Screens. Each coupled union (20-ft pipe joints) is a mating pin-and-box with two inner o-rings and two stainless-steel wire-rope splines. The column pipe is tested for leaks during installation because it relies on the precise installation of the o-rings for sealing. Testing of the column pipe is a hydrostatic test that is also, by default, an additional pressure test of the Baski flow-control valve (FCV) and check valve between the FCV and pump shroud. The FCV in the injection well is open (full flow) at zero pressure. To test the column pipe, the FCV must be pressurized to a shut-in condition (zero flow). The column pipe in each injection well is tested three times as the downhole assembly is installed: once early in the process, a second time approximately at the half way point, and a third time when the assembly is fully installed. The FCV is pressurized and the column pipe is filled with potable water. Upon filling to the top, the water level in the column pipe is observed to see if it remains static or if it falls. A falling water level would indicate a leaky o-ring.

Tables 1 and 2 below provide the results from three hydrostatic tests of the column pipes at injection wells CrIN-4 and CrIN-5. All tests at both locations passed indicating that that all joints are leak-free.

4. **FCV Installation and Testing.** Critical to the performance and operational integrity of an injection well is the FCV. The FCV regulates recharge injection flow into the well and provides controlled, noncavitating head loss from the column pipe. Because of the design of the FCV, injected water will enter the wells under significantly reduced pressure and velocity. The FCV is pneumatically adjustable, which will allow flexibility in optimizing flows for particular injection wells. The injection wells may require pumping periodically to prevent and/or remedy well-screen plugging. A submersible pump is installed inside a pump shroud beneath the FCV. A check valve is installed between the FCV and pump to allow pumping with a single column pipe when the FCV is shut-in (closed).

Enclosure 2 provides a copy of the Baski Installation Procedures for the Downhole Flow Control Valve.

Ms. Michelle Hunter
EPC-DO-16-341

- 3 -

Pressure testing of the FCVs at injection wells CrIN-4 and CrIN-5 was conducted per the manufacturer's installation guidance. Testing is conducted to confirm the connections at the control line to FCV fittings and the FCV liquid inflation chamber and inflatable element. (The FCVs are new equipment and are thoroughly tested by the manufacturer before shipping.) This pressure test is conducted at approximately 400 pounds per square inch (psi) for a minimum of 30 minutes.

Tables 1 and 2 below provide the results from testing the FCV at injection wells CrIN-4 and CrIN-5. Test results from additional injection wells will be provided to NMED as the wells are completed.

Table 1. Results from Column Pipe and FCV Testing at Injection Well CrIN-4

Location	Test	Date	Pressure	Duration	Result
CrIN-4	FCV: initial pressure	10/12/16	430 psi	50 min.	Pass
	Column pipe: hydrostatic #1, 20 ft of pipe above FCV	10/13/16	230 psi	15 min.	Pass
	Column pipe: hydrostatic #2, 500.6 ft of pipe above FCV	10/13/16	230 psi	55 min.	Pass
	Column pipe: hydrostatic #2, 1126.6 ft of pipe above FCV	10/15/16	482 psi	60 min.	Pass

Table 2. Results from Column Pipe and FCV Testing at Injection Well CrIN-5.

Location	Test	Date	Pressure	Duration	Result
CrIN-5	FCV: initial pressure	10/16/16	394 psi	57 min.	Pass
	Column pipe: hydrostatic #1, 20 ft of pipe above FCV	10/16/16	200 psi	59 min.	Pass
	Column pipe: hydrostatic #2, 640.6 ft of pipe above FCV	10/17/16	300 psi	16 min.	Pass
	Column pipe: hydrostatic #2, 1219.5 ft of pipe above FCV	10/19/16	520 psi	30 min.	Pass

Ms. Michelle Hunter
EPC-DO-16-341

- 4 -

Please contact Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding the mechanical integrity test methods presented above.

