Safety & Environmental Solutions
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Memorandum

Date: February 18, 2015
To: Tomas J. Oberding, Ph.D.
cc: Bob Allen, SESI; Mickey Horn, Paladin Energy Corporation
From: David G. Boyer, P.G.
RE: Sampling at Paladin S. Vacuum SWD Line Release

On November 12, 2014, the above addresses met with you at the OCD office in Hobbs. The purpose of the meeting was to discuss results of six years of groundwater sampling data collected from the release area and to request a reduction in sampling frequency with reevaluation of results in two years.

Background

On February 28, 2008 a representative of DCPM notified Paladin that while remediating a leak at the DCPM's Eddy County Loop (COP line #12200), it was discovered that there was soil contaminated with chlorides released from Paladins' S. Vacuum SWD line that crosses the DCPMs' line. SESI was contracted to perform a site investigation at the leak area located in Unit D, Section 35, Township 18S, Range 35E (location shown on attached vicinity map).

A Monitor well was installed at this site and the depth of groundwater on June 6, 2008 was 61.42 feet below land surface. During July two additional monitor wells were installed in vicinity at locations assumed to be upgradient and off-gradient. After determining the groundwater flow direction two additional monitor wells were installed in August 2008 downgradient of the leak area. The locations of the monitor wells are shown on the attached site map.

Beginning in 2008, groundwater monitoring at the location was performed with samples obtained for analysis of chloride, TDS and BTEX. Wells MW-1, MW-4 and MW-5 have chloride and TDS values which currently exceed NM groundwater standards. These three wells also have had detections of benzene but only MW-1 showed benzene levels at or in excess of the NM standard. These occurred in 2009 and 2010 with a high of 0.061 mg/L in September 2009. Benzene has not been detected in any of the three wells since 2011. Wells MW-2 and MW-3 have not shown any detection of BTEX at their detection levels, and chloride and TDS concentrations are at background with very little change during this time. A tabulation of sample results is attached together with time series graphs showing chloride and TDS levels.

