

APPROVED

By Olivia Yu at 7:38 am, May 07, 2018

NMOCD agrees that delineation is completed for 1RP-4723. See email communication regarding proposed remediation plan.

1RP-4723
REMEDIATION PLAN
East Caprock SWD Well #5
Produced Water Spill
Lea County, New Mexico

Latitude: N33° 16' 59.80"
Longitude: W103° 41' 13.20"

LAI Project No. 17-0158-01

January 31, 2018

Prepared for:

Pogo Resources, LLC
4809 Cole Avenue, Suite 108
Dallas, Texas 75025

Prepared by:

Larson & Associates, Inc.
507 North Marienfeld Street, Suite 205
Midland, Texas 79701



Mark J. Larson, P.G.
Certified Professional Geologist #10490

This Page Intentionally Left Blank

Table of Contents

1.0	INTRODUCTION	1
1.1	Background	1
1.2	Physical Setting	1
1.3	Remediation Action Levels.....	2
2.0	SPILL DELINEATION	2
3.0	REMEDIATION PLAN.....	3
4.0	CONCLUSION.....	3

Figures

Figure 1	Topographic Map
Figure 2	Aerial Map
Figure 3	Site Map Showing Soil Borings
Figure 4	Proposed Soil Excavation Area

Tables

Table 1	Soil Sample Analytical Data Summary
---------	-------------------------------------

Appendices

Appendix A	OCD Correspondence
Appendix B	Laboratory Reports
Appendix C	Boring Logs
Appendix D	Photographs
Appendix E	Initial C-141

1.0 INTRODUCTION

Larson & Associates, Inc. (LAI) submits this final delineation report and remediation plan to the New Mexico Oil Conservation Division (OCD) District 1 on behalf of Pogo Resources, LLC (Pogo). The final delineation report and remediation plan supersedes delineation reports and remediation plans submitted to OCD on July 21, 2017 and August 30, 2017. The final delineation report and remediation plan is for a produced water spill (1RP-4723) that occurred at the East Caprock SWD Well #5 (Site) on June 11, 2017. The legal description is Unit B (NW/4, NE/4), Section 14, Township 12 South, Range 32 East in Lea County, New Mexico. The geodetic position is north 33° 16' 59.80" and west 103° 41' 13.20". Figure 1 presents a location and topographic map. Figure 2 presents an aerial map.

1.1 Background

On June 11, 2017, Paladin (former operator of the Site) discovered the release, which was due to a poly injection line that parted at a valve located near the SWD well. The spill breached the berm near the southwest corner of the location, allowing produced water to flow east into the pasture approximately 950 feet. Approximately 1,700 bbl of produced water was released with approximately 1,020 bbl recovered. Paladin personnel discovered the release on June 12, 2017. Verbal notification was provided to the OCD District 1, on June 13, 2017. The initial C-141 was submitted to the OCD District 1 and approved on June 15, 2017. The release was assigned remediation permit number 1RP-4723 with conditions. Appendix A presents the initial C-141.

The spill occurred in an unlined area near the well. The spill covered the well location measuring about 33,928 square feet and flowed east into the pasture covering an area approximately 90,000 square feet for a total of approximately 122,928 square feet or about 2.82 acres. The injection pump was shut in and water was recovered to allow repairs to the injection line. Soil was pushed up to repair the berm near the southwest corner to contain fluid to the location. Paladin contracted a vacuum truck to recover standing fluid on the well location and return it to tanks.

On June 21, 2017, LAI on behalf of Paladin, submitted a plan to the OCD for delineating the spill. Spill delineation was performed on June 28, 2017, July 7, 2017 and January 3, 2018. Appendix B presents OCD communications.

On August 18, 2017, Pogo took over ownership of the assets of Paladin and assumed responsibility for the spill.

1.2 Physical Setting

The physical setting is as follows:

- Elevation is approximately 4,356 feet above mean sea level (MSL);
- Topography slopes gently toward the east;
- The nearest surface water feature is a playa located about 1,650 feet east of the Site;

- The soils are designated as “Kimbrough Gravelly Loam” and “Kimbrough-Lea complex”, consisting of calcareous alluvium derived from reworking the Blackwater Draw (Pleistocene) and Ogallala (Pliocene) formations, in descending order;
- The soil developed over cemented material (caliche);
- The upper geological unit is the Tertiary-age Blackwater Draw and Ogallala formations, in descending order, comprised of very fine to medium-grained quartz sand and gravel, with minor amount of silt and clay with indistinct to massive crossbeds;
- The Ogallala formation is underlain by clay, silty clay, shale and sandstone of the Chinle formation (Triassic) and is about 300 feet thick;
- The Chinle formation occurs between about 17 and 21 feet below ground surface (bgs)
- The nearest freshwater well is located in Unit E (SW/4, NW/4), Section 13, Township 12 Suth, Range 32 East, about 2,500 feet east – southeast (down gradient) of the Site);
- The well is used for livestock watering and has a reported depth to groundwater of approximately 30 feet below ground surface (bgs);
- Groundwater was not observed in borings drilled into the Ogallala formation or into the Dockum group (shale) at approximately 50 feet bgs in boring SB-11 and about 20 feet bgs.

1.3 Remediation Action Levels

Remediation action levels (RRAL) were calculated for benzene, BTEX and TPH based on the following criteria established by the OCD in “*Guidelines for Remediation of Leaks, Spills and Releases*, pp. 6-7, August 13, 1993”:

Criteria	Result	Score
Depth-to-Groundwater	>50 Feet	0
Wellhead Protection Area	NO	0
Distance to Surface Water Body	>1000 Horizontal Feet	0

The following RRAL apply to the release for ranking score: 0

- Benzene 10 mg/Kg
- BTEX 50 mg/Kg
- TPH 1,000 mg/Kg

Groundwater was not observed above the Dockum Group (shale) encountered in borings drilled to approximately 50 feet bgs therefore the delineation limit for chloride where groundwater exceeds 50 and 100 feet is 600 mg/Kg plus five (5) feet farther in depth.

2.0 ADDITIONAL SPILL DELINEATION

The results of the initial delineation were submitted to the OCD District 1 on July 21, 2017. An amended delineation report was submitted on August 30, 2017 (*Amended Delineation Report, East Caprock SWD*

#5). On October 31, 2017, OCD responded to the amended delineation report and requested additional vertical delineation for chloride at locations S-1 (SB-1), S-6(SB-2/SB-12), S-10 (SB-5/SB-13) and SB-10. Appendix B presents OCD communications.

On January 3, 2018, LAI personnel supervised air rotary drilling borings at locations (S-1 (SB-1), S-6(SB-2/SB-12), S-10(SB-5/SB-13) and SB-10. The air rotary borings were drilled by Scarborough Drilling, Inc., Lamesa Texas, to a depth of 50 feet bgs, with samples collected every 5 feet beginning at 30 feet bgs. Additional samples were collected at SB-14, located approximately 200 feet west (up gradient) of SB-10 to assess the background concentrations of chloride. The samples were collected every 5 feet, beginning at surface and terminating at 50 feet bgs. The samples were delivered under preservation and chain of custody to Permian Basin Environmental Lab (PBEL), in Midland Texas. The soil samples were analyzed for chloride by EPA Method 300.

Chloride decreased below 600 mg/Kg in all borings with at least 5 additional feet of samples with chloride below 600 mg/Kg. Chloride in the background boring (SB-14) was 859 mg/Kg at 45 feet bgs and decreased to 106 mg/Kg at 50 feet bgs.

3.0 REMEDIATION PLAN

Pogo requests approval to defer completely remediating the well pad until the well is plugged, therefore, Pogo proposes to excavate soil from the well pad to a depth of about one (1) foot bgs in the vicinity of S-1 (SB-1), S-2 and S-3. To achieve the remediation goal for chloride, Pogo proposes to excavate soil to a depth of about 1.5 feet bgs in the vicinity of S-7 (SB-4), S-10 (SB-5/SB-13), S-12 (SB-8) and S-14 (SB-7). Soil will be excavated to approximately 2 feet bgs at S-8 (SB-3) and to approximately 3 feet bgs at S-6 (SB-2/SB-12) and S-11 (SB-6). Confirmation samples will be collected from the bottom and side walls of the excavations at S-6 (SB-2/SB-12), S-7 (SB-4), S-8 (SB-3), S-10 (SB-5/SB-13), S-11 (SB-6), S-12 (SB-8) and S-14 (SB-7). Confirmation samples will be analyzed for chloride by EPA Method 300 except S-8 (SB-3) which will be analyzed for TPH by EPA SW-846 Method 8015, including GRO, DRO and ORO. The contaminated soil will be disposed at a OCD approved waste facility. Figure 4 presents the proposed soil excavation areas and excavation depths.

4.0 CONCLUSION

A remediation report will be prepared and submitted to the OCD upon completion and receipt of the laboratory report from the confirmation soil samples.

