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Mark Sievers, Chairman  
Thomas E. Wright, Commissioner  
Shari Feist Albrecht, Commissioner

Sam Brownback, Governor

January 14, 2013

Ms. Susan Kannarr, Chief Clerk  
Kansas House of Representatives  
Room 272-W, Statehouse  
Topeka, Kansas 66612

Dear Ms. Kannarr:

Legislative action during the 1996 session resulted in the creation of the Abandoned Well Plugging and Site Remediation Fund. K.S.A. 55-192 and K.S.A. 55-193 provide funding for the plugging of abandoned wells and the remediation of contamination sites. The Conservation Division of the Kansas Corporation Commission regulates oil and gas activities within the state and by statute the Commission has jurisdiction over all oil and gas contamination. With the creation of the Abandoned Oil & Gas Well / Remediation Fund, additional sources of funding in the form of approximately \$400,000 each from the State General fund, the State Water Plan, one half of the state's revenue from the Federal Mineral Leasing Program, and an additional assessment on oil and gas production were dedicated to the problem of abandoned oil and gas wells and associated contamination sites in the state for which there is no responsible party.

Further, K.S.A. 55-194 section a. provides that a report be submitted to your attention concerning the status of active contamination sites to include a description and evaluation of the site, the impact and immediacy of the threat to public health or the environment, the level of remediation recommended and an estimated cost to achieve remediation.

K.S.A. 55-194 section b. provides that a report be submitted concerning: 1) the status of the abandoned well inventory including the documentation of the number of unplugged abandoned wells, 2) a system for ranking wells with respect to the potential threat posed to the environment or public health and safety by those wells and 3) a multi-year plan dealing with unplugged abandoned wells.

The Commission has been charged with delivering copies of the referenced reports to the Governor, and the Chairperson and ranking minority member of the Senate committee on Natural Resources and of the House of Representatives committee on Energy and Utilities.

Please feel free to contact me if additional information is needed or if you have any questions. The reports can also be viewed on our web site at: <http://kcc.ks.gov>

Sincerely,

A handwritten signature in blue ink, appearing to read "Patti Petersen-Klein". The signature is fluid and cursive.

Patti Petersen-Klein  
Executive Director



# KANSAS CORPORATION COMMISSION

*Remediation Site Status Report*

2013

**Abandoned Oil and Gas Well / Remediation Site Fund  
Remediation Sites  
Status Report**

**Introduction**

During the 1996 legislative session House Substitute for Senate Bill 755 was passed. A part of this legislation created an Abandoned Oil and Gas Well / Remediation Fund with the expressed purpose of providing funds to the Kansas Corporation Commission to plug abandoned wells and remediate contamination sites (sites and wells having no responsible parties) related to oil and gas exploration and production activities. The legislation also required the Corporation Commission prepare an annual Remediation Site Status Report for the office of the Governor and certain legislative committees. This report for the period January 1, 2012 through December 31, 2012 contains information for each of the sites with regard to the following: (1) A description and evaluation of the site; (2) the immediacy of the threat to public health and environment; (3) the level of remediation sought; (4) any unusual problems associated with the investigation or remediation; (5) any remedial efforts completed during the review period; (6) current contaminate level; (7) status of the site; (8) direct and indirect costs associated with remedial efforts; and (9) an estimate of the cost to achieve the recommended level of remediation or an estimate of the cost to conduct an investigation sufficient to determine the cost of remediation. The Site Remediation cash expenditures for FY2013 are projected to be approximately \$60,000.

**Site Inventory**

The inventory of sites listed in the current Remediation Site Status Report consists of 58 sites. This report includes sites that were transferred to the control of the Kansas Corporation Commission (KCC) from the Kansas Department of Health and Environment (KDHE) by legislative action in 1995 and in-house sites already under KCC jurisdiction. Of the original 109 sites, four were combined with other sites. During previous evaluation periods, 69 sites have been resolved and 22 sites have been added. The current evaluation period, January 1, 2012 through December 31, 2012, ended with the resolution of three sites, resulting in a total of 55 active sites. Summary tables for site impacts and immediacy levels as well as estimated costs are found at the beginning of the report. The tables below provide an overview of distribution of sites with respect to both resources impacted and the range of immediacy levels for required remediation.

**Distribution of Active Sites with Respect to Impacted Resources**

<b>Impacted Resources</b>	<b>Number of Sites</b>
Groundwater, Surface Water, Soil and Well Problems (Cavity, Abandoned)	79
Public Water Supply	9
Domestic Supply	23
Stock Supply	14
Irrigation Supply	12

\*Some sites have impacts to multiple resources

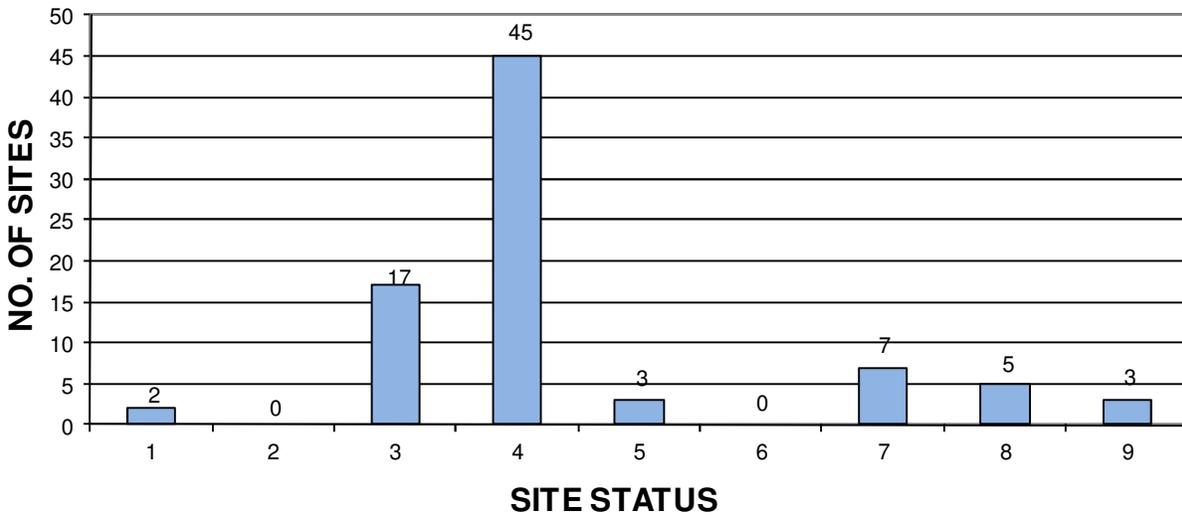
### Distribution of Active Sites with Respect to Immediacy Levels

Range of Immediacy Level	No. of Sites
Low & Low to Moderate	23
Moderate	13
Moderate to High & High	12
Other (Under Remediation)	7
Total	55

### Site Status

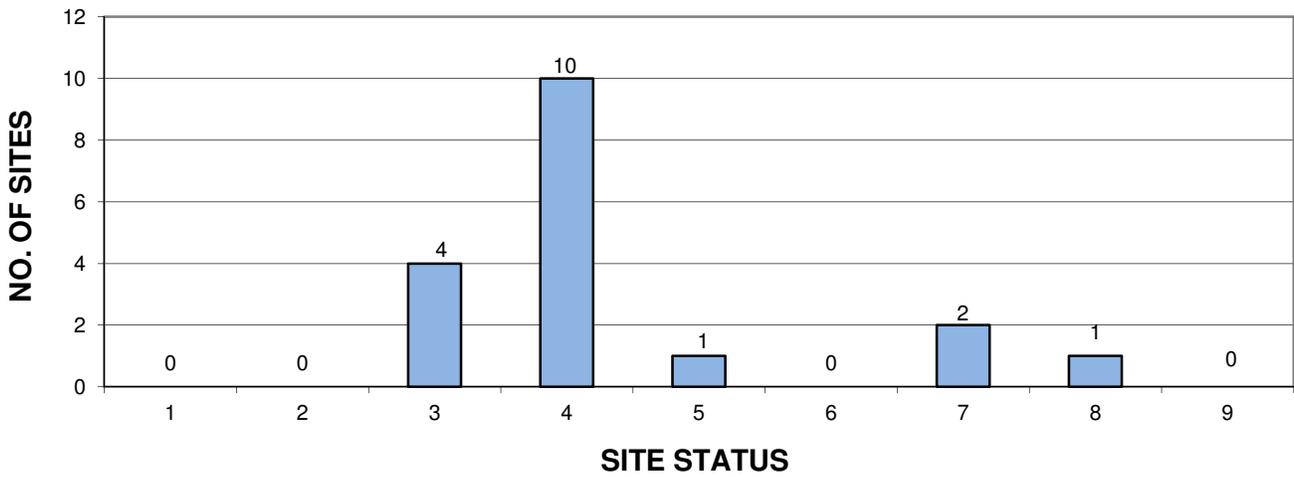
In general each contamination site has a definable life cycle. This cycle begins with, then follows a sequence, of investigatory and possible remedial activities which move the site towards ultimate resolution. The first phase of the cycle is the site assessment. This phase defines general site parameters and conditions forming the basis for additional efforts at the site. Once the assessment is complete the site moves on to a new phase. This next phase may be short term or long term monitoring followed by resolution of the site. Another scenario might include an extensive investigation phase followed by the installation of a monitoring system whose sample results may indicate the necessity for certain remedial activities and additional post remediation monitoring prior to resolution of the site. The following graphs depict the current status of the 58 listed sites on a statewide and K.C.C. District basis.

### STATEWIDE DISTRIBUTION OF SITES BY STATUS



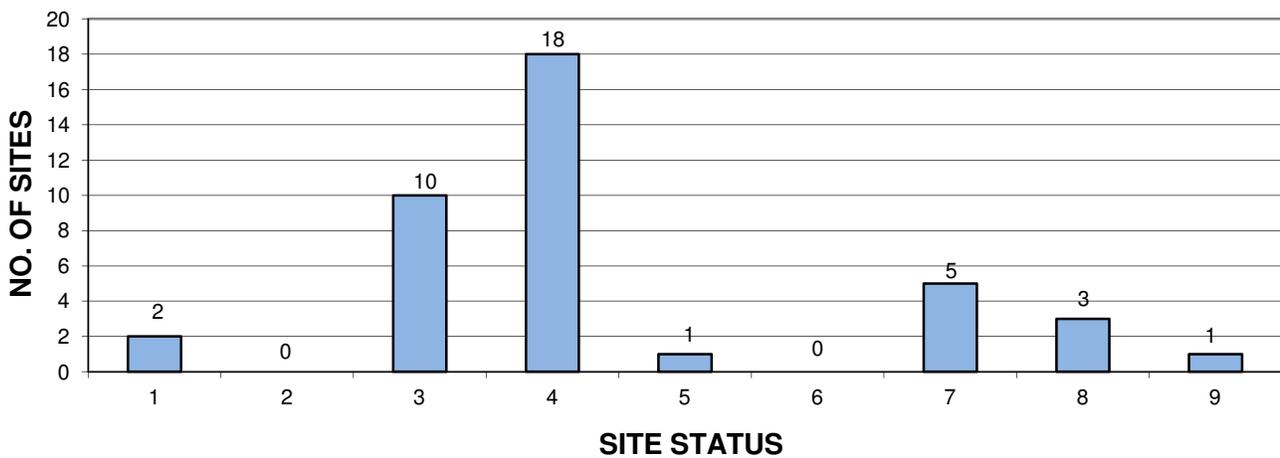
1. SITE ASSESSMENT	2. SHORT TERM MONITORING	3. INVESTIGATION
4. LONG TERM MONITORING	5. REMEDIATION PLAN	6. INSTALLATION
7. REMEDIATION	8. POST REMEDIATION MONITORING	9. RESOLVED

## DISTRICT 1 DISTRIBUTION OF SITES BY STATUS



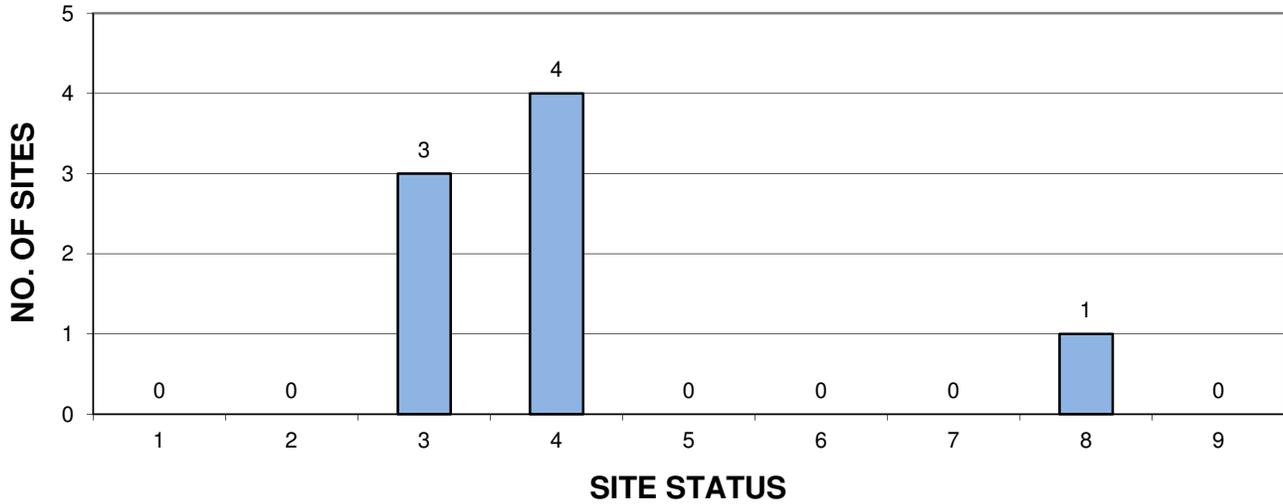
1. SITE ASSESSMENT	2. SHORT TERM MONITORING	3. INVESTIGATION
4. LONG TERM MONITORING	5. REMEDIATION PLAN	6. INSTALLATION
7. REMEDIATION	8. POST REMEDIATION MONITORING	9. RESOLVED

## DISTRICT 2 DISTRIBUTION OF SITES BY STATUS



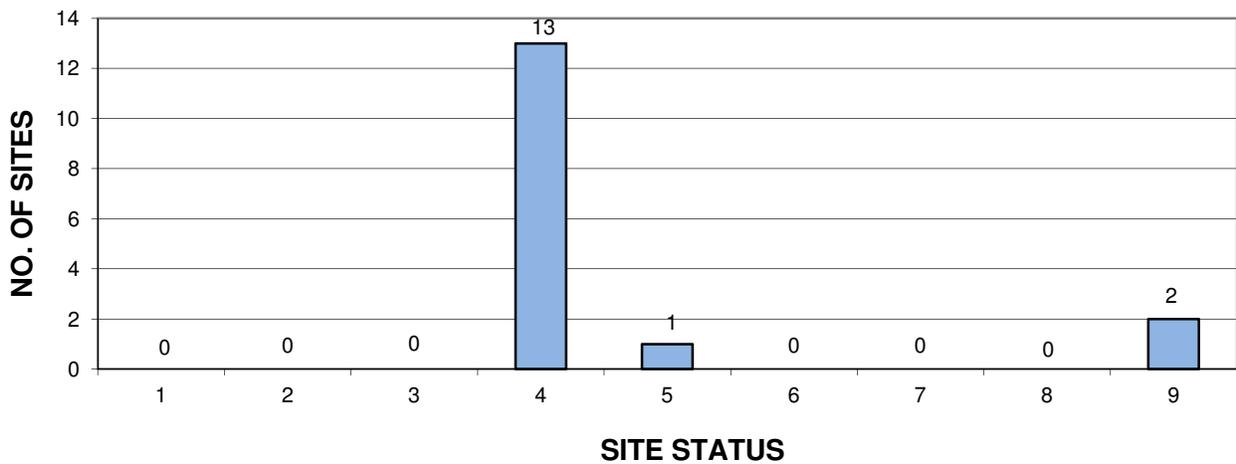
1. SITE ASSESSMENT	2. SHORT TERM MONITORING	3. INVESTIGATION
4. LONG TERM MONITORING	5. REMEDIATION PLAN	6. INSTALLATION
7. REMEDIATION	8. POST REMEDIATION MONITORING	9. RESOLVED

## DISTRICT 3 DISTRIBUTION OF SITES BY STATUS



- |                         |                                |                  |
|-------------------------|--------------------------------|------------------|
| 1. SITE ASSESSMENT      | 2. SHORT TERM MONITORING       | 3. INVESTIGATION |
| 4. LONG TERM MONITORING | 5. REMEDIATION PLAN            | 6. INSTALLATION  |
| 7. REMEDIATION          | 8. POST REMEDIATION MONITORING | 9. RESOLVED      |

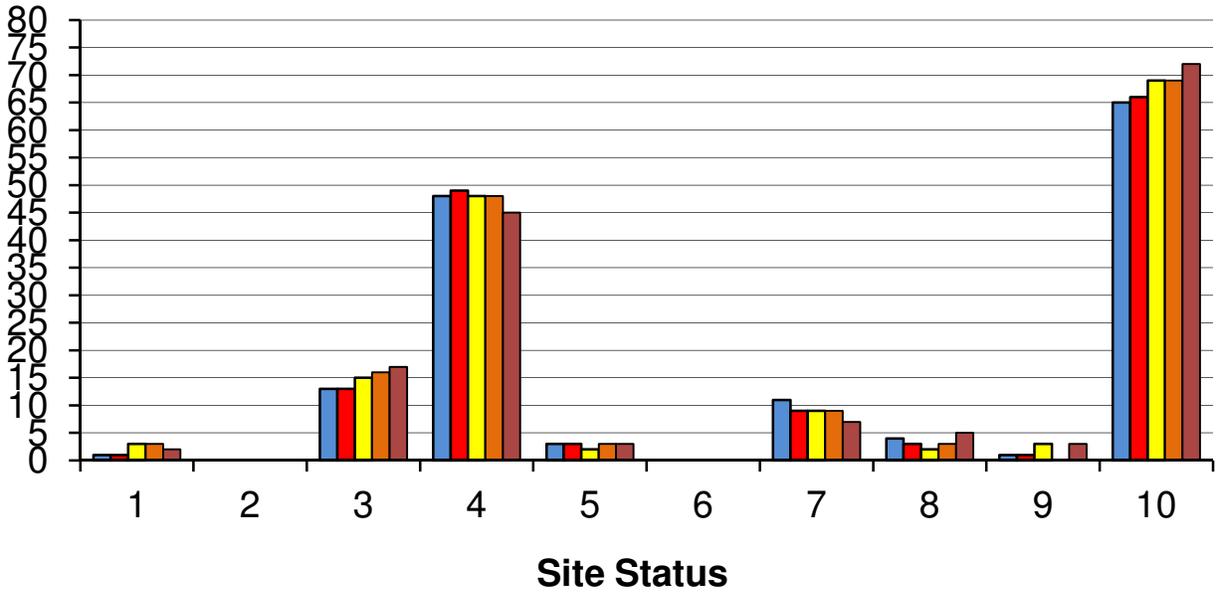
## DISTRICT 4 DISTRIBUTION OF SITES BY STATUS



- |                         |                                |                  |
|-------------------------|--------------------------------|------------------|
| 1. SITE ASSESSMENT      | 2. SHORT TERM MONITORING       | 3. INVESTIGATION |
| 4. LONG TERM MONITORING | 5. REMEDIATION PLAN            | 6. INSTALLATION  |
| 7. REMEDIATION          | 8. POST REMEDIATION MONITORING | 9. RESOLVED      |

This graph depicts the distribution of sites by status for the reporting periods 2009 through 2013.

## Distribution of Sites by Status for Reporting Periods 2009 - 2013



2009
  2010
  2011
  2012
  2013

- |                            |                                |                  |
|----------------------------|--------------------------------|------------------|
| 1. SITE ASSESSMENT         | 2. SHORT TERM MONITORING       | 3. INVESTIGATION |
| 4. LONG TERM MONITORING    | 5. REMEDIATION PLAN            | 6. INSTALLATION  |
| 7. REMEDIATION             | 8. POST REMEDIATION MONITORING | 9. RESOLVED      |
| 10. RESOLVED - CUMMULATIVE |                                |                  |

### Conclusions

This report provides information concerning the location, resource impact, immediacy level, and site description and status for 58 listed contamination / remediation sites related to exploration and production activities in the state. In addition, data is presented with regard to staff expenditures for site management, administration, and inspections, as well as authorization and/or expenditures against the Abandoned Well / Remediation fund for investigatory and remedial activities at the sites.

The Conservation Division of the Corporation Commission is committed to work with the oil and gas industry of the state, other state agencies and the public to provide a scientifically sound and technically based remediation program.

**Impacts, Immediacy and Target Remediation Levels  
For  
Kansas Corporation Commission Contamination Sites**

<b>Site Name</b>	<b>County</b>	<b>KCC District</b>	<b>Impact</b>	<b>Immediacy</b>	<b>Target Level Of Remediation</b>	<b>Unusual Problems</b>	<b>Estimated Total Cost</b>
Arlington	Reno	2	GW / Soil / DM / IR / WSW	UR	250 ppm	Yes	\$ 7,500*
Balthazor	Graham	4	GW / Domestic(Sole Source)	Low	250 ppm	Yes	\$ 10,000
Benson	Reno	2	Groundwater / Soil	Moderate	500 ppm	Yes	\$ 4,500*
Brazil	Neosho	3	SW / GW / PWS / Soil	Low-Mod	500 ppm	No	\$ 63,000
Brothers	Rice	2	Groundwater	Low	500 ppm	Yes	\$ 4,000
Burrton	Harvey/Reno	2	GW / Domestic / Irrigation	High	Variable	Yes	\$3,000,000+
Clawson(Mesa)	Haskell	1	Groundwater / Irrigation	UR	350 ppm	Yes	\$ 450(yr)*
Codell	Rooks	4	GW / Public Water Supply	Mod-High	250 ppm	Yes	\$ 17,950+
Curtis	Stafford	1	Groundwater / Irrigation	Low-Mod	500-1000 ppm	Yes	\$ 27,000
Dinkel	Ellis	4	GW / Domestic (SS)	Moderate	250 ppm	Yes	\$ 30,000
Dinkler	Butler	2	GW / Domestic / Irrigation	Low	500 ppm	Yes	\$ 60,000
Dortland, E	Russell	4	GW / STK / SW	Resolved	Reached	Yes	\$ 2,287
EB-3C	Reno	2	Groundwater	Low	.78 mg/l TPH	Yes	\$ 8,000
El Dorado BTA	Butler	2	Soil / WP(AB Wells)	Moderate	NA	Yes	\$ 5,000

Site Name	County	KCC District	Impact	Immediacy	Target Level Of Remediation	Unusual Problems	Estimated Total Cost
Elm Creek	Rooks	4	GW / Domestic / Stock Well	Mod-High	500 ppm	Yes	\$ 300,000
Enoch-Thompson	Pawnee	1	Groundwater / Stock Well	Low-Mod	1000 ppm	No	\$ 500(yr)*
Fink, Leon	Graham	4	Groundwater / Stock Well	Low	500 ppm	Yes	\$ 2,000
Fowler	Montgomery	3	Soil	Low	300 ppm	Yes	\$ 4,500
French	Stafford	1	GW / SW / SD / WP	Mod-High	500 ppm	Yes	\$ 3,000
Galva City	McPherson	2	Groundwater	UR	500 ppm	Yes	\$ 500,000
Gross, Marcellus	Ellis	4	Groundwater / SD	Resolved	Reached	No	\$ 1,385
Harbaugh	Barber	1	GW / Domestic / Stock Well	High	1000 ppm	Yes	\$ 450,000*+
Hollow-Nikkel	Harvey	2	GW / Domestic / Irrigation	Moderate	500 ppm	Yes	\$ 75,000
Hrencher	Barber	1	GW/ STK / Soil / SW	Mod-High	1000 ppm	No	\$ 150,000
Irey - Hrabe	Rooks	4	Groundwater	Low	500 ppm	Yes	\$ 4,000
Jennings	Decatur	4	Groundwater / PWSW	Low-Mod	500 ppm	Yes	\$ 2,000
Johnson, C	Rice	2	Groundwater / SD	Low	750 ppm	No	\$ 2,500
Knackstedt	McPherson	2	WP (Cavity)	Moderate	NA	Yes	\$ 5,000
Lawless	McPherson	2	Groundwater / Domestic	Resolved	Reached	No	\$ 2,923
Leesburg Sink	Stafford	1	WP (Cavity)	Mod-High	NA	Yes	\$ 62,000*

Site Name	County	KCC District	Impact	Immediacy	Target Level Of Remediation	Unusual Problems	Estimated Total Cost
Little River	Rice	2	Groundwater / PWS	High	300 ppm	Yes	\$ 46,500
Macksville	Pawnee	1	Groundwater / IR	Low	300 ppm	Yes	\$ 20,000(yr)*
Mantooth	Montgomery	3	GW / Domestic (SS) / SW	Moderate	500 ppm	Yes	\$ 10,000+
Maupin	Russell	4	Groundwater / Stock Well	Low-Mod	500 ppm	No	\$ 2,000
McDonald - East	Linn	3	Surface Water	Low	500 ppm	No	\$ 1,500(yr)
McPherson LandFill	McPherson	2	GW / DM / SD / INDWSW	UR	500 ppm	No	\$ 26,500*
Mount, C. E.	Reno	2	GW / DM / Irrigation / SD	Moderate	1000 ppm	Yes	\$ 6,750*
Nikkel-Epps	McPherson	2	GW / Domestic (SS)	Mod-High	500 ppm	Yes	\$ 20,000
Packard	Barber	1	GW / Water Well / STK	Moderate	1000 ppm	Yes	\$ 10,000
Ruder	Ellis	4	Groundwater / SW	Moderate	500 ppm	Yes	\$ 29,000
Running Turkey Ck	McPherson	2	DM/PWS/SW/SD/STK/IR	Mod-High	500 ppm	Yes	\$ 125,000
Russell City	Russell	4	GW / Domestic / Irrigation	Moderate	1000 ppm	Yes	\$ 400,000
Russell RWD #1	Russell	4	Groundwater / PWSW	Mod-High	250 ppm	Yes	\$ 33,000
Sample	Sedgwick	2	Groundwater	Moderate	500 ppm	Yes	\$ 2,000
Sander	Russell	4	GW / Domestic / Stock Well	Low	1000 ppm	Yes	\$ 300
Schraeder	Hodgeman	1	Groundwater / Stock Well	Low	350 ppm	No	\$ 30,000
Schruben-Rogers	Rooks	4	GW / Domestic (SS)	Low	250 ppm	No	\$ 2,000

