AP - 60

STAGE 1 & 2 REPORTS

DATE: 12-22-10

Hansen, Edward J., EMNRD

From: Katie Jones [kjones@riceswd.com]
Sent: Friday, February 18, 2011 1:18 PM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; lpg@texerra.com
Subject: EME Jct. K-33-1 (AP-60) and Sarah Phillips EOL (1R427-17) Termination Request Addendum
Attachments: EME Jct. K-33-1 and Sarah Phillips Termination Request Addendum - Figure 7.pdf

Mr. Hansen,

Attached is a revised Figure 7 to replace Figures 7a and 7b (pages 10 and 11) of the EME Jct. K-33-1 (AP-60) and Sarah Phillips EOL (1R427-17) Termination Request. ROC also requests to plug and abandon MW-1, MW-2, MW-3, and MW-4 located at Jct. K-33-1 and MW-1 located at Sarah Phillips EOL using a cement grout with 1 to 3% bentonite and a 3 foot cap of cement. If you have any questions or require any additional information, please contact Hack Conder at (575)631-6432 or myself at (575)393-9174.

Thank you.

Katie Jones
Environmental Project Coordinator
RICE *Operating Company*

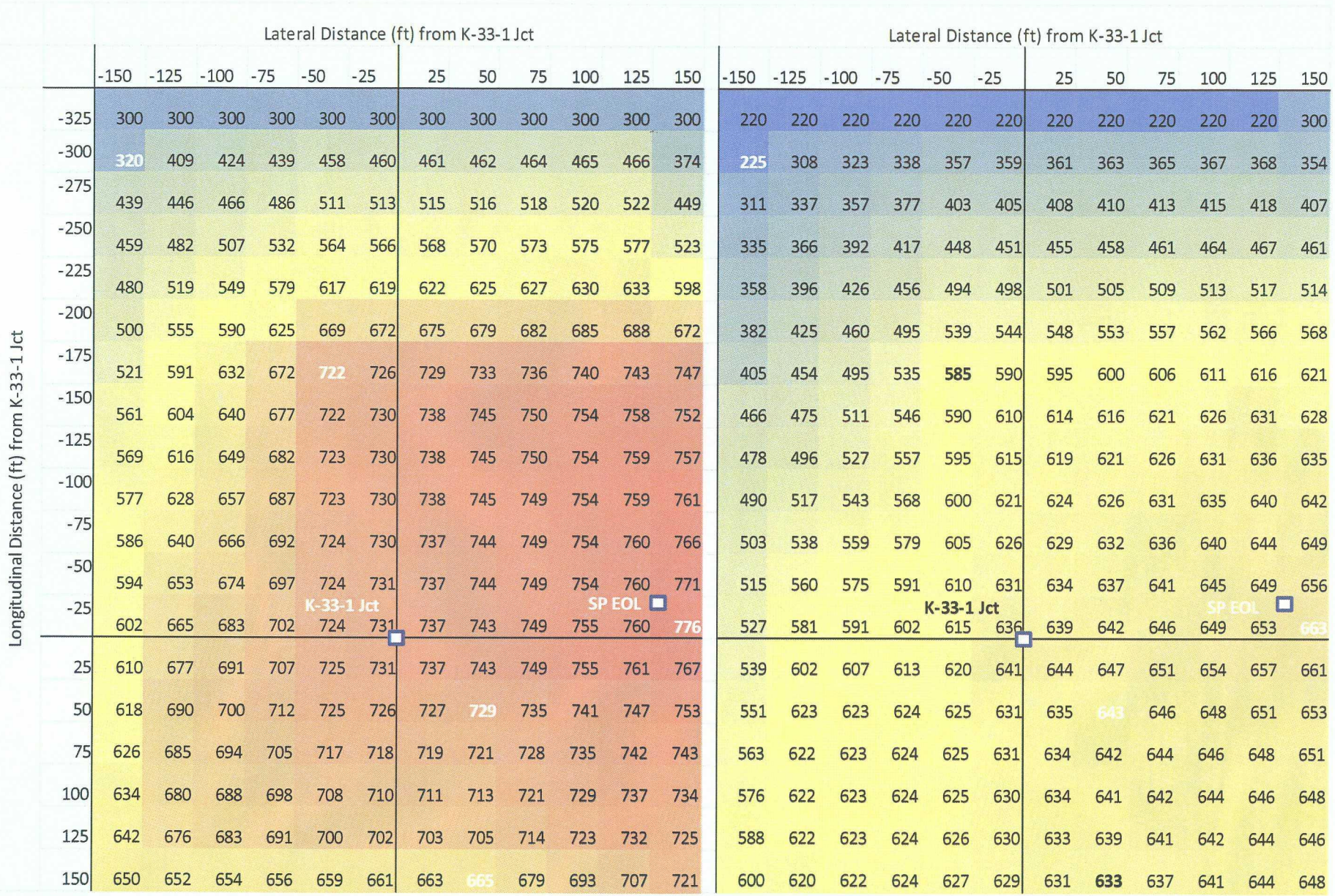

Figure 7 – Average annual groundwater chloride concentrations (mg/kg) for 2007 (left) and 2010 (right). These data indicate that the source of the moderately elevated groundwater chloride concentrations observed near the EME K-33-1 and Sarah Phillips junction boxes in 2007 is from the regional chloride plume known to exist to the west of these sites. The data also indicate that chloride concentrations are gradually diminishing over time due to natural attenuation. [The regional direction of groundwater flow is from NW to SE. North is "up". Maps are approximations to actual scale].

Texerra

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Tel: 719-339-6791 E-mail: lpg@texerra.com

December 22nd, 2010

Mr. Edward Hansen
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87504

RE: **Groundwater Monitoring Report & Remediation Termination Request**
Rice Operating Company EME SWD System
Sarah Phillips Jct – NMOCD Case Number 1R-427-17
K-33-1 Jct - NMOCD AP-60

Sent via E-mail and U.S. Certified Mail: No. 7008 1140 0001 3068 8715

Mr. Hansen:

This letter presents and interprets groundwater chloride monitoring data collected for the above-referenced projects over the past several years. In this report we are aggregating the groundwater monitoring data from both the EME K-33-1 and the EME Sarah Phillips sites because of their close proximity (Figures 1, 2 & 3). The location of the K-33-1 and Sarah Phillips sites relative to the known regional chloride plume south of Monument is shown in Figure 4.