Figures

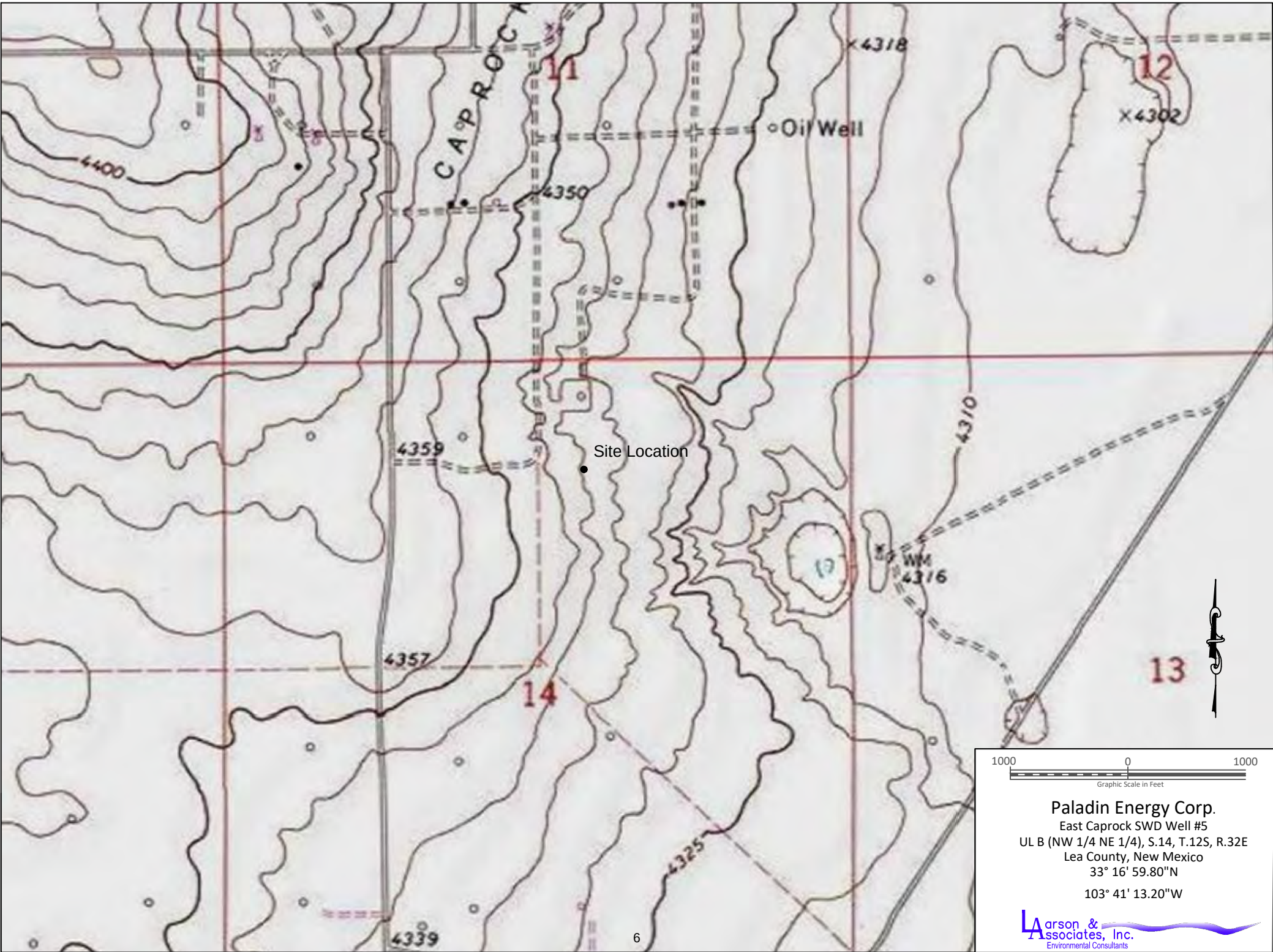
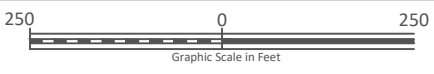


Figure 1 - Topographic Map

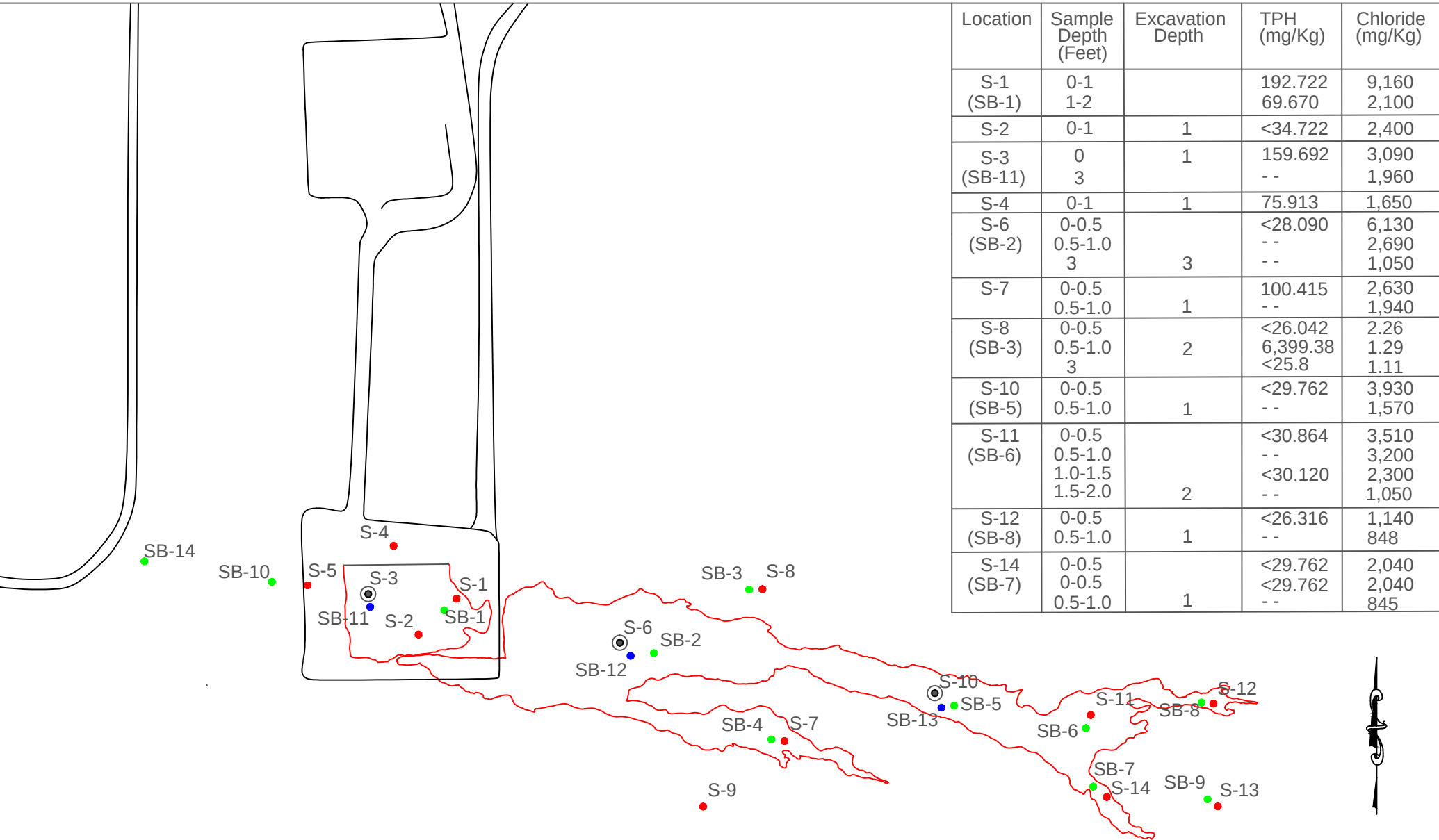


Paladin Energy Corp.
East Caprock SWD Well #5
UL B (NW 1/4 NE 1/4), S.14, T.12S, R.32E
Lea County, New Mexico
33° 16' 59.80"N
103° 41' 13.20"W



Figure 2 - Aerial Map

Location	Sample Depth (Feet)	Excavation Depth	TPH (mg/Kg)	Chloride (mg/Kg)
S-1 (SB-1)	0-1 1-2		192.722 69.670	9,160 2,100
S-2	0-1	1	<34.722	2,400
S-3 (SB-11)	0 3	1	159.692 --	3,090 1,960
S-4	0-1	1	75.913	1,650
S-6 (SB-2)	0-0.5 0.5-1.0 3	3	<28.090 -- --	6,130 2,690 1,050
S-7	0-0.5 0.5-1.0	1	100.415 --	2,630 1,940
S-8 (SB-3)	0-0.5 0.5-1.0 3	2	<26.042 6,399.38 <25.8	2.26 1.29 1.11
S-10 (SB-5)	0-0.5 0.5-1.0	1	<29.762 --	3,930 1,570
S-11 (SB-6)	0-0.5 0.5-1.0 1.0-1.5 1.5-2.0	2	<30.864 -- <30.120 --	3,510 3,200 2,300 1,050
S-12 (SB-8)	0-0.5 0.5-1.0	1	<26.316 --	1,140 848
S-14 (SB-7)	0-0.5 0-0.5 0.5-1.0	1	<29.762 <29.762 --	2,040 2,040 845



Legend

SB-11

- Soil Boring Location, August 9, 2017

SB-1

- Soil Boring Location, July 6-7, 2017

S-1

- Soil Sample Location, June 28, 2017

- Spill Area

175

0

175

Graphic Scale in Feet

Paladin Energy Corp.

East Caprock SWD Well #5

UL B (NW 1/4 NE 1/4), S.14, T.12S, R.32E

Lea County, New Mexico

33° 16' 59.80"N

103° 41' 13.20"W

Larson & Associates, Inc.