Site Name	County	KCC District	Impact	Immediacy	Target Level Of Remediation	Unusual Problems	Estimated Total Cost
Schulte Field	Sedgwick	2	GW / Domestic / PWSW	UR	500 ppm	Yes	\$ 300,000
Selzer	McPherson	2	Groundwater / SW	Moderate	500-750 ppm	Yes	\$ 20,000
Smith-Finn	Morton	1	Groundwater / Domestic	UR	500 ppm	Yes	\$ 200,000*
South Spivey	Kingman	2	GW / DM / SW	Low	750 ppm	Yes	\$ 5,000*
South Wichita	Sedgwick	2	GW / PWSW / DM / IR	Low-Mod	500 to 750 ppm	Yes	\$ 43,000
Stowe-Zaid	Rice	2	Groundwater / Soil	Low	350 ppm	Yes	\$ 12,000
Trostle	Kingman	2	GW / Domestic / STK / Soil	Low	500 ppm	No	\$ 2,500*
Voshell	McPherson	2	GW / SW / DM / IR / STK	Moderate	500 ppm	Yes	\$ 20,000
Wildboy's	Barber	1	GW / SW / PWSW	Mod-High	500 ppm	No	\$ **
Wingate	Wilson	3	Groundwater / Soil	Low	500 ppm	Yes	\$ 15,000
Yoeman	Kingman	2	GW / DM / Stock Well	UR	NA	Yes	\$ 56,000+
Total Estimated Cost							\$6,242,545

ABDW=Abandoned Well    DM=Domestic    GW=Groundwater    INDWSW=Industrial Water Supply Well    IR=Irrigation Well  
Mod=Moderate    PWSW=Public Water Supply Well    SD=Surface Damage    STK=Stock Well    SW=Surface Water  
SS=Sole Source    UR=Under Remediation    WSW=Water Supply Well    WP=Well Problem

\*PRP – Potential Responsible Party involvement    \*\*See Harbaugh Site for costs    +Actual costs have exceeded original estimate

# CONTAMINATION SITE EXPENDITURES

SITE NAME	CONTROL NO.	STAFF HOURS	EXPENDITURE FOR STAFF HOURS	REMEDIATION FUND AUTHORIZATION / EXPENDITURE	
				FY 2012/13	TOTAL
ARLINGTON	20030016-001	61.5	\$1,580.28		
BALTHAZOR	970023-00	11	\$277.51		
BENSON	20000034-001	8	\$217.20		
BRAZIL	990040-001	48.5	\$1,281.95	\$8,957.50	\$10,767.25
BROTHERS	970029-00	30	\$795.58		\$4.26
BURRTON	970003-00	23.5	\$620.09	\$4,334.52	\$310,726.31
CLAWSON	970005-00	30.5	\$789.23		
CODELL	970033-00	8	\$198.64		\$19,491.40
CURTIS	970034-00	37.5	\$932.44		\$4,199.17
DINKEL	970035-00	6	\$146.06		
DINKLER	20050047-001	6	\$157.38		\$9,642.50
DORTLAND, E	970038-00	7	\$181.63		
EB-3C	970042-00	2	\$59.46		\$2,350.00
EL DORADO	20110055-001	8	\$217.20		
ELM CREEK	970043-00	24	\$586.80		\$29,212.25
ENOCH THOMPSON	970044-00	24	\$610.00		
FINK	970007-00	6	\$146.06		
FOWLER	970046-00	11.5	\$309.22		
FRENCH	990002-001	10	\$267.46		\$346.50
GALVA CITY AREA	980033-001	140.5	\$3,631.85	\$6,175.75	\$231,382.59
GROSS	970008-00	3	\$85.75		
HARBAUGH	970049-00	49.5	\$1,199.20	\$2,002.47	\$533,465.90
HOLLOW NIKKEL	970009-00	6	\$157.38	\$2,287.52	\$29,244.65
HRENCHER	970051-00	17.5	\$460.00		\$189.94
IREY-HRABE	970053-00	3	\$85.75		
JENNINGS	970054-00	15	\$364.11		

SITE NAME	CONTROL NO.	STAFF HOURS	EXPENDITURE FOR STAFF HOURS	REMEDIATION FUND AUTHORIZATION / EXPENDITURE	
				FY 2012/13	TOTAL
JOHNSON	970055-00	9	\$243.49		\$416.28
KNACKSTEDT	970060-00	22	\$574.40		\$153.39
LAWLESS	970063-00	7	\$190.91		
LEESBURG SINK	20040003-001	7.5	\$204.06		\$6,266.00
LITTLE RIVER	20000057-001	10	\$269.78		\$3,112.20
MACKSVILLE	970066-00	71.5	\$1,703.34	\$1,343.71	\$71,668.02
MANTOOTH	980058-001	82.5	\$2,175.81	\$12,444.00	\$17,349.00
MAUPIN	970068-00	10	\$251.22		
MC DONALD-EAST	970070-00	34	\$900.74		
MCPHERSON LANDFILL	980034-001	17.5	\$507.67	\$534.00	\$18,505.98
MOUNT, C E	20030036-001	12	\$315.12		
NIKLE-EPPS	20100082-001	181.5	\$4,794.44	\$8,318.75	\$8,318.75
PACKARD	970075-00	10	\$269.78		\$310.09
RUDER	970082-00	7	\$172.35		\$12,960.00
RUNNING TURKEY CREEK	20010033-001	71	\$1,815.55		\$61,603.07
RUSSELL CITY	970083-00	3	\$85.75		\$1,192.60
RUSSELL RWD #1	970084-00	11	\$277.51		
SAMPLE	970088-00	16	\$402.18		
SANDER	970089-00	2	\$59.46		
SCHRAEDER	970013-00	25.5	\$640.16		\$1,590.90
SCHRUBEN-ROGERS	970014-00	7	\$172.35		
SCHULTE	970015-00	202	\$5,207.88	\$2,223.15	\$142,595.03
SELZER	970093-00	212.5	\$5,518.04	\$5,204.25	\$6,929.25
SMITH-FINN	970095-00	71.5	\$1,759.02		
SOUTH SPIVEY	970096-00	38	\$955.22		
SOUTH WICHITA	970016-00	51	\$1,318.71		\$10,767.02
STOWE-ZAID	20000035-001	24	\$605.26		\$4,057.85
TROSTLE	980038-001	28.5	\$748.91		

SITE NAME	CONTROL NO.	STAFF HOURS	EXPENDITURE FOR STAFF HOURS	REMEDIATION FUND AUTHORIZATION / EXPENDITURE	
				FY 2012/13	TOTAL
VOSHELL	20030059-001	28	\$699.56	\$311.50	\$18,596.44
WILDBOY'S	970017-00	16	\$411.28		
WINGATE	970107-00	35	\$927.03	\$8,296.00	\$8,296.00
YEOMAN	20060021-001	23.5	\$617.46		\$93,690.76
<b>Totals:</b>		1944.5	\$50,152.59	\$62,433.12	\$1,669,401.35

**REMEDIATION  
SITES  
REPORT  
2013  
EXISTING SITES**

**Project: Arlington Site**

**Site Location:** The site is located approximately 5 miles west and 1 mile south of Arlington, Kansas. The brine spill, which was the source of the contamination at this site, took place on the Henson lease located in the NE/4 of Section 14, Township 25 South, Range 9 West, Reno County. Rama Operating Company is the Primary Responsible Party, and operator of the Henson lease.

**Impact/Immediacy:** Impacts are to both soil and groundwater as a result of a large saltwater line leak from August 2000. Initially the spill impacted irrigation well in the SE/4 of Section 11 and a domestic well on the lease in late 2001. The domestic well was abandoned and a new one was drilled, and the irrigation well was taken out of use for several seasons allowing the saltwater plume to migrate back to the southeast and be remediated in the NE/4 of Section 14. This site immediacy level should be classified as moderate.

**Site Description:** The south half of section 11 and northwestern section 13 is cultivated farmland with various crops grown. There is circle irrigation in both the SW/4 and SE/4 of section 11 and the northwest of section 13. The north half of section 14 is in CRP, and the topography is relatively flat with only eleven feet of total relief across the area. The subsurface strata consist of 3 to 4 feet of topsoil and brown clay grading into sands ranging in size from very fine to coarse mixed with clay layers down to the Harper Siltstone, which is the bedrock. Bedrock depths range from 47 to 56 feet. The highest chlorides have been found on the bedrock indicating the clay layers across the area are not contiguous forming aquitards. Depth to water ranges from 13 to 17 feet during non irrigation, and 17+ feet during irrigation. The only visible remnant of the line leak at the surface is a soil scar approximately 100 feet by 40 feet that is located near the center of the NE/4.

**Unusual Problems:** Water quality must be constantly monitored during summer because of offsetting irrigation wells.

**Status of the Project:** Since 2001 Rama Operating Company has installed 16 monitoring wells and 8 recovery wells within the area of the Arlington contamination Site. Rama is currently not running any of the recovery wells, with KCC permission, in order to investigate the chloride rebound potential of the site. High amounts of irrigation water was pumped to combat the 2011 record breaking heat and drought which might be influencing the ground water elevations taken during the sampling event.

On April 19, 2012, nine groundwater monitoring wells (MW-1, MW-2, MW-3(D), MW-5, MW-7, MW-8, MW-10(M), MW-14, MW-15) were gauged and sampled. KCC returned on May 9, 2012, to gauge and sample the remaining four monitoring wells (MW-4, MW-6, MW-9, and MW-11) and the eastern irrigation test well, located in section 13. Prior to sampling, groundwater levels were measured in each monitoring well using an electronic water level indicator. Air-lift technology was used to purge a minimum of three well volumes of groundwater from each well, save MW-15 which was pumped via submersible Proactive® Water-Spout water pump. The irrigation well was bailed three times via hand bailer before sampling. Purge water was tested for conductivity prior to being discharged onto the ground surface at the Site or contained in a 250 gallon poly-tank if conductivity was high before disposed of into a deep injection well. MW-12 was located in section 11 was found to be destroyed by farming activities and is not repairable. Groundwater samples from each monitoring well were collected in one 250 (ml) polyurethane container for analysis at the KCC District #2 Laboratory. Each sample for this monitoring event was analyzed for the presence of Chloride by United States Environmental Protection Agency USEPA Silver Nitrate Buret Titration Method - Method 8225

Groundwater levels below the ground surface ranged from approximately 14.50 to 22.59 feet in the sampled wells during the April 19, 2012 and May 9, 2012 events, and increased an average of 2.44 feet since the July 16, 2011 sampling event. Groundwater flow direction remains toward the east even with the lack of water used from the irrigation well battery during the spring sampling event. The hydraulic gradient was found to be 0.001950297 ft/ft between MW-5 and MW-6 which lies approximately along the direction of groundwater flow. Due to the significant length of time between measuring events the assumptions made from the groundwater data are approximations of the current conditions.

**Level of Remediation Sought:**

**Ideal:** 30 to 80 ppm (background)

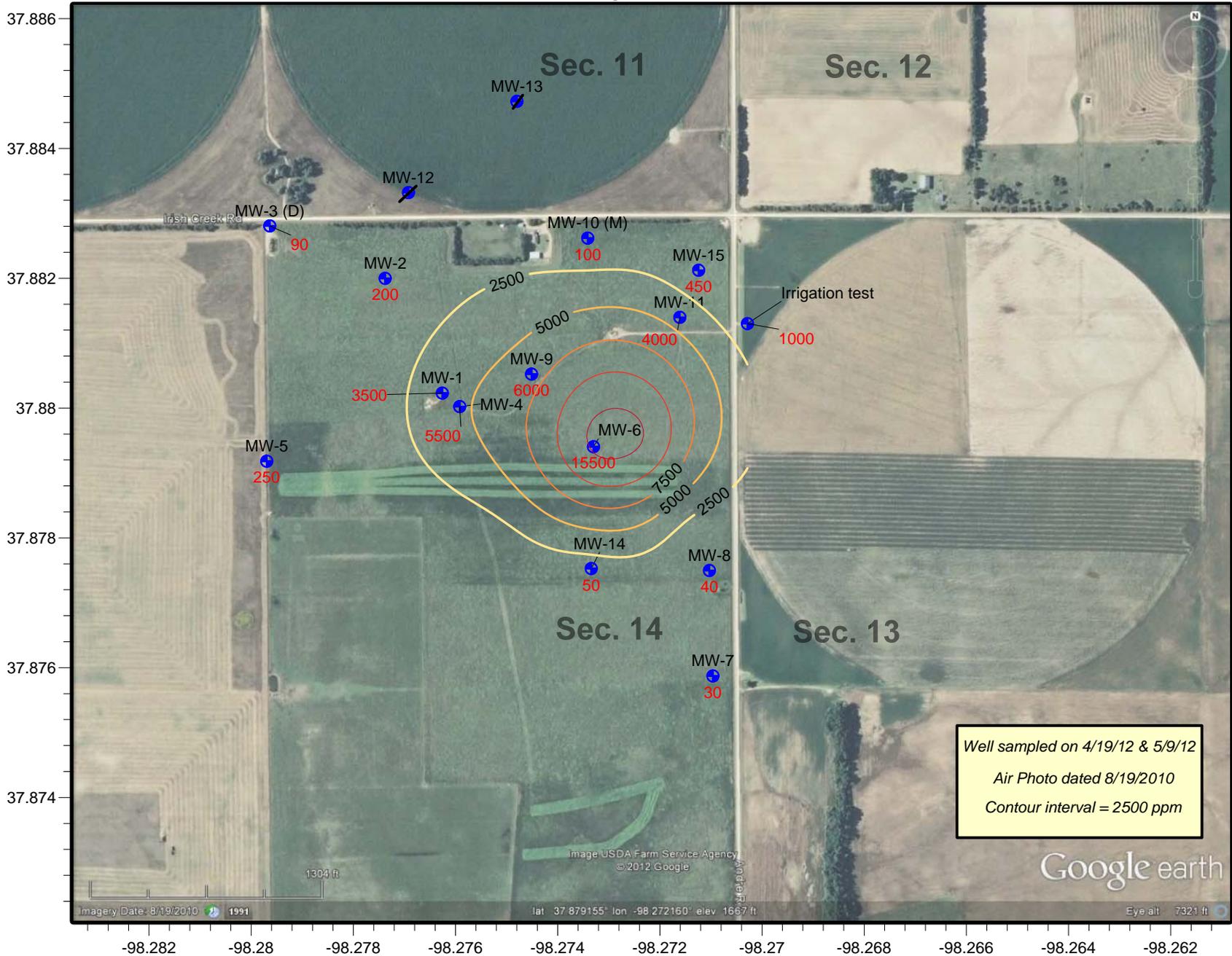
**Target:** 250 ppm

**Recommendation for Future Work:** Data suggests that chlorides have finally moved east into the irrigation well battery in section 13. If the wells are continued to be used for irrigation there is a strong probability that the draw down from these large wells will continue to pull high chloride fluids into their zone of influence. The 2<sup>nd</sup> 2012 groundwater sampling event is scheduled for late November 2012.

**Estimated Total Cost:** \$2000 for Bi-Annual Groundwater sampling and Conductivity Survey. Staff time perform reviews and research into reports and projects remediating the Site.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20030016-001	61.5 Hrs. / \$1,580.28		
<b>Current Contaminate Level: 15,500 mg/l in MW-6</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation	<input checked="" type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 9 W



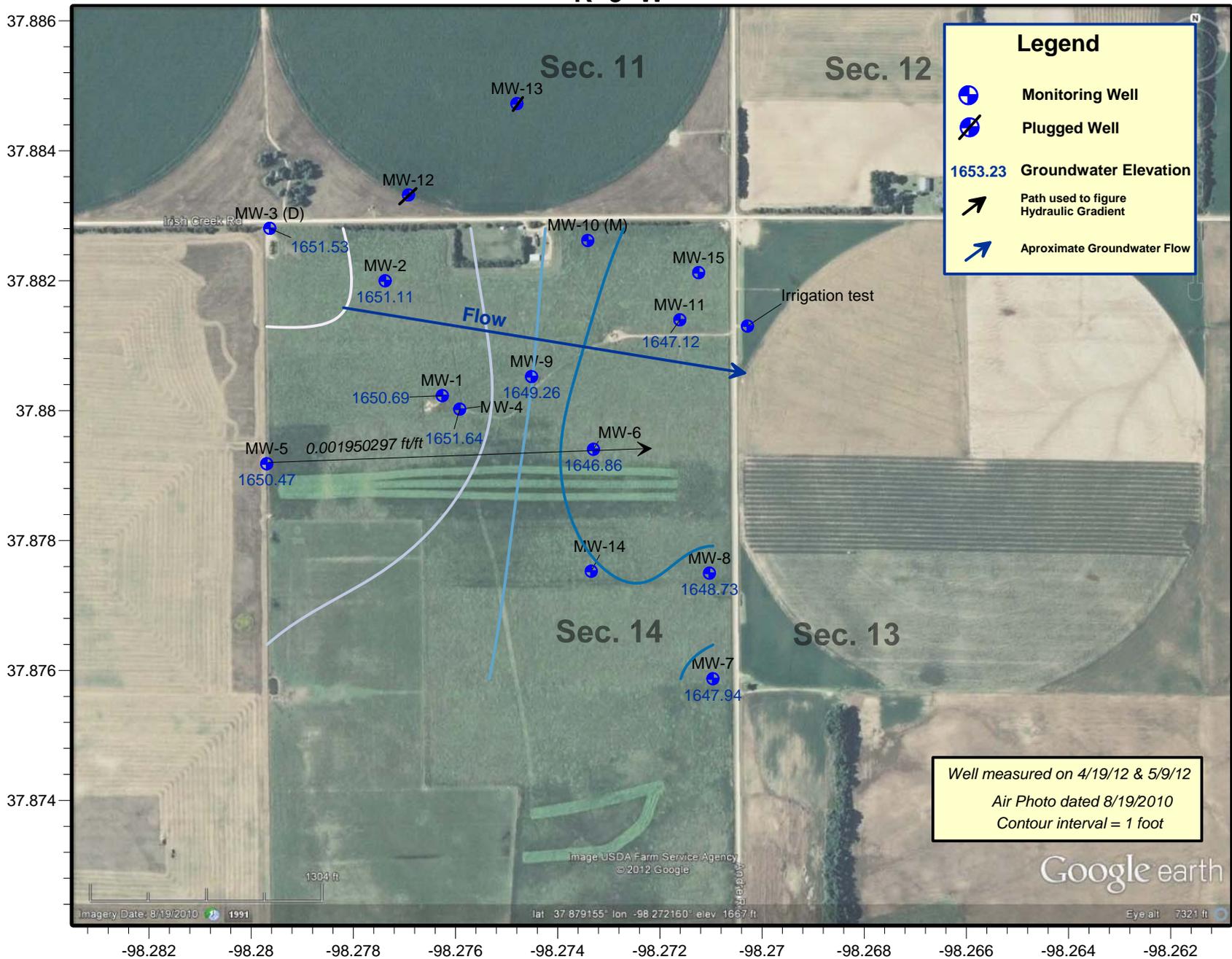
T 25 S



**Arlington Contamination Site**  
 Sec 14 - T 25 S - R 9 W, Reno County, Kansas  
**2012 1st Biannual Groundwater Sampling Event Chloride Concentrations**  
 KCC Project Code #20030016-001 - District #2 - D. Bollenback - 5/16/2012

R 9 W

T 25 S



### Arlington Contamination Site

Sec 14 - T 25 S - R 9 W, Reno County, Kansas

2012 1st Biannual Groundwater Sampling Event Groundwater Elevation

KCC Project Code #20030016-001 - District #2 - D. Bollenback - 5/18/2012

**Project: Gil Balthazor Contamination Site**

**Site Location:** Sections 13, 14, 23 and 24 of Township 9 South, Range 21 West, Graham County

**Impact/Immediacy:** Groundwater, affected domestic water well that is the only source of water for the residence. Immediacy level is rated as low.

**Site Description:** Brine contamination of shallow aquifer.

**Unusual Problems:** Number of potential sources.

**Status of Project:** Chloride levels in the old domestic well were at 600 ppm on a sample taken in April of 2002. The old domestic well is no longer used by the landowner. Chlorides in the new domestic well were at 2300 ppm in 2011. In 2012 the chloride levels in the new well dropped to 1700 ppm chlorides.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

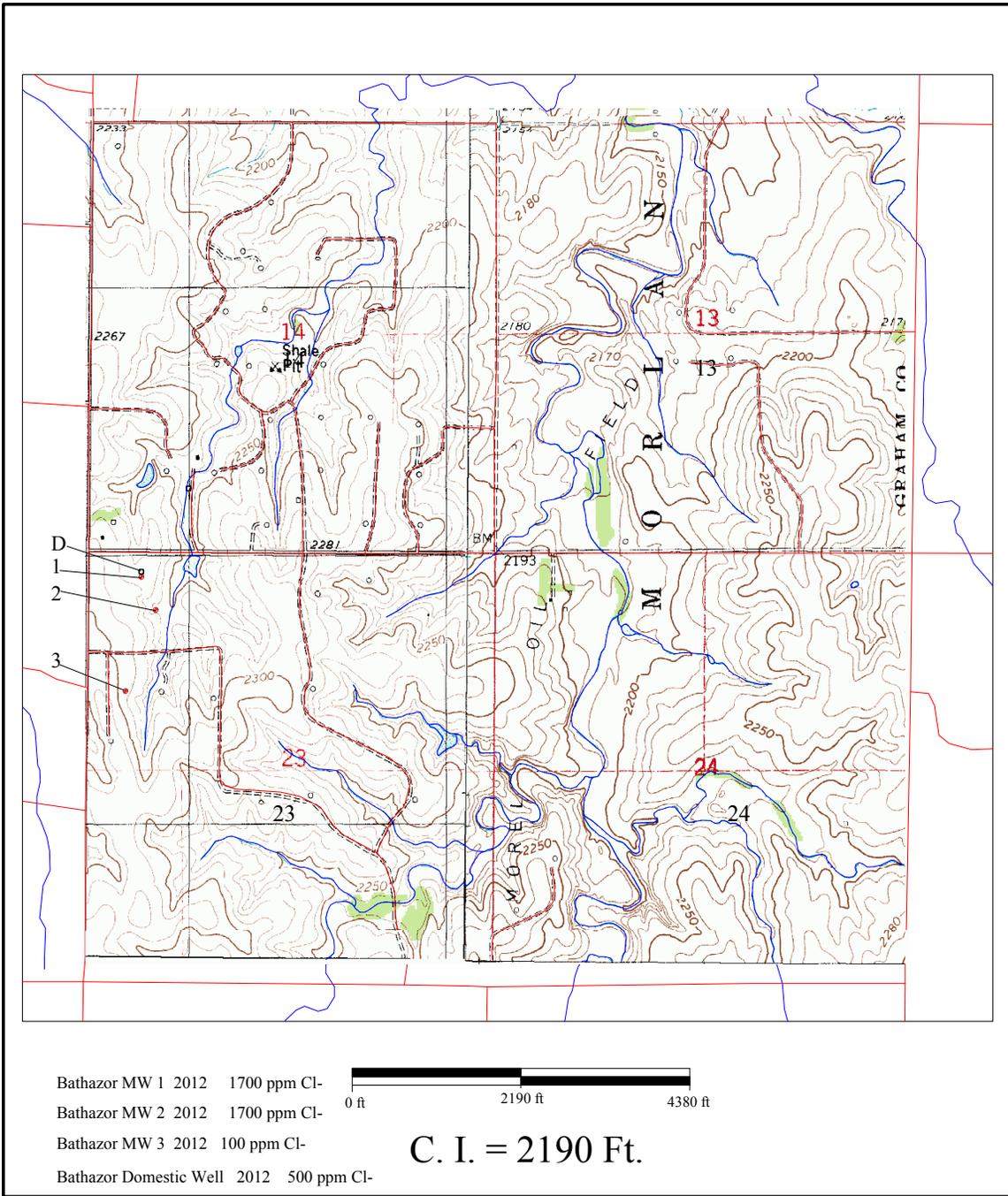
**Target:** 250 ppm Chloride

**Recommendations for Future Work:** The source of chlorides for the old domestic well located in 14-9-21W is likely spills from lead line leaks to the west. The source for the new domestic well is likely an old brine pit located in the NW/4 of Sec 23-9-21 W. Continue to monitor.

**Estimated Total Costs:** \$10,000.00+

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970023-00	11 Hrs. / \$277.51		
<b>Current Contaminate Level: 100 ppm to 1700 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

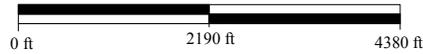
R 21 W



T  
09  
S



Bathazor MW 1 2012 1700 ppm Cl-  
 Bathazor MW 2 2012 1700 ppm Cl-  
 Bathazor MW 3 2012 100 ppm Cl-  
 Bathazor Domestic Well 2012 500 ppm Cl-



C. I. = 2190 Ft.

- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ★ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | ★ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ★ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ★ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ Pit   |
| ★ Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | □ Tank Battery                                    |
| ★ Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | □ Gas Storage Monitoring Well                     |
| ★ TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | □ Plugged Gas Storage Monitoring Well             |
| ★ Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | □ TA Gas Storage Monitoring Well                  |
| ▽ Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | □ Abandoned Gas Storage Monitoring Well           |
| ▽ Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ▽ Gas Storage Injection Withdrawal Well           |
| ▽ TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | ▽ Plugged Gas Storage Injection Withdrawal Well   |
| ▽ Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ▽ TA Gas Storage Injection Withdrawal Well        |
| ▲ Injection Well           | ○ Water Supply Well                 | □ Abandoned Public Water Supply Well | ▽ Abandoned Gas Storage Injection Withdrawal Well |
| ▲ Plugged Injection Well   | ○ Plugged Water Supply Well         | ○ Possible Location                  |   |
| ▲ TA Injection Well        | ○ TA Water Supply Well              | +                                    |   |
| ▲ Abandoned Injection Well | ○ Abandoned Water Supply Well       | ×                                    |   |
|                            |                                     |                                      |   |

**Kansas Corporation Commission**  
 Balthazor  
 Sec. 14, Twn. 9 S., Rng. 21 W.  
 Contaminated Domestic Well  
 970023-00  
 Date: 21 Oct 2004      District: Hays

**Project: Benson SWDW Spill**

**Site Location:** The site is located approximately 1 mile north and 1/3 mile west of Langdon, Kansas. The location is in the SE/4 of Section 17, Township 25 South, Range 9 West, Reno County.

**Impact/Immediacy:** Impact is to soil and groundwater as a result of numerous saltwater spills. The potential exists to impact domestic, public water supply and irrigation wells in the area. This site should be classified as moderate immediacy level.

**Site Description:** The topography grades from stable sand dune to low relief / gently rolling cultivated farmland, which is under irrigation. The chloride plume at the present time extends from the source well to the east-northeast. The plume direction to the northeast seems to be controlled by the water gradient and flow and not any aquitard formation. The substrata consist of silt and silty clay mix with sand to a depth of 8 feet and then fine sand and gravel to a depth of 60 feet. The water level of the sand and gravel aquifer in this area is at a depth of 10.5 feet +/-.

**Unusual Problems:** There is a High School slightly down and side gradient of the plume.

**Status of the Project:** Phillips Petroleum has installed fourteen monitoring wells and two recovery wells at the Benson Remediation site. Active remediation began at this site in September of 2000. A rebound test during the 2010 year failed and the recovery system was restarted by Phillips Petroleum. The chlorides levels at the project, sample by GSI on 8/22/2012, range from 8.9 mg/l at MW 99-04 to 390 mg/l in the MW 00-09. The chloride levels at the Gaston house well and the school well are near or below background levels. A second rebound test was approved by KCC District #2 for the 2012 year. During this test chloride rebound remained under target levels set at 500 mg/L. Groundwater movement is to the east-northeast during the August sampling event with hydraulic gradients of 0.002535714 ft/ft between MW-99-04 and MW 00-09 and 0.008276923 ft/ft between MW 00-09 and MW 02-12. Average groundwater elevation fell from 2011 levels by 2.43'.