The chloride concentration of groundwater that encounters and flows across the K-33-1 and Sarah Phillips locations is presented Figure 5a. The baseline groundwater chloride concentration has dropped from approximately 750 mg/kg to approximately 550 mg/kg over the last nearly four years. Nearly identical patterns in groundwater chloride concentrations over time have been observed in the K-33-1 near source, down-gradient monitor well (MW-1, Figure 5b) and in the (farther) down-gradient monitor well (MW-3, Figure 5c). A far up-gradient monitor well (MW-4, Figure 5d) illustrates lower concentrations but a similar pattern of decline over time, dropping from approximately 320 mg/kg to approximately 280 mg/kg over the past three years. Groundwater chloride data from the near source, down-gradient monitor well at the Sarah Phillips location (Figure 6) illustrates a pattern strikingly similar to the near source down-gradient monitor well at the K-33-1 location. These data are presented in plain view in Figure 7, where it is evident that the center of mass of the groundwater chloride plume has moved down-gradient and had become more dilute (through natural groundwater dispersion) over the past three years. In fact the largest declines (in dark blue) are in and near the center of mass of the plume, indicating that there has been little or no downward migration of residual soil chlorides into groundwater.

Taken together, **these data are indicative of a groundwater chloride plume that has migrated across the Sarah Phillips and K-33-1 locations from an up-gradient source and that is gradually moving down-gradient and decreasing in concentration over time**. The average, aggregate rate of decline in groundwater chloride concentrations among all of the monitor wells is approximately 5% per year. We may expect, then, that the groundwater chloride concentrations below and proximal to these locations to diminish below 250 mg/kg in approximately 20 years (Figure 8).

It having been demonstrated that the observed impacts on groundwater quality beneath the Sarah Phillips and K-33-1 locations have apparently been caused by historical up-gradient land use practices which are gradually diminishing over time, and that natural vegetation is becoming reestablished across these sites (Figure 9), we respectfully request that NMOCD grant remediation termination or similar\closure status to these projects.

ROC is the service provider (agent) for the EME Salt Water Disposal System and has no ownership of any portion of pipeline, well or facility. The EME SWD System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis.

Please do not hesitate to contact either myself or Rice Operating Company if you have any questions or need additional information.

Sincerely,

L. Peter Galusky, Jr. Ph.D.

Copy: Rice Operating Company

EME Sarah Phillips & K-33-1

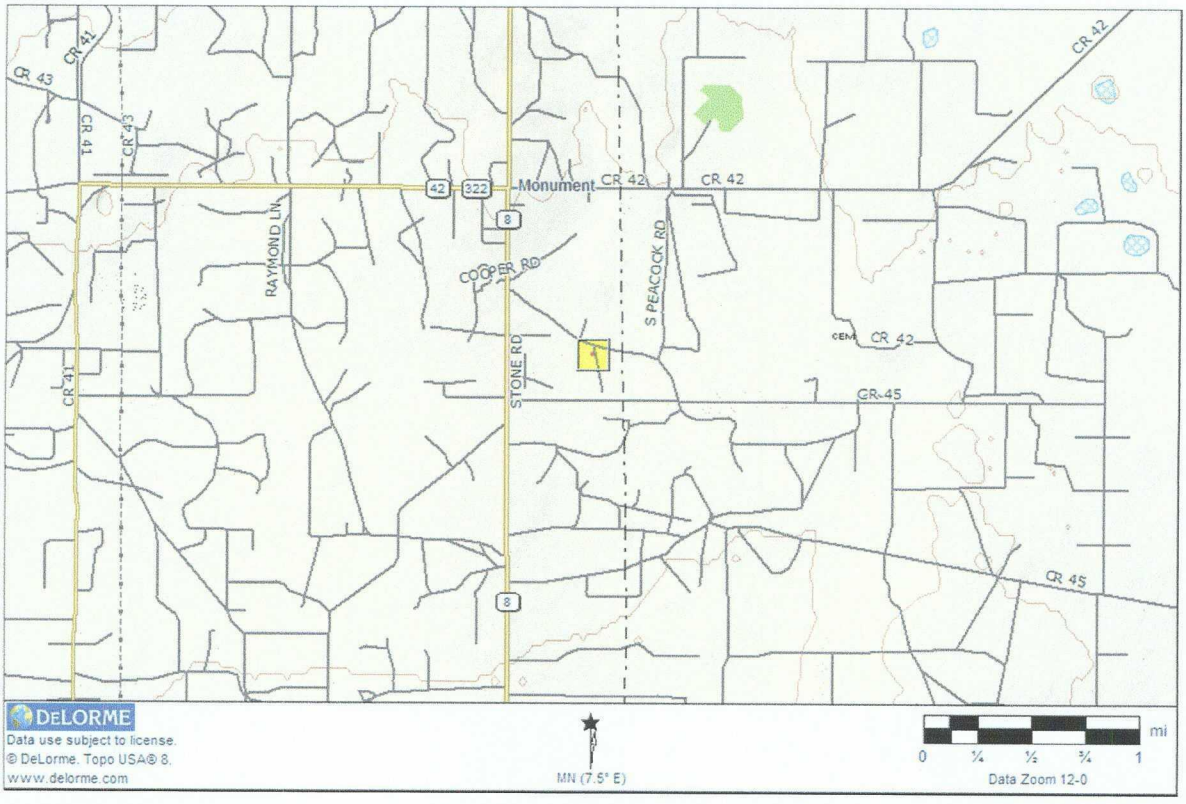
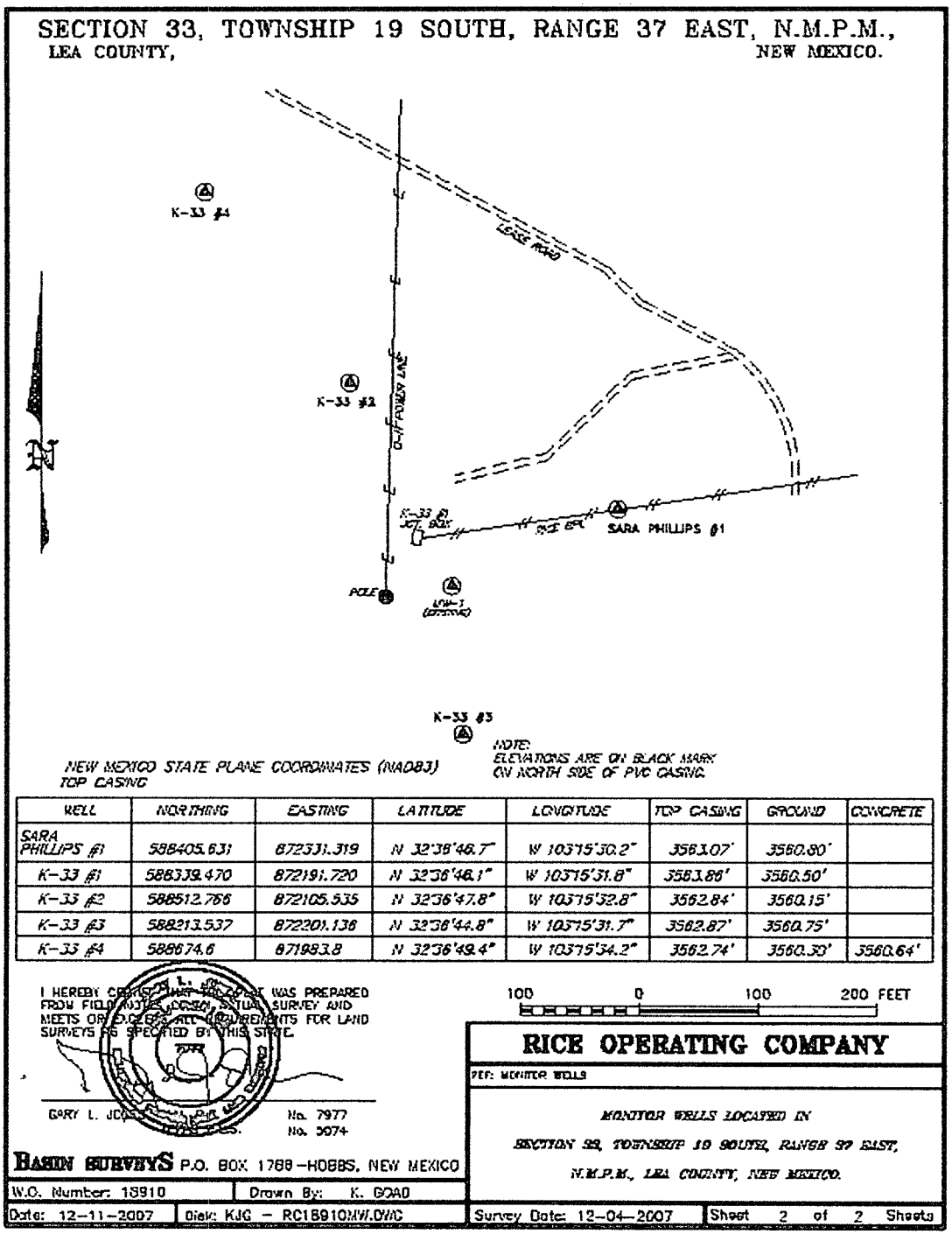