Environmental Consultants

Figure 3 - Site Map Showing Soil Sample and Boring Locations

Location	Sample Depth (Feet)	Excavation Depth	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:			5,000	*600
S-1 (SB-1)	0-1	1	--	9,160
S-2	0-1	1	--	2,400
S-3	0-1	1	--	3,090
(SB-11)	1-2	1	--	2,560
S-4				
S-6 (SB-2) (SB-12)	0-0.5 0.5-1.0	3	-- --	6,130 2,690
S-7	0-0.5 0.5-1.0	1.5	-- --	2,630 1,940
S-8 (SB-3)	0-0.5 0.5-1.0	2	<26.042 6,399.38	-- --
S-10 (SB-5)	0-0.5 0.5-1.0	1.5	-- --	3,930 1,570
S-11 (SB-6)	0-0.5 0.5-1.0 1.0-1.5 1.5-2.0	3	-- -- -- --	3,510 3,200 2,300 1,050
S-12	0-0.5	1.5	--	1,140
S-14 (SB-7)	0-0.5 0-0.5 0.5-1.0	1.5	-- -- --	2,040 2,040 845

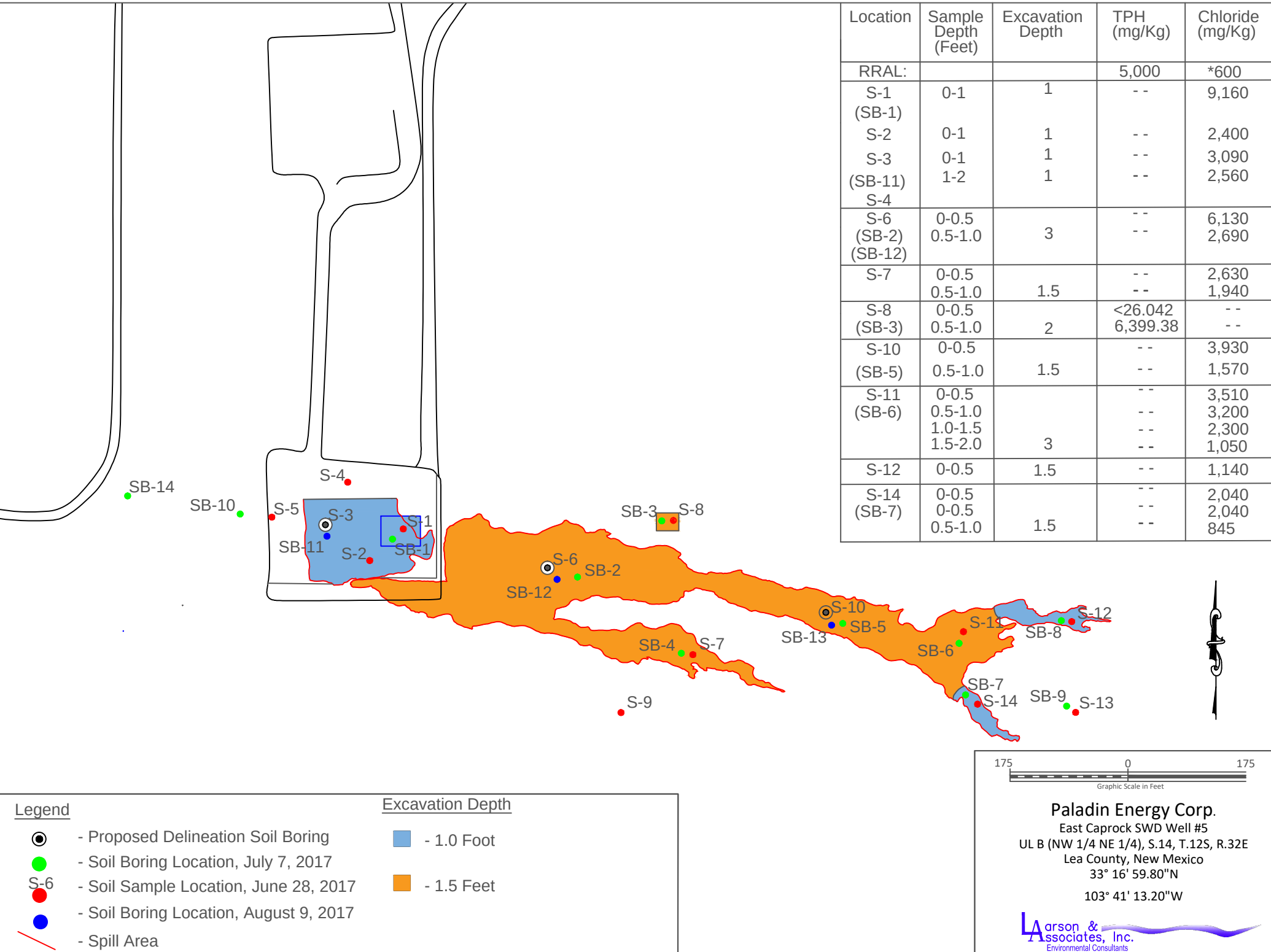


Figure 4- Proposed Remediation Area

Tables

Table 1
Delineatio Soil Sample Analytical Data Summary
Paladin Energy Corporation, East Caprock SWD Well #5
Lea County, New Mexico
1RP-4723

Page 1 of 6

Sample	Depth (Feet)	Collection Date	Status	C6 - C12 (mg/Kg)	C12 - C28 (mg/Kg)	C28 - C35 (mg/Kg)	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:							100	*600
S-1 (SB-1)	0 - 1	06/28/2017	In-Situ	<26.596	141.02	51.702	192.722	9,160
	1 - 2	06/28/2017	In-Situ	<28.409	69.670	<28.409	69.670	2,100
	3	07/06/2017	In-Situ	<31.6	<31.6	<31.6	<31.6	2,710
	5	07/06/2017	In-Situ	--	--	--	--	1,090
	7	07/06/2017	In-Situ	--	--	--	--	1,040
	10	07/06/2017	In-Situ	--	--	--	--	42.1
	15	07/06/2017	In-Situ	--	--	--	--	155
	20	07/06/2017	In-Situ	--	--	--	--	839
	25	07/06/2017	In-Situ	--	--	--	--	803
	30	01/03/2018	In-Situ	--	--	--	--	1,150
	35	01/03/2018	In-Situ	--	--	--	--	845
	40	01/03/2018	In-Situ	--	--	--	--	613
	45	01/03/2018	In-Situ	--	--	--	--	34.4
	50	01/03/2018	In-Situ	--	--	--	--	<1.14
S-2	0 - 1	06/28/2017	In-Situ	<34.722	<34.722	<34.722	<34.722	2,400
S-3 (SB-11)	0 - 1	06/28/2017	In-Situ	<27.473	117.78	41.912	159.692	3,090
	0	08/09/2017	In-Situ	--	--	--	--	2,560
	3	08/09/2017	In-Situ	--	--	--	--	1,960
	5	08/09/2017	In-Situ	--	--	--	--	30.8
	7	08/09/2017	In-Situ	--	--	--	--	46.8
	10	08/09/2017	In-Situ	--	--	--	--	23.7
	15	08/09/2017	In-Situ	--	--	--	--	28.9
	20	08/09/2017	In-Situ	--	--	--	--	30.1
S-4	0 - 1	06/28/2017	In-Situ	<27.174	46.337	29.576	75.913	1,650
S-5	0 - 1	06/28/2017	In-Situ	<32.468	67.455	48.481	115.936	<1.30
		08/09/2017	In-Situ	<27.5	<27.	<27.5	<27.5	--

Table 1
Delineatio Soil Sample Analytical Data Summary
Paladin Energy Corporation, East Caprock SWD Well #5
Lea County, New Mexico

1RP-4723

Page 2 of 6

Sample	Depth (Feet)	Collection Date	Status	C6 - C12 (mg/Kg)	C12 - C28 (mg/Kg)	C28 - C35 (mg/Kg)	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:							100	*600
S-6 (SB-2) (SB-12)	0 - 0.5	06/28/2017	In-Situ	<28.090	<28.090	<28.090	<28.090	6,130
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	2,690
	3	07/06/2017	In-Situ	--	--	--	--	1,050
	5	07/06/2017	In-Situ	--	--	--	--	11.3
	7	07/06/2017	In-Situ	--	--	--	--	<1.11
	10	07/06/2017	In-Situ	--	--	--	--	<1.06
	15	07/06/2017	In-Situ	--	--	--	--	49
	20	08/09/2017	In-Situ	--	--	--	--	29.9
	25	08/09/2017	In-Situ	--	--	--	--	942
	30	01/03/2018	In-Situ	--	--	--	--	1,080
	35	01/03/2018	In-Situ	--	--	--	--	828
	40	01/03/2018	In-Situ	--	--	--	--	345
	45	01/03/2018	In-Situ	--	--	--	--	52.4
	50	01/03/2018	In-Situ	--	--	--	--	18.0
S-7 (SB-4)	0 - 0.5	06/28/2017	In-Situ	<28.736	56.839	43.276	100.415	2,630
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	1,940
	3	07/06/2017	In-Situ	--	--	--	--	61.4
	5	07/06/2017	In-Situ	--	--	--	--	<1.04
	7	07/06/2017	In-Situ	--	--	--	--	<1.03
	10	07/06/2017	In-Situ	--	--	--	--	<1.06
	15	07/06/2017	In-Situ	--	--	--	--	17.4
S-8 (SB-3)	0 - 0.5	06/28/2017	In-Situ	<26.042	<26.042	<26.042	<26.042	2.26
	0.5 - 1.0	06/28/2017	In-Situ	1,445.3	4,413.3	540.78	6,399.38	1.29
	3	07/06/2017	In-Situ	<25.8	<25.8	<25.8	<25.8	1.11
	5	07/06/2017	In-Situ	<25.8	<25.8	<25.8	<25.8	<1.03
	7	07/06/2017	In-Situ	--	--	--	--	<1.04
	10	07/06/2017	In-Situ	--	--	--	--	45.9