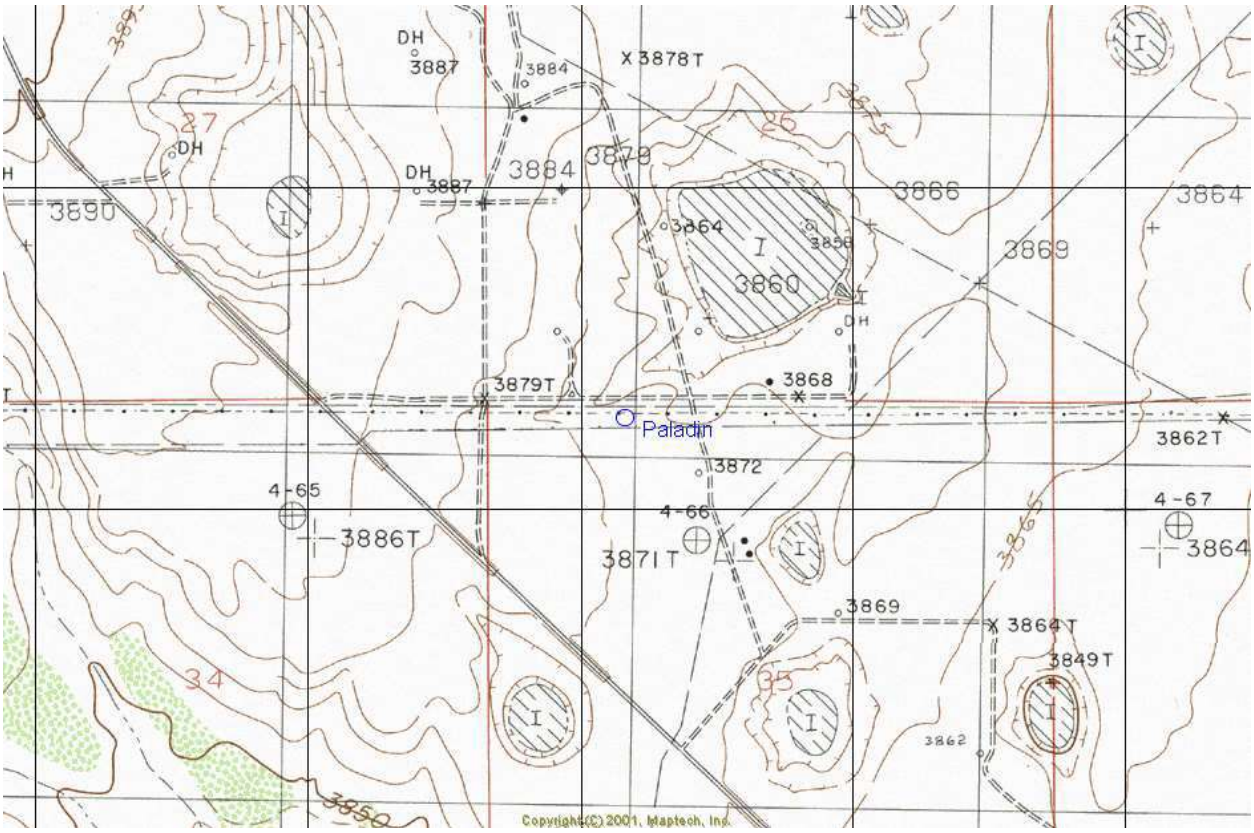
Request

At the meeting we presented the above data and discussed the sampling modification we are requesting. However, I misunderstood what else may have been necessary to have it considered which is a formal written request. This document provides the request which follows:

1. A reduction in sampling frequency from quarterly to semi-annually, and
2. Re-evaluation of all data at the end of a two-year period to determine further action, if necessary.

Following review, your approval of this request would be appreciated. If you have questions regarding this request, please contact me at the above phone number or by email at dboyer@sesi-nm.com