Sincerely,



John C. Bretzke
Division Leader
Environmental Protection & Compliance Division
Los Alamos National Security LLC

Sincerely,



Cheryl L. Rodriguez
Program Manager, FPD-II
Environmental Management
Los Alamos Field Office

JCB:CLR:MTS:RSB/lm

Enclosures:

- (1) Video logs (CD) from injection wells CrIN-4 and CrIN-5
- (2) Baski Installation Procedures, Downhole Flow Control Valve

Cy: Shelly Lemon, NMED/SWQB, Santa Fe, NM, (E-File)
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Randall Mark Erickson, ADEM, (E-File)
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Stephani F. Swickley, ADEM-PO, (E-File)
Danny Katzman, ADEM-PO, (E-File)
Gerald F. Fordham, ER-ES, (E-File)
Michael T. Saladen, EPC-CP, (E-File)

Ms. Michelle Hunter
EPC-DO-16-341

- 5 -

Cy (continued):

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Date: **NOV 10 2016**
Symbol: EPC-DO-16-341
LA-UR: 16-28427
Locates Action No.: U1601822

GROUND WATER

NOV 10 2016

BUREAU

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Ms. Hunter:

SUBJECT: Mechanical Integrity Testing of Injection Wells CrIN-4 and CrIN-5, Discharge Permit DP-1835, Class V Underground Injection Control Wells

In accordance with Condition No. 3 of Discharge Permit DP-1835, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) are submitting mechanical integrity test methods for review and approval by the New Mexico Environment Department for the Chromium Pipeline and Infrastructure Project. The methods for ensuring injection well integrity are described below. Supporting information is provided in Enclosures 1 and 2.

1. **Well-Casing Construction.** Critical to well casing integrity is the quality of the welded joints. The integrity of welded joints is demonstrated through compliance with Los Alamos National Laboratory (LANL) Welding Standards. Welders must be certified by performance qualification testing at the LANL test facility. Ten percent of all welded joints are inspected by a qualified LANL Welding Inspector during well-casing construction.



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Date: NOV 15 2016
Symbol: EPC-DO-16-345
LA-UR: 16-28489
Locates Action No.: U1602175

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Ms. Hunter:

Subject: Results from Integrity Testing of Distribution Piping from CrEX-1 to CrIN-4 and CrIN-5, Discharge Permit DP-1835, Class V Underground Injection Control Wells

In accordance with Condition No. 3 of Discharge Permit DP-1835, on October 14, 2016, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) submitted a mechanical integrity test method for review and approval by the New Mexico Environment Department (NMED) for the Chromium Pipeline and Infrastructure Project. NMED approved the test method on October 17, 2016 (Enclosure 1). The above-referenced approval letter from NMED contains the following requirement:

- *NMED understands that the procedures described in the workplan are scheduled to be completed in series as segments of piping are installed and UIC wells are completed, and that the Permittees will submit the results of the mechanical integrity testing for each segment within 60 days of each test completion and prior to bringing the segments online.*

Ms. Michelle Hunter
EPC-DO-16-345

- 2 -

DOE/LANS has completed integrity testing of the first segment of distribution piping for the Chromium Pipeline and Infrastructure Project: the 6-in. and 4-in., single-wall, high-density polyethylene (HDPE) pipelines connecting extraction well CrEX-1 with injection wells CrIN-4 and CrIN-5. Enclosure 2 contains inspection reports from the hydrostatic testing of 1665 ft. of 6-in DR-11 HDPE pipe and 150 ft. of 4-in DR-11 HDPE pipe. All test results demonstrated satisfactory pipe integrity per the specified test method.

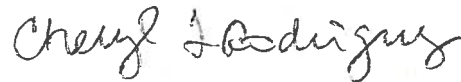
Please contact Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding the enclosed test results.

Sincerely,



John C. Bretzke
Division Leader
Environmental Protection & Compliance Division
Los Alamos National Security LLC

Sincerely,



Cheryl L. Rodriguez
Program Manager, FPD-II
Environmental Management
Los Alamos Field Office

JCB:CLR:MTS:RSB/lm

Enclosures:

- (1) October 17, 2016, approval letter from NMED to DOE/LANS regarding integrity testing of distribution piping, DP-1835
- (2) Results from integrity testing of distribution piping from CrEX-1 to CrIN-4 and CrIN-5

Cy: Shelly Lemon, NMED/SWQB, Santa Fe, NM, (E-File)
John E. Kielsing, NMED/HWB, Santa Fe, NM, (E-File)
Stephen M. Yanicak, NMED/DOE/OB, (E-File)
Douglas E. Hintze, EM-LA, (E-File)
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Ms. Michelle Hunter
EPC-DO-16-345