Figure 1 – Location of EME Sarah Phillips & K-33-1 sites (yellow box). The prevailing direction of groundwater flow is toward the southeast (lower right).

Figure 2 – Aerial photograph showing locations of Sarah Phillips and K-33-1 sites and monitor wells. The up-gradient monitor well (K-33-1 MW-2) provides data on the baseline quality of groundwater as it encounters and flows across the K-33-1 and Sarah Phillips locations.



WELL	NORTHING	EASTING	LATITUDE	LONGITUDE	TOP CASING	GROUND	CONCRETE
SARA PHILLIPS #1	588405.631	872331.319	N 32°38'46.7"	W 103°15'30.2"	3561.07'	3560.80'	
K-33 #1	588339.470	872191.720	N 32°38'46.1"	W 103°15'31.8"	3561.86'	3560.50'	
K-33 #2	588512.766	872105.535	N 32°38'47.8"	W 103°15'32.8"	3562.84'	3560.15'	
K-33 #3	588213.537	872201.136	N 32°38'44.8"	W 103°15'31.7"	3562.87'	3560.75'	
K-33 #4	588674.6	871983.8	N 32°38'49.4"	W 103°15'34.2"	3562.74'	3560.30'	3560.64'

Figure 3 – Surveyed plat showing locations of groundwater monitor wells at EME K-33-1 and Sarah Phillips locations.