Table 1
Delineatio Soil Sample Analytical Data Summary
Paladin Energy Corporation, East Caprock SWD Well #5
Lea County, New Mexico

1RP-4723

Page 3 of 6

Sample	Depth (Feet)	Collection Date	Status	C6 - C12 (mg/Kg)	C12 - C28 (mg/Kg)	C28 - C35 (mg/Kg)	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:							100	*600
S-9	0 - 0.5	06/28/2017	In-Situ	<26.042	<26.042	<26.042	<26.042	<1.04
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	<1.09
	7	07/07/2017	In-Situ	--	--	--	--	<1.02
	10	07/07/2017	In-Situ	--	--	--	--	<1.08
	15	07/07/2017	In-Situ	--	--	--	--	140
S-10 (SB-5) (SB-13)	0 - 0.5	06/28/2017	In-Situ	<29.762	<29.762	<29.762	<29.762	3,930
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	1,570
	3	07/07/2017	In-Situ	--	--	--	--	22.4
	5	07/07/2017	In-Situ	--	--	--	--	<1.02
	7	07/07/2017	In-Situ	--	--	--	--	<1.02
	10	07/07/2017	In-Situ	--	--	--	--	<1.08
	15	07/07/2017	In-Situ	--	--	--	--	140
	20	08/09/2017	In-Situ	--	--	--	--	452
	25	08/09/2017	In-Situ	--	--	--	--	760
	30	01/03/2018	In-Situ	--	--	--	--	853
	35	01/03/2018	In-Situ	--	--	--	--	648
	40	01/03/2018	In-Situ	--	--	--	--	705
	45	01/03/2018	In-Situ	--	--	--	--	46.6
	50	01/03/2018	In-Situ	--	--	--	--	<1.12
S-11	0 - 0.5	06/28/2017	In-Situ	<30.864	<30.864	<30.864	<30.864	3,510
	7	07/07/2017	In-Situ	--	--	--	--	<1.02
	10	07/07/2017	In-Situ	--	--	--	--	<1.08
	15	07/07/2017	In-Situ	--	--	--	--	140
	20	08/09/2017	In-Situ	--	--	--	--	452
	25	08/09/2017	In-Situ	--	--	--	--	760
	30	01/03/2018	In-Situ	--	--	--	--	853
	35	01/03/2018	In-Situ	--	--	--	--	648
	40	01/03/2018	In-Situ	--	--	--	--	705

Table 1
Delineatio Soil Sample Analytical Data Summary
Paladin Energy Corporation, East Caprock SWD Well #5
Lea County, New Mexico

1RP-4723

Page 4 of 6

Sample	Depth (Feet)	Collection Date	Status	C6 - C12 (mg/Kg)	C12 - C28 (mg/Kg)	C28 - C35 (mg/Kg)	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:							100	*600
	45	01/03/2018	In-Situ	--	--	--	--	46.6
	50	01/03/2018	In-Situ	--	--	--	--	<1.12
S-11 (SB-6)	0 - 0.5	06/28/2017	In-Situ	<30.864	<30.864	<30.864	<30.864	3,510
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	3,200
	1.0 - 1.5	06/28/2017	In-Situ	<30.120	<30.120	<30.120	<30.120	2,300
	1.5 - 2.0	06/28/2017	In-Situ	--	--	--	--	1,050
	3	07/07/2017	In-Situ	--	--	--	--	387
	5	07/07/2017	In-Situ	--	--	--	--	2.76
	7	07/07/2017	In-Situ	--	--	--	--	9.23
	10	07/07/2017	In-Situ	--	--	--	--	<1.05
	15	07/07/2017	In-Situ	--	--	--	--	<1.06
S-12 (SB-8)	0 - 0.5	06/28/2017	In-Situ	<26.316	<26.316	<26.316	<26.316	1,140
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	848
	3	07/07/2017	In-Situ	--	--	--	--	75.0
	5	07/07/2017	In-Situ	--	--	--	--	<1.03
	7	07/07/2017	In-Situ	--	--	--	--	<1.05
	10	07/07/2017	In-Situ	--	--	--	--	2.82
	15	07/07/2017	In-Situ	--	--	--	--	98.5
S-13 (SB-9)	0 - 0.5	06/28/2017	In-Situ	<26.596	<26.596	<26.596	<26.596	<1.06
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	<1.11
	3	07/07/2017	In-Situ	--	--	--	--	6.07
	5	07/07/2017	In-Situ	--	--	--	--	2.03
	7	07/07/2017	In-Situ	--	--	--	--	<1.02
	10	07/07/2017	In-Situ	--	--	--	--	<1.04
S-14 (SB-7)	0 - 0.5	06/28/2017	In-Situ	<29.762	<29.762	<29.762	<29.762	2,040
	0 - 0.5	06/28/2017	In-Situ	<29.762	<29.762	<29.762	<29.762	2,040

Table 1
Delineatio Soil Sample Analytical Data Summary
Paladin Energy Corporation, East Caprock SWD Well #5
Lea County, New Mexico

1RP-4723

Page 5 of 6

Sample	Depth (Feet)	Collection Date	Status	C6 - C12 (mg/Kg)	C12 - C28 (mg/Kg)	C28 - C35 (mg/Kg)	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:							100	*600
	0.5 - 1.0	06/28/2017	In-Situ	--	--	--	--	845
	3	07/07/2017	In-Situ	--	--	--	--	83.6
	5	07/07/2017	In-Situ	--	--	--	--	<1.04
	7	07/07/2017	In-Situ	--	--	--	--	26.1
	10	07/07/2017	In-Situ	--	--	--	--	80.6
	15	07/07/2017	In-Situ					<1.18
SB-10	0-1	07/06/2017	In-Situ	<27.2	<27.2	<27.2	<27.2	<1.09
	3	07/06/2017	In-Situ	<25.5	<25.5	<25.5	<25.5	4.43
	5	07/06/2017	In-Situ	--	--	--	--	6.19
	7	07/06/2017	In-Situ	--	--	--	--	4.07
	10	07/06/2017	In-Situ	--	--	--	--	2.34
	20	08/09/2017	In-Situ	--	--	--	--	1,190
	25	08/09/2017	In-Situ	--	--	--	--	1,100
	30	01/03/2018	In-Situ	--	--	--	--	1,120
	35	01/03/2018	In-Situ	--	--	--	--	630
	40	01/03/2018	In-Situ	--	--	--	--	126
	45	01/03/2018	In-Situ	--	--	--	--	446
	50	01/03/2018	In-Situ	--	--	--	--	10.3
SB-14	0	01/03/2018	In-Situ	--	--	--	--	12.6
	5	01/03/2018	In-Situ	--	--	--	--	19.5
	10	01/03/2018	In-Situ	--	--	--	--	181
	15	01/03/2018	In-Situ	--	--	--	--	1,090
	20	01/03/2018	In-Situ	--	--	--	--	2,200
	25	01/03/2018	In-Situ	--	--	--	--	1,610
	30	01/03/2018	In-Situ	--	--	--	--	1,330
	35	01/03/2018	In-Situ	--	--	--	--	1,140
	40	01/03/2018	In-Situ	--	--	--	--	999
	45	01/03/2018	In-Situ	--	--	--	--	859

Table 1
Delineatio Soil Sample Analytical Data Summary
Paladin Energy Corporation, East Caprock SWD Well #5
Lea County, New Mexico
1RP-4723

Page 6 of 6

Sample	Depth (Feet)	Collection Date	Status	C6 - C12 (mg/Kg)	C12 - C28 (mg/Kg)	C28 - C35 (mg/Kg)	TPH (mg/Kg)	Chloride (mg/Kg)
RRAL:							100	*600
	50	01/03/2018	In-Situ	--	--	--	--	106

Notes: Laboratory analysis performed by Permian Basin Environmental Lab, Midland, Texas by EPA SW-846 Method 8015M (TPH) and 300 (chloride)

Depth in feet below ground surface (bgs)

mg/Kg: milligrams per kilogram equivalent to parts per million (ppm)

*: OCD delineation level

Exceeds OCD Recommended Remediation Action Level (RRAL)

Appendix A
OCD Correspondence

Mark Larson

From: Mark Larson
Sent: Thursday, June 22, 2017 1:26 PM
To: 'Yu, Olivia, EMNRD'
Cc: 'ggfenton@aol.com'; 'David Plaisance'; 'paladinmid@suddenlink.net'
Subject: Re: 1RP-4723, Delineation Plan, East Caprock SWD Well #5 Produced Water Spill, June 21, 2017
Attachments: 1RP-4723, Delineation Plan, East Caprock SWD Well #5 Produced Water Spill, June 21, 2017.pdf

Olivia,

On behalf of Paladin Energy Corporation (Paladin) please find the attached delineation plan for assessing the extent of impact from the produced water spill at the East Caprock SWD Well #5 in Lea County, New Mexico. Please contact Mickey Horn with Paladin at (432) 63406599 or paladinmidland@suddenlink.net or me if you have questions.

Mark J. Larson, P.G.
President/Sr. Project Manager
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432- 556-8656
Fax – 432-687-0456
mark@laenvironmental.com



"Serving the Permian Basin Since 2000"

Mark Larson

From: Yu, Olivia, EMNRD [Olivia.Yu@state.nm.us]
Sent: Thursday, August 10, 2017 4:52 PM
To: Mark Larson; Billings, Bradford, EMNRD
Cc: 'ggfenton@aol.com'; 'David Plaisance'; 'paladinmid@suddenlink.net'
Subject: RE: 1RP-4723, Delineation Report, East Caprock SWD #5 Produced Water Spill, July 20, 2017

Dear Mr. Larson:

Please address these concerns regarding 1RP-4723.