DGB/DGB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Monitor Well #2
Monitor Well #3
Monitor Well #1
Monitor Well #4
Monitor Well #5
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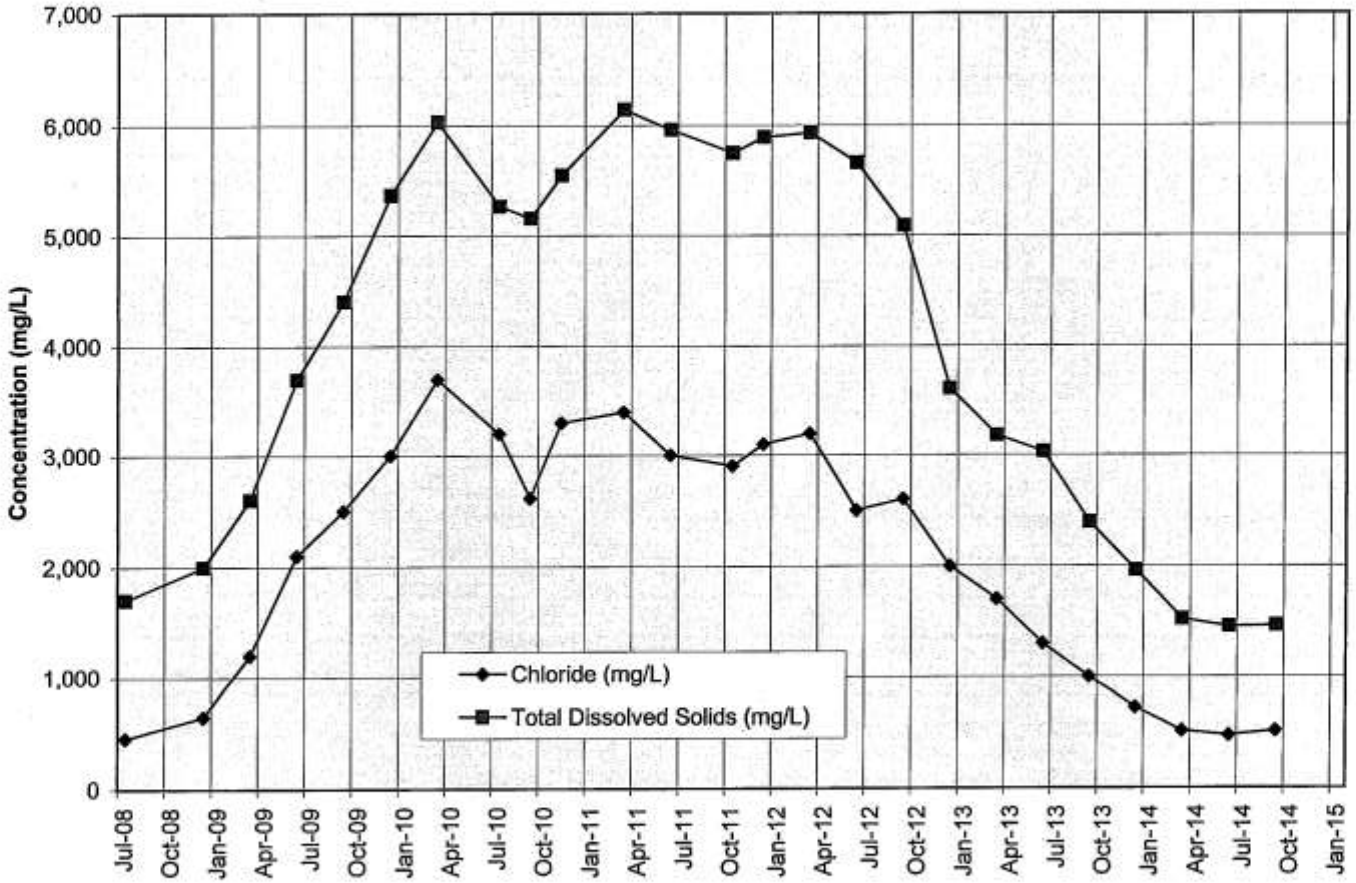
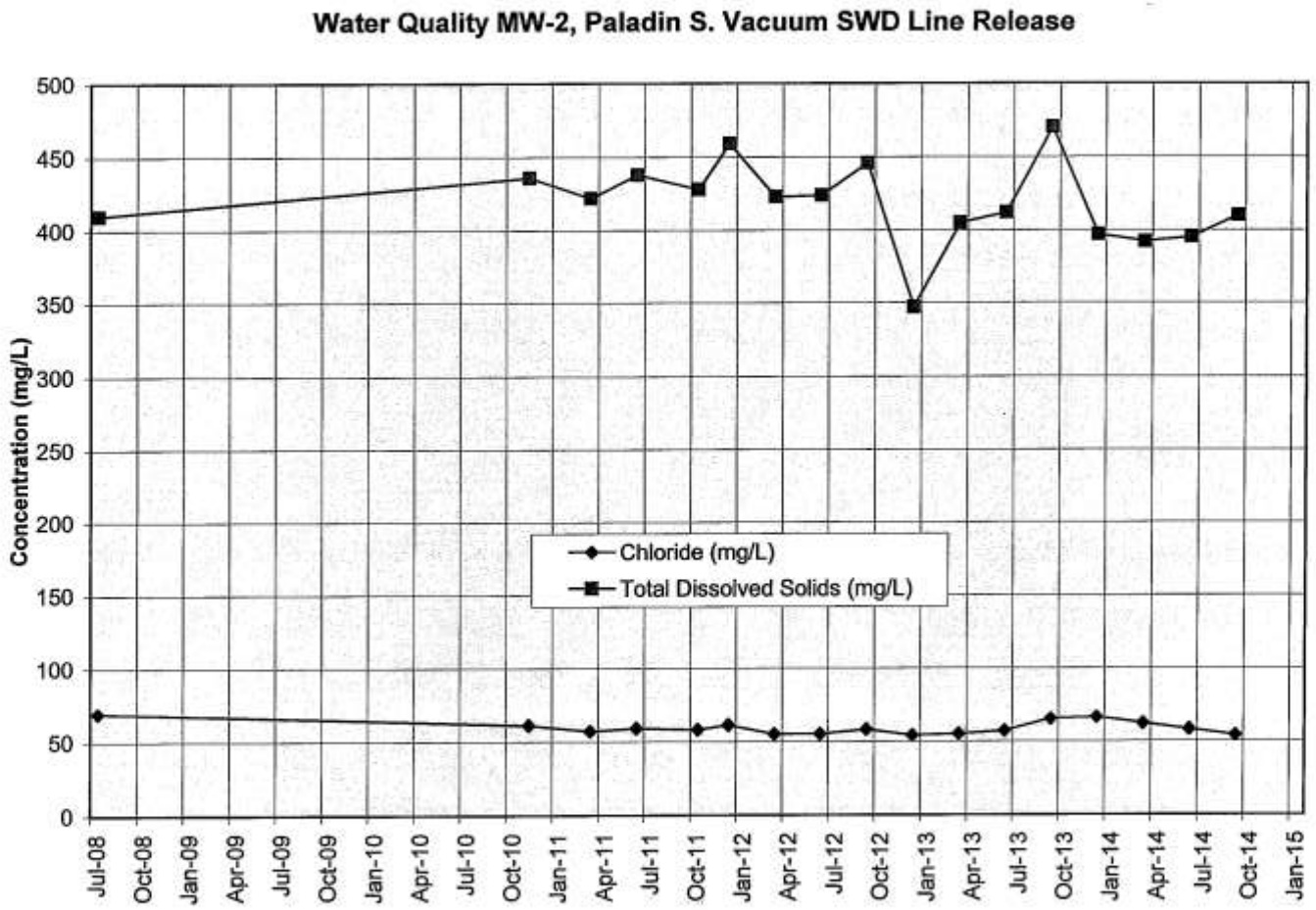
Water Quality MW-1, Paladin S. Vacuum SWD Line Release