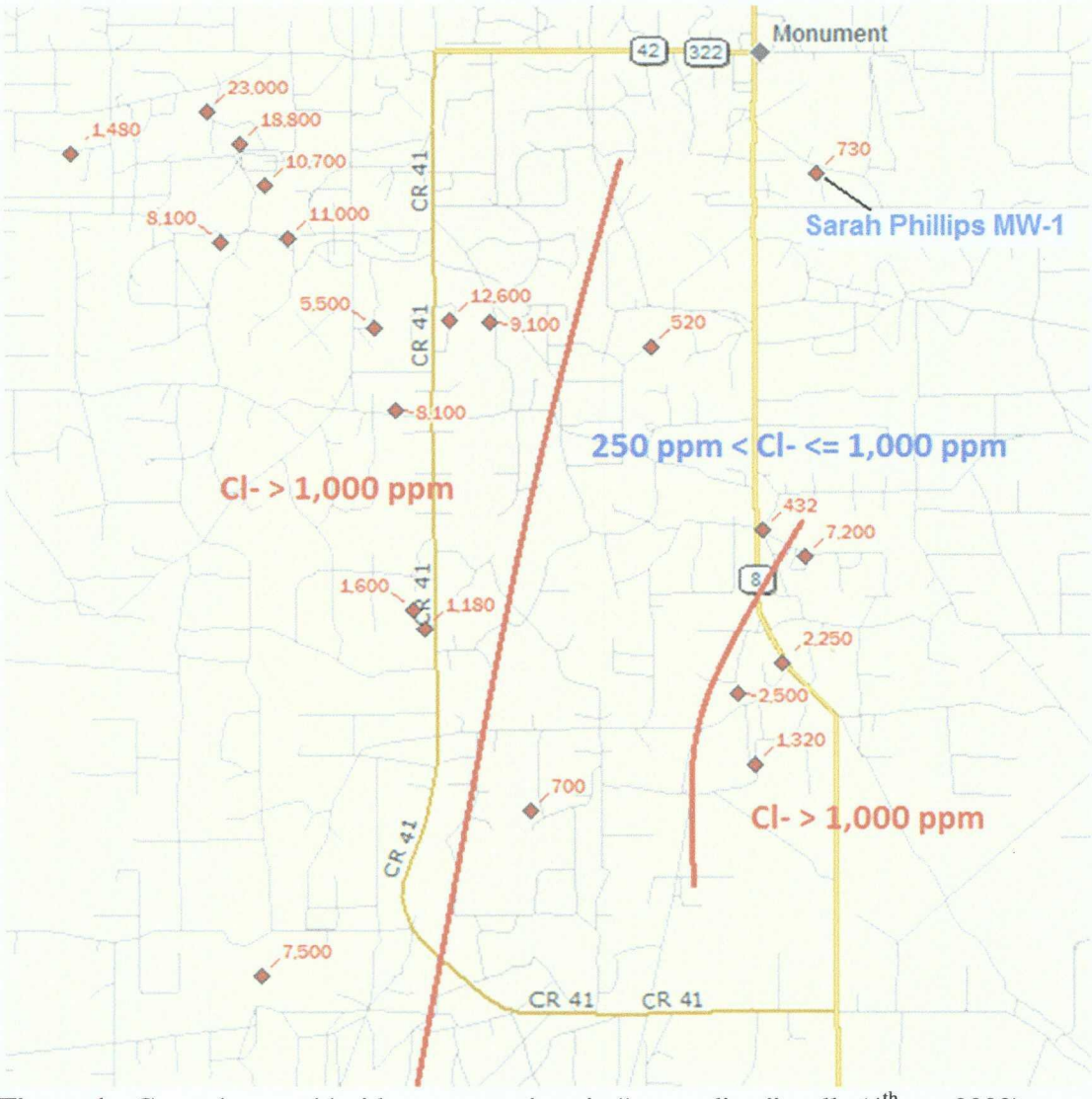
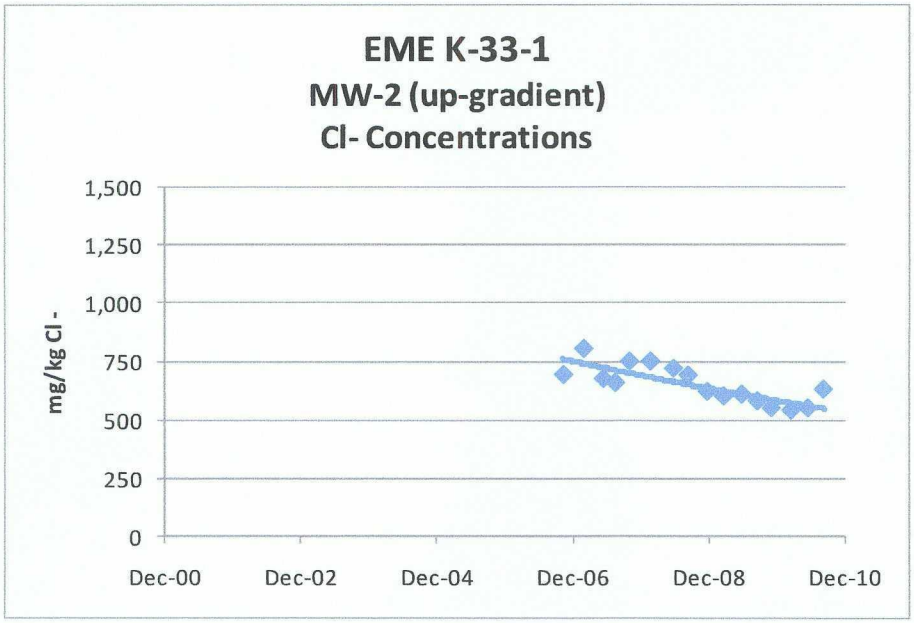


Figure 4 – Groundwater chloride concentrations in "up-gradient" wells (4th qtr, 2009) at various Rice Operating Company locations. The groundwater south of Monument is clearly "regionally impacted" from historical land use activities not caused by Rice operations. The 2nd Qtr 2009 chloride concentration of the near-source monitor well at the Sarah Phillips location is shown in the upper right portion of the figure. The Sarah Phillips and K-33-1 sites appear to be just north of this regional plume but are likely affected by similar regional, historical land use factors.