1. The area represented by S1 does not have vertical delineation completed. If the groundwater monitoring data from 1RP-4666 is proposed to be utilized for this release, please clearly state this application.
2. S2, S3, and S4 are not completely delineated vertically. Please provide rationale for 1 ft. excavation for the area represented by S2 - S4.
3. Delineation data indicate that the chloride and/or TPH levels at the proposed excavation depths for the specified areas exceed permissible values. In areas where the bottom of the excavation exceeds permissible chloride and TPH levels, proceed to excavation to the next foot.
4. Each separately defined areas, based on proposed excavation depths as demarcated in Figure 4, must have confirmatory bottom and sidewall samples. Mark confirmation sample locations on another scaled map.

Thanks,
Olivia

From: Mark Larson [mailto:Mark@laenvironmental.com]
Sent: Friday, July 21, 2017 8:40 AM
To: Yu, Olivia, EMNRD <Olivia.Yu@state.nm.us>
Cc: 'ggfenton@aol.com' <ggfenton@aol.com>; 'David Plaisance' <dplaisance@paladinenergy.com>; 'paladinmid@suddenlink.net' <paladinmid@suddenlink.net>
Subject: FW: 1RP-4723, Delineation Report, East Caprock SWD #5 Produced Water Spill, July 20, 2017

Olivia,
Larson & Associates, Inc. (LAI), on behalf of Paladin Energy Corporation (Paladin), submits the above captioned report for delineation of a produced water spill at the East Caprock SWD #5 in Le County, New Mexico. The delineation was performed according to the plan submitted to the OCD on June 21, 2017. Additional samples were collected to assess the vertical limits of the spill. The document presents the proposed remediation plan for the spill. Please use the link below to download the report. Please contact Mickey Horn with Paladin at (432) 63406599 or paladinmidland@suddenlink.net or me if you have questions.

Link: <https://files.acrobat.com/a/preview/2511c632-c03c-42ea-b4d6-ef732f7ec48c>

Respectfully,

Mark J. Larson, P.G.
President/Sr. Project Manager
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432- 556-8656
Fax – 432-687-0456
mark@laenvironmental.com



“Serving the Permian Basin Since 2000”

From: Mark Larson
Sent: Wednesday, June 28, 2017 7:43 AM
To: 'Yu, Olivia, EMNRD'
Cc: 'ggfenton@aol.com'; 'David Plaisance'; 'paladinmid@suddenlink.net'
Subject: FW: 1RP-4723, Delineation Plan, East Caprock SWD Well #5 Produced Water Sill, June 21, 2017

Olivia,
This is to let you know that personnel from Larson & Associates, Inc. (LAI) will be at the location of the spill (1RP-4723) Wednesday, June 28, 2017, for the purpose of collecting soil sample to delineate the extent of the produced water release at the above-referenced location. Soil samples will be collected according to the attached delineation plan that was submitted to the OCD on behalf of Paladin Energy Corporation (Paladin) on June 22, 2017. Please contact Mickey Horn with Paladin at (432) 63406599 or paladinmidland@suddenlink.net or me if you have questions.
Respectfully,

Mark J. Larson, P.G.
President/Sr. Project Manager
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432- 556-8656
Fax – 432-687-0456
mark@laenvironmental.com



“Serving the Permian Basin Since 2000”

From: Mark Larson
Sent: Thursday, June 22, 2017 1:26 PM
To: 'Yu, Olivia, EMNRD'
Cc: 'ggfenton@aol.com'; 'David Plaisance'; 'paladinmid@suddenlink.net'
Subject: Re: 1RP-4723, Delineation Plan, East Caprock SWD Well #5 Produced Water Sill, June 21, 2017

Olivia,

On behalf of Paladin Energy Corporation (Paladin) please find the attached delineation plan for assessing the extent of impact from the produced water spill at the East Caprock SWD Well #5 in Lea County, New Mexico. Please contact Mickey Horn with Paladin at (432) 63406599 or paladinmidland@suddenlink.net or me if you have questions.

Mark J. Larson, P.G.
President/Sr. Project Manager
507 N. Marienfeld St., Suite 205
Midland, Texas 79701
Office – 432-687-0901
Cell – 432- 556-8656
Fax – 432-687-0456
mark@laenvironmental.com



"Serving the Permian Basin Since 2000"

Appendix B
Laboratory Reports

**PERMIAN BASIN
ENVIRONMENTAL LAB, LP
1400 Rankin Hwy
Midland, TX 79701**



Analytical Report

Prepared for:

Mark Larson
Larson & Associates, Inc.
P.O. Box 50685
Midland, TX 79710

Project: Pogo Fast Caprock 5

Project Number: 17-0158-01

Location: New Mexico

Lab Order Number: 8A05004



NELAP/TCEQ # T104704516-16-7

Report Date: 01/08/18

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB-13 30'-31'	8A05004-01	Soil	01/03/18 11:25	01-05-2018 09:10
SB-13 35'-36'	8A05004-02	Soil	01/03/18 11:27	01-05-2018 09:10
SB-13 40'-41'	8A05004-03	Soil	01/03/18 11:28	01-05-2018 09:10
SB-13 45'-46'	8A05004-04	Soil	01/03/18 11:32	01-05-2018 09:10
SB-13 50'-51'	8A05004-05	Soil	01/03/18 11:34	01-05-2018 09:10
SB-12 30'-31'	8A05004-06	Soil	01/03/18 12:29	01-05-2018 09:10
SB-12 35'-36'	8A05004-07	Soil	01/03/18 12:30	01-05-2018 09:10
SB-12 40'-41'	8A05004-08	Soil	01/03/18 12:31	01-05-2018 09:10
SB-12 45'-46'	8A05004-09	Soil	01/03/18 12:34	01-05-2018 09:10
SB-12 50'-51'	8A05004-10	Soil	01/03/18 12:36	01-05-2018 09:10
SB-1 30'-31'	8A05004-11	Soil	01/03/18 13:38	01-05-2018 09:10
SB-1 35'-36'	8A05004-12	Soil	01/03/18 13:30	01-05-2018 09:10
SB-1 40'-41'	8A05004-13	Soil	01/03/18 13:31	01-05-2018 09:10
SB-1 45'-46'	8A05004-14	Soil	01/03/18 13:35	01-05-2018 09:10
SB-1 50'-51'	8A05004-15	Soil	01/03/18 13:37	01-05-2018 09:10
SB-10 30'-31'	8A05004-16	Soil	01/03/18 14:10	01-05-2018 09:10
SB-10 35'-36'	8A05004-17	Soil	01/03/18 14:14	01-05-2018 09:10
SB-10 40'-41'	8A05004-18	Soil	01/03/18 14:16	01-05-2018 09:10
SB-10 45'-46'	8A05004-19	Soil	01/03/18 14:19	01-05-2018 09:10
SB-10 50'-51'	8A05004-20	Soil	01/03/18 14:22	01-05-2018 09:10
SB-14 0'-1'	8A05004-21	Soil	01/03/18 14:55	01-05-2018 09:10
SB-14 5'-6'	8A05004-22	Soil	01/03/18 15:03	01-05-2018 09:10
SB-14 10'-11'	8A05004-23	Soil	01/03/18 15:05	01-05-2018 09:10
SB-14 15'-16'	8A05004-24	Soil	01/03/18 15:07	01-05-2018 09:10
SB-14 20'-21'	8A05004-25	Soil	01/03/18 15:08	01-05-2018 09:10
SB-14 25'-26'	8A05004-26	Soil	01/03/18 15:11	01-05-2018 09:10
SB-14 30'-31'	8A05004-27	Soil	01/03/18 15:13	01-05-2018 09:10
SB-14 35'-36'	8A05004-28	Soil	01/03/18 15:14	01-05-2018 09:10
SB-14 40'-41'	8A05004-29	Soil	01/03/18 15:15	01-05-2018 09:10
SB-14 45'-46'	8A05004-30	Soil	01/03/18 15:18	01-05-2018 09:10
SB-14 50'-51'	8A05004-31	Soil	01/03/18 15:20	01-05-2018 09:10

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-13 30'-31'
8A05004-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	853	1.12	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0
% Moisture	11.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-13 35'-36'
8A05004-02 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	648	1.15	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-13 40'-41'
8A05004-03 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	705	1.15	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-13 45'-46'
8A05004-04 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	46.6	1.11	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0
% Moisture	10.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-13 50'-51'
8A05004-05 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	ND	1.12	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	11.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-12 30'-31'
8A05004-06 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1080	1.15	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-12 35'-36'
8A05004-07 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	828	1.12	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	11.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-12 40'-41'
8A05004-08 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	345	1.12	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	11.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-12 45'-46'
8A05004-09 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	52.4	1.12	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	11.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-12 50'-51'
8A05004-10 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	18.0	1.15	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-1 30'-31'
8A05004-11 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1150	5.95	mg/kg dry	5	P8A0507	01/05/18	01/06/18	EPA 300.0
% Moisture	16.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-1 35'-36'
8A05004-12 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	845	1.14	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	12.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-1 40'-41'
8A05004-13 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	613	1.14	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	12.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-1 45'-46'
8A05004-14 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	34.4	1.15	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-1 50'-51'
8A05004-15 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	ND	1.14	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	12.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-10 30'-31'
8A05004-16 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1120	1.18	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	15.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-10 35'-36'
8A05004-17 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	630	1.16	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	14.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-10 40'-41'
8A05004-18 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	126	1.15	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-10 45'-46'
8A05004-19 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	446	1.18	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	15.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-10 50'-51'
8A05004-20 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	10.3	1.14	mg/kg dry	1	P8A0507	01/05/18	01/06/18	EPA 300.0	
% Moisture	12.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 0-1'
8A05004-21 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	12.6	1.04	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	4.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 5'-6'
8A05004-22 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	19.5	1.04	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	4.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 10'-11'
8A05004-23 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	181	1.06	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	6.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 15'-16'
8A05004-24 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1090	5.32	mg/kg dry	5	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	6.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 20'-21'
8A05004-25 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	2200	5.95	mg/kg dry	5	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	16.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 25'-26'
8A05004-26 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1610	6.10	mg/kg dry	5	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	18.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 30'-31'
8A05004-27 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1330	5.88	mg/kg dry	5	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	15.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 35'-36'
8A05004-28 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	1140	1.16	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	14.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 40'-41'
8A05004-29 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	999	1.15	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	13.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 45'-46'
8A05004-30 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	859	1.12	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	11.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

SB-14 50'-51'
8A05004-31 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	--------------------	-------	----------	-------	----------	----------	--------	-------

Permian Basin Environmental Lab, L.P.