**Level of Remediation Sought:**

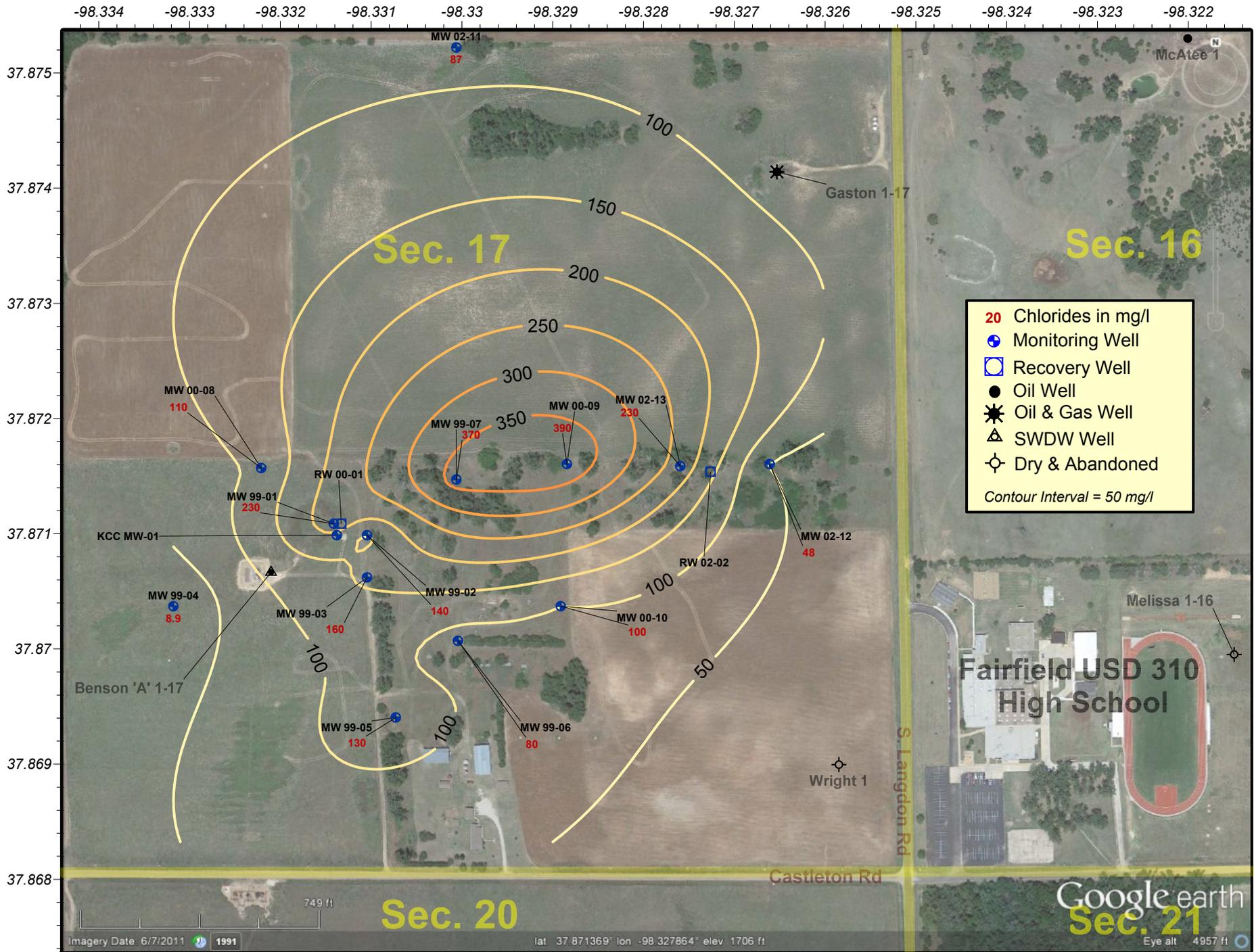
**Ideal: 50 mg/l (background)**

**Target: 500 mg/l**

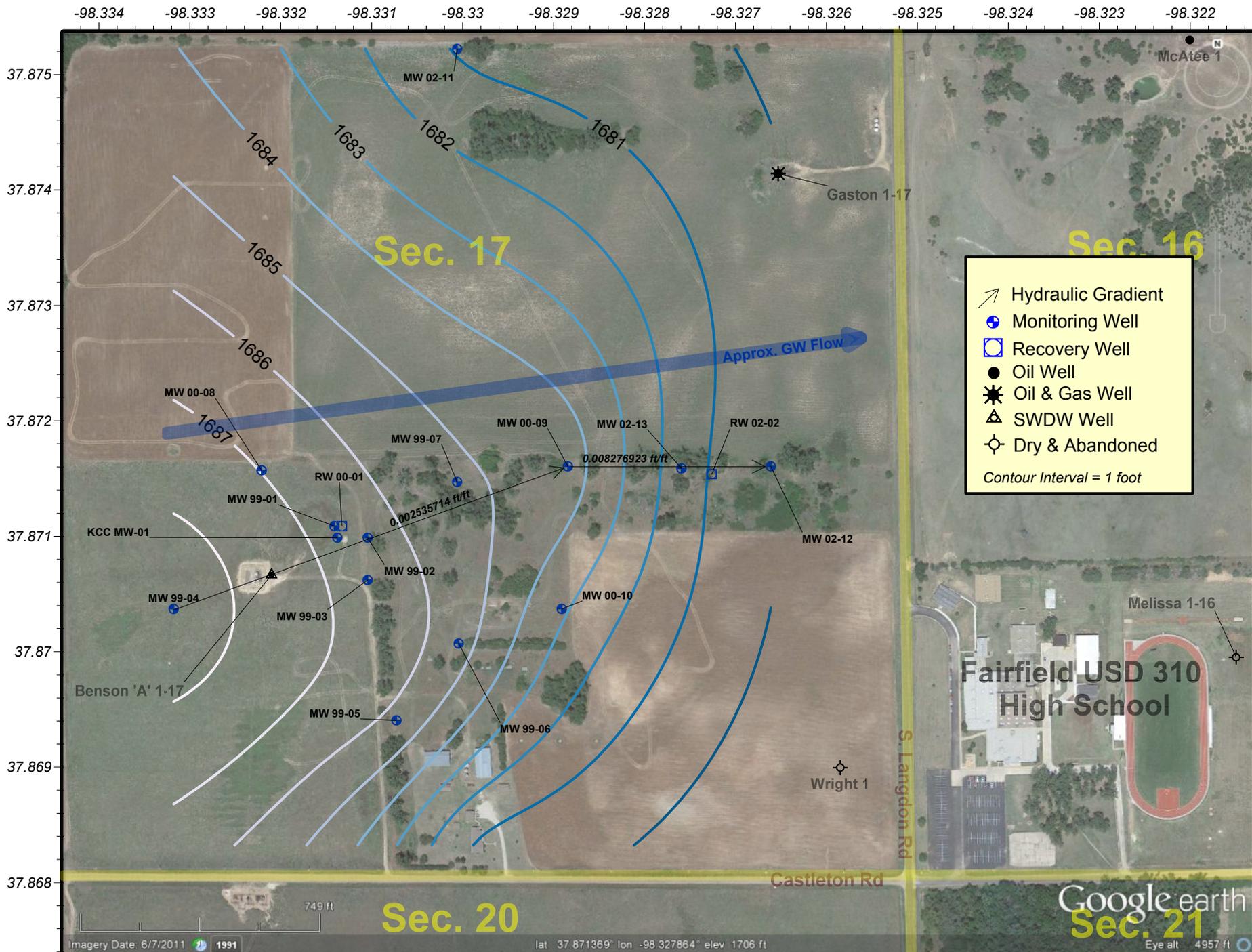
**Recommendation for Future Work:** KCC has informed Bittersweet Energy, Inc (consultant for Phillips) that a limited groundwater sampling event should be schedule for the spring of 2013. Monitoring wells 99-07, 00-09 and 02-12 will be sampled to make sure chloride rebound has not occurred. If levels remain under 500 mg/L KCC will consider this site resolved and allow Phillips Exploration to plug all site monitoring and recovery wells and remove the remediation system including restoration of the land to pre remediation condition.

**Estimated Total Costs:** Costs for report review, site inspection, and annual report preparation.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20000034-001	8 Hrs. / \$217.20		
Current Contaminate Level: 8.9 mg/l to 390 mg/l Cl-		8/22/2012	
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input checked="" type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Benson Remediation Site - Phillips Exploration, Inc. - PRP**  
 Section 17 of Township 25 South & Range 9 west, Reno County, Kansas  
 2012 Chloride Levels in Groundwater Wells  
 District #2 - Sampled on 8/22/2012 by GSI - Map Drawn on 10/24/2012 by D.Bollenback



↗ Hydraulic Gradient  
 ● Monitoring Well  
 ◻ Recovery Well  
 ● Oil Well  
 ★ Oil & Gas Well  
 ▲ SWDW Well  
 ○ Dry & Abandoned  
 Contour Interval = 1 foot

Imagery Date: 6/7/2011 1991

lat 37.871369° lon -98.327864° elev 1706 ft

Eye alt 4957 ft



**Benson Remediation Site - Phillips Exploration, Inc. - PRP**  
 Section 17 of Township 25 South & Range 9 West, Reno County, Kansas  
 2012 Static Groundwater Elevation  
 District #2 - Sampled on 8/22/2012 by GSI - Map Drawn on 10/25/2012 by D.Bollenback

**Project:** *Brazil Contamination Site*

**Site Location:** Section 27, Township 28 South, Range 18 East, Neosho County.

**Impact/Immediacy:** Chloride contamination at this site has verified impacts to both surface water and soil resources with a strong potential for ongoing impact to groundwater resources. The immediacy level is rated as low to moderate for water resources and moderate to high for soil resources.

**Site Description:** The site consisted of an abandoned oil lease with 30 abandoned wells. Surface runoff over areas of past brine spillage and near surface leakage from abandoned wells is affecting both surface water and soil resources. The surface drainage through this lease is a minor tributary to the Neosho River, which is a public water supply source.

**Unusual Problems:** None.

**Status of Project:** The Fee Fund Plugging Project for this lease was completed in early spring of 1999. Twenty-three wells were plugged while seven of the wells were determined to already have been plugged. Four new monitoring wells were constructed in early 2012. These wells were specifically located to further determine the extent and possible source area of the chlorides impacting the area groundwater and surface soils. This property has also been leased by Quest Cherokee and six new gas wells have been drilled in this section since 2006. Some drainage modifications have been implemented by Operator. Soil samples collected in September of 2011 indicate brine impacted soils are expanding within cropland to the south. The following sample results were obtained this year on **02/29/2012**: Well #MW01; 1,400 ppm Cl-; Well # MW02; 1,900 ppm Cl- ; Well # MW03; 400 ppm Cl- and Well # MW04; 1,400 ppm Cl- . On **08/24/2012** : Well #MW01; 1,500 ppm Cl-; Well # MW02; 1,400 ppm Cl- ; Well # MW03; 400 ppm Cl- and Well # MW04; 2,000 ppm Cl- . Five pits were also excavated on 09/27/2011 to a depth of approximately 8 ft. After 24 hrs fluids were present in Pit #2 and Pit #5 and samples collected and tested. Pit #2, 3,200 ppm Cl- and Pit #5 1,800 ppm Cl-.

**Level of Remediation Sought:**

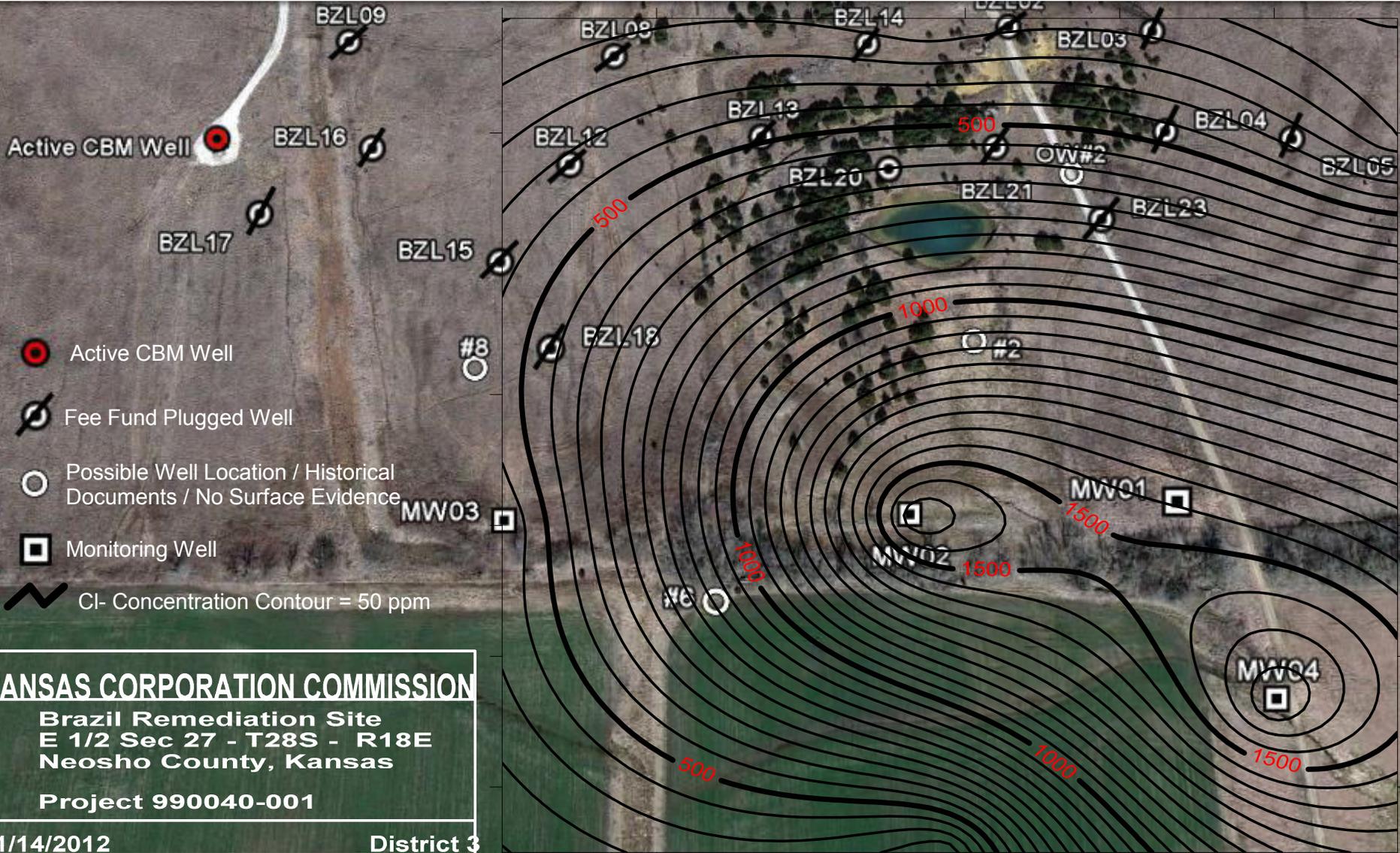
**Ideal:** 250 ppm Chloride

**Target:** 500 ppm Chloride

**Recommendation for Future Work:** Future work at the site, beyond possible plugging operations, will include collection of additional data from the newly constructed monitoring wells and possible construction of additional monitoring wells. This information will assist in determining the location and extent of the brine impact. All work will need to be coordinated with the current Operator.

**Estimated Total Cost:** Plugging cost for this site totaled \$57697.10. Monitoring Well Construction completed in early 2012 totaled \$8,196.00.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
990040-001	48.5 Hrs. / \$1,281.95	\$8,957.50	\$10,767.25
<b>Current Contaminate Level: 400 ppm to 1,900 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



© 2012 Google

Active CBM Well  
 ©2010 Google

**Project: *Brothers Contamination Site***

**Site Location:** This contamination site is located nine miles east, two and one half miles north of Sterling. The legal location is S/2 NE of Section 12, Township 21 South, Range 7 West, Rice County, Kansas.

**Impact\Immediacy:** Low immediacy. The only water wells within one mile are to the southwest and were drilled in the 1980s as oil field supply wells.

**Site Description:** The site is located in the Sand Hills of Rice County. The groundwater aquifer is a shallow permeable zone consisting of loose fine-grained sand underlain by a thick clay layer. The groundwater flow is to the south-southwest.

**Unusual Problem:** Monitoring wells onsite have shown that the aquifer has low deliverability.

**Status of Project:** KCC visited the site and collected water samples on August 8<sup>th</sup>, 2012. KCC laboratory results of the three monitoring wells show that natural attenuation and delusion is occurring at the Brothers Site. This is shown by lower chloride levels in MW-1. MW-3 was slightly higher than 2011 at 2,100 ppm chlorides. MW-2 is screened in the lower aquifer and was still below 100 ppm chlorides. There was not a sample taken at the pond this year as the pond was dry.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l Chloride

**Target:** 500 mg/l Chloride

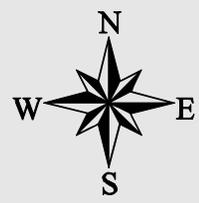
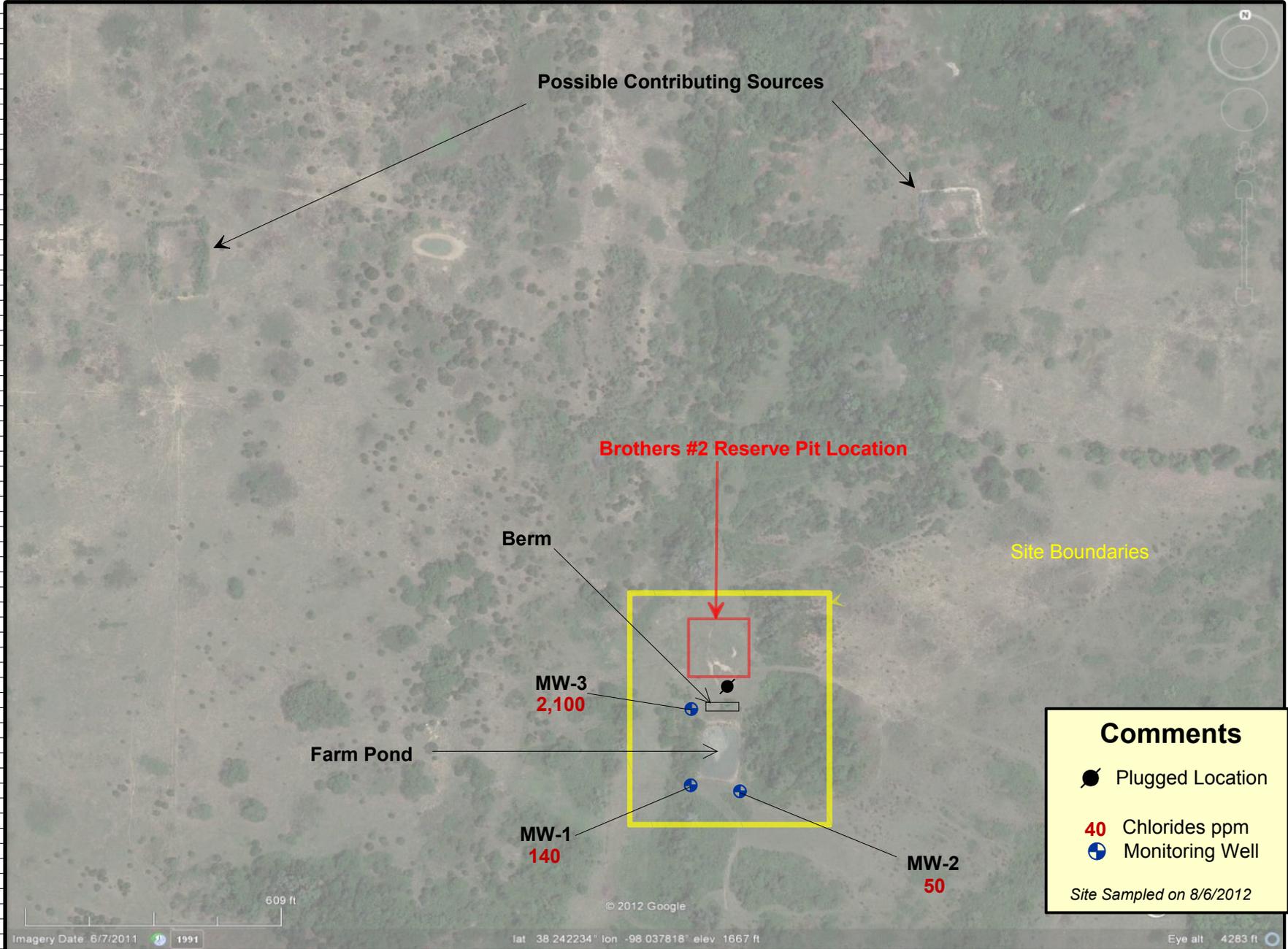
**Recommendations for Future Work:** KCC recommends that a Geoprobe<sup>®</sup> rig be used to probe the area surrounding the site. Probe work could indicate whether or not the chloride contamination is still high in the old drilling pit area. Probe work could also show whether or not this chloride contamination is part of a larger chloride situation from past oil field activities. Data found from a probing event could be used to help plan on a time table for site closure or help indicate other avenues of remediation in order to hasten clean up.

**Estimated Total Costs:** \$4000.00 for Geoprobe work and routine annual sampling events.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970029-00	30 Hrs / \$795.58		\$4.26
Current Contaminate Level: 50 mg/l to 2100 mg/l Chloride		8/8/2012	
Status:			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-98.043 -98.042 -98.041 -98.04 -98.039 -98.038 -98.037 -98.036 -98.035 -98.034 -98.033

38.245  
38.2445  
38.244  
38.2435  
38.243  
38.2425  
38.242  
38.2415  
38.241  
38.2405  
38.24  
38.2395



**Brothers Contamination Site**  
 S/2 NE of 12-T21S-R7W - Rice County  
**2012 Annual Groundwater Sampling Event - Chloride Levels**  
 KCC Code #970029-00 - District #2 - D.Bollenback - Drawn: 8/16/2012

**Project: Burrton Contamination Site**

**Site Location:** The site is located in western Harvey County and eastern Reno County approximately 18 miles west of the city of Newton and 12 miles east of the city of Hutchinson. The site includes acreage in Townships 23 and 24 South, Ranges 3 and 4 west.

**Impact/Immediacy:** Presently the contamination site is affecting local domestic and irrigation wells. Hydrogeologic computer modeling shows portions of the plume will intercept parts of the Wichita Well Field within 50 years. The Equus Beds aquifer is a major source of public water supply for much of the population of Sedgwick County. This case is ranked at a high level of immediacy based on the resource impacted and the size of the site.

**Site Description:** Total maximum area affected by the contamination covers approximately 25 to 30 square miles. In general, the contaminate plume is aligned in a northeast to southwest configuration parallel with the associated producing areas. A water quality-sampling network maintained by the local groundwater management district indicates oil field brine contamination of all three major zones within the Equus Beds Aquifer. Depth to groundwater ranges from 10 to 35 feet with saturated thickness in the order of 150 to 250 feet.

**Unusual Problems:** The lack of suitable disposal facilities and the large area extent of the plume make the clean up of this site very costly. The physical day-to-day maintenance and monitoring of a withdrawal and disposal system of this size would require a large commitment of labor and resources. In addition, over pumping the aquifer as part of a remediation plan for oilfield brine could cause natural chlorides to migrate from the Arkansas River into the Equus Beds, thus impacting parts of the aquifer that are not contaminated.

**Status of the Project:** GMD #2 sampled the monitoring wells in late 2012. This site is currently in monitoring status. In 2013 bids will be acquired for the laboratory work for water sample analysis. District #2 began investigating private groundwater wells in the area. Plans to meet with GMD#2 to exchange data regarding the water well database in the site area is to be planned over the winter of 2012-13. The Brine plumes in the B and C zones were found to be stable with minor fluctuations in some wells. The A Zone was similar except for a marked increase in the north-northeast of the site at EB5A. It does not appear that this is a new issue, but that EB5AA was historically mapped whereas this year KCC determined that EB5A would be a more representative depth for interpreting the A Zone at that location.

**Level of Remediation Sought:**

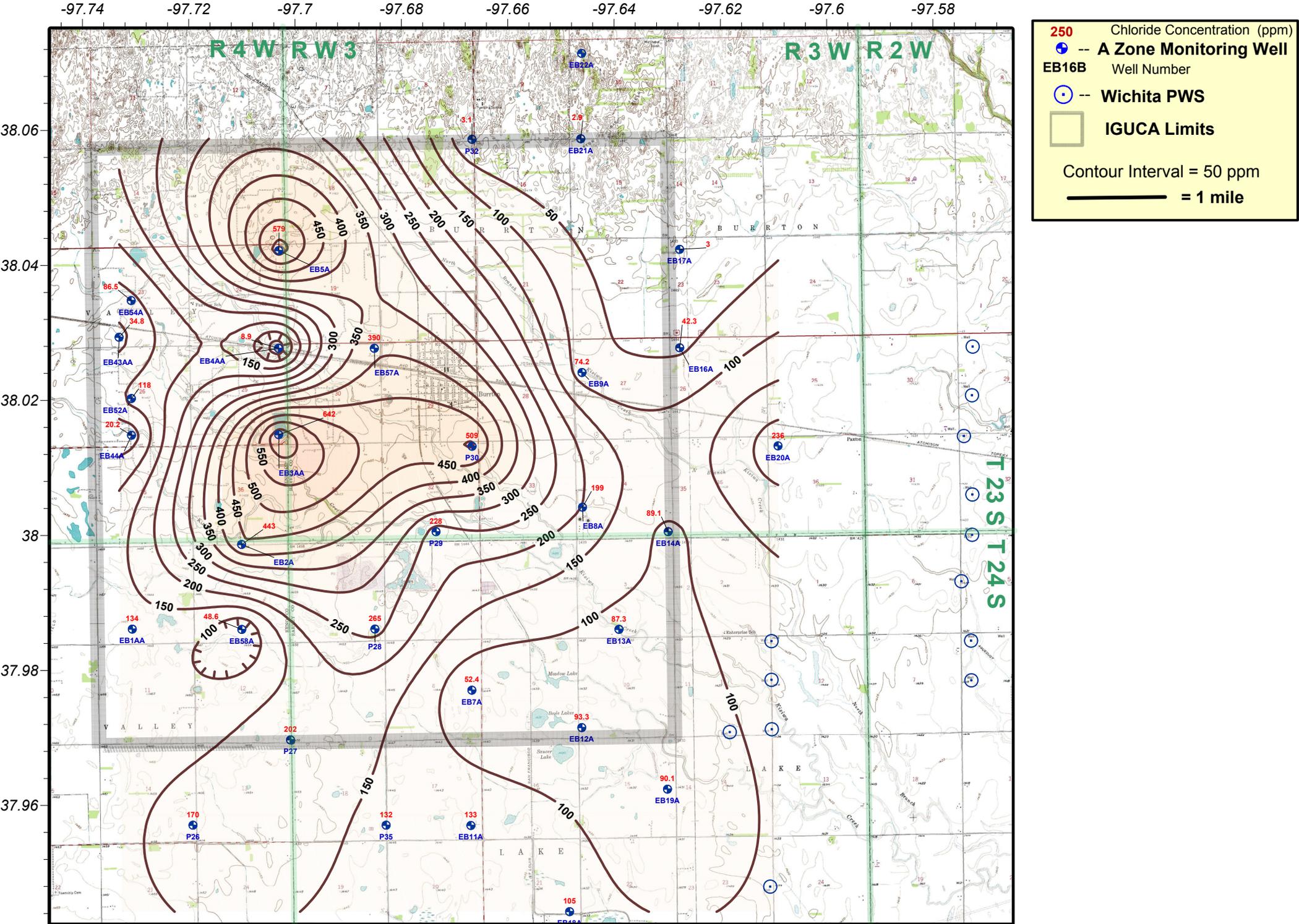
**Ideal:** 250 mg/l Chloride

**Target:** Considering the variable conditions within the aquifer different areas within the contaminate plume would need to be evaluated separately during cleanup to insure that fresh and usable water is not being disposed of needlessly.