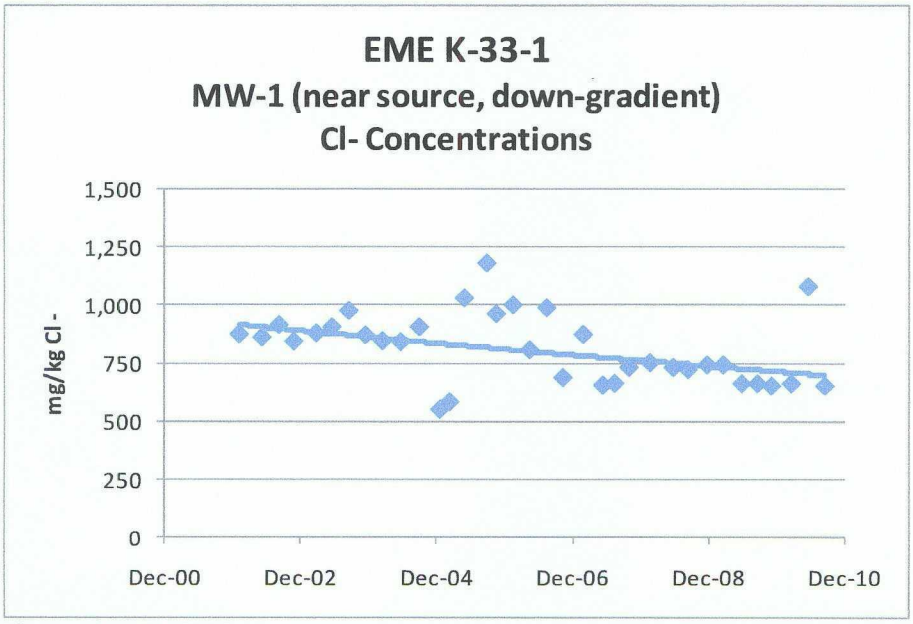
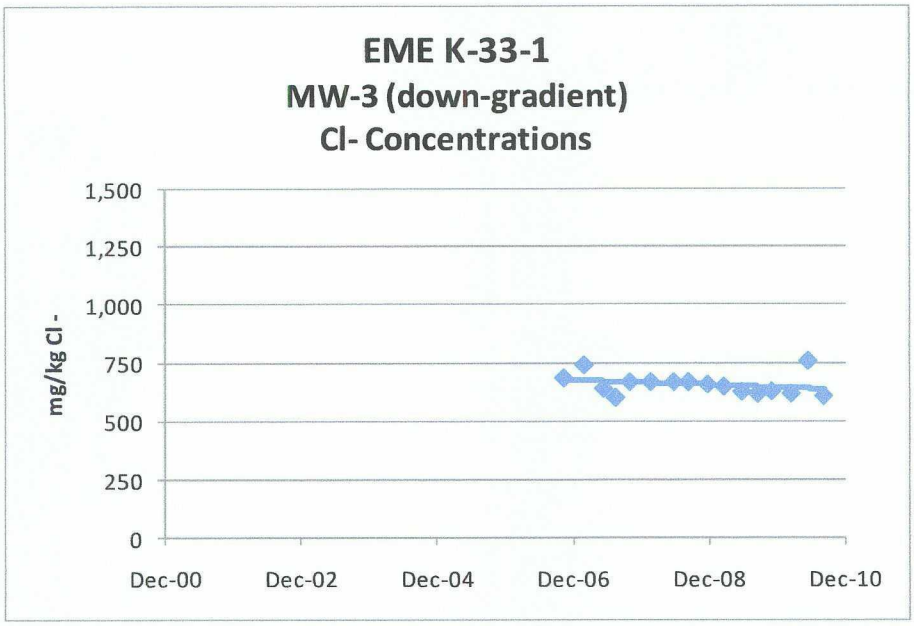


Figure 5 – EME K-33-1 groundwater monitoring data. **5a** (upper graph) – upgradient monitor well data. **5b** (lower graph) – near source down-gradient monitor well data.



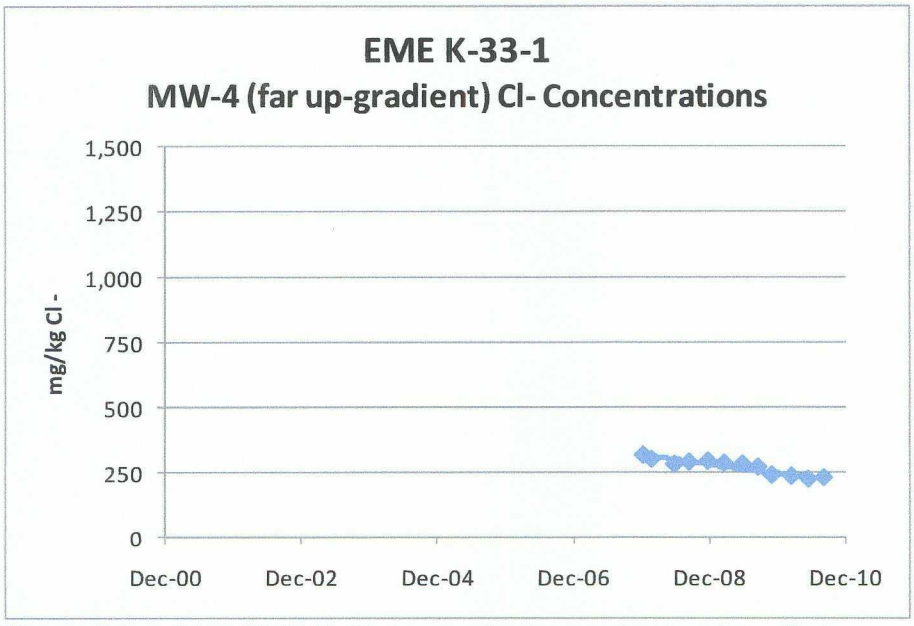


Figure 5 (cont'd) – EME K-33-1 groundwater monitoring data. **5c** (upper graph) – down-gradient monitor well data. **5d** (lower graph) – far up-gradient monitor well data.