General Chemistry Parameters by EPA / Standard Methods

Chloride	106	1.10	mg/kg dry	1	P8A0508	01/05/18	01/06/18	EPA 300.0	
% Moisture	9.0	0.1	%	1	P8A0801	01/08/18	01/08/18	ASTM D2216	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

General Chemistry Parameters by EPA / Standard Methods - Quality Control
Permian Basin Environmental Lab, L.P.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch P8A0507 - * DEFAULT PREP *****

Blank (P8A0507-BLK1)				Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	ND	1.00	mg/kg wet							
LCS (P8A0507-BS1)				Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	413	1.00	mg/kg wet	400		103	80-120			
LCS Dup (P8A0507-BSD1)				Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	413	1.00	mg/kg wet	400		103	80-120	0.0218	20	
Duplicate (P8A0507-DUP1)				Source: 8A05004-01		Prepared: 01/05/18 Analyzed: 01/06/18				
Chloride	857	1.12	mg/kg dry		853			0.403	20	
Duplicate (P8A0507-DUP2)				Source: 8A05004-11		Prepared: 01/05/18 Analyzed: 01/06/18				
Chloride	1250	5.95	mg/kg dry		1150			8.31	20	
Matrix Spike (P8A0507-MS1)				Source: 8A05004-01		Prepared: 01/05/18 Analyzed: 01/06/18				
Chloride	1960	1.12	mg/kg dry	1120	853	98.8	80-120			

Batch P8A0508 - * DEFAULT PREP *****

Blank (P8A0508-BLK1)				Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	ND	1.00	mg/kg wet							
LCS (P8A0508-BS1)				Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	414	1.00	mg/kg wet	400		104	80-120			
LCS Dup (P8A0508-BSD1)				Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	383	1.00	mg/kg wet	400		95.8	80-120	7.79	20	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

General Chemistry Parameters by EPA / Standard Methods - Quality Control
Permian Basin Environmental Lab, L.P.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch P8A0508 - * DEFAULT PREP *****

Duplicate (P8A0508-DUP1)		Source: 8A05004-21		Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	10.6	1.04	mg/kg dry		12.6			16.5	20	
Duplicate (P8A0508-DUP2)		Source: 8A05004-31		Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	109	1.10	mg/kg dry		106			3.01	20	
Matrix Spike (P8A0508-MS1)		Source: 8A05004-21		Prepared: 01/05/18 Analyzed: 01/06/18						
Chloride	1140	1.04	mg/kg dry	1040	12.6	108	80-120			

Batch P8A0801 - * DEFAULT PREP *****

Blank (P8A0801-BLK1)				Prepared & Analyzed: 01/08/18						
% Moisture	ND	0.1	%							
Duplicate (P8A0801-DUP1)		Source: 8A05003-25		Prepared & Analyzed: 01/08/18						
% Moisture	13.0	0.1	%		12.0			8.00	20	
Duplicate (P8A0801-DUP2)		Source: 8A05004-26		Prepared & Analyzed: 01/08/18						
% Moisture	18.0	0.1	%		18.0			0.00	20	
Duplicate (P8A0801-DUP3)		Source: 8A05005-22		Prepared & Analyzed: 01/08/18						
% Moisture	8.0	0.1	%		7.0			13.3	20	
Duplicate (P8A0801-DUP4)		Source: 8A05006-02		Prepared & Analyzed: 01/08/18						
% Moisture	1.0	0.1	%		2.0			66.7	20	R2
Duplicate (P8A0801-DUP5)		Source: 8A05007-10		Prepared & Analyzed: 01/08/18						
% Moisture	15.0	0.1	%		15.0			0.00	20	

Larson & Associates, Inc.
P.O. Box 50685
Midland TX, 79710

Project: Pogo Fast Caprock 5
Project Number: 17-0158-01
Project Manager: Mark Larson

Fax: (432) 687-0456

Notes and Definitions

R2 The RPD exceeded the acceptance limit.

BULK Samples received in Bulk soil containers

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis

RPD Relative Percent Difference

LCS Laboratory Control Spike

MS Matrix Spike

Dup Duplicate

Report Approved By:



Date: 1/8/2018

Brent Barron, Laboratory Director/Technical Director

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-686-7235.

507 N. Marientfeld, Ste. 200
Midland, TX 79701
432-687-0901

Data Reported to:

DATE: Jan 3 2018 PAGE 1
PO #: _____ LAB WORK ORDER #: 2A0556
PROJECT LOCATION OR NAME: Pogo East Caprock 5
LAI PROJECT #: 17-0158-01 COLLECTOR: SJ

Page 37 of 39

CHAIN-OF-CUSTODY

[illegible]

507 N. Marientfeld, Ste. 200
Midland, TX 79701
432-687-0901

Data Reported to:

DATE: Jan 5 2018 PAGE 2 OF 3
PO #: _____ LAB WORK ORDER #: _____
PROJECT LOCATION OR NAME: Pogo East (approx 5
LAI PROJECT #: 17-0158-01 COLLECTOR: SJ

Page 38 of 39

TRRP report?		☐ Yes ☒ No		P=PAINT SI=SLUDGE OT=OTHER	
TIME ZONE:					
Time zone/State:					
MST/TTX					
Field Sample I.D.	Lab #	Date	Time	Matrix	# of Containers
S8-10 30'31"	16	1/31/8	14:10	S	4
35'-36'	17		14:14		
40'-41'	18		14:16		
45'-46'	19		14:19		
50'-51'	20		14:22		
S8-14 0'-1'	21		14:35		
5'-6'	22		15:03		
10'-11'	23		15:05		
15'-16'	24		15:07		
20'-21'	25		15:08		
25'-26'	26		15:11		
30'-31'	27		15:13		
35'-36'	28		15:14		
40'-41'	29		15:15		
45'-46'	30		15:16		
TOTAL					

PRESERVATION

HCl ☐ HNO₃ ☐ H₂SO₄ ☐ NaOH ☐

ICE ☐ UNPRESERVED ☐

ANALYSES

BTEX ☐ MTBE ☐ TRPH 418:1 ☐ TPH 1005 ☐ TPH 1006 ☐

GASOLINE MOD 8015 ☐ DIESEL - MOD 8015 ☐ VOC 8260 ☐ SVOC 8270 ☐ PAH 8270 ☐ HOLDPAH ☐

8081 PESTICIDES ☐ 8151 HERBICIDES ☐ TCLP - METALS (RCRA) ☐ TCLP VOC ☐ TCLP - PEST ☐ HERB ☐ Semi-VOC ☐

TCLP - PCBs ☐ TOTAL METALS (RCRA) ☐ DW 200.8 ☐ TCLP ☐ LEAD - TOTAL ☐ FLASHPOINT ☐ TDS ☐ TOX ☐ % MOISTURE ☐ CYANIDE ☐

R/C ☐ TSS ☐ HEXAVALENT CHROMIUM ☐ PH ☐ PECHLORATE ☐ EXPLOSIVES ☐ ANIONS ☐ ALKALINITY ☐

M3CO

FIELD NOTES

TURN AROUND TIME

NORMAL ☐ 1 DAY ☒ 2 DAY ☐ OTHER ☐

LABORATORY USE ONLY:

RECEIVING TEMP: 23 THERM #: _____

CUSTODY SEALS - ☐ BROKEN ☒ INTACT ☐ NOT USED

CARRIER BILL # _____

HAND DELIVERED ☒

Varson & Associates, Inc.
Environmental Consultants

507 N. Marientfeld, Ste. 200
Midland, TX 79701
432-687-0901

Data Reported to:

DATE: Jun 5 2018 PAGE: 3 OF
PO #: LAB WORK ORDER #:
PROJECT LOCATION OR NAME: Boyo Fast Track 5
LAI PROJECT #: 17-0158-01 COLLECTOR: S.J

Page 39 of 39

[illegible]

Appendix C

Boring Logs

BORING RECORD																			
GEOLOGIC UNIT	DEPTH	Start: 13:05 NM Finish: 13:40 DESCRIPTION LITHOLOGIC	DESCRIPTION USCS	GRAPHIC LOG	PID READING								SAMPLE		REMARKS				
					PPM X 1								NUMBER	PID READING	RECOVERY	DEPTH	BACKGROUND PID READING		
					2	4	6	8	10	12	14	16						18	
	30	Clay Sand, 7.5YR 3/4, Dusky Red, Fine Grain, Clay Interbedded with Sand 7.5YR 6/1, Reddish Gray, Clay-Sand, Very Fine Grain, Redbed	SW CL																
	35																	13:28	
	40																		13:30
	42																		13:31
	45	5YR 7/1, Light Gray Clay-Sand	CL																
	50	TD: 50'																	13:37
	55																		
	60																		
	65																		
	70																		

ONE CONTINUOUS AUGER SAMPLER

STANDARD PENETRATION TEST

UNDISTURBED SAMPLE

WATER TABLE (24 HRS)

WATER TABLE (TIME OF BORING)

LABORATORY TEST LOCATION

PENETROMETER (TONS/ SQ. FT)

NR NO RECOVERY

DRILL DATE :

01-03-18

BORING NUMBER :

SB-1

JOB NUMBER :

17-0158-01

HOLE DIAMETER :

5"

LOCATION :

Pogo East Caprock 005

LAI GEOLOGIST :

S.J.