**Recommendations for Future Work:** Continue funding annual water well sampling and analysis of this critical data. KCC will continue to review data for locations for possible additional wells to help delineate the plume. Open communication with the City of Wichita regarding data exchange and future cooperation in addressing the contamination problem and the Wichita Water Well Recharge Project. Continued cooperation and communication with GMD #2 is vital to the monitoring of the brine plume.

**Estimated Total Cost:** Cost associated with funding the sampling done by GMD #2, along with KCC staff research and report preparation.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970003-00	23.5 Hrs. / \$620.09	\$4,334.52	\$310,726.31
<b>Current Contaminate Level: 2.9 mg/l EB21A to 1540 mg/l Cl- EB4B</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**250** Chloride Concentration (ppm)

**●** -- A Zone Monitoring Well

**EB16B** Well Number

**○** -- Wichita PWS

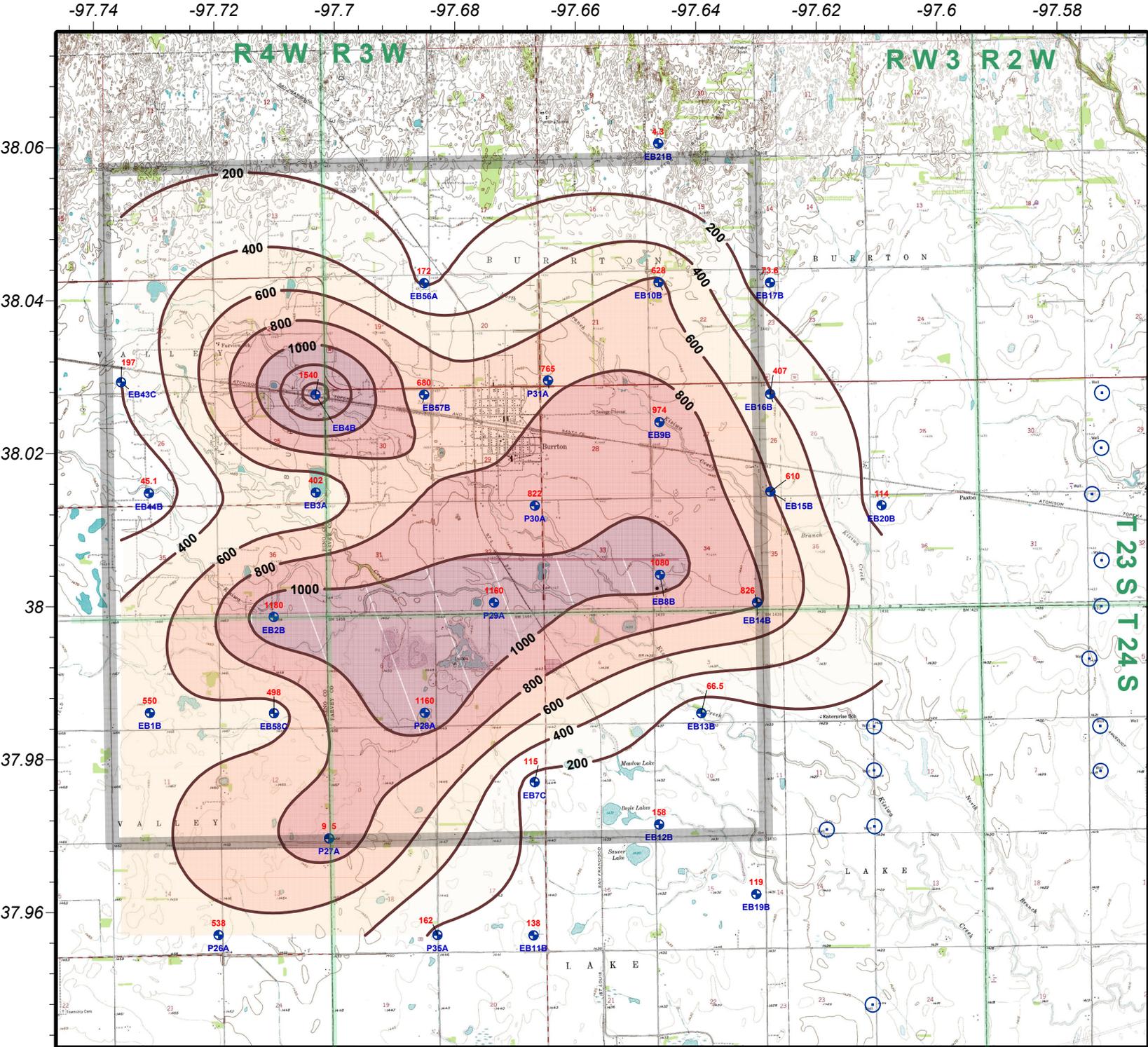
**□** IGUCA Limits

Contour Interval = 50 ppm

**—** = 1 mile



**Burrtion (IGUCA) Oil Field Brine Contamination Site**  
**2012-13 Equus Beds A Zone Chloride Concentration Map**  
 Harvey and Reno Counties, Kansas - KCC Control #970003-00  
 KCC District #2 - Sampled by GMD#2 - Map Drawn by D. Bollenback on 11/5/2012



**250** Chloride Concentration (ppm)

**+** -- B Zone Monitoring Well

EB16B Well Number

**○** -- Wichita PWS

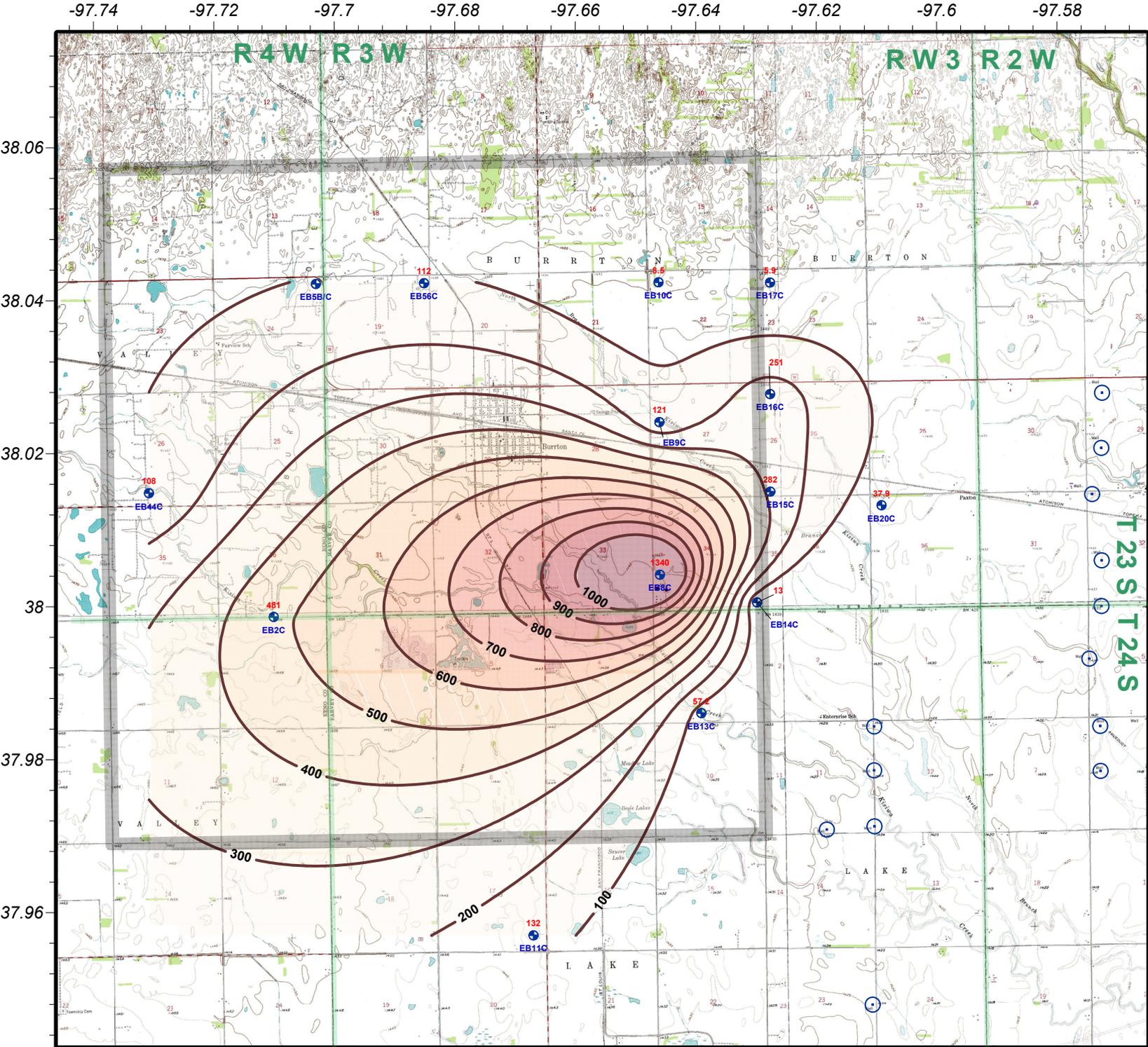
**□** IGUCA Limits

**—** = 1 Mile

Contour Interval = 200 ppm



**Burrton (IGUCA) Oil field Brine Contamination Site**  
**2012-13 Equus Beds B Zone Chloride Concentration Map**  
 Harvey and Reno Counties, Kansas - KCC Control #970003-00  
 KCC District #2 - Sampled by GMD#2 - Map Drawn by D. Bollenback on 11/5/2012



**250** Chloride Concentration (ppm)

**+** -- C Zone Monitoring Well

EB16C Well Number

**○** -- Wichita PWS

**□** IGUCA Limits

**—** = 1 Mile

Contour Interval = 100 ppm



**Burrtion (IGUCA) Oil field Brine Contamination Site**  
**2012-13 Equus Beds C Zone Chloride Concentration Map**  
 Harvey and Reno Counties, Kansas - KCC Control #970003-00  
 KCC District #2 - Sampled by GMD#2 - Map Drawn by D. Bollenback on 11/8/2012

**Project: Clawson Contamination Site**

**Site Location:** Legal location is East half of Section 33 and all of Section 34, Township 29 South, Range 34 West, Haskell County.

**Impact/Immediacy:** Irrigation well is contaminated and a pollution threat to other irrigation wells if contaminate is not contained to site. Site immediacy is rated at moderate to high and is under remediation at the present time by the PRP.

**Site Description:** The site consists of a plume of brine-contaminated groundwater moving in an easterly direction. Area is blanketed by 500 feet of Ogallala sand and gravel. Bedrock underlying the Ogallala is the Dakota/Cheyenne formation. There is a total of 600 feet of freshwater bearing strata. Pollution occurs along a clay layer 360 feet below the surface (in the upper part of the freshwater aquifer). No domestic wells in the affected area. One irrigation well is currently polluted to the extent it cannot be used for irrigation purposes. Depth to groundwater is 300 feet. Depth to Cretaceous bedrock is 510 feet in the center of the SW/4 of Section 34. The Red Beds underlie the three aquifers at a depth of 635 feet.

**Unusual Problems:** High yield rates of the Ogallala formation.

**Status of Project:** The Clawson remediation project has made significant progress of the last year and the size of the plume, as well as the concentration of chlorides are both on the decline. Daniel B Stephens & Associates met with the KCC on March 5<sup>th</sup> in order to discuss the future of the project, at that time a decision was made to shut in the recovery wells to see if there would be any rebound, this was completed on March 23<sup>rd</sup>. Annual sampling of the wells was completed on May 2-4 2012 by DBS&A, Inc. An increase in chlorides was noted in one monitoring well and five recovery wells, this was likely from the wells being offline since late March. The rest of the monitoring wells showed a decline in chlorides from previous events. After the annual sampling event in May, the recovery wells were restarted and quarterly sampling of the recovery wells has been resumed. During the June sampling event, it was noted that recovery wells 02-04 and 05-1 were below the fresh water standard. As 02-04 is up gradient, DBS&A requested to shut the well in indefinitely, the request was granted by the KCC. 05-1 being a down gradient well has remained active.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

**Target:** 350 ppm Chloride

**Recommendations for Future Work:** As the plume continues to dwindle in size, more recovery wells will likely be shut in. It is also probable that some of the monitoring wells will be plugged in the near future. All of these expenses will be covered by the PRP and will only happen with the consent of the KCC. The will continue to stay in remediation for the time being, but is moving steadily closer to the monitoring phase.

**Estimated Total Costs:** KCC - \$450 a year. PRP – in excess of \$2 million.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970005-00	30.5 Hrs. / \$789.26		
<b>Current Contaminate Level: 50.7 ppm Cl- to 2,540 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

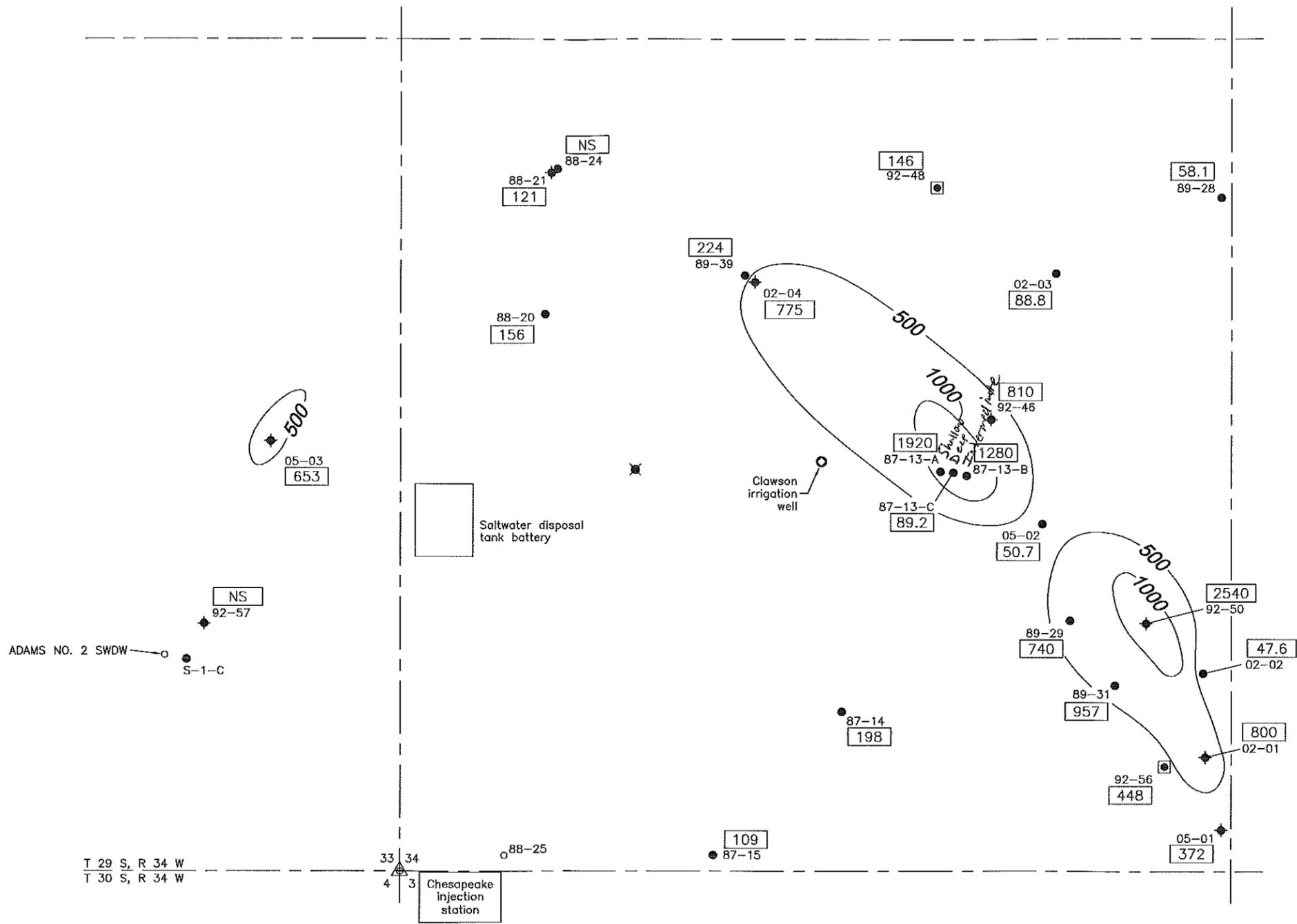
U:\Client\Pioneer\Haskell Co\Drawings\Haskell Co ff1zd.dwg

Approximate location of Schwartegger irrigation well

Approximate location of Murphy irrigation well



- Explanation
- Monitor well
  - Monitor well with pump
  - Recovery well
  - Injection well
  - Irrigation well
  - Chloride concentration (mg/L)  
NS = not sampled
  - Chloride concentration contour (mg/L)



*ceder*

Haskell County Brine Cleanup  
Haskell County, Kansas  
**Chloride Concentrations**  
May 2-4, 2012

Daniel B. Stephens & Associates, Inc.  
5/25/12

5/30/12

2012 Annual Sampling Results

Figure 3

**Project: Codell Contamination Site**

**Site Location:** Sections 2, 3, and 11 of Township 10 South, Range 17 West, Rooks County

**Impact/Immediacy:** Public Supply Well is still below drinking water standards for chlorides. Immediacy level is rated as moderate to high.

**Site Description:** Brine contamination of shallow aquifer along Paradise Creek. High chlorides were detected in the domestic wells and stock ponds at ranges from 500 to 2,000 ppm from 1977 through 1980. These contaminated waters were thought to be a threat to the Public Supply Well for the city of Codell. No specific source was found during investigations from 1977 through 1980.

**Unusual Problems:** Very little documentation.

**Status of Project:** Well net drilled along affected creek.

Monitor well No.	Year	Chlorides	Year	Chlorides	Year	Chlorides
1	2010	300 ppm	2011	240 ppm	2012	300 ppm
2	2010	500 ppm	2011	320 ppm	2012	500 ppm
3	2010	500 ppm	2011	340 ppm	2012	400 ppm
4	2010	200 ppm	2011	220 ppm	2012	300 ppm
5	2010	100 ppm	2011	50 ppm	2012	100 ppm

**Level of Remediation Sought:**

**Ideal:** 100 ppm Chloride

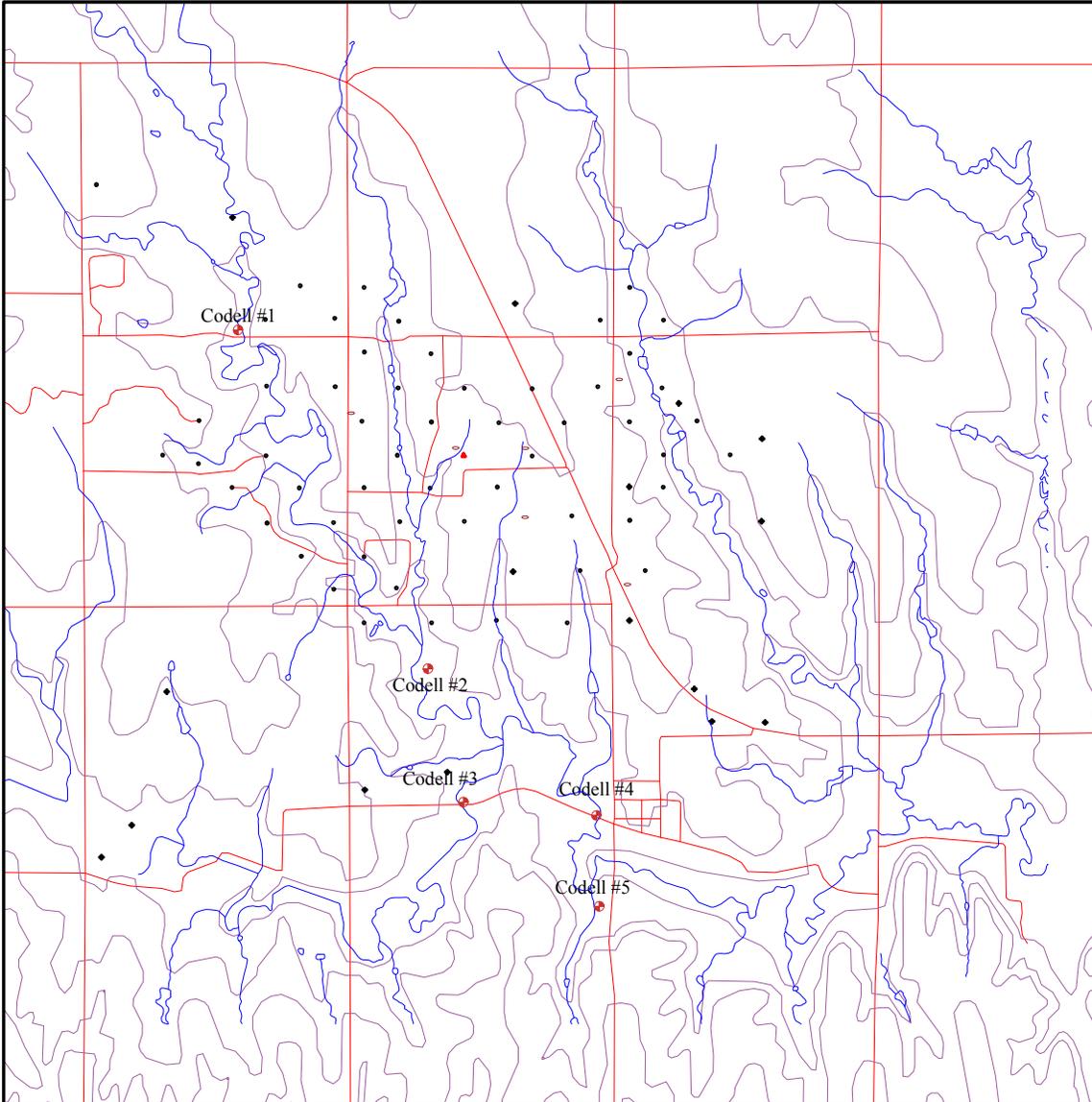
**Target:** 250 ppm Chloride

**Recommendations for Future Work:** Will continue to monitor the well net.

**Estimated Total Costs:** \$10,150 for monitor well net, and \$7800 for 5 year monitoring program.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970033-00	8 Hrs. / \$198.64		\$19,491.40
<b>Current Contaminate Level: 100 ppm Cl- to 500 Cl-.</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 17 W



T  
10  
S



Codell MW1 2012 300 ppm Cl-  
 Codell MW2 2012 500 ppm Cl-  
 Codell MW3 2012 400 ppm Cl-  
 Codell MW4 2012 300 ppm Cl-  
 Codell MW5 2012 100 ppm Cl-

CI = 3640 feet



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | ✱ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ✱ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ Pit   |
| ● Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | ○ Tank Battery                                    |
| ● Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | □ Gas Storage Monitoring Well                     |
| ● TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | □ Plugged Gas Storage Monitoring Well             |
| ● Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | □ TA Gas Storage Monitoring Well                  |
| ● Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | □ Abandoned Gas Storage Monitoring Well           |
| ● Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | □ Gas Storage Injection/Withdrawal Well           |
| ● TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | □ Plugged Gas Storage Injection/Withdrawal Well   |
| ● Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | □ TA Gas Storage Injection/Withdrawal Well        |
| ● Injection Well           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | □ Abandoned Gas Storage Injection/Withdrawal Well |
| ● Plugged Injection Well   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ● TA Injection Well        | ● TA Water Supply Well              | ● Test Hole                          |   |
| ● Abandoned Injection Well | ● Abandoned Water Supply Well       | ● Sample Site                        |   |

**Kansas Corporation Commission**

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Codell

Sec. 13, Twn 10 S., Rng. 17 W., Rooks County

Old Chloride Plume

970033-00

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Date: 21 Oct. 2004      District: Hays

**Project: Curtis Contamination Site**

**Site Location:** The legal location is Sections 23, 24, 25 & 26 of Township 24 South, Range 14 West, Stafford County

**Impact/Immediacy:** The impact is to groundwater resources that have been contaminated by the flow of salt water from an old core drill hole. The core hole thought to be the source of contamination was plugged in 1988. This site has a low to moderate immediacy rating.

**Site Description:** This site was investigated after the Curtis irrigation well was reported salty. The aquifer in this area consists of unconsolidated material consisting mostly of sand and gravel, and is in general ninety feet thick. Several thin aquitards were encountered in the unconsolidated material. Bedrock consists of clay shale of various colors and was encountered at approximately 90 to 100 feet. The Curtis irrigation well tested salty upon completion and it was reportedly never used. It was also reported that no preliminary test boreholes were made before drilling the irrigation well. The irrigation well was probably drilled into the top of the bedrock and may have pumped chloride contaminated water from this zone.

**Unusual Problems:** The old core hole may have allowed cross flow of brine into the groundwater aquifer of the Rattlesnake Creek for more than forty years. The plume from this massive intrusion of brine extends to the northeast approximately two miles from the original source area.

**Status of Project:** Samples were taken from nine monitoring wells in 2012. The chlorides have remained steady in most of the area with the only significant increase coming from MW-1, where the chlorides increased by 840ppm to 3950ppm. I believe this increase is due to a difference in sampling techniques used in 2012 versus 2011 and is not attributed to a fluctuation in actual chlorides. Three monitoring wells were repaired this year, MW-4, MW-5, and MW-11 were all broken and repaired. MW-11 is also plugged off at about 17 feet below ground level. An additional unidentified 5" well in the SW/NW of Section 19-T24S-R13W was also sampled, chlorides in this well are 3700ppm. The two irrigation wells in section 19 were not sampled this year because they were not running at the time of sampling.