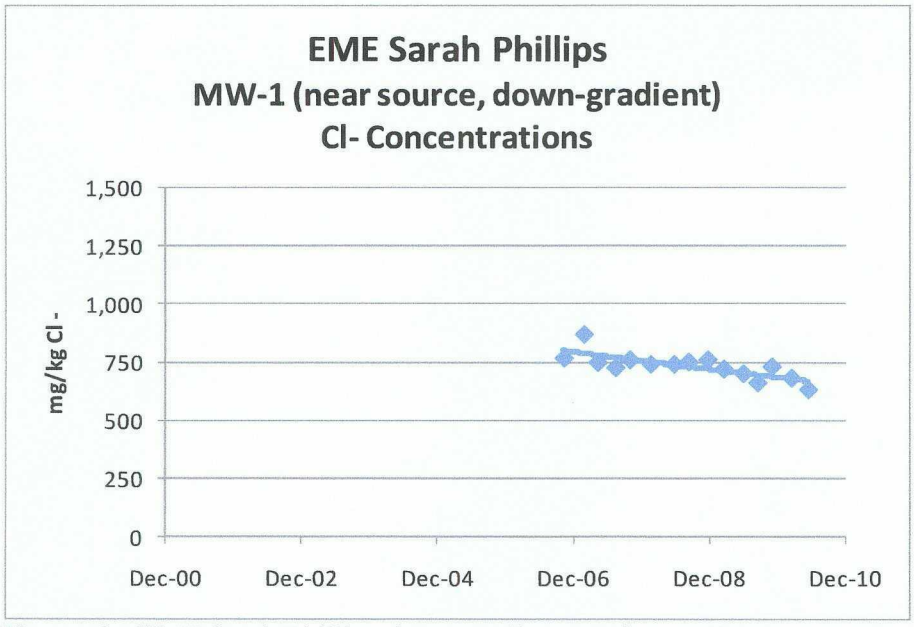
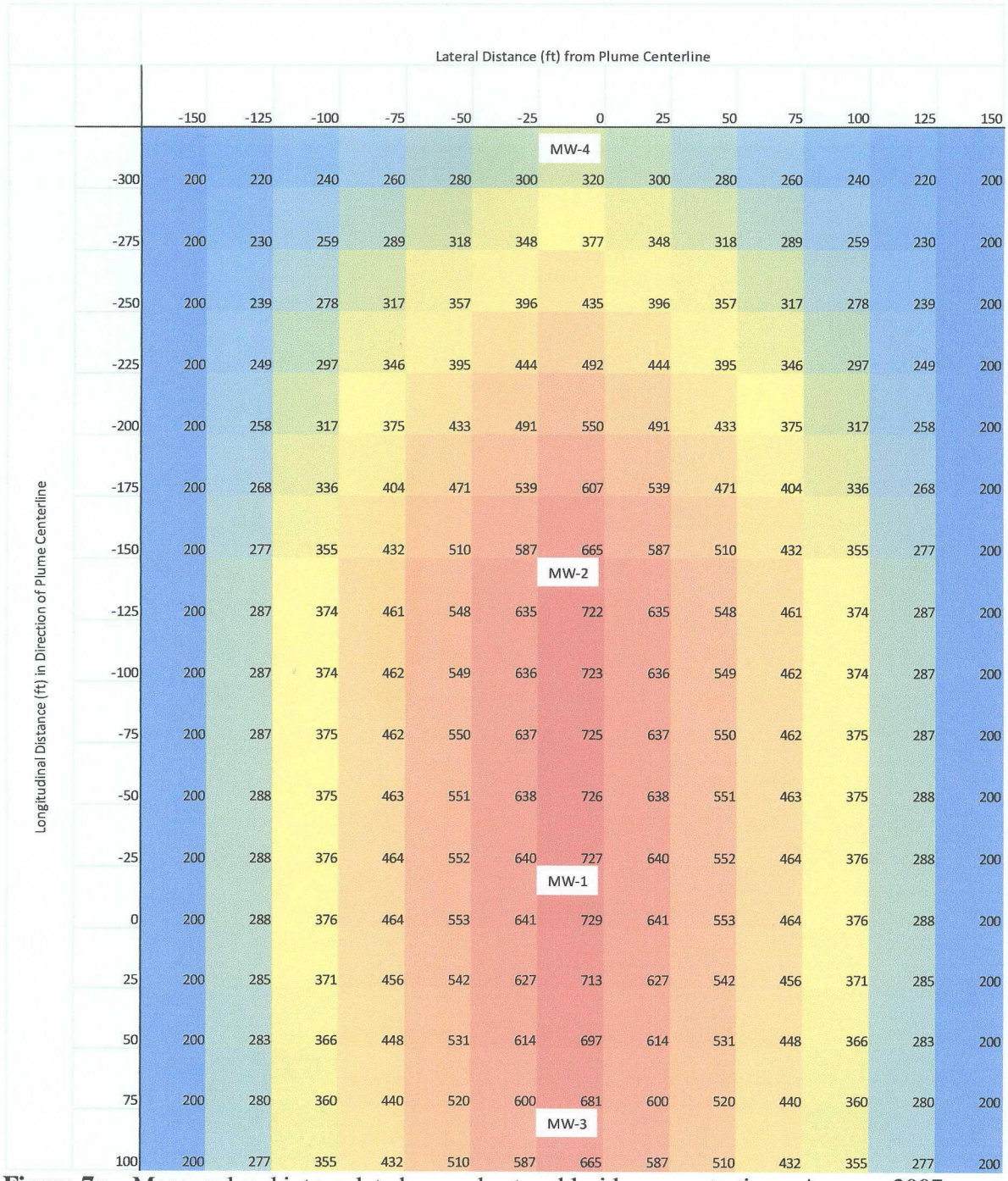


Figure 6 – EME Sarah Phillips down-gradient monitor well data.



Longitudinal Distance (ft) in Direction of Plume Centerline	Lateral Distance (ft) from Plume Centerline												
	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150
							MW-4						
-300	200	220	240	260	280	300	320	300	280	260	240	220	200
-275	200	230	259	289	318	348	377	348	318	289	259	230	200
-250	200	239	278	317	357	396	435	396	357	317	278	239	200
-225	200	249	297	346	395	444	492	444	395	346	297	249	200
-200	200	258	317	375	433	491	550	491	433	375	317	258	200
-175	200	268	336	404	471	539	607	539	471	404	336	268	200
-150	200	277	355	432	510	587	665	587	510	432	355	277	200
							MW-2						
-125	200	287	374	461	548	635	722	635	548	461	374	287	200
-100	200	287	374	462	549	636	723	636	549	462	374	287	200
-75	200	287	375	462	550	637	725	637	550	462	375	287	200
-50	200	288	375	463	551	638	726	638	551	463	375	288	200
-25	200	288	376	464	552	640	727	640	552	464	376	288	200
							MW-1						
0	200	288	376	464	553	641	729	641	553	464	376	288	200
25	200	285	371	456	542	627	713	627	542	456	371	285	200
50	200	283	366	448	531	614	697	614	531	448	366	283	200
75	200	280	360	440	520	600	681	600	520	440	360	280	200
							MW-3						
100	200	277	355	432	510	587	665	587	510	432	355	277	200

Figure 7a – Measured and interpolated groundwater chloride concentrations: Average 2007 values. [Note that the lateral plume boundaries were assumed to equal a baseline groundwater chloride concentration of 200 mg/kg].