Water Quality MW-2, Paladin S. Vacuum SWD Line Release
Concentration (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Chloride (mg/L)
Total Dissolved Solids (mg/L)
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
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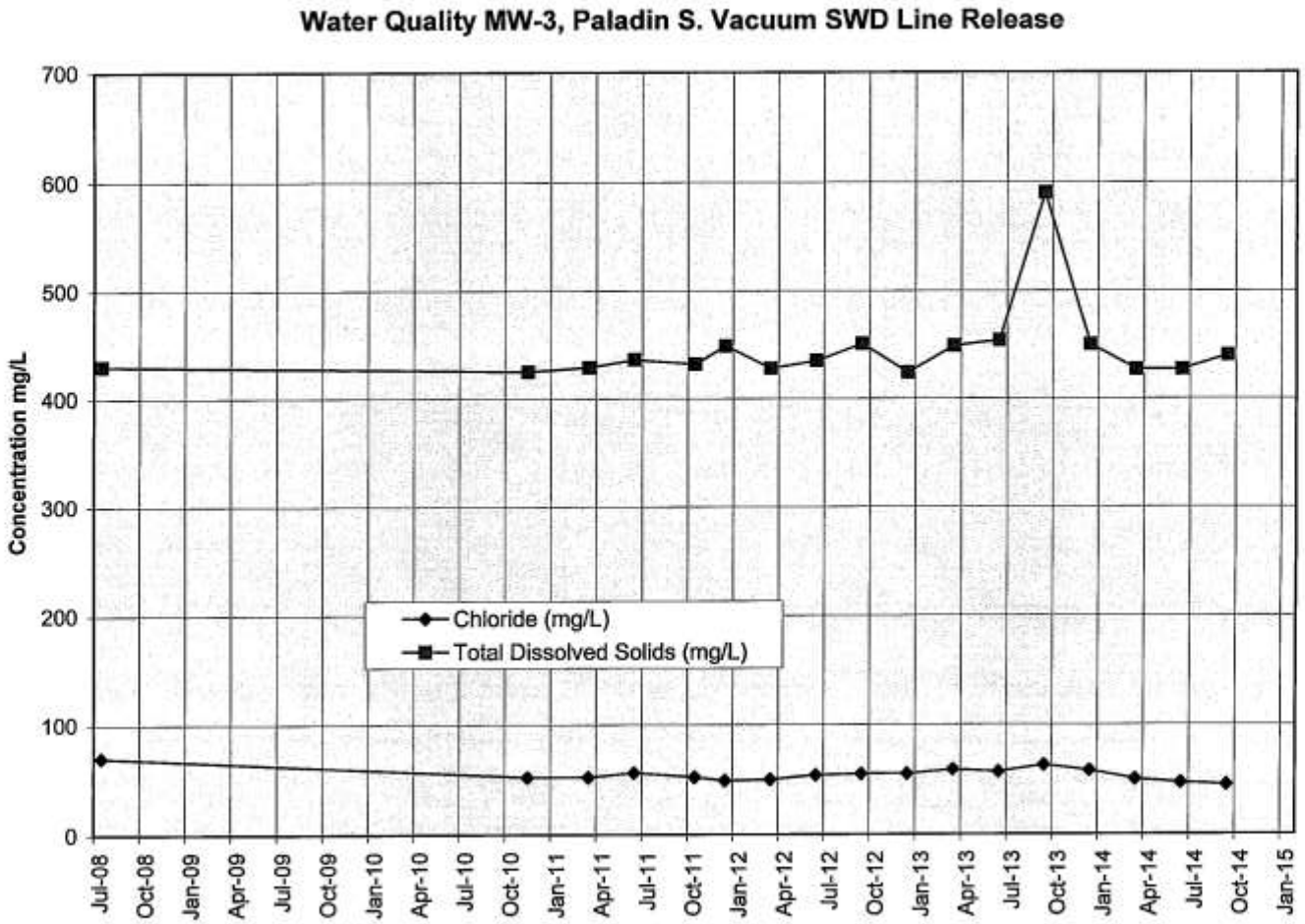
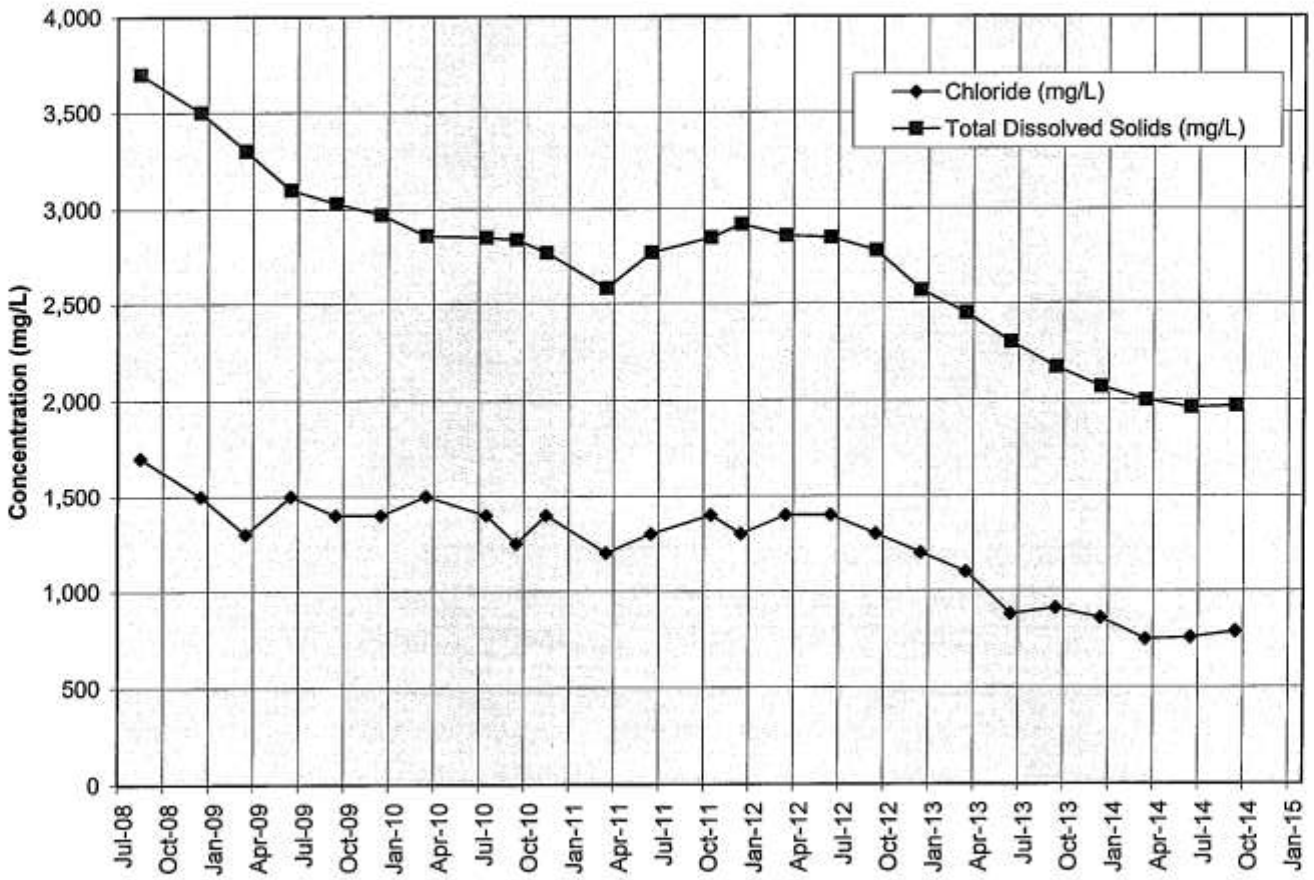
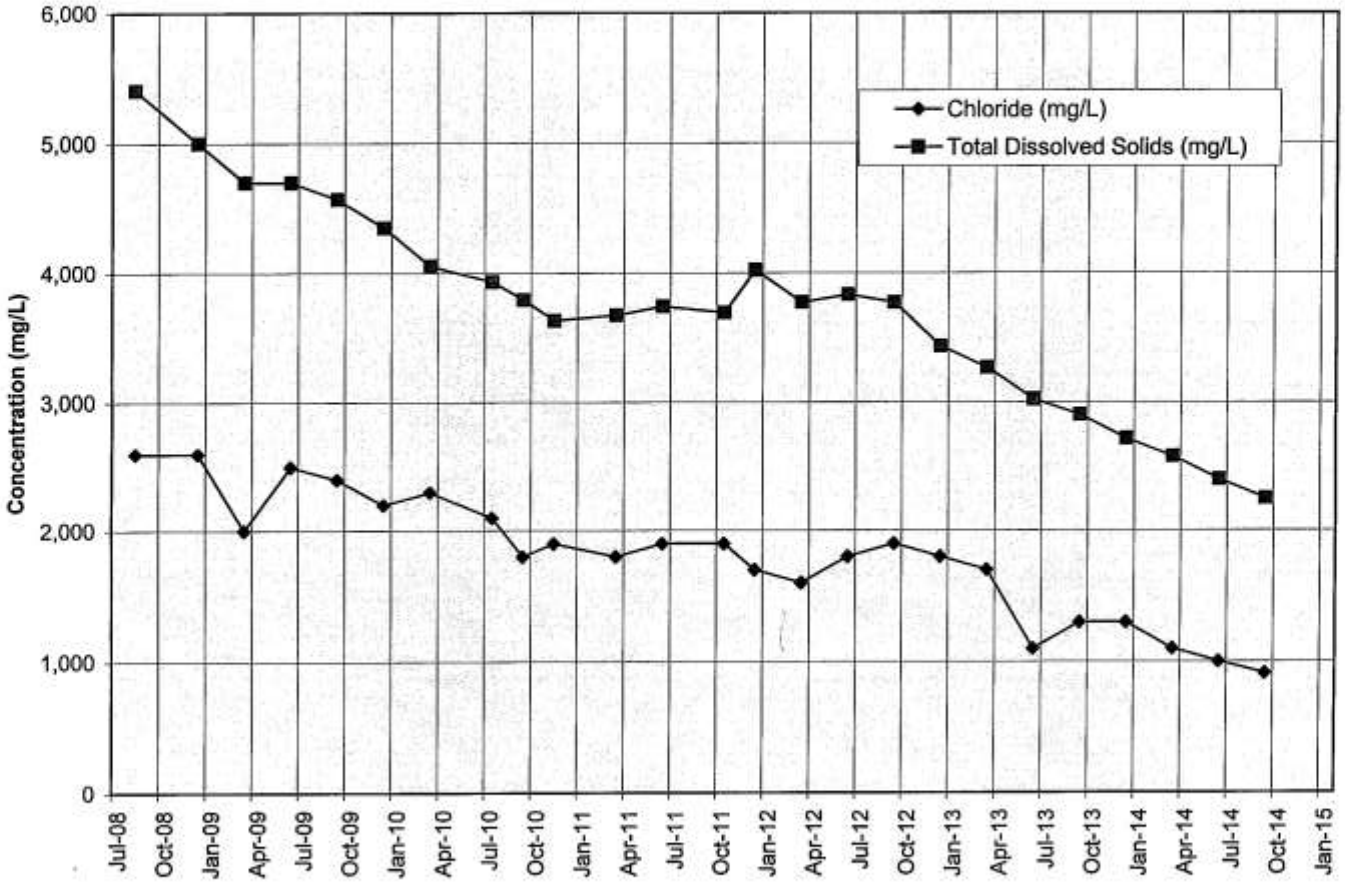
Apr-14
Jul-14
Oct-14
Jan-15