**Level of Remediation Sought:**

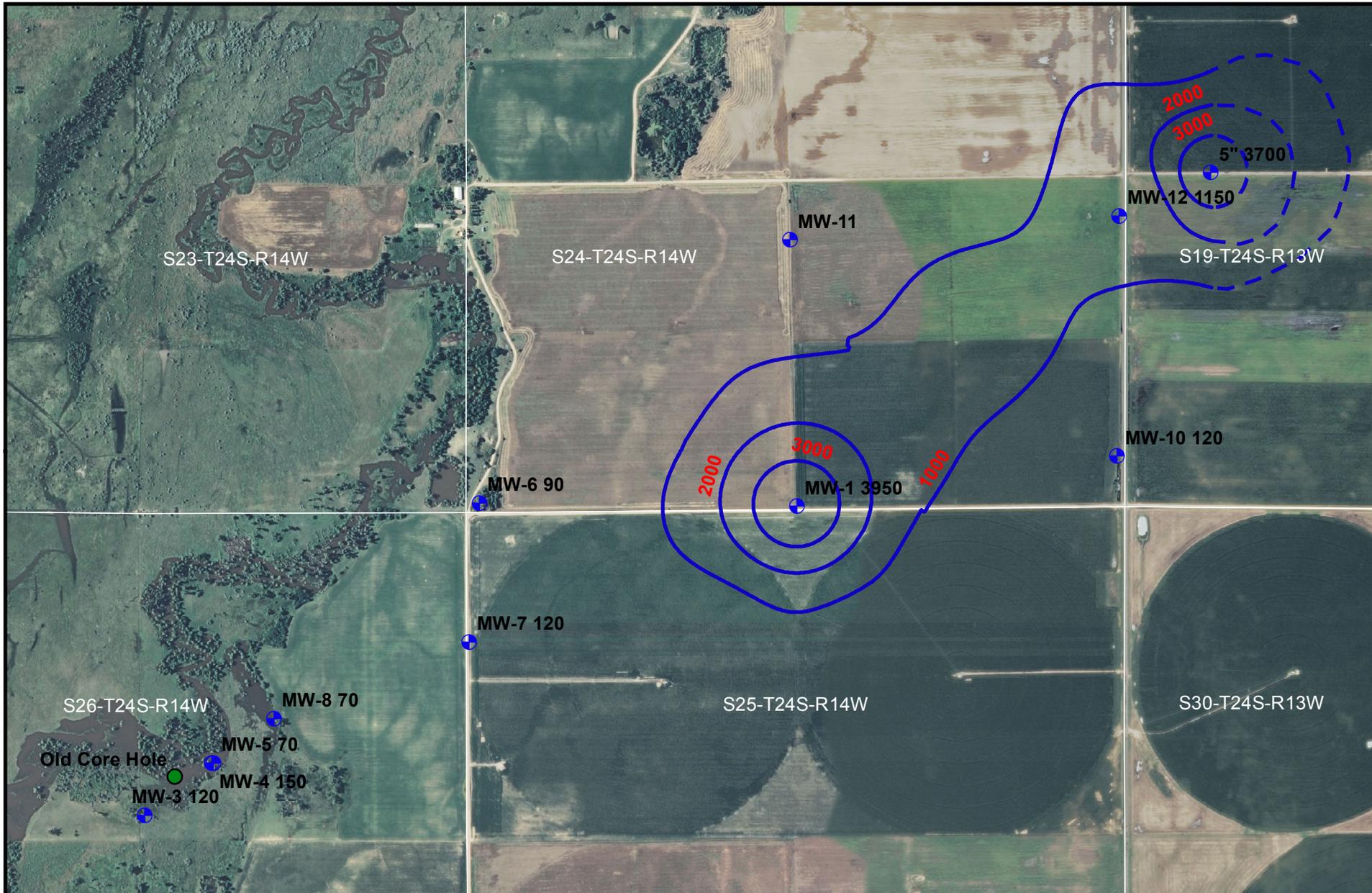
Ideal: 250 ppm

Target: 500-1000 ppm

**Recommendation for Future Work:** MW-11 will need to be cleaned out in order to get a sample for next year. The two irrigation wells in section 19 will need to be sampled to see if the chlorides have begun to impact the water quality. Using photogrammetric methods on a multispectral image could help to identify a deeper channel or other influencing factor, or electromagnetic induction profiling (EM), could be run to determine where the chlorides are, and pinpoint the highest impacted areas. This would give a better representation of the chlorides than the thin network of monitoring wells, and would help to pinpoint where future work would need to be focused. An EM survey would also help to identify if there is a current source of chloride intrusion.

**Estimated Total Costs:** \$27,000

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970034-00	37.5 Hrs. / \$932.44		\$4,199.17
<b>Current Contaminate Level: 70 ppm Cl- to 3950 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Curtis Contamination Site**  
 Sections 24,25,26-T33S-R11W  
 Stafford County, Kansas  
**Chloride Isopleth Map - sampled on 10-17-2012**  
*KCC Project Code #970034-00 - District #1 - D. Bernasconi - 10-31-12*

**Project: Jim Dinkle Contamination Site**

**Site Location:** SE/4 of Section 32, Township 13 South, Range 17 West, Ellis County

**Impact/Immediacy:** Groundwater, affected domestic water well is the only source of water for the residence. Immediacy level is rated as moderate.

**Site Description:** Brine contamination of a shallow aquifer. Contamination originally thought to be from deicing activities on Interstate 70. Contamination is likely from an old brine water evaporation pit (revoked July 1, 1958) and/or a shallow injection well (revoked September 3, 1969).

**Unusual Problems:** The hydrogeology of the site includes a very tight clay (approx. 8 feet thick) with a lime stone derived clay overlying sands 15 feet in thickness.

**Status of Project:** Extensive drilling was completed in August and September of 2000. A total of 16 holes were drilled on the site, and three were completed as monitor wells. The major contributor to chlorides in the area old drill pits located south west of the Dinkel domestic well. Landowner is now on rural water.

Chloride levels from samples over the last two years are as follows:

Year	Monitor Well	Chlorides	Year	Monitor Well	Chlorides
2011	Dnkl #5	1140	2012	Dnkl #5	1060
2011	Dnkl #7	760	2012	Dnkl #7	880
2011	Dnkl #9	1060	2012	Dnkl#9	1020

**Level of Remediation Sought:**

**Ideal:** 100 ppm Chloride

**Target:** 250 ppm Chloride

**Recommendations for Future Work:** Investigation is completed. Continue to monitor.

**Estimated Total Costs:** \$28,000 to \$30,000

Control No.	Staff Hours/Expenditures	Fund Expenditures FY 2012/13	Total
970035-00	6 Hrs. / \$146.06		
<b>Current Contaminate Level: 880 to 1060 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Project: Dinkler Site**

**Site Location:** The Dinkler site is located within the area of the Four Mile Creek oilfield. The legal description for the site is the west half of section 4 and the north half of section 5, T 28 S- R 3 E in Butler County. Part of the site lies in the north end of the Flint Hills National development.

**Impact/ Immediacy:** Impact is to the ground water for domestic home sites with water being used for irrigation of lawns and for watering livestock. The site is classified at a low immediacy level.

**Site Description:** The site is located in grassland underlain by shallow bedrock. The small creeks have down cut into the bedrock producing fingering drainage to the north into the Four Mile Creek, which drains to the east. Four Mile Creek is spring fed and runs through out the year. The aquifer for the water wells in the area is the bedrock limestone with water wells generally being approximately 100 feet deep. The area now has home sites at the Flint Hills National development. This site started with a complaint of a salty domestic yard well in Section 4, Township 28 South, and Range 3 East and was traced to the west-northwest.

**Unusual Problems:** During the construction of a house on golf course property the surface casing for Graham No. 4 was encountered and oil was found in the casing. A rig was moved in and the well was replugged. Due to the problem encountered with well Graham No.4, Graham No.1 and No. 5 were located with a metal detector on the golf course (2006). Due to the exclusiveness of the golf course and real estate, plugging the unplugged oil wells and adding additional Monitoring wells would be difficult.

**Status of Project:** In the winter of 2005-2006 unplugged wells identified as the Graham #4 and the Dinkler #2 were plugged by the KCC. Three monitoring wells were installed down gradient to the plugged wells to evaluate water quality. Annual sampling is done on these very low yielding wells. MW #1 was found to have an obstruction approximately 60' down and a decay odor. It appears that a small animal has fallen down the well and become stuck. MW #2 is currently 13,500 mg/l, and MW #3 is 800 mg/l, which is significantly lower than years in the past. Research indicates that new domestic wells have and are being drilled in the residential area west of the monitoring wells over the last couple of years.

**Level of Remediation Sought:**

**Ideal: 250 mg/l**

**Target: 500 mg/l**

**Recommendation for Future Work:** MW#1 is still obstructed by an unknown blockage assumed to be a dead animal. Attempts to knock down the obstruction proved unsuccessful. This well will need to be acidized to break down the obstruction then sanitized to removed unwanted bacteria. Due to the exclusiveness of the site it is recommended that this site be sampled every other year. KCC has no further plans for this site at this time.

**Estimated Total Cost:** \$50,000+ depending on material and contractor cost to plug both the Graham No. 1 and No. 5 wells.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20050047-001	6 Hrs. / \$157.38		\$9,642.50
<b>Current Contaminate Level: 13,500ppm in MW-2 &amp; 800 ppm in MW-3</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.136 -97.134 -97.132 -97.13 -97.128 -97.126 -97.124 -97.122 -97.12 -97.118 -97.116 -97.114 -97.112 -97.11 -97.108



### Dinkler/Flint Hills National Contamination Site

Sections 4 & 5 of T 28 S & R 3 E of Butler County, Kansas

#### Site Map and Chloride Values in 2012

KCC Code# 200050047-001 - District #2 - D. Bollenback - 10/31/2012

**Project: Everett Portland Contamination Site**

**Site Location:** W2 of Section 5, Township 14 South, Range 15 West, Russell County

**Impact/Immediacy:** Groundwater, stock well and natural springs. Immediacy level is rated as low.

**Site Description:** Brine contamination of a shallow aquifer. Contamination could be the result of use of brine ponds in the past, poorly constructed injection and disposal wells, lead line leaks, and poor lease practices.

**Unusual Problems:** This site is within a water flood project that was managed by the Home Stead Oil Co. in the late fifties and early sixties. The water flood was problematic with numerous poorly designed injection wells, brine ponds, reported overflows in emergency pits, severe lead line and high pressure line leaks. Due to these factors, this is a non-point source pollution site.

**Status of Project:** Monitoring. The household is on rural water district water and both sources are used for watering livestock. The chloride levels for 2010 are back down at 500 ppm. A sample for 2011 was at 300 ppm.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

**Target:** 500 ppm Chloride

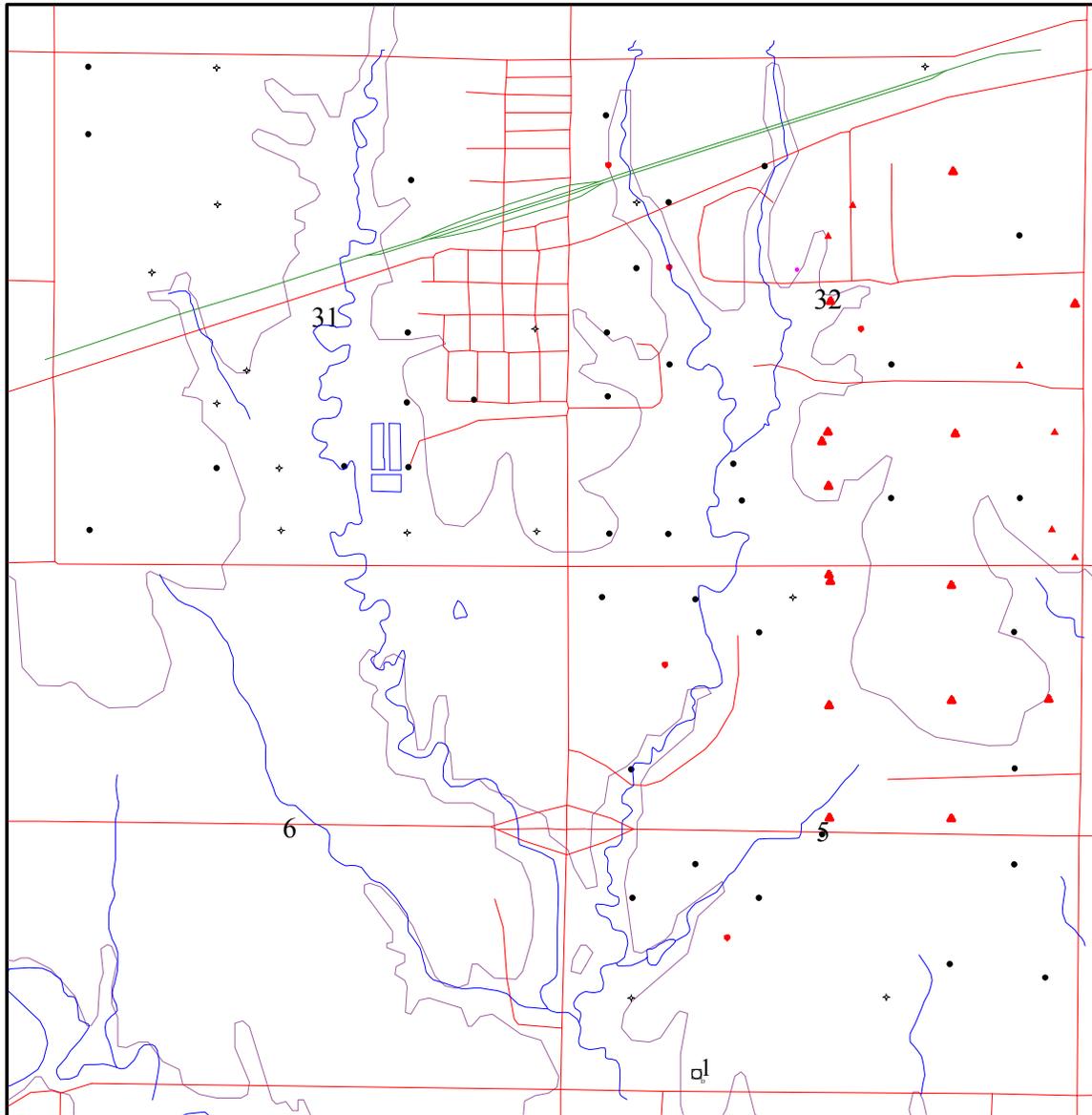
**Recommendations for Future Work:** Close this site.

**Total Costs:** \$2,286.76

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970038-00	7 Hrs. / \$181.63		
<b>Current Contaminate Level: 300 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input checked="" type="checkbox"/> 9. Resolved	

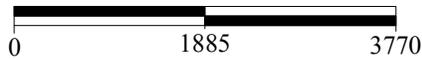
R 15 W

T  
14  
S



1 Dortmund Domestic Well 2012  
Well is not in working order.  
No sample

CI = 1885 Feet



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location                                      |
| ● Plugged Oil Well         | ✱ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                               |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                       |
| ● Abandoned Oil Well       | ✱ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ⊖ Pit   |
| ✱ Gas Well                 | ⊙ Dual Completed Oil Well           | □ Agricultural Well                  | □ Tank Battery                                  |
| ✱ Plugged Gas Well         | ⊙ Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | □ Gas Storage Monitoring Well                   |
| ✱ TA Gas Well              | ⊙ TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | □ Plugged Gas Storage Monitoring Well           |
| ✱ Abandoned Gas Well       | ⊙ Abandoned Dual Completed Oil Well | □ Irrigation Well                    | □ TA Gas Storage Monitoring Well                |
| ▽ Disposal Well            | ⊙ Dual Completed Gas Well           | □ Plugged Irrigation Well            | □ Abandoned Gas Storage Monitoring Well         |
| ▽ Plugged Disposal Well    | ⊙ Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ▽ Gas Storage Inject on/Withdraw Well           |
| ▽ TA Disposal Well         | ⊙ TA Dual Completed Gas Well        | □ Public Water Supply Well           | ▽ Plugged Gas Storage Inject on/Withdraw Well   |
| ▽ Abandoned Disposal Well  | ⊙ Abandoned Dual Completed Gas Well | ⊙ Plugged Public Water Supply Well   | ▽ TA Gas Storage Injection/Withdraw Well        |
| △ Inject on Well           | ○ Water Supply Well                 | ⊙ Abandoned Public Water Supply Well | ▽ Abandoned Gas Storage Inject on/Withdraw Well |
| △ Plugged Inject on Well   | ○ Plugged Water Supply Well         | ○ Possible Location                  |   |
| △ TA Injection Well        | ○ TA Water Supply Well              | +                                    |   |
| △ Abandoned Inject on Well | ○ Abandoned Water Supply Well       | ×                                    |   |
|                            |                                     |                                      |   |

**Kansas Corporation Commission**

Dortland

Sec. 5, Twn. 14 S., Rng. 15 W., Russell County

Elevated Chlorides

970038-00

Date: 21 Oct 2004      District: Hays

**Project: Burrton Crude Oil EB-3C**

**Site Location:** The EB-3C contamination site is located at a crossroads located at the convergence of Sections 25 and 36, Township 23 South, Range 4 West and Sections 30 and 31 of Township 23 South and Range 3 West, Harvey and Reno County. The site is one mile west and one mile south of Burrton, Kansas.

**Impact/Immediacy:** Low immediacy level. The spill affects a shallow groundwater aquifer with no residences within a half mile. The area extent of contamination is believed to be less than one acre. No domestic water wells or irrigation wells are immediately down gradient of the site.

**Site Description:** The site is located in rural Harvey and Reno County. The land use is agricultural. The depth to groundwater is less than ten feet. The affected groundwater is the Equus Beds. The A layer of the Equus Beds is very permeable, is very productive and contains good water quality.

**Unusual Problems:** This site is a hydrocarbon impacted site with problems different than brine impaction.

**Status of Project:** On 4/6/2011, KCC performed a Geoprobe Survey of the areas last known to have hydrocarbon contamination in attempt to delineate and monitor the natural attenuation of the original crude oil spill. 8 probes were bored into the area with a direct push Geoprobe® unit. 3 of the 8 probes showed the presence of free crude oil residing on top of the shallow aquifer. Other probes showed either no sign of hydrocarbon impaction or some past impaction that has naturally attuned. KCC District #2 in 2012 attempted to locate information regarding abandoned pipelines in the area in hopes to locating a PRP for the crude oil problems at the EB-3C site. KCC was unsuccessful in finding a possible PRP and has now resigned to remediate/monitor the crude oil contamination with the Contamination Site Funds.

**Level of Remediation Sought:**

**Ideal:** Non –detect of TPH (Aqueous-Phase)

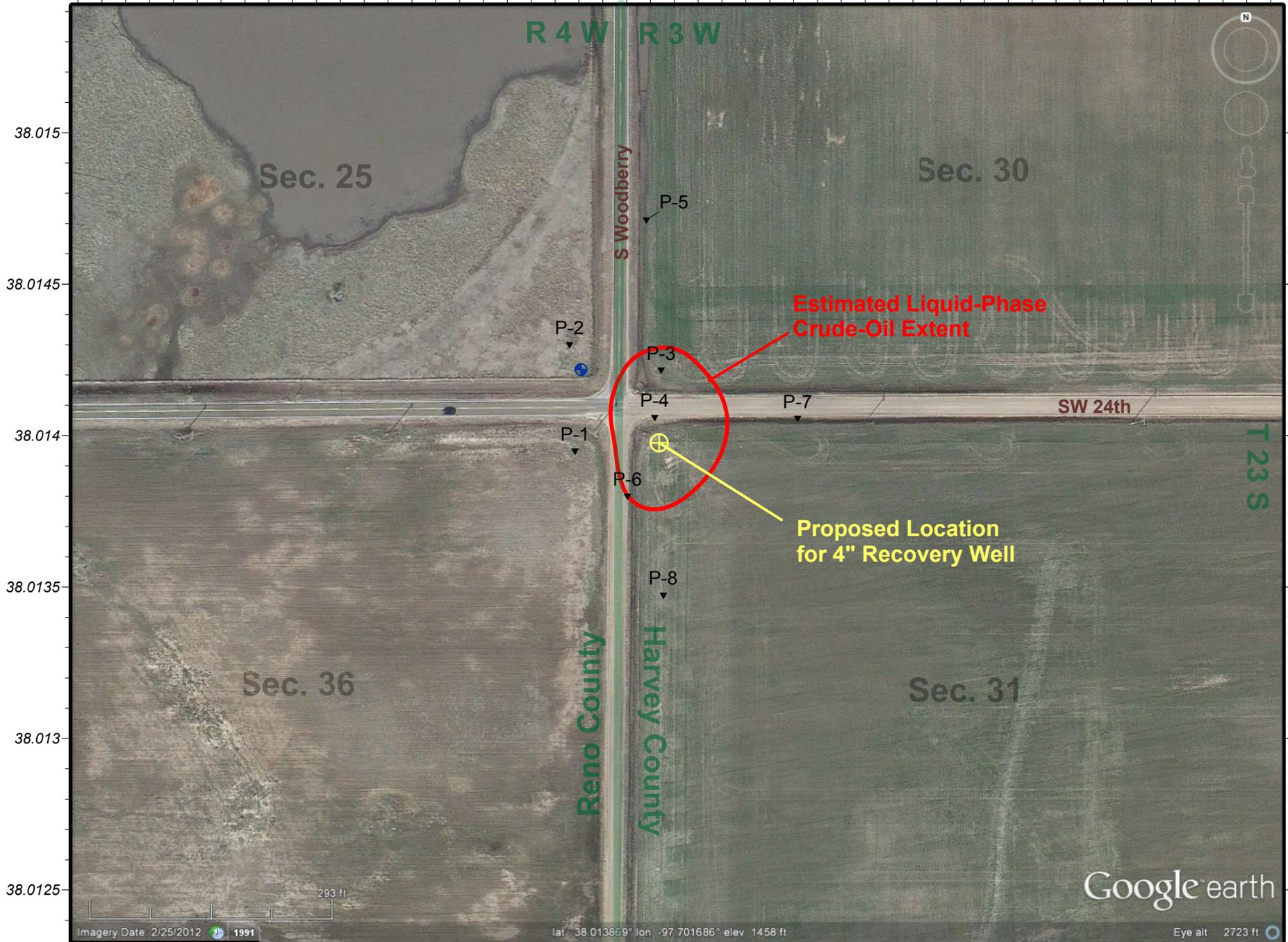
**Target:** No Free Liquid-Phase Hydrocarbon

**Recommendations for Future Work:** GMD #2 has a monitoring well battery in the northwest corner but they are completed and screened for monitoring the base of the aquifer and the top of the water table is located behind solid casing. This makes the battery of wells almost useless for monitoring either liquid or aqueous phase hydrocarbon impaction. It is evident that natural attenuation is occurring but at an exceptionally slow rate. To expedite this, shallow well/s could be placed within the free product area and physical removal via mechanical method or hydrocarbon absorption socks could be done on a quarterly program to facilitate the hydrocarbon removal.

**Estimated Total Costs:** Approximately \$3,000 to install shallow well/s and obtain remedial equipment and man hours needed to maintain any remedial operation on a quarterly schedule.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970042-00	2 Hrs. / \$59.46		\$2,350
<b>Current Contaminate Level: NDA</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input checked="" type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.704 -97.7035 -97.703 -97.7025 -97.702 -97.7015 -97.701 -97.7005 -97.7 -97.6995



Imagery Date: 2/25/2012 1991 lat 38.013859° lon -97.701686° elev 1458 ft Eye alt 2723 ft



Burrton EB-3C - Crude Oil Spill - Control # 970042-00  
 Section 25, Township 23 South & Range 4 West, Harvey and Reno Counties, Kansas  
 Annual Site Update Map  
 District #2 - Drawn on: 10/17/2012 by D. Bollenback

**Project:** *El Dorado American Legion Golf Course*

**Site Location:** The American Legion Golf Course is located within the City of El Dorado in the SW/4 of Section 3, Township 26 South, Range 5 East. The site is located within the El Dorado oil field.

**Impact / Immediacy:** The site is classified as moderate.

**Site Description:** The site is bordered by three streets. These are Central Ave to the North, Haverhill Rd to the west, and Towanda Rd to the South. There is residential housing to the east. Constant Creek transverses through the site from the north to south and is down gradient to the south. The area consists of silty clay loam over silty clay which covers the Ft. Riley and Florence Limestone Formations. A sink hole exist on the property that is located approximately NW SW SW.

**Unusual Problems:** It is unknown where the groundwater flow is coming from due to the karsted and jointed limestone bedding in the area.

**Status of Project:** KCC worked with the City of El Dorado in locating and investigating the old well sites. A Phase III was conducted by the KDHE in early 2011. This study was to investigate near surface soils for contamination before the beginning of the new stadium construction. KCC contracted GPPR from Oklahoma City to perform a Ground Penetrating Radar survey of the NW corner of the golf course in attempt to find the old abandoned wells and test-holes in that area. Unfortunately the survey did not turn up the locations of the wells in the area. In the fall of 2011 there was a ground-breaking ceremony for the stadium construction in the southwest part of the site. As of October 2012, the stadium has been completed and is in use.

**Level of Remediation Sought:**

**Ideal:** Find, check, and plug all wells within the site boundaries.

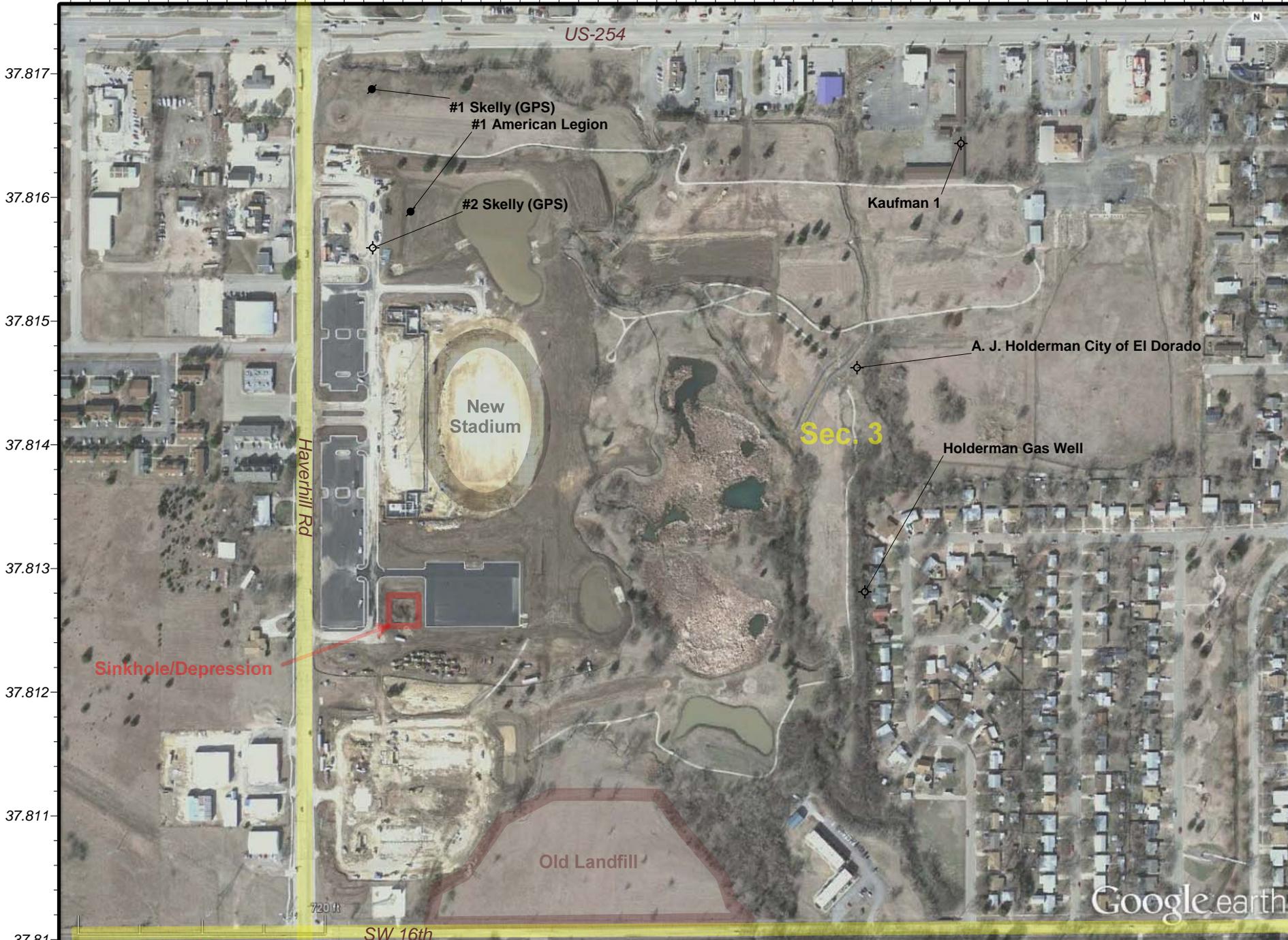
**Target:** Find, check, and plug if necessary any wells that are developed on.