DRILLING CONTRACTOR :

SDC

DRILLING METHOD :

Air Rotary

BORING RECORD

GEOLOGIC UNIT	DEPTH	Start: 13:58 Finish: 14:22 DESCRIPTION LITHOLOGIC	DESCRIPTION USCS	GRAPHIC LOG	PID READING										SAMPLE			REMARKS		
					PPM X <u>1</u>										NUMBER	PID READING	RECOVERY	DEPTH	BACKGROUND PID READING	
					2	4	6	8	10	12	14	16	18							
	30	Redbed, 2.5YR 5/4, Reddish Brown Very Fine Grain	Shale																	
	31																	14:10		
	35																	14:14		
	40	Sandy Clay, 2.5YR 7/1, Light Gray, Fine Grain, Qtz Dim	SW CL																	
	42																	14:16		
	45																	14:19		
	48	Redbed 2.5YR 5/4, Reddish Brown, Very Fine Grain	Shale																	
	50																	14:22		
		TD: 50'																		
	55																			
	60																			
	65																			
	70																			

- ONE CONTINUOUS AUGER SAMPLER
 WATER TABLE (TIME OF BORING)
- STANDARD PENETRATION TEST
 LABORATORY TEST LOCATION
- UNDISTURBED SAMPLE
 PENETROMETER (TONS/ SQ. FT)
- WATER TABLE (24 HRS)
 NR NO RECOVERY

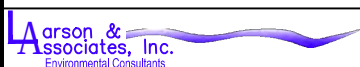
JOB NUMBER : 17-0158-01
 HOLE DIAMETER : 5"
 LOCATION : Pogo East Caprock 005
 LAI GEOLOGIST : S.J.
 DRILLING CONTRACTOR : SDC
 DRILLING METHOD : Air Rotary

BORING RECORD

GEOLOGIC UNIT	DEPTH	Start: 12:17 NM Finish: 12:37 DESCRIPTION LITHOLOGIC	DESCRIPTION USCS	GRAPHIC LOG	PID READING										SAMPLE			REMARKS			
					PPM X <u>1</u>										NUMBER	PID READING	RECOVERY	DEPTH	BACKGROUND PID READING		
					2	4	6	8	10	12	14	16	18								
	30	7.5YR 5/3, Weak, Red Clay-Sand, Fine Grain, Well Graded, Quartz Dom. Redbed																			
	35	5YR 7/2, Pinkish Gray, Clay-Sand, Fine Grain Quartz Dom.	SW CL																31	12:29	
	40	2.5YR 5/4, Reddish Brown Clay-Sand																	35	12:30	
	45																		40	12:31	
	46	Clay 2.5YR 3/4, Dark Reddish Brown, Very Fine Grain Clay Redbed	Shale																45	12:34	
	50	TD: 50.00'																	50	12:36	
	55																				
	60																				
	65																				
	70																				

- | | | |
|------------------------------|--------------------------|--------------------------------|
| ONE CONTINUOUS AUGER SAMPLER | WATER TABLE (24 HRS) | WATER TABLE (TIME OF BORING) |
| STANDARD PENETRATION TEST | LABORATORY TEST LOCATION | PENETROMETER (TONS/ SQ. FT) |
| UNDISTURBED SAMPLE | NO RECOVERY | |

JOB NUMBER : 17-0158-01
HOLE DIAMETER : 5"
LOCATION : Pogo East Caprock 005
LAI GEOLOGIST : S.J.
DRILLING CONTRACTOR : SDC
DRILLING METHOD : Air Rotary



DRILL DATE : 01-03-18

BORING NUMBER : SB-12

BORING RECORD																		
GEOLOGIC UNIT	DEPTH	Start: 11:00 NM Finish: 11:35 DESCRIPTION LITHOLOGIC	DESCRIPTION USCS	GRAPHIC LOG	PID READING								SAMPLE		REMARKS			
					PPM X <u>1</u>								NUMBER	PID READING	RECOVERY	DEPTH	BACKGROUND PID READING	
					2	4	6	8	10	12	14	16						18
	30																	
	32	Fine Sand, 7.5YR 6/2, Pinkish Gray, Fine Grain Quartz Dom., Poorly Graded	SW														31	11:25
	35	Mottled Clay- Sand, Redbed 2.5YR 5/4, Reddish Brown, Fine Grain, Clay Nodules	CL SW														35	11:27
	40																	
	41	Sandy Clay, 5YR 5/2, Reddish Gray, Clay Nodules, Fine Grain	SW CL														40	11:28
	44																	
	45	5YR 4/1, Dark Gray Sand Med-Fine Grain, Poorly Sorted	SW														45	11:32
	50	TD: 50.00'															50	11:34
	55																	
	60																	
	65																	
	70																	

ONE CONTINUOUS AUGER SAMPLER

STANDARD PENETRATION TEST

UNDISTURBED SAMPLE

WATER TABLE (24 HRS)

WATER TABLE (TIME OF BORING)

LABORATORY TEST LOCATION

PENETROMETER (TONS/ SQ. FT)

NO RECOVERY

JOB NUMBER : 17-0158-01

HOLE DIAMETER : 5"

LOCATION : Pogo East Caprock 005

LAI GEOLOGIST : S.J.

DRILLING CONTRACTOR : SDC

DRILLING METHOD : Air Rotary

DRILL DATE : 01-03-18

BORING NUMBER : SB-13

Larson & Associates, Inc.
Environmental Consultants

BORING RECORD																					
GEOLOGIC UNIT	DEPTH	Start: 14:50 Finish: 15:20 DESCRIPTION LITHOLOGIC	DESCRIPTION USCS	GRAPHIC LOG	PID READING										SAMPLE		REMARKS				
					PPM X <u>1</u>										NUMBER	PID READING	RECOVERY	DEPTH	BACKGROUND PID READING		
					2	4	6	8	10	12	14	16	18								
	0																		SOIL : _____ PPM		
	2	Sandy Clay, 5YR 5/4, Reddish Brown Lithic Fine Grain, Slightly Compacted Feldspar Dom Poorly Graded	SW															0	14:55		
			Caliche															5	15:03		
	10																	10	15:05		
																			15	15:07	
	20	5R 8/2, Light Pink Caliche	SW CL															20	15:08		
		Sandy Clay, 5R 4/2, Weak Red Clay Nodules Interbedded With Sand Fine Gain																25	15:11		
	30																	30	15:13		
					Shale															35	15:14
	40																			40	15:15
		Redbed, 7.5R 3/4, Dusky Red, Very Fine Grain Well Indurated																45	15:18		
	50																	50	15:20		
	60																				
	70																				
	80																				
	90																				
		TD: 50'																			

ONE CONTINUOUS AUGER SAMPLER

STANDARD PENETRATION TEST

UNDISTURBED SAMPLE

WATER TABLE (24 HRS)

WATER TABLE (TIME OF BORING)

LABORATORY TEST LOCATION

PENETROMETER (TONS/ SQ. FT)

NO RECOVERY

JOB NUMBER : 17-0158-01
 HOLE DIAMETER : 5"
 LOCATION : Pogo East Caprock 005
 LAI GEOLOGIST : S.J.

DRILLING CONTRACTOR : SDC
 DRILLING METHOD : Air Rotary

DRILL DATE :

01-03-18

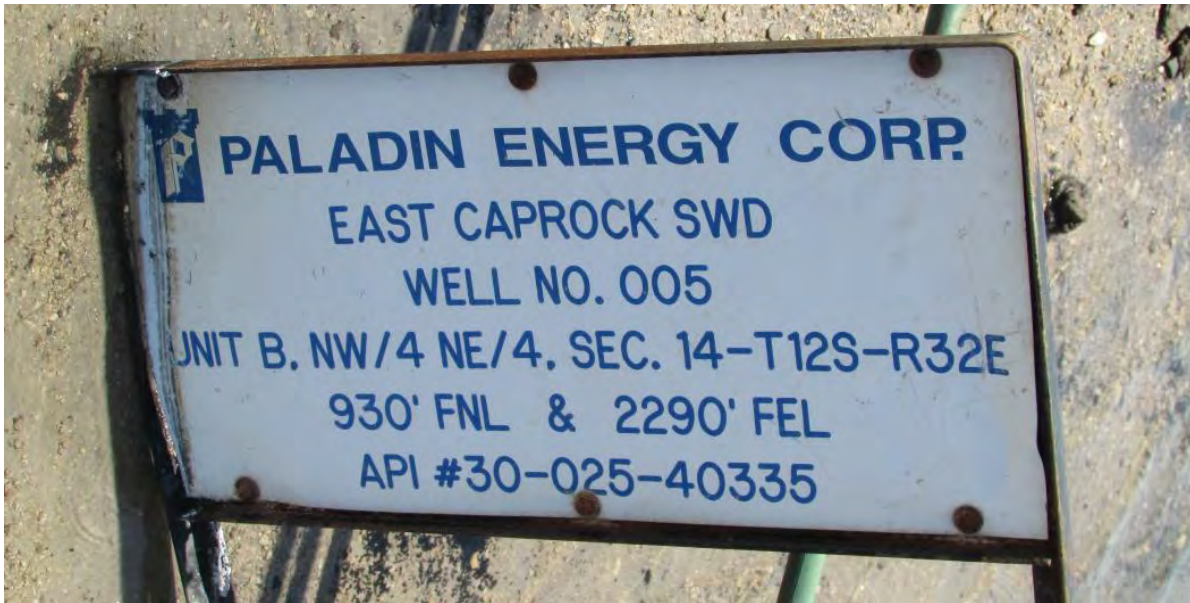
BORING NUMBER :

SB-14

Larson & Associates, Inc.