- 3 -

Cy (continued):

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Date: NOV 15 2016
Symbol: EPC-DO-16-345
LA-UR: 16-28489
Locates Action No.: U1602175

GROUND WATER

NOV 15 2016

BUREAU

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Ms. Hunter:

Subject: Results from Integrity Testing of Distribution Piping from CrEX-1 to CrIN-4 and CrIN-5, Discharge Permit DP-1835, Class V Underground Injection Control Wells

In accordance with Condition No. 3 of Discharge Permit DP-1835, on October 14, 2016, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) submitted a mechanical integrity test method for review and approval by the New Mexico Environment Department (NMED) for the Chromium Pipeline and Infrastructure Project. NMED approved the test method on October 17, 2016 (Enclosure 1). The above-referenced approval letter from NMED contains the following requirement:

- *NMED understands that the procedures described in the workplan are scheduled to be completed in series as segments of piping are installed and UIC wells are completed, and that the Permittees will submit the results of the mechanical integrity testing for each segment within 60 days of each test completion and prior to bringing the segments online.*





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Date: **NOV 03 2016**
Symbol: **EPC-DO-16-334**
LA-UR: **16-28206**
Locates Action No.: **U1601822**

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Ms. Hunter:

**Subject: Notification of Commencement of Injection, Discharge Permit DP-1835,
Class V Underground Injection Control Wells**

In accordance with Condition No. 4 of Discharge Permit DP-1835, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) are providing notification to the New Mexico Environment Department (NMED) that the discharge of treated groundwater to injection wells CrIN-4 and CrIN-5 will commence on or about November 28, 2016. DOE/LANS will follow with an email notification to NMED 24-hrs before system startup.

Please contact Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding this notification.

Sincerely,

John C. Bretzke
Division Leader
Environmental Protection & Compliance Division
Los Alamos National Security LLC

Sincerely,

Douglas E. Hintze
Manager, Environmental Management
Los Alamos Field Office

Ms. Michelle Hunter
EPC-DO-16-334

- 2 -

JCB:DEH:MTS:RSB/lm

Cy: Shelly Lemon, NMED/SWQB, Santa Fe, NM, (E-File)
John E. Kieling, NMED/HWB, Santa Fe, NM, (E-File)
Stephen M. Yanicak, NMED/DOE/OB, (E-File)
Douglas E. Hintze, EM-LA, (E-File)
David S. Rhodes, EM-WM, (E-File)
Cheryl L. Rodriguez, EM-LA, (E-File)
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Date: NOV 03 2016
Symbol: EPC-DO-16-334
LA-UR: 16-28206
Locates Action No.: U1601822

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
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Harold Runnels Building, Room N2261
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Santa Fe, NM 87502

GROUND WATER

NOV 3 2016

BUREAU

Dear Ms. Hunter:

**Subject: Notification of Commencement of Injection, Discharge Permit DP-1835,
Class V Underground Injection Control Wells**

In accordance with Condition No. 4 of Discharge Permit DP-1835, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) are providing notification to the New Mexico Environment Department (NMED) that the discharge of treated groundwater to injection wells CrIN-4 and CrIN-5 will commence on or about November 28, 2016. DOE/LANS will follow with an email notification to NMED 24-hrs before system startup.

Please contact Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding this notification.

Sincerely,

John C. Bretzke
Division Leader
Environmental Protection & Compliance Division
Los Alamos National Security LLC

Sincerely,

Douglas E. Hintze
Manager, Environmental Management
Los Alamos Field Office

From: Foley, William Joseph
To: [Huey, Greg](#); [Huddleson, Steven](#)
Cc: [Dale, Michael](#); [Dhawan, Neelam](#); [Rhodes, David](#); [Rodriguez, Cheryl L](#); [Swickley, Stephani Fuller](#); [Katzman, Danny](#); [Saladen, Michael Thomas](#); [Beers, Bob](#)
Subject: DP-1835: 24-hr notification to NMED prior to commencing injection
Date: Tuesday, November 29, 2016 1:45:00 PM

Dear Mr. Huddleson and Mr. Huey,

The U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) will begin discharging into injection wells CrIN-4 and CrIN-5 on or after December 1, 2016 under Discharge Permit DP-1835. In accordance, with our November 3, 2016 correspondence (EPC-DO-16-334) we are providing NMED with email notification 24 hrs prior to commencing discharge. This notification is for injection of treated groundwater from extraction well CrEX-1 into injection wells CrIN-4 and CrIN-5.