**Recommendation for Future Work:** KCC recommend closure of this site as the stadium has now been built. The #1 American Legion, (P&A 1982) has been exposed in an undeveloped location and does not pose a problem for current development. KCC will advise BCCC that they may cut the casing down and weld a plate on it if they wish to do so. Other wells/test hole should be evaluated when excavation occurs on top of them.

**Estimated Total Cost:** \$5,000 for staff time.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20110055-001	8 Hrs. / \$217.20		
<b>Current Contaminate Level: N/A</b>			
<b>Status:</b>			
<input checked="" type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-96.882 -96.881 -96.88 -96.879 -96.878 -96.877 -96.876 -96.875 -96.874 -96.873 -96.872 -96.871



37.817  
37.816  
37.815  
37.814  
37.813  
37.812  
37.811  
37.81

Imagery Date 2/28/2012 1991 lat 37.813722 lon -96.876631 elev 1301 ft Eye alt 4473 ft



American Legion El Dorado Golf Course BTA - SW section 3 of Township 26 South & Range 5 East, Butler County, Kansas  
 2012-2013 Annual Report - Site Map  
 District #2 - Drawn on 10/22/2012 by D. Bollenback

**Project: Elm Creek Contamination Site**

**Site Location:** Sections 19, 20, 29, 32, of Township 7 South, Range 17 West  
Sections 5, 6, 8, 17, 20, 28 & 32 of Township 8 South, Range 17 West  
Section 1 of Township 9 South, Range 18 West  
Sections 1, 6, 8, of Township 9 South, Range 17 West, Rooks County

**Impact/Immediacy:** Domestic wells and stock wells affected. Area serviced by Rural Water District #3. Immediacy level is rated as moderate to high.

**Site Description:** Alluvial aquifer contaminated by oil field activity. In the past, this office received numerous complaints about high chlorides from landowners throughout the Elm Creek drainage. The individual sites were put together to form the Elm Creek contamination site. This site covers an area of approximately 38 square miles. Many of the original wells tested have been plugged or are no longer accessible. Chlorides levels in the drainage ranged from 60 ppm to 8000 ppm in 1989. Levels have fallen appreciably since to 150 ppm to 1300 ppm in 1995.

**Unusual Problems:** The area affected is very large. The source or sources have not been delineated.

**Status of Project:** Phase I, installation of the monitor well net was completed in May of 1998. Phase II, sampling of the monitor for five years was completed. The well net was sampled on a quarterly basis for three years and biannually for two years. Sampling is now by KCC staff. Samples taken in 2011 ranged from the north end of the well net range from 40 to 320 ppm chloride. Samples from the south end of the net range from 280 to 820 ppm. This may be due to lack of rainfall in 2011. Samples taken in 2012 ranged in the north end of the well net range from 60 to 340 ppm chloride. Samples from the south end of the net range from 280 to 860 ppm. Little change from 2011 to 2012. Will continue to monitor.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

**Target:** 500 ppm Chloride

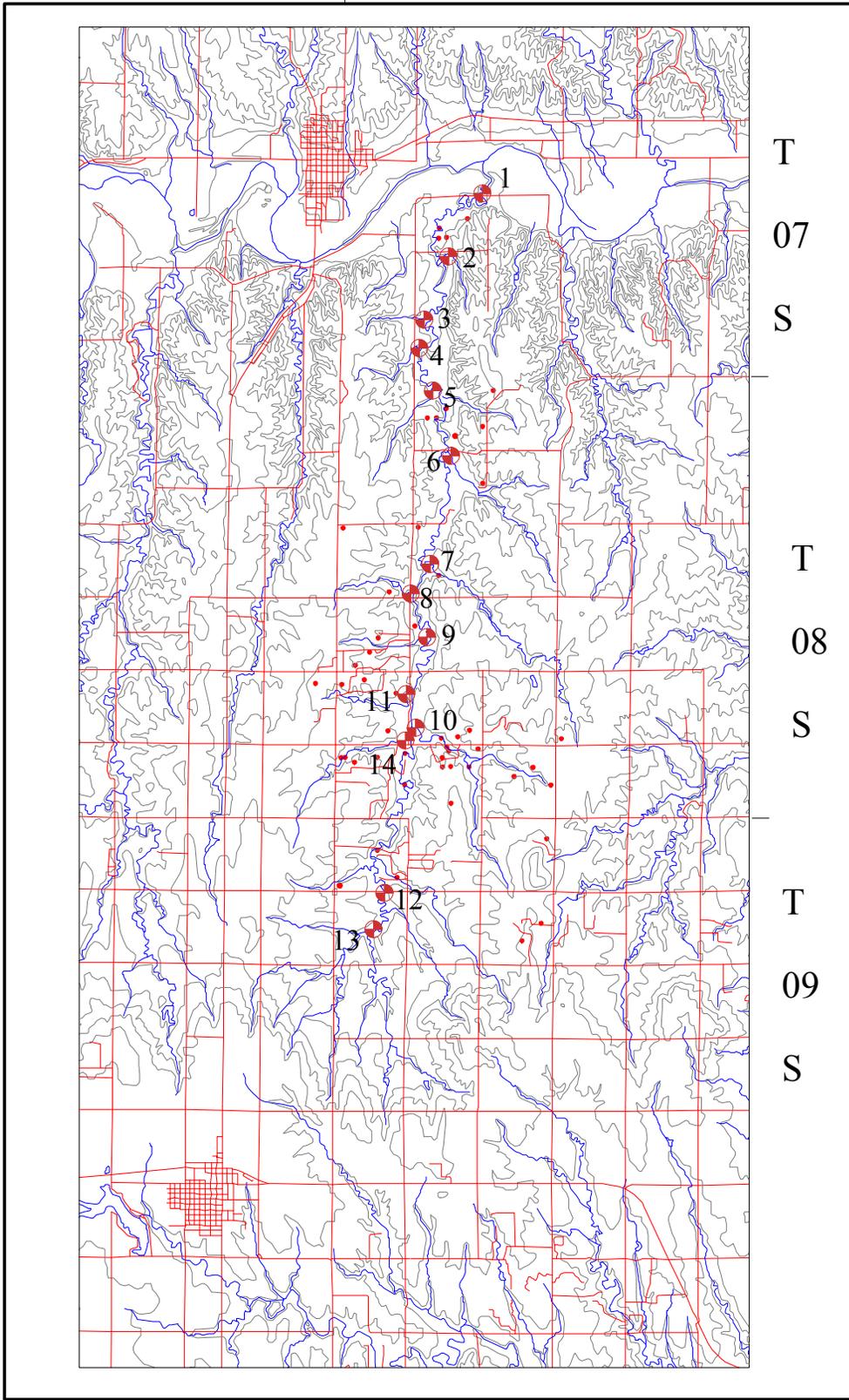
**Recommendations for Future Work:** At present, chloride levels within the basin do not warrant drilling out sub-drainages. Long term monitoring is recommended.

**Estimated Total Cost:** Phase I \$29,000+. Phase II 30,000+. Remediation costs are at \$100,000 to \$250,000 if warranted.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970043-00	24 Hrs. / \$586.80		\$29,212.25
<b>Current Contaminate Level: 60 ppm Cl- to 860 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 18 W

R 17 W

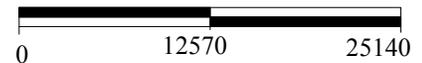


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EC MW1	2012	220 ppm Cl-
EC MW2	2012	60 ppm Cl-
EC MW3	2012	80 ppm Cl-
EC MW4	2012	340 ppm Cl-
EC MW5	2012	160 ppm Cl-
EC MW6	2012	180 ppm Cl-
EC MW7	2012	140 ppm Cl-
EC MW8	2012	120 ppm Cl-
EC MW9	2012	860 ppm Cl-
EC MW10	2012	700 ppm Cl-
EC MW11	2012	520 ppm Cl-
EC MW12	2012	620 ppm Cl-
EC MW13	2012	280 ppm Cl-
EC MW14	2012	480 ppm Cl-



CI = 12,570



- Oil Well
- Plugged Oil Well
- TA Oil Well
- Abandoned Oil Well
- Gas Well
- Plugged Gas Well
- TA Gas Well
- Abandoned Gas Well
- Disposal Well
- Plugged Disposal Well
- TA Disposal Well
- Abandoned Disposal Well
- Injection Well
- Plugged Injection Well
- TA Injection Well
- Abandoned Injection Well
- Oil & Gas Well
- Plugged Oil & Gas Well
- TA Oil & Gas Well
- Abandoned Oil & Gas Well
- Dual Completed Oil Well
- Plugged Dual Completed Oil Well
- TA Dual Completed Oil Well
- Abandoned Dual Completed Oil Well
- Dual Completed Gas Well
- Plugged Dual Completed Gas Well
- TA Dual Completed Gas Well
- Abandoned Dual Completed Gas Well
- Water Supply Well
- Plugged Water Supply Well
- TA Water Supply Well
- Abandoned Water Supply Well
- Dry Hole
- Domestic Well
- Plugged Domestic Well
- Abandoned Domestic Well
- Agriculture Well
- Plugged Agriculture Well
- Abandoned Agriculture Well
- Irrigation Well
- Plugged Irrigation Well
- Abandoned Irrigation Well
- Public Water Supply Well
- Plugged Public Water Supply Well
- Abandoned Public Water Supply Well
- Possible Location
- Test Hole
- Sample Site
- Locat on
- Monitoring Well
- Plugged Monitoring Well
- Tank Battery
- Gas Storage Monitoring Well
- Plugged Gas Storage Monitoring Well
- TA Gas Storage Monitoring Well
- Abandoned Gas Storage Monitoring Well
- Gas Storage Injection/Withdrawal Well
- Plugged Gas Storage Injection/Withdrawal Well
- TA Gas Storage Injection/Withdrawal Well
- Abandoned Gas Storage Injection/Withdrawal Well

**Kansas Corporation Commission**  
 Elm Creek  
 Twn. 17-18 S., Rng. 7-9 W., Rooks County  
 Moderate Chloride Contamination in Area  
 970043-00

Date: 21 Oct 2004      District: Hays

**Project:** *Enoch Thompson Contamination Site*

**Site Location:** Legal location is NW/4 Section 17, Township 21 South, Range 20 West, Pawnee County.

**Impact/Immediacy:** Stock well was damaged by chlorides from a line leak found near the SWDW. An irrigation well is located to the southwest of the site in the direction of the plume flow. Potential responsible parties drilled one recovery well and a replacement stock well in October 1988, thereafter the chlorides of which dropped through the years. The site is rated moderate to low in immediacy.

**Site Description:** The contamination is confined to a narrow alluvial scour channel filled with sandy gravel and silty clay. The high concentrate of brine water moved from the source area in the north to the south and contaminated Mr. Thompson's stock well.

**Unusual Problems:** None

**Status of Project:** Six groundwater samples were collected in 2012. Chloride levels across the board have seen a decrease in all except MW-2, which had a slight increase. The recovery system has been down since 2003 following P&A of the disposal well due to wellbore problems. KDHE-1, which has historically been the highest in terms of chlorides, was destroyed sometime between 2009 and 2011. The chloride plume continues to be localized in a relatively small area of alluvial scour between the recovery well and the plugged disposal well. It is unlikely that without the recovery well operational, the site will see any significant change in chlorides.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

**Target:** 1000 ppm Chloride

**Recommendation for Future Work:** Continue groundwater sampling on an annual basis to monitor movement of chloride plume through the area. Should a disposal well be drilled nearby, the feasibility of restarting the recovery well should be evaluated.

**Estimated Total Cost:** \$500 for yearly sampling.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970044-00	24 Hrs. / \$610		
<b>Current Contaminate Level: 70 ppm Cl- to 1500 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



## Enoch Thompson Contamination Site

Section 17-T21S-R20W  
Pawnee County, Kansas

Chloride Isopleth Map - sampled on 8-16-2012

KCC Project Code #970044-00 - District #1 - D. Bernasconi - 10-9-12

**Project:** *Fink Contamination Site*

**Site Location:** NE/4 of Section 27, Twn. 8 S., Rng. 22 W., Graham County.

**Impact/Immediacy:** Codell Formation stock well high in chlorides. Immediacy level is rated as low.

**Site Description:** Contamination of shallow ephemeral water and Codell water well by oil field brine. Saltwater had moved through the Niobrara chalk and probably into the Codell aquifer. The Codell aquifer is encountered at 300 feet.

**Unusual Problems:** Codell Sandstone at 250 to 300 feet deep.

**Status of Project:** The KCC investigated the problem in 1989. Samples from the stock well were still at 3000 ppm during a five day pump test of the well. Samples taken in 2010 contained concentrations of 850 ppm in this well. A sample of the stock well in 2011 was down to 600 ppm chloride. Chloride levels from a sample taken in 2012 were at 940 ppm. The domestic well has not been accessible since 2004. The chloride levels at that time were 200 ppm.

**Level of Remediation Sought:**

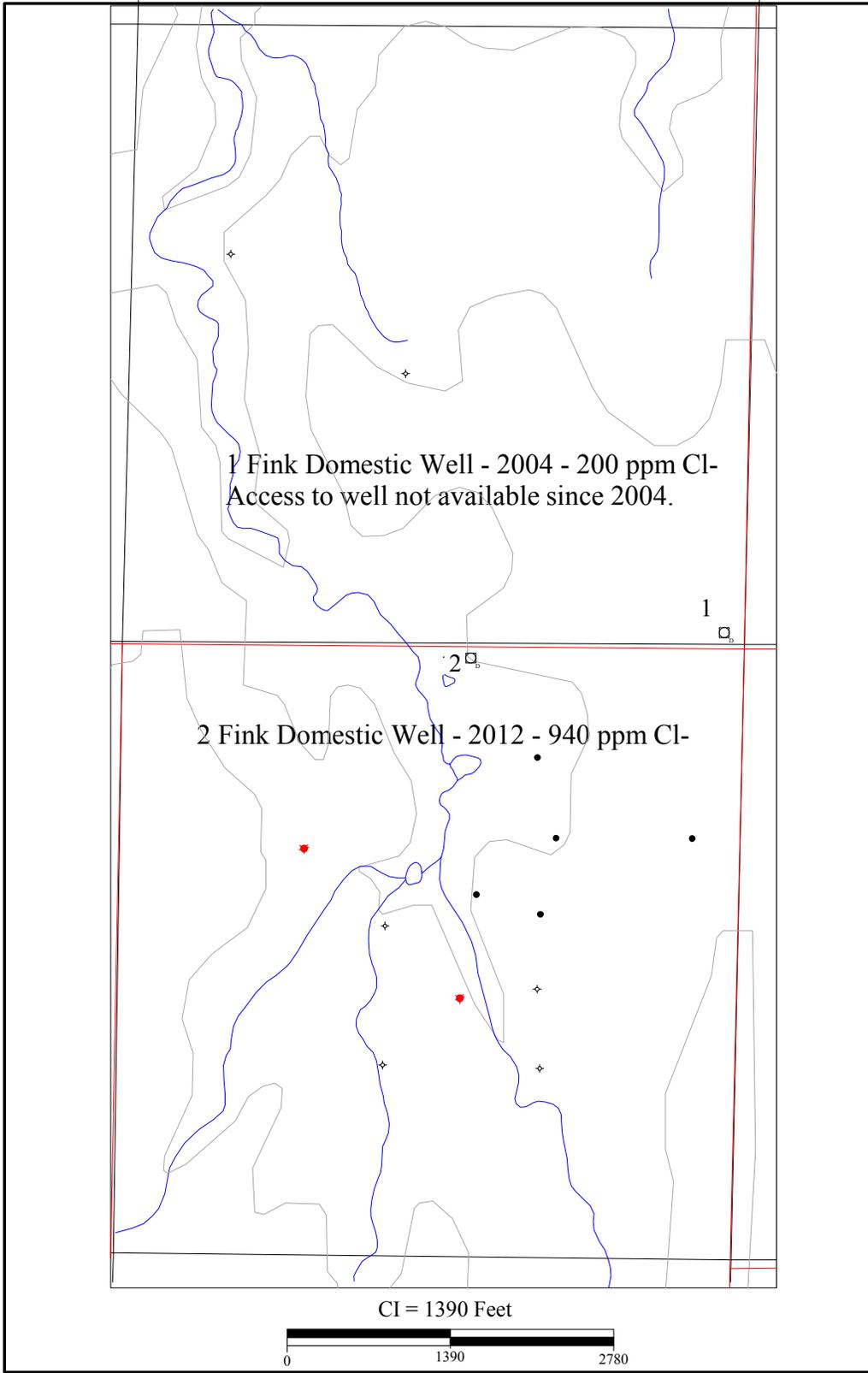
**Ideal:** 140 ppm Chloride (background levels)

**Target:** 500 ppm Chloride

**Recommendations for Future Work:** Continue to monitor.

**Estimated Total Costs:** \$2000

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970007-00	6 Hrs. / \$146.06		
<b>Current Contaminate Level: Stock Well 940 ppm Cl-; Domestic well unknown</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



1 Fink Domestic Well - 2004 - 200 ppm Cl-  
Access to well not available since 2004.

2 Fink Domestic Well - 2012 - 940 ppm Cl-

CI = 1390 Feet



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|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas We 1                    | ✧ Dry Hole                           | ○ Location  |
| ● Plugged Oil We 1         | ✱ Plugged Oil & Gas We 1            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ○ Pie   |
| ● Abandoned Oil & Gas We 1 | ✱ Abandoned Oil & Gas We 1          | □ Abandoned Domestic Well            | □ Tank Battery                                    |
| ✱ Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | □ Gas Storage Monitoring Well                     |
| ✱ Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | □ Plugged Gas Storage Monitoring Well             |
| ✱ TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | □ Gas Storage Injection/Withdrawal Well           |
| ✱ Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | □ TA Gas Storage Monitoring Well                  |
| ▼ Disposal We 1            | ● Dual Completed Gas We 1           | □ Plugged Irrigation Well            | □ Abandoned Gas Storage Monitoring Well           |
| ▼ Plugged Disposal Well    | ● Plugged Dual Completed Gas We 1   | □ Abandoned Irrigation Well          | □ Gas Storage Injection/Withdrawal Well           |
| ▼ TA Disposal Well         | ● TA Dual Completed Gas We 1        | □ Public Water Supply Well           | ▼ Plugged Gas Storage Injection/Withdrawal Well   |
| ▼ Abandoned Disposal We 1  | ● Abandoned Dual Completed Gas We 1 | □ Plugged Public Water Supply Well   | ▼ TA Gas Storage Injection/Withdrawal Well        |
| ▲ Inject on We 1           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | ▼ Abandoned Gas Storage Injection/Withdrawal Well |
| ▲ Plugged Inject on We 1   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ▲ TA Injection Well        | ● TA Water Supply Well              | +                                    |   |
| ▲ Abandoned Inject on We 1 | ● Abandoned Water Supply Well       | ✱                                    |   |

**Kansas Corporation Commission**

Fink

Sec. 27, Twn. 8 S., Rng. 22 W., Graham County

Contaminated Domestic Well

970007-00

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Date: 21 Oct 2004 District: Hays

**Project: *Fowler Contamination Site***

**Site Location:** NE/4 of Section 19, Township 32 South, Range 14 East, Montgomery County

**Impact/Immediacy:** Impact is to the soil. The immediacy is rated as low.

**Site Description:** Site is located below an old three-cell storage/settling pond.

**Unusual Problems:** Access to dependable sample locations and lack of monitoring wells.

**Status of Project:** Monitoring of small creek running through project area. The Fowler lease was approved for a Fee Fund Project in the fall of 2000. Approximately 112 wells were plugged in 2001. Two samples were collected in 2012 on 04/27/2012. These samples tested 340 ppm Cl- from Sample Location #1 and 340 ppm Cl- from Sample Location #2. Brine impacted areas did show visual improvement of vegetative growth.

**Level of Remediation Sought:**

**Ideal:** 200 ppm Chloride

**Target:** 300 ppm Chloride

**Recommendation for Future Work:** Continued monitoring and treatment again with gypsum and re-seeding when appropriate. Construction of approximately 3-4 monitoring wells to determine if saltwater is migrating into the physical boundary of lease from other sources.

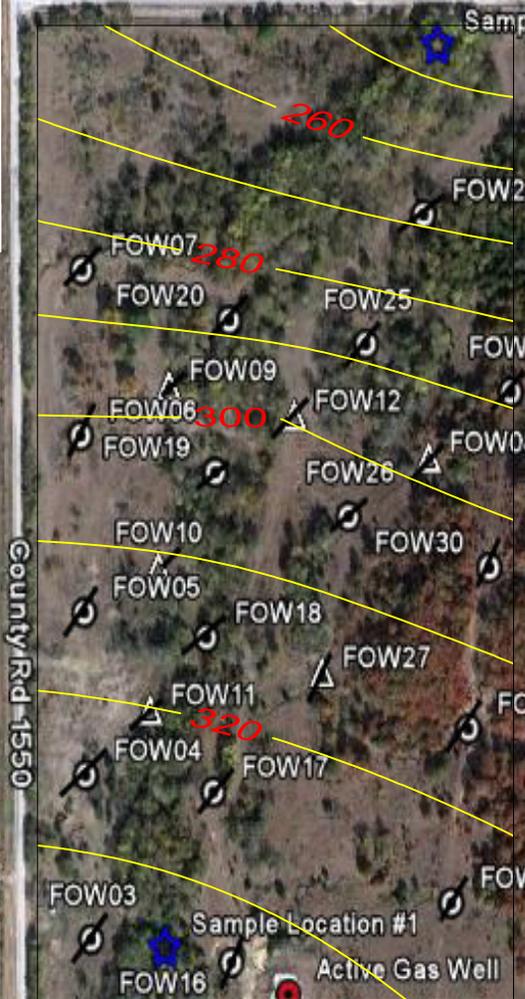
**Estimated Total Costs:** Monitoring cost approximately \$1,500.00 per year

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970046-00	11.5 Hrs. / \$309.22		
<b>Current Contaminate Level: ppm Cl- to ppm Cl-</b>			
<b>Status: Active</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input checked="" type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

Fowler Remediation Site  
NE 19 - T32S - R14E  
Montgomery County Kansas  
Project 970046-00

11/14/2012 District 3

- Active Gas Well
- Fee Fund Plugged Oil Well
- Fee Fund Plugged UIC Well
- Sample Location
- CI- Concentration Contour = 10 ppm



**Project: French Contamination Site**

**Site Location:** The site is located in Section 17, Township 23 South, Range 13 West, Stafford County.

**Impact / Immediacy:** Potential exists for impacts on stock and irrigation resources. Subsidence around the French "A" 1 has developed into a sinkhole. Worst-case scenario would be a catastrophic collapse taking part of an east-west county road and several acres of farm ground. Probable action is a gentle downward movement of the area until stable. The site has a moderate to high rating.

**Site Description:** The site consists of an unplugged saltwater disposal well whose operation led to the development of a solution cavity. The site is located in a rural setting 330' north of a county road. Land use is agricultural with oil activities in the area. The subsidence at the site now covers an area of approximately 600 x 1000' in size.

**Unusual Problems:** A solution cavity was determined to exist under the existing location by a seismic survey conducted by the KGS. The seismic survey indicates the cavity is approximately 60' thick.

**Status of the Project:** Six elevation points were shot in 2012. In 2003 the rate of subsidence was about one foot per year, since then nine years have passed and the total subsidence has been about two feet. This latest data shows a dramatic decline in the subsidence rate and possible stabilization of the sink hole. The most dramatic change in elevation occurred at the north point on the north east corner of the depression whereas the SW corner had little to no change in elevation since the last survey. This indicates that the sink is moving more to the east and north east whereas the western side of the sink may have stabilized. This data corresponds with the seismic survey that was performed in 1997.

**Level of Remediation Sought:**

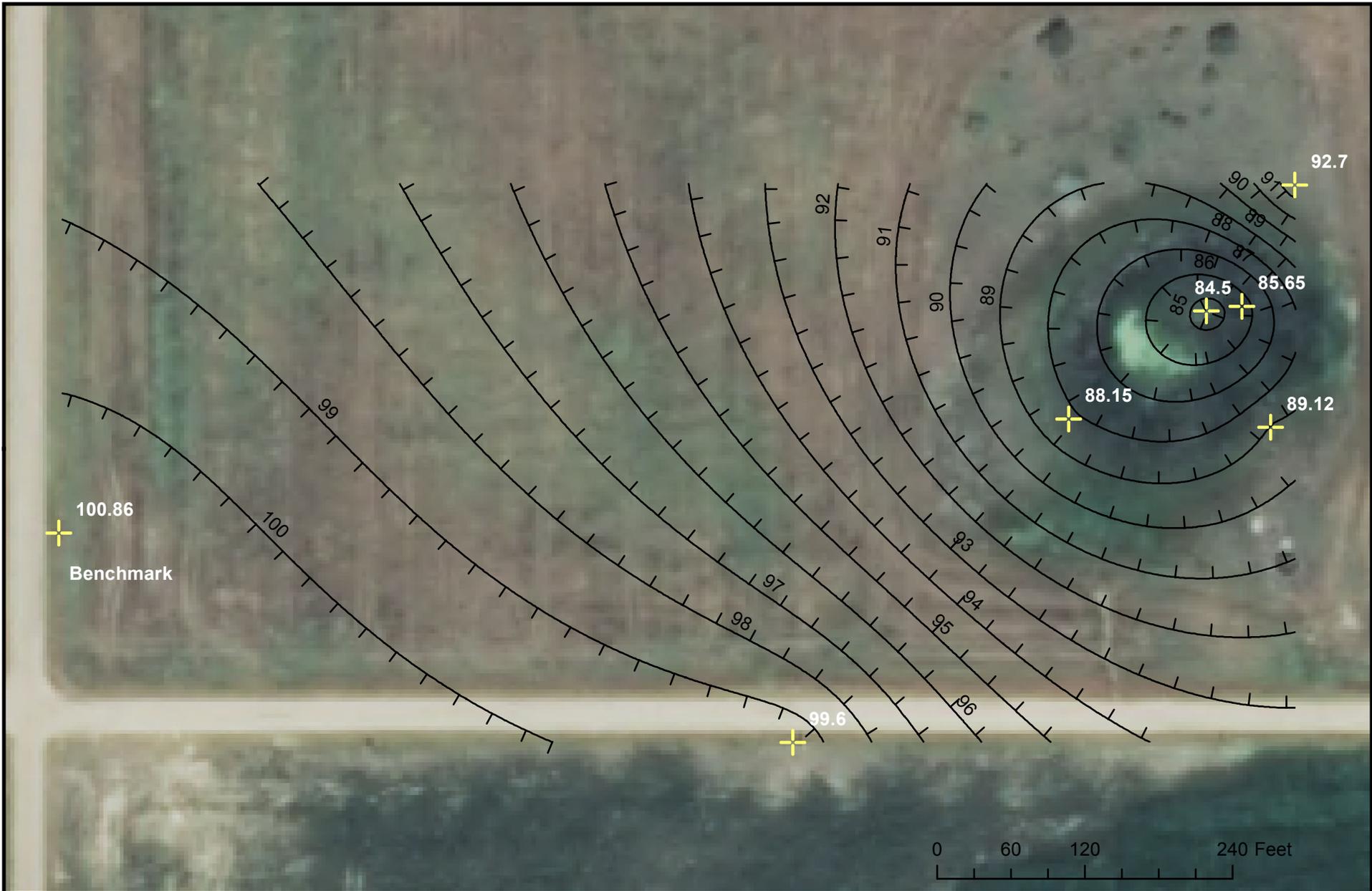
**Ideal:** Stabilize cavity and plug well bore in accordance with KCC rules and regulations.