Environmental Consultants

Attachment D
Photographs



Location Sign



Spill Area near Southwest Corner of Well Pad Viewing North, June 12, 2017



Spill Area West of Well Viewing South, June 12, 2017



Spill Area South of Well Viewing East, June 12, 2017



Spill Area East of Location Viewing West, June 12, 2017



Spill Area East of Location Viewing East, June 12, 2017



Spill Area East of Location Viewing East, June 12, 2017



Spill Area East of Location Viewing West, June 12, 2017



Spill Area South of Location Viewing East, June 20, 2017



Spill Area East of Location Viewing East, June 20, 2017



Spill Area East of Location Viewing East, June 20, 2017

Attachment E

Initial C-141

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised October 10, 2003

Submit 2 Copies to appropriate
District Office in accordance
with Rule 116 on back
side of form

Release Notification and Corrective Action

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company: Paladin Energy Corporation	Contact: Mickey Horn
Address: 10290 Monroe Drive Suite 301, Dallas, TX 75229	Telephone No.: (214) 352-7273
Facility Name: East Caprock SWD No. 005	Facility Type: SWD Well
Surface Owner: Ricky Pierce	Mineral Owner
Lease No. API No. 3002540335	

LOCATION OF RELEASE

Unit Letter B	Section 14	Township 12S	Range 32E	Feet from the 930	North/South Line North	Feet from the 2290	East/West Line East	County Lea
------------------	---------------	-----------------	--------------	----------------------	---------------------------	-----------------------	------------------------	---------------

Latitude: N33° 16' 59.80" Longitude: W103° 41' 13.20"

NATURE OF RELEASE

Type of Release: Produced Water	Volume of Release: 1,700 bbl	Volume Recovered: 1,020 bbl
Source of Release: Poly line parted at valve near well	Date and Hour of Occurrence: 06-11-2017	Date and Hour of Discovery: 06-12-2017; 08:00AM
Was Immediate Notice Given? ☒ Yes ☐ No ☐ Not Required	If YES, To Whom? Olivia Yu, Environmental Specialist, OCD District 1	
By Whom? Mickey Horn	Date and Hour 6/13/2017; 09:30AM	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*

RECEIVED

By Olivia Yu at 9:02 am, Jun 15, 2017

Describe Cause of Problem and Remedial Action Taken.* Poly injection line parted at valve near well causing produced water released onto location. Spill breached berm near southeast corner of location allowing produced water to flow east into pasture approximately 950 feet. Injection pump was shut-in and berm repaired to contain fluid to location. Vacuum truck was dispatched to recover standing fluid on location.

Describe Area Affected and Cleanup Action Taken.* Affected area on location is approximately 33,928 square feet. Affected area east of location is approximately 90,000 square feet for a total of approximately 122,928 square feet. Approximately 1,020 bbl of produced water was recovered and returned to tanks. Affected area will be delineated to determine remediation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: 	OIL CONSERVATION DIVISION	
Printed Name: George G. Fenton	Approved by District Supervisor: 	
Title: President	Approval Date: 6/15/2017	Expiration Date:
E-mail Address:	Conditions of Approval: see attached directive	Attached ☒
Date: 06-13-2017 Phone: (214) 654-0132		

* Attach Additional Sheets If Necessary

1RP-4723

nOY1716632697

pOY1716633006

Operator/Responsible Party,

The OCD has received the form C-141 you provided on 6/13/2017 regarding an unauthorized release. The information contained on that form has been entered into our incident database and remediation case number 1RP-4723 has been assigned. **Please refer to this case number in all future correspondence.**

It is the Division's obligation under both the Oil & Gas Act and Water Quality Act to provide for the protection of public health and the environment. Our regulations (19.15.29.11 NMAC) state the following,

The responsible person shall complete division-approved corrective action for releases that endanger public health or the environment. The responsible person shall address releases in accordance with a remediation plan submitted to and approved by the division or with an abatement plan submitted in accordance with 19.15.30 NMAC. [emphasis added]

Release characterization is the first phase of corrective action unless the release is ongoing or is of limited volume and all impacts can be immediately addressed. Proper and cost-effective remediation typically cannot occur without adequate characterization of the impacts of any release. Furthermore, the Division has the ability to impose reasonable conditions upon the efforts it oversees. **As such, the Division is requiring a workplan for the characterization of impacts associated with this release be submitted to the OCD District 1 office in Hobbs on or before 7/15/2017. If and when the release characterization workplan is approved, there will be an associated deadline for submittal of the resultant investigation report. Modest extensions of time to these deadlines may be granted, but only with acceptable justification.**

The goals of a characterization effort are: 1) determination of the lateral and vertical extents along with the magnitude of soil contamination. 2) determine if groundwater or surface waters have been impacted. 3) If groundwater or surface waters have been impacted, what are the extents and magnitude of that impact. 4) The characterization of any other adverse impacts that may have occurred (examples: impacts on vegetation, impacts on wildlife, air quality, loss of use of property, etc.). To meet these goals as quickly as possible, the following items must, at a minimum, be addressed in the release characterization workplan and subsequent reporting:

- Horizontal delineation of soil impacts in each of the four cardinal compass directions. Adsorbed soil contamination must be characterized for the following constituents using the associated laboratory methods: benzene, toluene, ethylbenzene, and total xylenes by either Method 8260 or 8021, total petroleum hydrocarbons by Method 8015 extended range (GRO+DRO+MRO; C₆ thru C₃₆), and for chloride by Method 300. This is not an exclusive list of potential contaminants. Analyzed parameters should be modified based on the nature of the released substance(s). Soil sampling must be both within the impacted area and beyond.
- Vertical delineation of soil impacts. Adsorbed soil contamination must be characterized for the following constituents using the associated laboratory methods: benzene, toluene, ethylbenzene, and total xylenes by either Method 8260 or 8021, total petroleum hydrocarbons by Method 8015 extended range (GRO+DRO+MRO; C₆ thru C₃₆), and for chloride by Method 300. As above, this is not an exclusive list of potential contaminants and can be modified. Vertical characterization samples should be taken at depth intervals no greater than five feet apart. Lithologic description of encountered soils must also be provided. At least ten vertical feet of soils with contaminant concentrations at or below these values must be demonstrated as existing above the water table.
- Nominal detection limits for field and laboratory analyses must be provided.
- Composite sampling is not generally allowed.
- Field screening and assessment techniques are acceptable (headspace, titration, EC [include algorithm for validation purposes], EM, etc.), but the sampling and assay procedures must be clearly defined. Copies of field notes are highly desirable. A statistically significant set of split samples must be submitted for confirmatory laboratory analysis, including the laterally farthest and vertically deepest sets of soil samples. Make sure there are at least two soil samples submitted

for laboratory analysis from each borehole or test pit (highest observed contamination and deepest depth investigated). Copies of the actual laboratory results must be provided including chain of custody documentation.

- Probable depth to shallowest protectable groundwater and lateral distance to nearest surface water. If there is an estimate of groundwater depth, the information used to arrive at that estimate must be provided. If there is a reasonable assumption that the depth to protectable water is 50 feet or less, the responsible party should anticipate the need for at least one groundwater monitoring well to be installed in the area of likely maximum contamination.

- If groundwater contamination is encountered, an additional investigation workplan may be required to determine the extents of that contamination. Groundwater and/or surface water samples, if any, must be analyzed by a competent laboratory for volatile organic hydrocarbons (typically Method 8260 full list), total dissolved solids, pH, major anions and cations including chloride and sulfate, dissolved iron, and dissolved manganese. The investigation workplan must provide the groundwater sampling method(s) and sample handling protocols. To the fullest extent possible, aqueous analyses must be undertaken using nominal method detection limits. As with the soil analyses, copies of the actual laboratory results must be provided including chain of custody documentation.

- Accurately scaled and well-drafted site maps must be provided providing the location of borings, test pits, monitoring wells, potentially impacted areas, and significant surface features including roads and site infrastructure that might limit either the release characterization or remedial efforts. Field sketches may be included in subsequent reporting, but should not be considered stand-alone documentation of the site's layout. Digital photographic documentation of the location and fieldwork is recommended, especially if unusual circumstances are encountered.

Nothing herein should be interpreted to preclude emergency response actions or to imply immediate remediation by removal cannot proceed as warranted. Nonetheless, characterization of impacts and confirmation of the effectiveness of remedial efforts must still be provided to the OCD before any release incident will be closed.

Jim Griswold

OCD Environmental Bureau Chief
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
505-476-3465
jim.griswold@state.nm.us