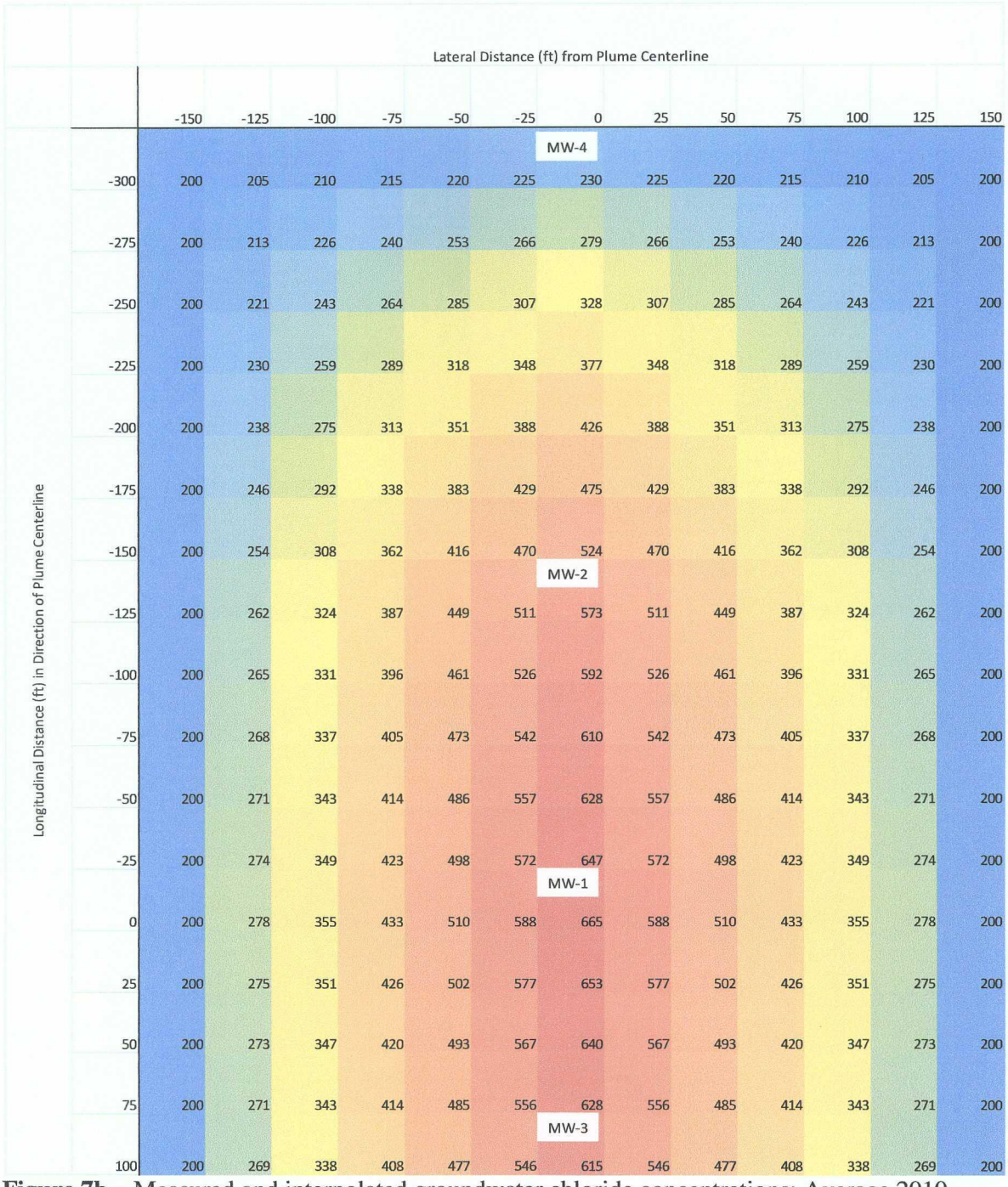
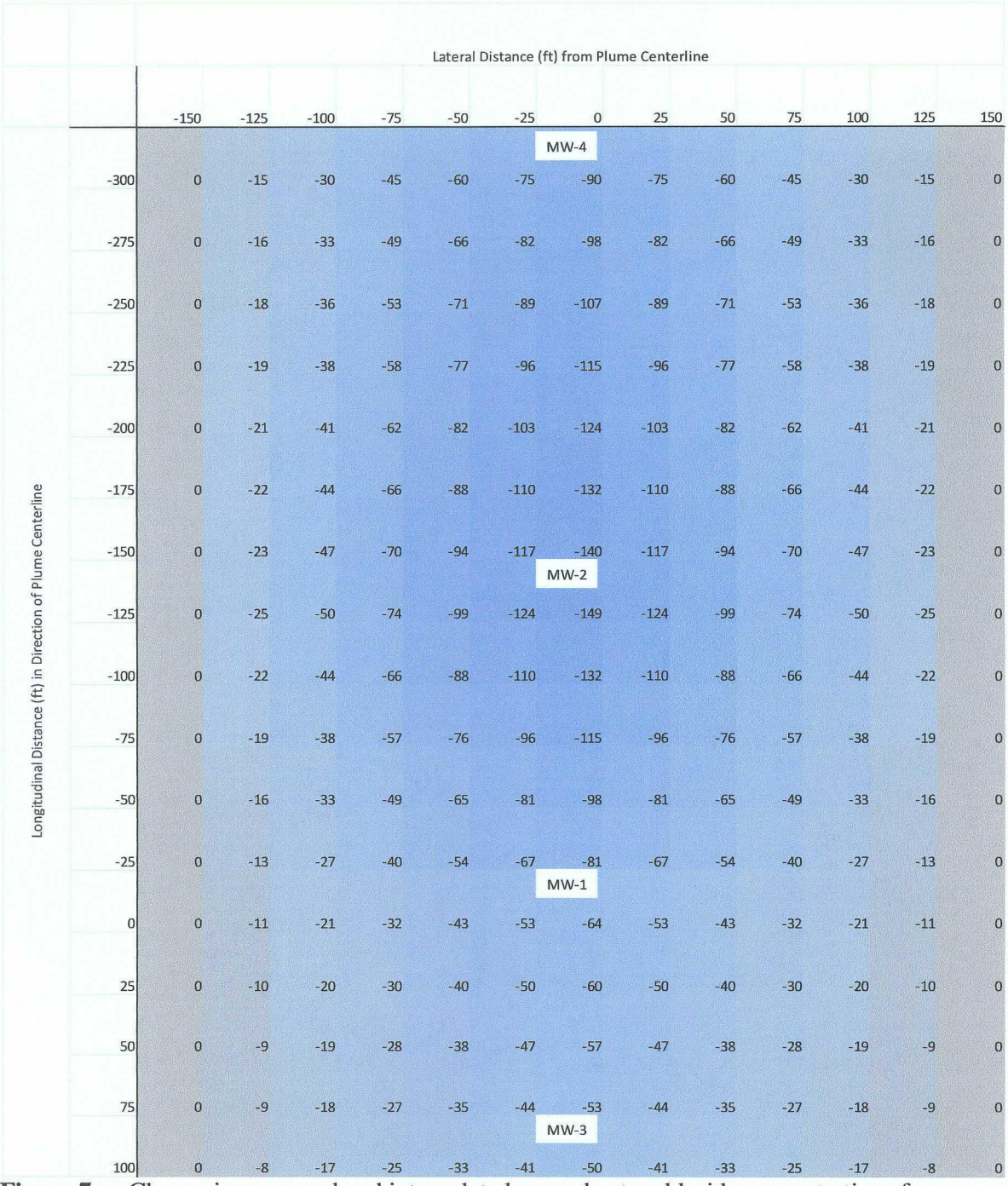