**Target:** Safely monitor site. Determine an acceptable plugging procedure, which will adequately address groundwater resources.

**Recommendations for Future Work:** Monitor stock wells and irrigation wells to the southeast of the depression. Resume the semi-annual survey of the site to establish a current rate of subsidence. Monitor possible second depression to the east of the original depression.

**Estimated Total Costs: \$3000.00**

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
990002-001	10 Hrs. / \$267.46		\$346.50
<b>Current Contaminate Level: Unknown.</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



## French Sinkhole

SW1/4 Section 17-T23S-R13W  
Stafford County, Kansas

**Change in elevation - Elevations shot on 10-22-2012**

KCC Project Code #990002-001 - District #1 - D. Bernasconi - 11-2-12

**Project: Galva City Area Contamination Site**

**Site Location:** This contamination site is located in Section 15 and 22 of Township 19 South, Range 2 West, which is half mile north and quarter mile east of Galva City in McPherson County.

**Impact/Immediacy:** This site has been up graded to a high level of immediacy. Groundwater has been impacted and the potential for contamination to domestic and **public water supply** at Galva City is very high. A water sample was taken from Galva City Well #3 in July 2006 and the chlorides tested 460 mg/l, 2007 tested 1170 mg/l and in July of 2008 tested 1200 mg/l. A Sample of the same public supply well was taken in 2011 and tested to be 670 mg/l. A sample was not available for 2012.

**Site Description:** The site is located in a rural area with topography of gentle sloping fields with a small drainage stream located east and west of site with the flow from the north to the southwest. This site is in the Ritz-Canton oil field, which has a past history of utilizing brine pits for the disposal of brine from the wells. The depth to the ground water is 17 <sup>+-</sup> feet and the bedrock or aquitard should be encountered at a depth of 60 feet. There are paleo buried channels in the area where the bedrock is encountered at approximately 90 feet which usually hold the highest chloride levels close to the top of the Wellington Shale.

**Unusual Problems:** The disposal well will not take the amount of fluid necessary run all four recovery wells at the same time. High Chloride water deteriorates metal pumps, fittings, etc. Recovery pumps have short life spans and the local groundwater has high levels of iron which clog up lines and equipment.

**Status of Project:** Currently two of the four recovery wells are operational at the Galva Site. The Disposal system shared with local operators does not allow for more than one recovery well to be operated at a time. Recovery well chloride level ranged considerably in each of the recovery wells. Recovery well #3 is still the well removing fluid from the highest level chlorides in the paleo-channel located up gradient from the city of Galva. KDHE opened an investigation to the NE of the site in Section 14, where a small refinery was operated in the 40's. There are large pond scars located in that section. In 2010 American Energies drilled a water supply well for drilling operations in the SE of section 11 which was tested in the KCC lab to be 35,000 mg/l chlorides. That well has been turned over to the KCC for the possibility of future remedial and monitoring. Recovery well # 4 will be replaced in 2012 as a result of higher chlorides near MW 802. The main remediation shed was broken into during the spring of 2012 and two monitor boxes were damaged and all heaters were stolen from the shed.

**Level of Remediation Sought:**

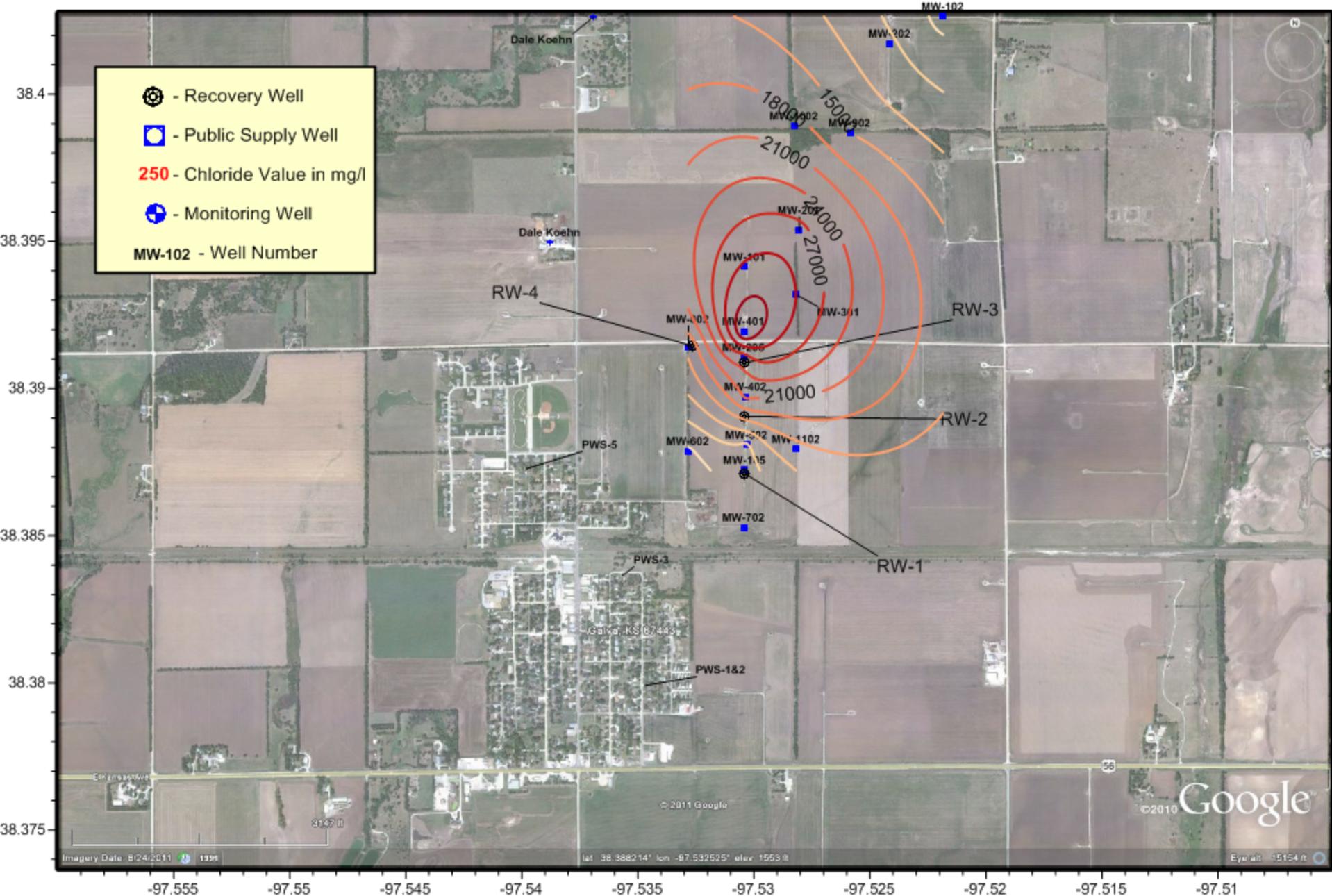
**Ideal:** 250 mg/l chlorides

**Target** 500 mg/l chlorides

**Recommendations for Future Work:** The Galva site will need to be delineated to the North and towards the east. KCC recommends the drilling of no less than 5 more wells to delineate the site. Soil core work should be done near the old pond scars where the refinery was located. KCC should contact the KDHE on its geoprobe work there and investigate if the chlorides contaminating the local area could be partially from the refinery. If that is the case, KDHE will need to be brought into the remedial efforts for the Galva City Site. KCC also recommends expansion of the Galva site into section 11 in order to investigate the possibility of chloride waters migrating from evaporation pits associated with oil production in that section years ago. If the chloride contamination in Section 11 is found to be isolated from the Galva City Site, KCC will be recommending the opening of a new site investigation for that contamination. A recovery well in Section 11 could be set up to begin remediating the chloride plume there, with partnership of operators in that area that wish to share a disposal system.

**Estimated Total Costs:** Annual cost of field inspection is \$3500. Research and field work addressing and modifying the Remediation system would vary depending on the direction decided upon. The estimated cost for a good disposal well would be the range of \$200,000+. The installation of 5 monitoring wells is estimated to be in the range of \$20,000. Geoprobe<sup>®</sup> work could range between \$2500 and \$7500 depending on the size of the scope of work done.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
980033-001	104.5 Hrs. / \$3,631.85	\$6,175.75	\$231,382.59
<b>Current Contaminate Level: 36,000 mg/l (MW 401) to 5,000 mg/l (MW 102) chlorides for 2012</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



### Galva City Contamination Site

Sec. 15, 16, 21, & 22 - T19S - R2W, McPherson County

2012-2013 Chloride Concentration Map

KCC Control #980033-01 - District #2 - B. Milner - 10/8/2012

**Project: *Marcellus Gross Contamination Site***

**Site Location:** NE/4 of Section 18, Twn. 15 S., Rng.17 W., Ellis County.

**Impact/Immediacy:** Ground surface affected by brine contamination but brine scars have improved. Groundwater contaminated in the waterway. Immediacy level is rated as low to moderate.

**Site Description:** Contamination of shallow alluvial aquifer from past use of an emergency pit which was eliminated by KDHE years ago. A surface salt scar which was a result of the emergency pit overflows initiated the investigation. Water samples collected by KDHE at a depth of three foot tested 2,450 ppm chloride at the time of the initial investigation. The water was moving on the contact zone between soil and clay. The Greenhorn limestone subcrops in the area and contains what was believed to be a stationary body of brackish water tied up in the soil and clay. The land use in the area is primarily pasture land.

**Unusual Problems:** None

**Status of Project:** Site has been visually inspected yearly since becoming a contamination site. The initial salt scars which were originally present have improved to a point where they are no longer evident. The decision to close this site was made given that the vegetation has not shown any stress during this year of drought.

**Level of Remediation Sought:**

**Ideal:** 200 ppm Chloride

**Target:** 500 ppm Chloride

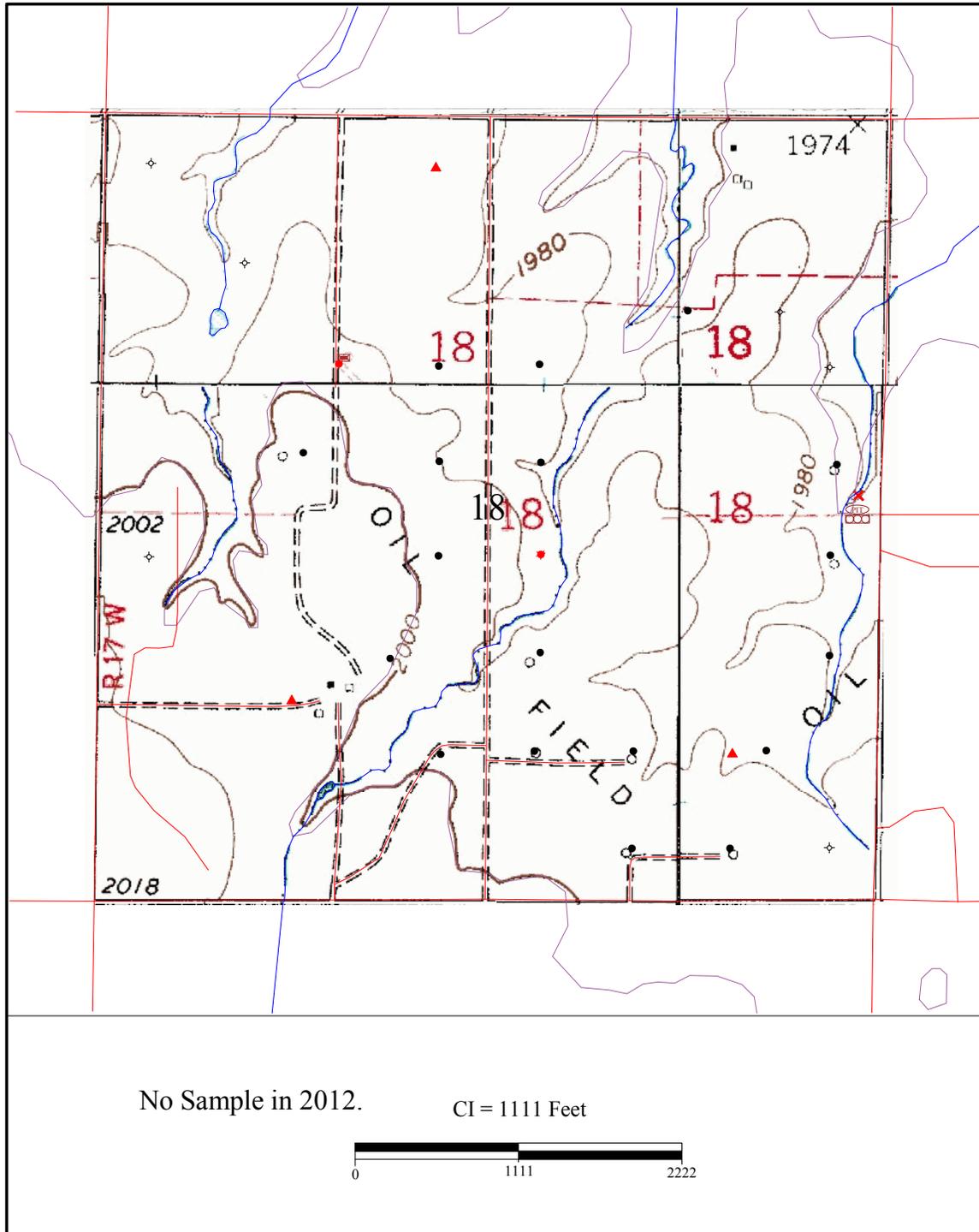
**Recommendations for Future Work:** Close Site. The affected waterway has completely recovered. No salt scars remain at the site.

**Total Costs:** \$1,385

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970008-00	3 Hrs. / \$85.75		
<b>Current Contaminate Level: Unknown – No samples in 2012</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input checked="" type="checkbox"/> 9. Resolved	

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- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | * Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | * Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | * TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | * Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ P.T.  |
| ● Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | ▭ Tank Battery                                    |
| ● Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ▭ Gas Storage Monitoring Well                     |
| ● TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | ▭ Plugged Gas Storage Monitoring Well             |
| ● Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ▭ TA Gas Storage Monitoring Well                  |
| ● Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | ▭ Abandoned Gas Storage Monitoring Well           |
| ● Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ▭ Gas Storage Injection/Withdrawal Well           |
| ● TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | ▭ Plugged Gas Storage Injection/Withdrawal Well   |
| ● Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ▭ TA Gas Storage Injection/Withdrawal Well        |
| ● Injection Well           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | ▭ Abandoned Gas Storage Injection/Withdrawal Well |
| ● Plugged Injection Well   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ● TA Injection Well        | ● TA Water Supply Well              | +                                    |   |
| ● Abandoned Injection Well | ● Abandoned Water Supply Well       | ×                                    |   |
|                            |                                     |                                      |   |

**Kansas Corporation Commission**

Gross

Sec. 29, Rng. 15 S., Rng. 17 W., Ellis County

Elevated Chlorides In Draw

970008-00

Date: 5 Nov 2003 District: Hays

**Project: Albert Harbaugh Contamination Site**

**Site Location:** Legal location is the SE/4 Section 20 & NE/4 Section 29, Township 33 South, Range 11 West, Barber County.

**Impact/Immediacy:** The groundwater for domestic and stock wells has been contaminated from several sources on this project. This site is rated as high immediacy and remediation of the groundwater began on November 1, 1999.

**Site Description:** The site is located in the alluvial valley on the flood plain of the Medicine River, in the Rhodes Pool, approximately nine miles south of Medicine Lodge. This site covers an area of approximately 1000 feet wide and 3500 feet long. This location and others sites in the area are continually increasing the chlorides in the groundwater aquifer of the Medicine River valley.

**Unusual Problems:** It is probable that all source areas of natural halite pollution into the aquifer have not been identified. Areas of suspected sources have not continued to contribute to the contamination since the remediation of the ground water has been implemented. These areas are suspected to have achieved a natural closure at this time. Unless all the source areas are located and plugged, the contamination will continue until there is natural closure.

**Status of Project:** Project is shut-in waiting on repairs to the recovery well header systems and acid treatment stimulation on the disposal well. Thirty-five monitoring and recovery wells were sampled in 2012. Chloride values in the northwest corner of the site continue to be elevated at unacceptable levels, with values ranging from 3700 ppm in MW-18 to 2100 ppm and 2800 ppm respectively in monitoring wells 13 and 26. An unidentified flowing core hole near these wells is the probable source of these chlorides with other sources contributing additional contamination across the rest of the remediation site. Differences in chloride values of wells in close proximity to each other are attributed to different screening depths. Monitoring wells 10, 29, and 30 were unable to be found and in turn were not sampled. In addition, MW-32 was found damaged and plugged off just below the surface.

**Level of Remediation Sought:**

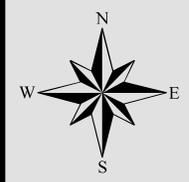
**Ideal:** 250 ppm Chloride

**Target:** 1000 ppm Chloride

**Recommendation for Future Work:** Obtain funds for well treatment and infrastructure repairs. Monitor the recovery well system for effectiveness of chloride plume containment. Continue annual sampling of monitor wells and bimonthly sampling of the recovery wells after they have been restarted.

**Estimated Total Cost:** Total costs have exceeded the original estimate of \$450,000.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970049-00	49.5 Hrs. / \$1,199.20	\$2002.47	\$533,465.90
<b>Current Contaminate Level: 150ppm Cl- to 3,800ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



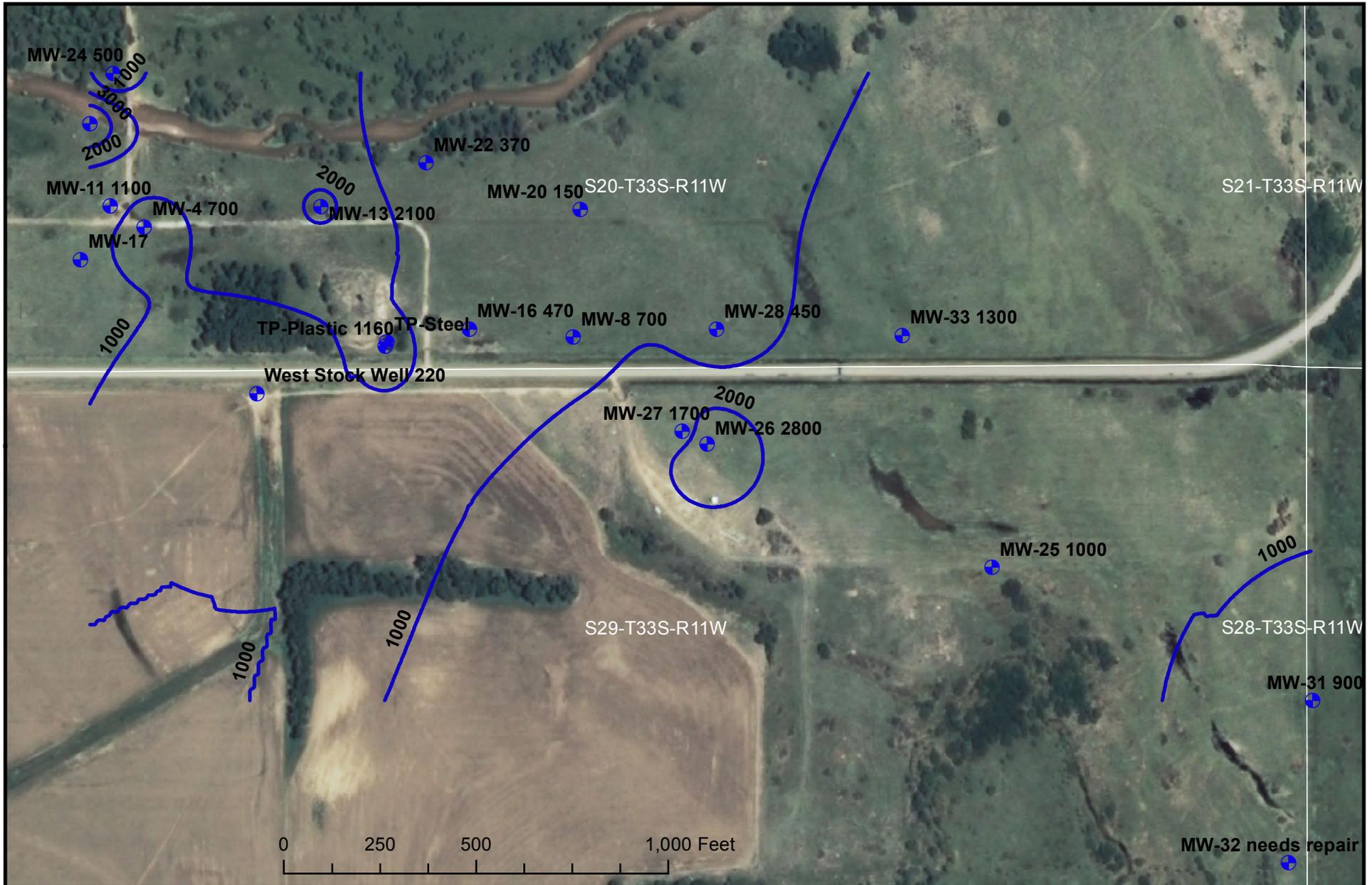
## Harbaugh Contamination Site

Sections 20, 29-T33S-R11W

Barber County, Kansas

**All Wells**

KCC Project Code #970049-00 - District #1 - D. Bernasconi - 11-8-2012

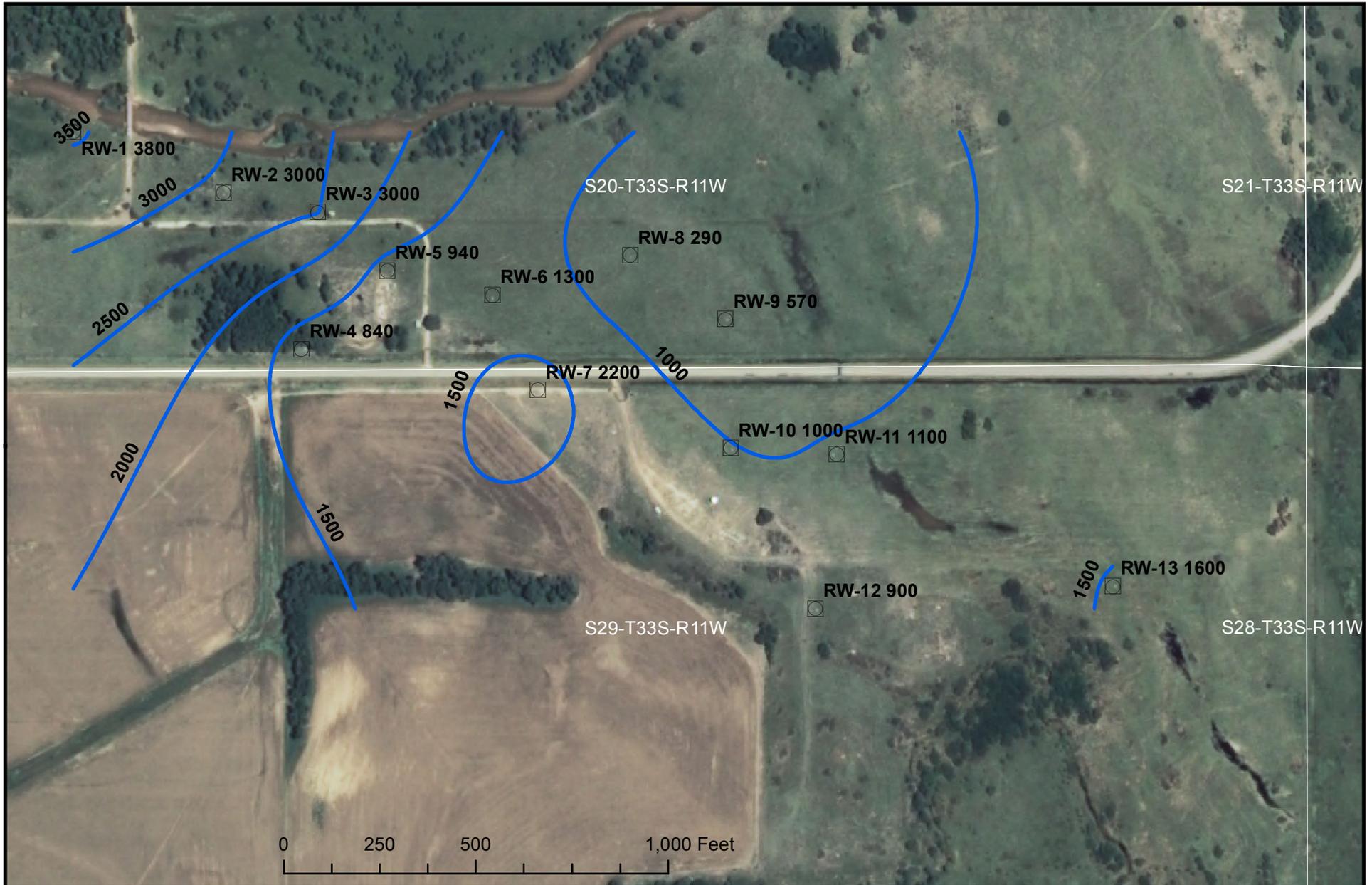


## Harbaugh Contamination Site

Sections 20, 29-T33S-R11W  
Barber County, Kansas

**Chloride Isopleth Map (monitoring wells) - sampled on 7-18, 7-19, and 8-8-2012**

KCC Project Code #970049-00 - District #1 - D. Bernasconi - 11-8-2012



## Harbaugh Contamination Site

Sections 20, 29-T33S-R11W  
Barber County, Kansas

**Chloride Isopleth Map (recovery wells) - sampled on 7-18, 7-19, and 8-8-2012**

KCC Project Code #970049-00 - District #1 - D. Bernasconi - 11-8-2012

**Project: *Hollow-Nikkel Contamination Site***

**Site Location:** The site is located in northwestern Harvey County approximately eighteen miles northwest of the city of Newton. The site includes parts of Sections 7, 8, 17, 18, 19, 20, 29, and 30 in Township 22 South, Range 3 West.

**Impact:** Potential impact is to irrigation and rural residential wells. Directly down gradient of the site there are nine domestic wells and irrigation well. This site should be rated at a moderate immediacy level.