Water Quality MW-3, Paladin S. Vacuum SWD Line Release
Concentration mg/L
700
600
500
400
300
200
100
0
Chloride (mg/L)
Total Dissolved Solids (mg/L)
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15

Water Quality MW-4, Paladin S. Vacuum SWD Line Release



Water Quality MW-5, Paladin S. Vacuum SWD Line Release



Monitor Well Water Quality, Palidin S. Vacuum SWD Line Release

Monitoring Well	Sample Date	Chloride (mg/L)	Total Dissolved Solids (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (total, µg/L)
MW-1	07/21/08	460	1,700	<0.5	<0.5	<0.5	<1.0
	12/29/08	650	2,000	<0.5	<0.5	<0.5	<1.0
	03/16/09	1,200	2,600	<0.5	<0.5	<0.5	<1.0
	06/24/09	2,100	3,700	6.1	<1.0	<1.0	<1.5
	09/11/09	2,500	4,400	61	<1.0	<1.0	<2.0
	12/18/09	3,000	5,370	21	<1.0	<1.0	<2.0
	03/10/10	3,700	6,030	10	<1.0	<1.0	2.6
	07/06/10	3,200	5,270	5.7	<1.0	<1.0	<1.5
	09/02/10	2,610	5,160	3.7	<1.0	<1.0	<2.0
	11/09/10	3,300	5,550	2.3	<1.0	<1.0	<2.0
	03/15/11	3,400	6,140	3.4	<1.0	<1.0	<2.0
	06/22/11	3,000	5,960	4.4	<1.0	<1.0	<2.0
	10/06/11	2,900	5,750	<1.0	<1.0	<1.0	2.3
	12/13/11	3,100	5,890	<1.0	<1.0	<1.0	2.1
	03/05/12	3,200	5,930	<1.0	<1.0	<1.0	<2.0
	06/05/12	2,500	5,660	<1.0	<1.0	<1.0	<2.0
	09/05/12	2,600	5,090	<1.0	<1.0	<1.0	<2.0
	12/05/12	2,000	3,610	<1.0	<1.0	<1.0	<2.0
	03/07/13	1,700	3,180	<1.0	<1.0	<1.0	<2.0
	06/24/13	1,300	3,030	<1.0	<1.0	<1.0	<2.0
	09/09/13	1,000	2,390	<1.0	<1.0	<1.0	<2.0
	12/26/13	720	1,960	<1.0	<1.0	<1.0	<2.0
	03/22/14	510	1,520	<1.0	<1.0	<1.0	<2.0
	06/17/14	470	1,450	<1.0	<1.0	<1.0	<2.0
	09/15/14	510	1,460	<1.0	<1.0	<1.0	<2.0
MW-2	07/08/08	69	410	<0.5	<0.5	<0.5	<1.0
	11/09/10	61	436	<1.0	<1.0	<1.0	<2.0
	03/15/11	57	422	<1.0	<1.0	<1.0	<2.0
	06/22/11	59	438	<1.0	<1.0	<1.0	<2.0
	10/06/11	58	428	<1.0	<1.0	<1.0	<2.0
	12/13/11	61	459	<1.0	<1.0	<1.0	2.1
	03/05/12	55	423	<1.0	<1.0	<1.0	<2.0
	06/05/12	55	424	<1.0	<1.0	<1.0	<2.0
	09/05/12	58	446	<1.0	<1.0	<1.0	<2.0
	12/05/12	54	347	<1.0	<1.0	<1.0	<2.0
	03/07/13	55	405	<1.0	<1.0	<1.0	<2.0
	06/24/13	57	412	<1.0	<1.0	<1.0	<2.0
	09/09/13	65	470	<1.0	<1.0	<1.0	<2.0
	12/26/13	66	397	<1.0	<1.0	<1.0	<2.0
	03/22/14	62	392	<1.0	<1.0	<1.0	<2.0
	06/17/14	58	395	<1.0	<1.0	<1.0	<2.0
	09/15/14	54	410	<1.0	<1.0	<1.0	<2.0

Monitor Well Water Quality, Palidin S. Vacuum SWD Line Release

Monitoring Well	Sample Date	Chloride (mg/L)	Total Dissolved Solids (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (total, µg/L)
MW-3	07/08/08	70	430	<0.5	<0.5	<0.5	<1.0
	11/09/10	52	425	<1.0	<1.0	<1.0	<2.0
	03/15/11	52	429	<1.0	<1.0	<1.0	<2.0
	06/22/11	56	436	<1.0	<1.0	<1.0	<2.0
	10/06/11	52	432	<1.0	<1.0	<1.0	<2.0
	12/13/11	49	449	<1.0	<1.0	<1.0	<2.0
	03/05/12	50	428	<1.0	<1.0	<1.0	<2.0
	06/05/12	54	435	<1.0	<1.0	<1.0	<2.0
	09/05/12	55	451	<1.0	<1.0	<1.0	<2.0
	12/05/12	55	424	<1.0	<1.0	<1.0	<2.0
	03/07/13	59	449	<1.0	<1.0	<1.0	<2.0
	06/24/13	57	454	<1.0	<1.0	<1.0	<2.0
	09/09/13	63	590	<1.0	<1.0	<1.0	<2.0
	12/26/13	58	450	<1.0	<1.0	<1.0	<2.0
	03/22/14	50	427	<1.0	<1.0	<1.0	<2.0
	06/17/14	47	427	<1.0	<1.0	<1.0	<2.0
	09/15/14	45	440	<1.0	<1.0	<1.0	<2.0
MW-4	08/26/08	1,700	3,700	1.3	<0.5	<0.5	<1.0
	12/29/08	1,500	3,500	1.1	<0.5	<0.5	<1.0
	03/16/09	1,300	3,300	0.9	<0.5	<0.5	<1.0
	06/24/09	1,500	3,100	<1.0	<1.0	<1.0	<1.5
	09/11/09	1,400	3,030	2.9	<1.0	<1.0	<2.0
	12/18/09	1,400	2,970	1.3	<1.0	<1.0	<2.0
	03/10/10	1,500	2,860	1.1	<1.0	<1.0	<1.5
	07/06/10	1,400	2,850	1.6	<1.0	<1.0	<1.5
	09/02/10	1,250	2,840	2.6	<1.0	<1.0	<2.0
	11/09/10	1,400	2,770	2.4	<1.0	<1.0	<2.0
	03/15/11	1,200	2,580	1.4	<1.0	<1.0	<2.0
	06/22/11	1,300	2,770	<1.0	<1.0	<1.0	<2.0
	10/06/11	1,400	2,850	<1.0	<1.0	<1.0	5.5
	12/13/11	1,300	2,920	<1.0	<1.0	<1.0	3.2
	03/05/12	1,400	2,860	<1.0	<1.0	<1.0	<2.0
	06/05/12	1,400	2,850	<1.0	<1.0	<1.0	<2.0
	09/05/12	1,300	2,780	<1.0	<1.0	<1.0	<2.0
	12/05/12	1,200	2,570	<1.0	<1.0	<1.0	<2.0
	03/07/13	1,100	2,450	<1.0	<1.0	<1.0	<2.0
	06/24/13	880	2,300	<1.0	<1.0	<1.0	<2.0
	09/09/13	910	2,170	<1.0	<1.0	<1.0	<2.0
	12/26/13	860	2,070	<1.0	<1.0	<1.0	<2.0
	03/22/14	750	2,000	<1.0	<1.0	<1.0	<2.0
	06/17/14	760	1,960	<1.0	<1.0	<1.0	<2.0
	09/15/14	790	1,970	<1.0	<1.0	<1.0	<2.0