Figure 7b – Measured and interpolated groundwater chloride concentrations: Average 2010 year-to-date values. [Note that the lateral plume boundaries were assumed to equal a baseline groundwater chloride concentration of 200 mg/kg].



Longitudinal Distance (ft) in Direction of Plume Centerline	Lateral Distance (ft) from Plume Centerline												
	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150
							MW-4						
-300	0	-15	-30	-45	-60	-75	-90	-75	-60	-45	-30	-15	0
-275	0	-16	-33	-49	-66	-82	-98	-82	-66	-49	-33	-16	0
-250	0	-18	-36	-53	-71	-89	-107	-89	-71	-53	-36	-18	0
-225	0	-19	-38	-58	-77	-96	-115	-96	-77	-58	-38	-19	0
-200	0	-21	-41	-62	-82	-103	-124	-103	-82	-62	-41	-21	0
-175	0	-22	-44	-66	-88	-110	-132	-110	-88	-66	-44	-22	0
-150	0	-23	-47	-70	-94	-117	-140	-117	-94	-70	-47	-23	0
							MW-2						
-125	0	-25	-50	-74	-99	-124	-149	-124	-99	-74	-50	-25	0
-100	0	-22	-44	-66	-88	-110	-132	-110	-88	-66	-44	-22	0
-75	0	-19	-38	-57	-76	-96	-115	-96	-76	-57	-38	-19	0
-50	0	-16	-33	-49	-65	-81	-98	-81	-65	-49	-33	-16	0
-25	0	-13	-27	-40	-54	-67	-81	-67	-54	-40	-27	-13	0
							MW-1						
0	0	-11	-21	-32	-43	-53	-64	-53	-43	-32	-21	-11	0
25	0	-10	-20	-30	-40	-50	-60	-50	-40	-30	-20	-10	0
50	0	-9	-19	-28	-38	-47	-57	-47	-38	-28	-19	-9	0
75	0	-9	-18	-27	-35	-44	-53	-44	-35	-27	-18	-9	0
							MW-3						
100	0	-8	-17	-25	-33	-41	-50	-41	-33	-25	-17	-8	0

Figure 7c – Change in measured and interpolated groundwater chloride concentrations from 2007 to 2010. All values inside the plume boundaries are negative indicating that groundwater chloride concentrations have declined. The largest declines (in dark blue) are in and near the center of mass of the plume, indicating that there has been little or no downward migration of residual soil chlorides into groundwater.

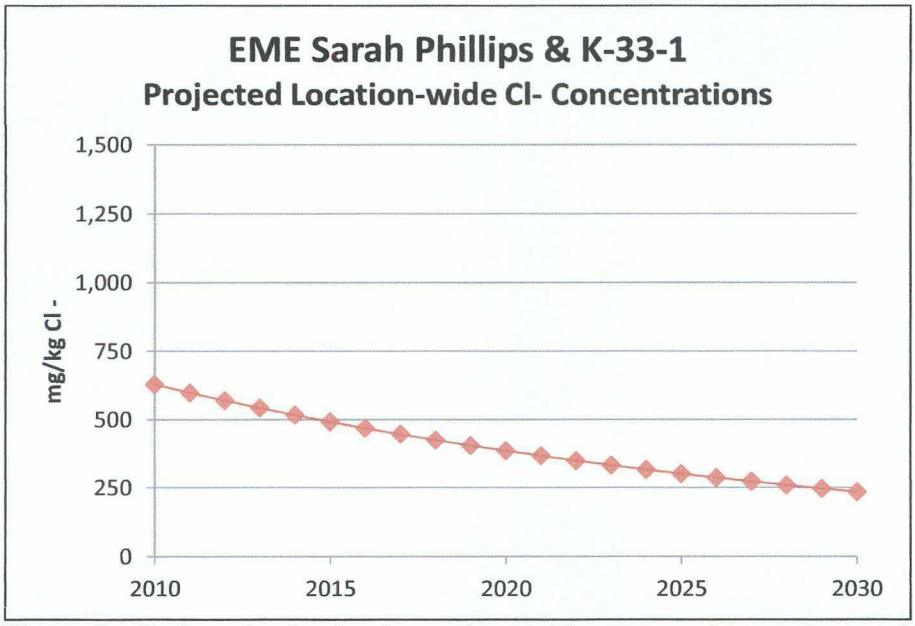


Figure 8 – Projected reduction in maximum (plume center) groundwater chloride concentrations.

Figure 9 – Sarah Phillips and K-33-1 locations showing the reestablishment of natural vegetation. **9a** (upper photograph) – K-33-1 MW-1 facing North. **9b** (lower photograph) – Sarah Phillips facing West towards K-33-1.