Please do not hesitate to contact me if you have questions regarding this notification.

Sincerely,

William Foley
Los Alamos National Security, LLC
505-665-8423



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Date: NOV 10 2016
Symbol: EPC-DO-16-336
LA-UR: 16-28325
Locates Action No.: U1601822

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2261
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Ms. Hunter:

**Subject: Documentation of Treatment Efficiency, Discharge Permit DP-1835, Class V
Underground Injection Control Wells**

In August 2016, the New Mexico Environment Department (NMED) issued Discharge Permit DP-1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through up to six Class V Underground Injection Control (UIC) wells. Condition No. 5 of the above-referenced permit contains the following requirement:

- *Prior to the initial discharge of treated effluent from an IX treatment system to the injection wells, and before injecting treated effluent following any major modification or repair of an IX treatment system that could adversely impact effluent quality, the permittees shall submit documentation that the IX systems achieve standards less than (<) 90% of the numeric standards of 20.6.2.3103 NMAC and <90% of the numeric standards established for tap water in Table A-1 for constituents not listed in 20.6.2.3103 NMAC.*

Beginning in June 2016, DOE/LANS treated groundwater from extraction wells CrEX-1 and CrEX-3 by ion exchange (IX) prior to discharge (by land application) under Discharge Permit DP-1793, Work Plan #3.

Ms. Michelle Hunter
EPC-DO-16-336

- 2 -

Effluent (treated water) quality data collected after the second IX vessel for three contaminants of concern—chromium (Cr), nitrate+nitrite-as nitrogen ($\text{NO}_3+\text{NO}_2\text{-N}$), and perchlorate (ClO_4)—provide documentation that the IX treatment proposed under Discharge Permit DP-1835 is capable of achieving compliance with the permit's numeric limits.

Enclosure 1 contains influent quality data from CrEX-1 and CrEX-3 for Cr, nitrate-as nitrogen ($\text{NO}_3\text{-N}$), and ClO_4 during 2016. Enclosure 2 contains effluent quality data for Cr, $\text{NO}_3+\text{NO}_2\text{-N}$, and ClO_4 from all IX treatment units in operation in 2016. Table 1 provides a statistical summary of the data contained in Enclosures 1 and 2. In addition, Table 1 provides the average treatment efficiency for removal of the three contaminants of concern. These data show that effluent concentrations for Cr, $\text{NO}_3+\text{NO}_2\text{-N}$, and ClO_4 are conservatively below the applicable 90% standards of 45 $\mu\text{g/L}$, 9 mg/L, and 12.4 $\mu\text{g/L}$, respectively.

Table 1. 2016 Average and Maximum Influent and Effluent Concentrations, and Treatment Efficiency.

Contaminant	Average Influent Concentration ¹	Maximum Influent Concentration	Average Effluent Concentration ²	Maximum Effluent Concentration	Average Treatment Efficiency	90% of Numeric Standards ³
Cr	167 $\mu\text{g/L}$	202 $\mu\text{g/L}$	3.3 $\mu\text{g/L}$	10.6 $\mu\text{g/L}$	98%	45 $\mu\text{g/L}$
$\text{NO}_3+\text{NO}_2\text{-N}$	3.5 mg/L ⁴	5.4 mg/L ⁴	2.9 mg/L	6.4 mg/L	17%	9 mg/L
ClO_4	0.75 $\mu\text{g/L}$	0.95 $\mu\text{g/L}$	0.14 $\mu\text{g/L}$	0.85 $\mu\text{g/L}$	81%	12.4 $\mu\text{g/L}$

Notes:

¹Untreated groundwater from extraction wells CrEX-1 and CrEX-3

²Following treatment by second IX vessel

³90% of the numeric standards of 20.6.2.3103 NMAC and <90% of the numeric standards established for tap water in Table A-1 for constituents not listed in 20.6.2.3103 NMAC.

⁴ $\text{NO}_3\text{-N}$

Please contact Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding this information.