Monitor Well Water Quality, Palidin S. Vacuum SWD Line Release

Monitoring Well	Sample Date	Chloride (mg/L)	Total Dissolved Solids (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (total, µg/L)
MW-5	08/26/08	2,600	5,400	<0.5	<0.5	<0.5	<1.0
	12/29/08	2,600	5,000	<0.5	<0.5	<0.5	<1.0
	03/16/09	2,000	4,700	<0.5	<0.5	<0.5	<1.0
	06/24/09	2,500	4,700	1.3	<1.0	<1.0	<1.5
	09/11/09	2,400	4,570	1.7	<1.0	<1.0	<2.0
	12/18/09	2,200	4,350	<1.0	<1.0	<1.0	<2.0
	03/10/10	2,300	4,050	<1.0	<1.0	<1.0	<1.5
	07/06/10	2,100	3,930	<1.0	<1.0	<1.0	<1.5
	09/02/10	1,800	3,790	<1.0	<1.0	<1.0	<2.0
	11/09/10	1,900	3,630	<1.0	<1.0	<1.0	<2.0
	03/15/11	1,800	3,670	<1.0	<1.0	<1.0	<2.0
	06/22/11	1,900	3,740	<1.0	<1.0	<1.0	<2.0
	10/06/11	1,900	3,690	<1.0	<1.0	<1.0	<2.0
	12/13/11	1,700	4,020	<1.0	<1.0	<1.0	<2.0
	03/05/12	1,600	3,770	<1.0	<1.0	<1.0	<2.0
	06/05/12	1,800	3,830	<1.0	<1.0	<1.0	<2.0
	09/05/12	1,900	3,770	<1.0	<1.0	<1.0	<2.0
	12/05/12	1,800	3,430	<1.0	<1.0	<1.0	<2.0
	03/07/13	1,700	3,260	<1.0	<1.0	<1.0	<2.0
	06/24/13	1,100	3,020	<1.0	<1.0	<1.0	<2.0
	09/09/13	1,300	2,900	<1.0	<1.0	<1.0	<2.0
	12/26/13	1,300	2,720	<1.0	<1.0	<1.0	<2.0
	03/22/14	1,100	2,580	<1.0	<1.0	<1.0	<2.0
	06/17/14	1,000	2,400	<1.0	<1.0	<1.0	<2.0
	09/15/14	910	2,250	<1.0	<1.0	<1.0	<2.0
TMW-2	06/06/08	480	--	--	--	--	--
	06/10/08	570	2,000	<0.5	<0.5	<0.5	<1.0
NM Groundwater Standard :		**250 mg/L**	**1,000 mg/L**	**10 µg/L**	**750 µg/L**	**750 µg/L**	**620 µg/L**

Notes: 1. Complete cation/anion analysis on file for 06/29/05 and 07/22/05.

2. Water Quality Control Commission Standards adopted by the NM Oil Conservation Division

2008-March 2009 analyses performed at Argon Laboratories, Hobbs, NM;

June 2009-2014 analyses performed by Hall Environmental Analysis Laboratory, Inc., Albuquerque

Argon analyses using EPA SW-846 method 8021B (BTEX) , 160.1 (TDS), and 300.0 (chloride).

Hall analyses using EPA SW-846 method 8021B or 8260B (BTEX) and 300.0 (chloride), and SM 2540C (TDS)