Sincerely,



John C. Bretzke
Division Leader
Environmental Protection & Compliance Division
Los Alamos National Security LLC

Sincerely,



Cheryl L. Rodriguez
Program Manager, FPD-II
Environmental Management
Los Alamos Field Office

JCB:CLR:MTS:RSB/lm

Enclosures:

- (1) Influent quality data from CrEX-1 and CrEX-3 for Cr, $\text{NO}_3\text{-N}$, and ClO_4 , 2016
- (2) Effluent quality data for Cr, $\text{NO}_3+\text{NO}_2\text{-N}$, and ClO_4 from IX treatment units

Ms. Michelle Hunter
EPC-DO-16-336

- 3 -

Cy: Shelly Lemon, NMED/SWQB, Santa Fe, NM, (E-File)
John E. Kieling, NMED/HWB, Santa Fe, NM, (E-File)
Stephen M. Yanicak, NMED/DOE/OB, (E-File)
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Symbol: EPC-DO-16-336
LA-UR: 16-28325
Locates Action No.: U1601822

Ms. Michelle Hunter, Chief
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New Mexico Environment Department
Harold Runnels Building, Room N2261
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Santa Fe, NM 87502

GROUND WATER

NOV 10 2016

BUREAU

Dear Ms. Hunter:

**Subject: Documentation of Treatment Efficiency, Discharge Permit DP-1835, Class V
Underground Injection Control Wells**

In August 2016, the New Mexico Environment Department (NMED) issued Discharge Permit DP-1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through up to six Class V Underground Injection Control (UIC) wells. Condition No. 5 of the above-referenced permit contains the following requirement:

- Prior to the initial discharge of treated effluent from an IX treatment system to the injection wells, and before injecting treated effluent following any major modification or repair of an IX treatment system that could adversely impact effluent quality, the permittees shall submit documentation that the IX systems achieve standards less than (<) 90% of the numeric standards of 20.6.2.3103 NMAC and <90% of the numeric standards established for tap water in Table A-1 for constituents not listed in 20.6.2.3103 NMAC.*

Beginning in June 2016, DOE/LANS treated groundwater from extraction wells CrEX-1 and CrEX-3 by ion exchange (IX) prior to discharge (by land application) under Discharge Permit DP-1793, Work Plan #3.

ENCLOSURE 6

**Groundwater Extraction and Treated Groundwater
Injection Summary Tables –
2016 Quarter 4, DP-1835**

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017

Table E6-1
Summary of Daily Extraction,
2016 Quarter 4, DP-1835

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)
12/1/2016	38,794	N/A	N/A
12/7/2016	9,233	N/A	N/A
12/14/2016	14,708	N/A	N/A
12/15/2016	83,600	N/A	N/A
12/16/2016	69,182	N/A	N/A
12/17/2016	108,236	N/A	N/A
12/18/2016	158,164	N/A	N/A
12/19/2016	17,305	N/A	N/A
12/20/2016	85,211	N/A	N/A
12/21/2016	80,834	N/A	N/A

Notes:

N/A = If groundwater was extracted on this day
from this location, it was not treated and
injected through the UIC wells.

Table E6-2
Summary of Daily Injection,
2016 Quarter 4, DP-1835

Date	CrIN-1 ¹ (gal.)	CrIN-2 ¹ (gal.)	CrIN-3 ¹ (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	CrIN-6 ¹ (gal.)
12/1/2016 ²	0	0	0	19,397	19,397	0
12/7/2016 ²	0	0	0	4,617	4,617	0
12/14/2016	0	0	0	5,161	4,460	0
12/15/2016	0	0	0	39,807	40,167	0
12/16/2016	0	0	0	41,770	32,719	0
12/17/2016	0	0	0	56,912	51,489	0
12/18/2016	0	0	0	53,860	63,277	0
12/19/2016	0	0	0	50,656	7,449	0
12/20/2016	0	0	0	48,434	36,158	0
12/21/2016	0	0	0	95,018	37,174	0

Notes:

¹ Treated groundwater not injected into UIC well during the reporting period.

² Volumes obtained from CTUA effluent value and equally proportioned between CrIN-4 and CrIN-5. Initial injection/calibration occurred on this day.

ENCLOSURE 7

Facility Layout Map –
2016 Quarter 4, DP-1835

EPC-DO: 17-066

LA-UR-17-20603

U1601822

Date: FEB 27 2017