**Site Description:** The project area covers approximately 700 acres with maximum chloride values in the range of 5 to 6100 mg/l in the lower zone of the aquifer. The contaminate plume is aligned in a north to south configuration and is approximately .5 mile wide and 2 miles in length. Plume morphology appears to be controlled by a bedrock channel, which has an alignment similar to that of the plume. Contamination mapped to date is primarily confined to the lower zone of the Equus Beds aquifer, which consists of unconsolidated sand and gravel deposits and lies at a depth of 200 to 250 feet.

**Unusual Problems:** If remediated, specifically the stage in which a new transportation line would be trenched to a new disposal facility, problems could arise in obtaining right of ways, and costs could also become inflated by difficult road and stream crossings. Loss of participation by the local operator could substantially increase disposal costs.

**Status of the Project:** The Ground Water Management District was contracted to do annual water sampling with the KCC funding the analysis of the water samples. The plumes in the A, B, and C zones appear to be relatively stable.

**Level of Remediation Sought:**

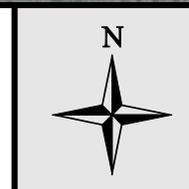
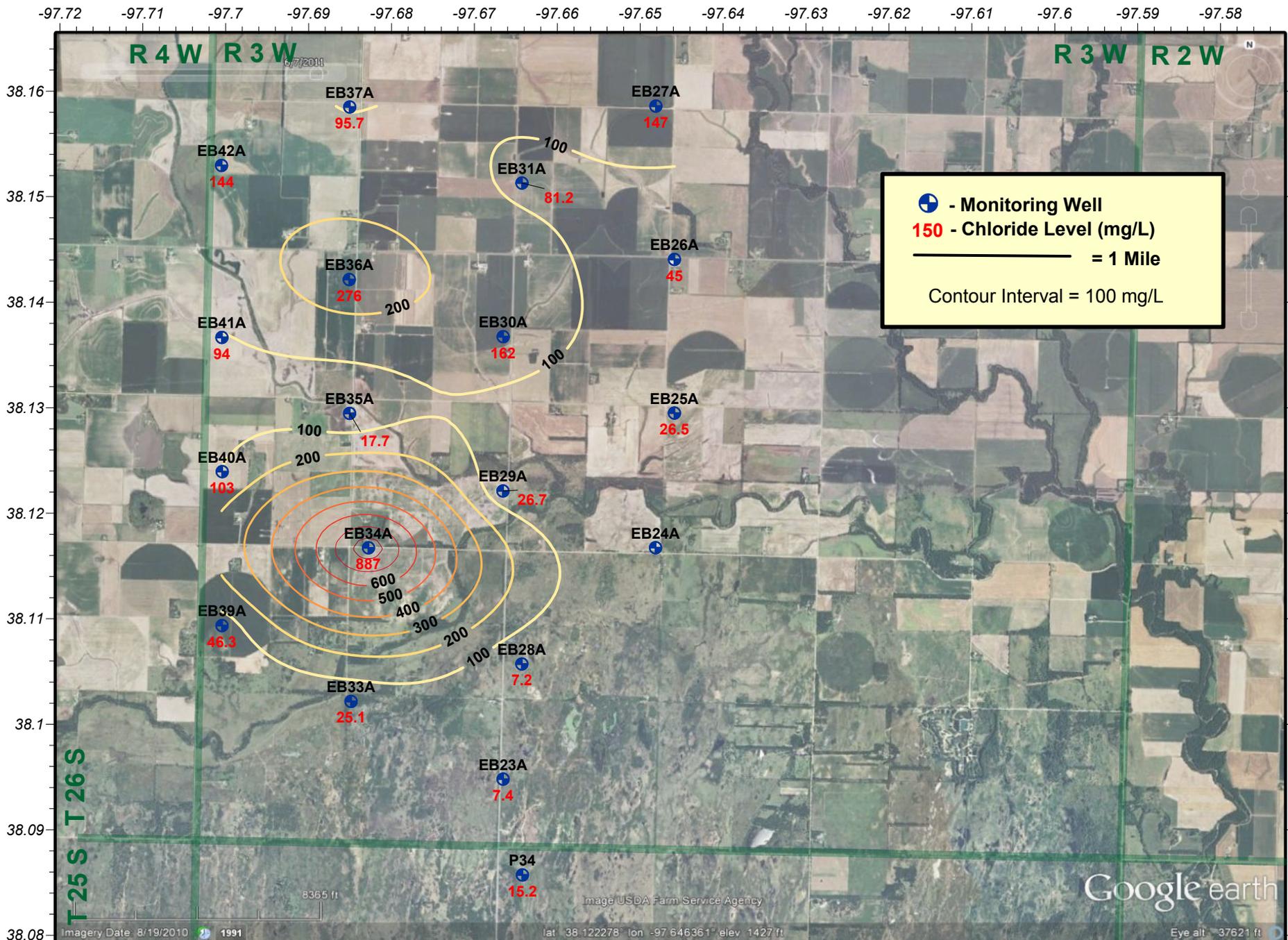
**Ideal:** 250 mg/l

**Target:** 500 mg/l

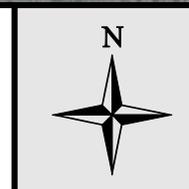
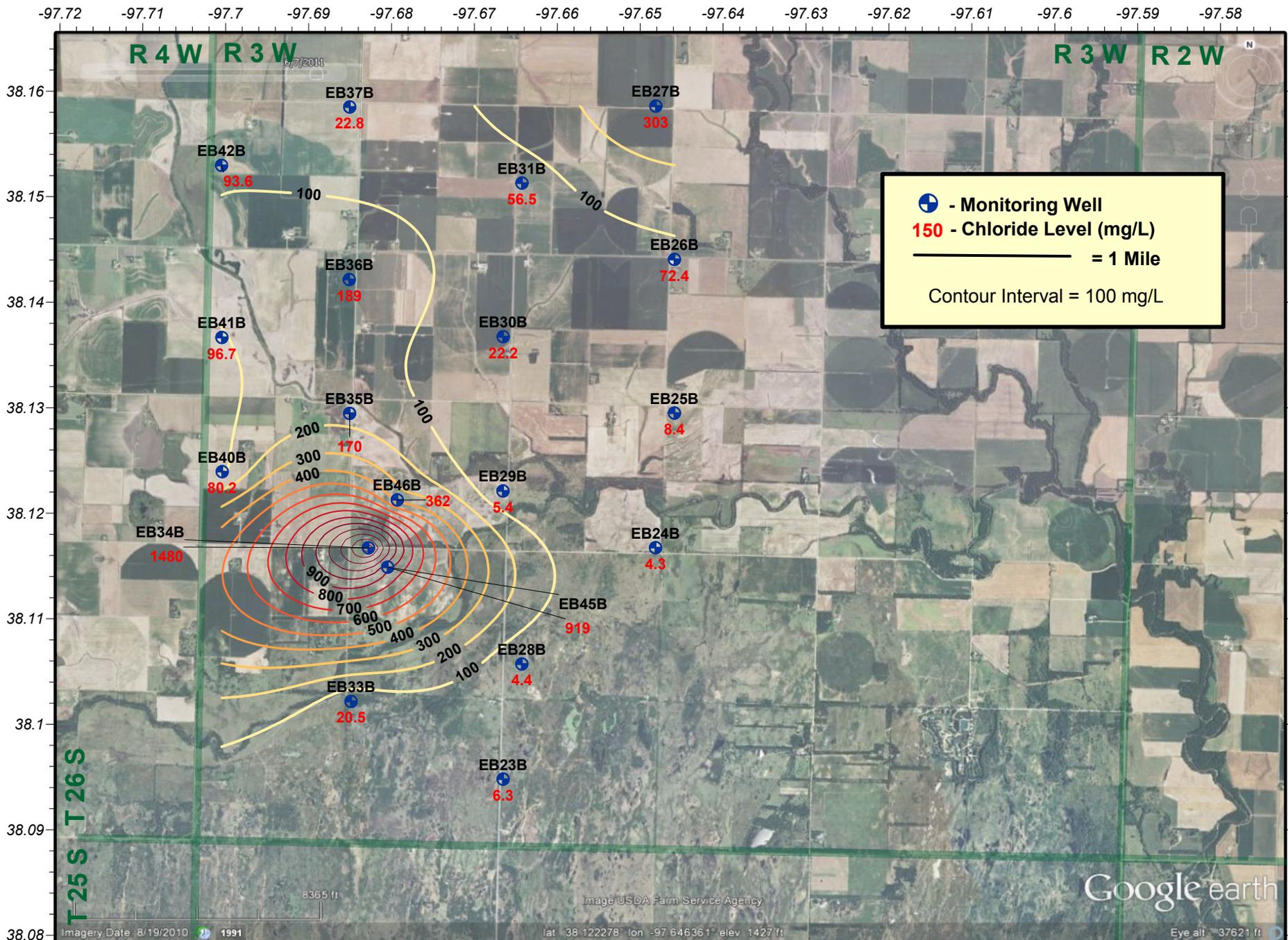
**Recommendations for Future Work:** Continue to collect data from GWD #2 on an annual basis for monitoring purposes. Some wells could be taken off the sampling list if they continue to show no indication of Chloride contamination.

**Estimated Total Costs:** Time for district personnel to put together and analyze data plus research possible remediation avenues.

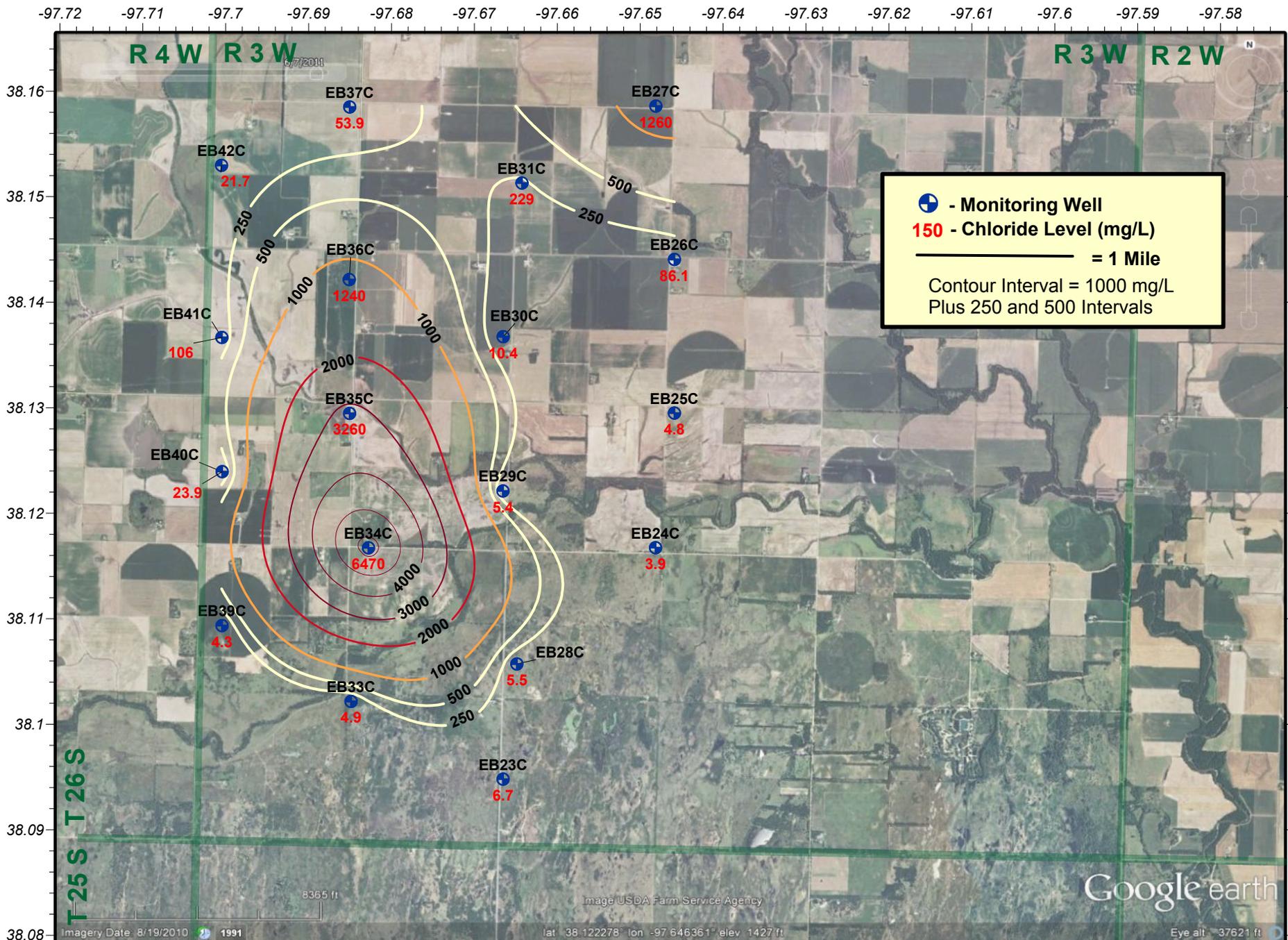
Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970009-00	6 Hrs. / \$157.38	\$2,287.52	\$29,244.65
<b>Current Contaminate Level: Varies; There are hot spots in each zone.</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Hollow-Nikkel Brine Contamination Site - KCC Control #970009-00**  
 Multiple Sections of Townships 25 and 26 South & Ranges 3 and 4 West, Harvey County, Kansas  
 2012 Chloride levels in the Equus Beds A Zone  
 KCC District #2 Office - Wells Sampled Fall of 2012 by GMD #2 - Map Drawn by D.Bollenback on 11/8/2012



**Hollow-Nikkel Brine Contamination Site - KCC Control #970009-00**  
 Multiple Sections of Townships 25 and 26 South & Ranges 3 and 4 West, Harvey County, Kansas  
 2012 Chloride levels in the Equus Beds B Zone  
 KCC District #2 Office - Wells Sampled Fall of 2012 by GMD #2 - Map Drawn by D.Bollenback on 11/8/2012



**Hollow-Nikkel Brine Contamination Site - KCC Control #970009-00**  
 Multiple Sections of Townships 25 and 26 South & Ranges 3 and 4 West, Harvey County, Kansas  
 2012 Chloride levels in the Equus Beds C Zone  
 KCC District #2 Office - Wells Sampled Fall of 2012 by GMD #2 - Map Drawn by D.Bollenback on 11/8/2012

**Project: Hrencher Contamination Site**

**Site Location:** Legal location is W/2 Section 36, Township 32 South, Range 12 West, Barber County.

**Impact/Immediacy:** The salt-water intrusion in the area affected the groundwater, small pond, stock wells and there is a salt scar near the pond. This site is classified as moderate to high for remediation.

**Site Description:** The surface area is predominately “red beds” of lower Permian age. The area is dissected by small drainage patterns and the alluvial channels filled with local parent material shale and gypsum. The area of high chlorides (1000 ppm +) is a narrow channel 300 feet wide and approximately 8000 feet long near the present stream. This small stream flows into the Medicine Lodge River within a half-mile.

**Unusual Problems:** None

**Status of Project:** Eight groundwater samples and one surface water sample was collected in 2012. Chloride levels in the project area have decreased slightly from 2011. Current chloride values at the site range from 190ppm in MW-6 in the northwest area of the site, to 10,600ppm in MW-1. As the plume is followed down gradient, or to the southeast, to MW-12, the chlorides are 3,100ppm, which is an increase of 2,030ppm since this well was last sampled in 2003. Comparing these values the historical data show a trend that plume is moving very slowly to the southeast. Since 2003 when the last full sampling event has taken place, MW-5, MW-7, and MW-11 have been destroyed. MW-5 was originally drilled to provide a profile of the chlorides in the main channel, whereas MW-7 was drilled to eliminate additional sources of contamination and has historically been fresh. MW-11 was drilled in order to evaluate the down gradient concentration of chlorides, but since it has been destroyed, the leading edge of the plume is left undefined.

**Level of Remediation Sought:**

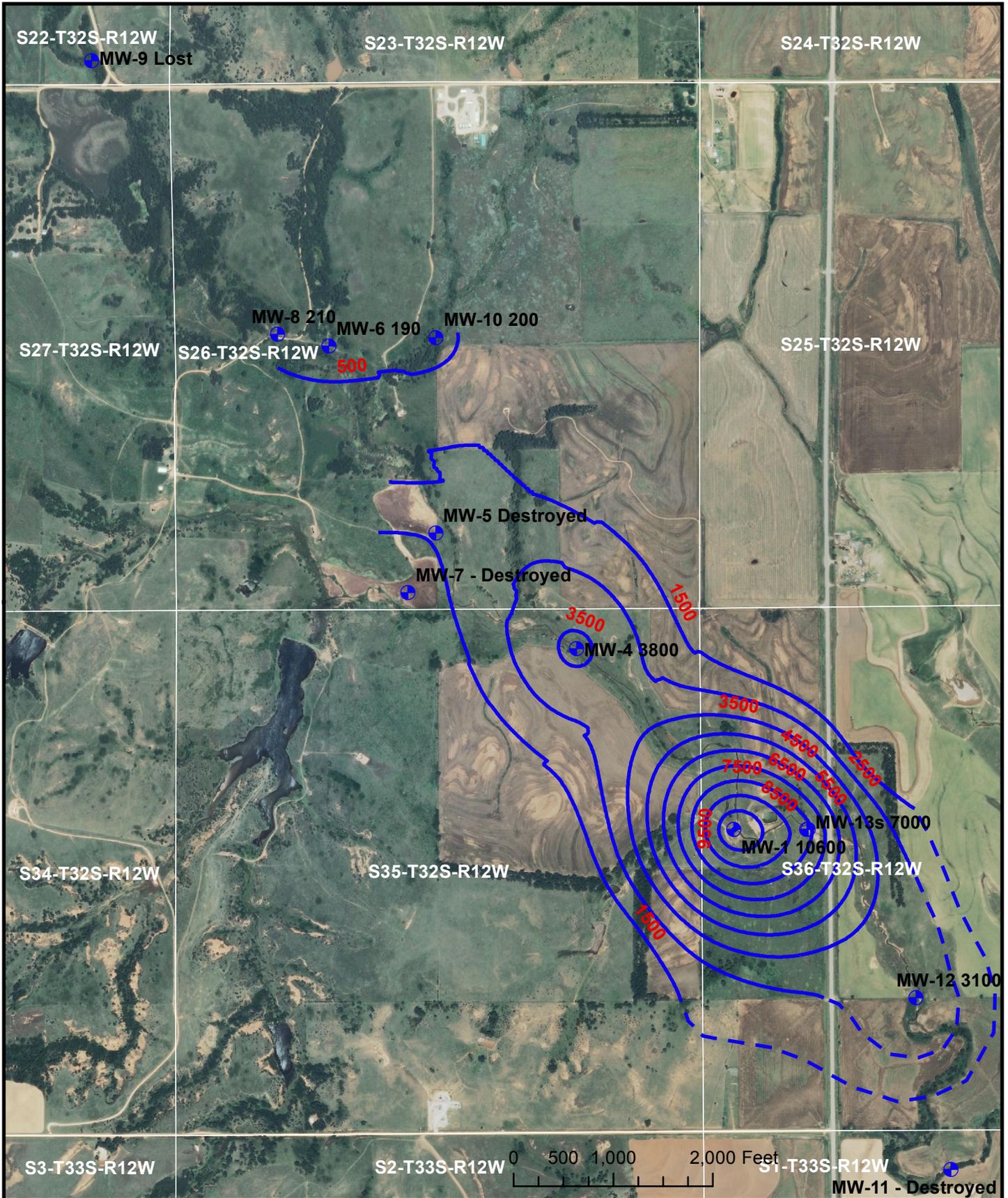
**Ideal:** 250 ppm Chloride

**Target:** 1000 ppm Chloride

**Recommendation for Future Work:** Continue sampling on an annual basis, sampling is scheduled for 2013. As chloride levels have continued to increase down gradient, it may be necessary to design and install a remedial system for this site. Further investigation and sampling will continue to determine if a remedial system is appropriate for this site.

**Estimated Total Cost:** \$150,000 if necessary to install a remediation system.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970051-00	17.5 Hrs. / \$460.00		\$189.94
<b>Current Contaminate Level: 190 ppm Cl- to 10,600 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Hrencher**  
 Sections 26/35/36-T32S-R12W  
 Barber County, Kansas  
**Chloride Isopleth Map - sampled on 7-17,18-2012**  
 KCC Project Code #970051-00 - District #1 - D. Bernasconi - 10-3-12

**Project: Irey-Hrabe Contamination Site**

**Site Location:** Section 1 and Section 12 of Township 9 South, Range 17 West, Rooks County

**Impact/Immediacy:** Groundwater. Immediacy is rated as low.

**Site Description:** Groundwater contaminated by poor oil field practices, including abused emergency pits, an illegal shallow injection well (Cedar Hills) and abandoned oil wells.

**Unusual Problems:** Lack of wells for monitoring purposes.

**Status of Project:** Site assessment is completed. No apparent problems on the lease. Problem SWD was plugged in November of 1988. A sample from abandoned water well in the area had chlorides concentrations of 1200 ppm in 2001. Chloride concentrations in the abandoned well increased to 1300 ppm in 2002 and remained at that level in 2003. These levels dropped to 900 ppm in 2004. In October, 2007 the chloride levels in this well were at 1200 ppm. No sample since 2008 due to well being inaccessible.

**Level of Remediation Sought:**

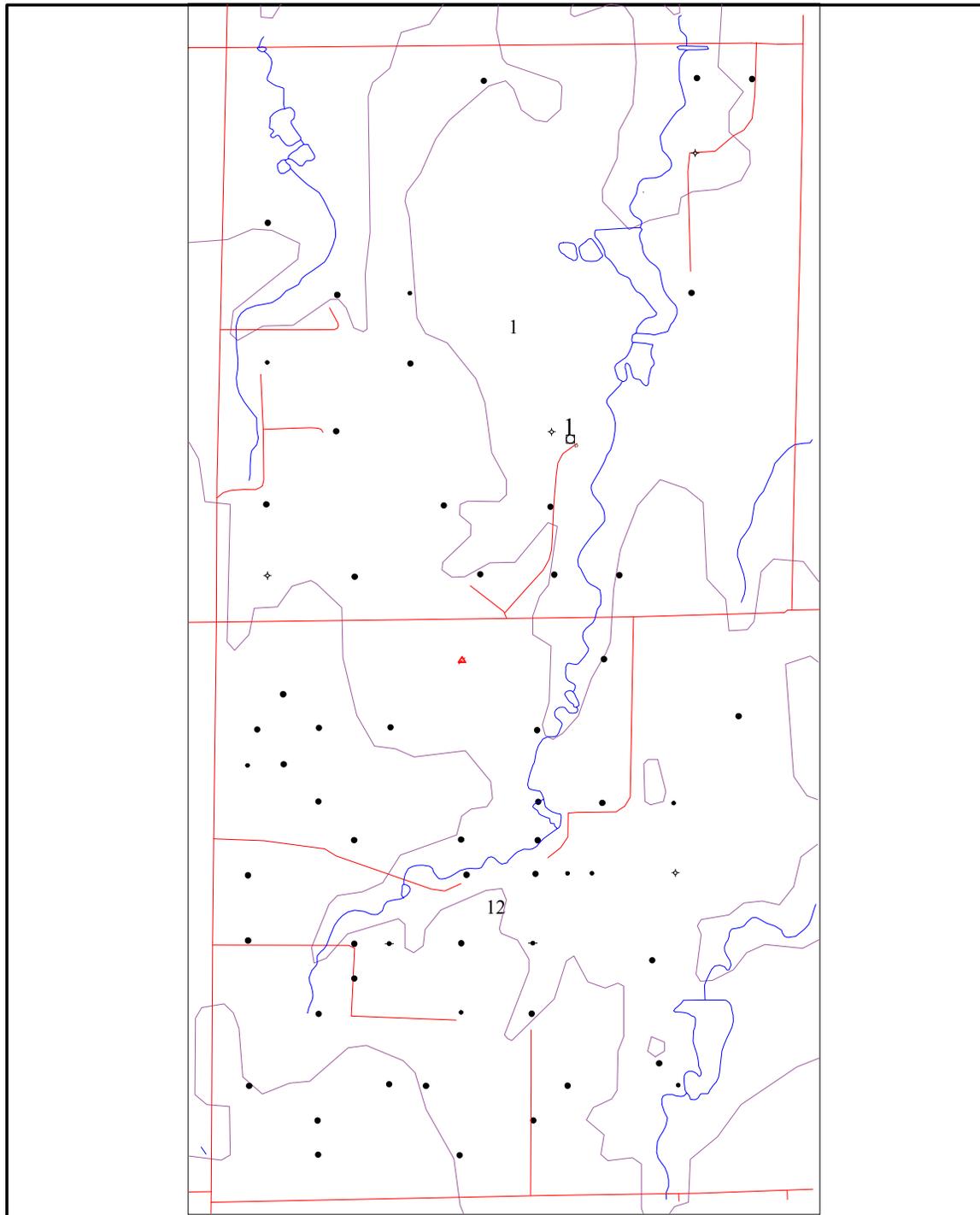
**Ideal:** 250 ppm Chloride

**Target:** 500 ppm Chloride

**Recommendations for Future Work:** Drill shallow monitor well.

**Estimated Total Costs:** \$4000.00

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970053-00	3 Hrs. / \$85.75		
<b>Current Contaminate Level: Unknown</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



CI = 1490



1 Irej-Hrabe Well - 2007 - 1200 ppm  
No Sample in 2012.



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas Well                    | ⊕ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | ✱ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ✱ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ Pit   |
| ⊕ Gas Well                 | ⊕ Dual Completed Oil Well           | □ Agriculture Well                   | ⊕ Tank Battery                                    |
| ⊕ Plugged Gas Well         | ⊕ Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ⊕ Gas Storage Monitoring Well                     |
| ⊕ TA Gas Well              | ⊕ TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | ⊕ Plugged Gas Storage Monitoring Well             |
| ⊕ Abandoned Gas Well       | ⊕ Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ⊕ TA Gas Storage Monitoring Well                  |
| ⊕ Disposal Well            | ⊕ Dual Completed Gas Well           | ⊕ Plugged Irrigation Well            | ⊕ Abandoned Gas Storage Monitoring Well           |
| ⊕ Plugged Disposal Well    | ⊕ Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ⊕ Gas Storage Injection/Withdrawal Well           |
| ⊕ TA Disposal Well         | ⊕ TA Dual Completed Gas Well        | □ Public Water Supply Well           | ⊕ Plugged Gas Storage Injection/Withdrawal Well   |
| ⊕ Abandoned Disposal Well  | ⊕ Abandoned Dual Completed Gas Well | ⊕ Plugged Public Water Supply Well   | ⊕ TA Gas Storage Injection/Withdrawal Well        |
| ⊕ Injection Well           | ⊕ Water Supply Well                 | □ Abandoned Public Water Supply Well | ⊕ Abandoned Gas Storage Injection/Withdrawal Well |
| ⊕ Plugged Injection Well   | ⊕ Plugged Water Supply Well         | ⊕ Possible Location                  |   |
| ⊕ TA Injection Well        | ⊕ TA Water Supply Well              | ⊕ Test Hole                          |   |
| ⊕ Abandoned Injection Well | ⊕ Abandoned Water Supply Well       | ⊕ Sample Site                        |   |

**Kansas Corporation Commission**

Irey - Hrabe

Sec. 1, Twn. 9 S., Rng. 17 W., Rooks County

Elevated Chlorides in Domestic Well

970053-00

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Date: 21 Oct 2004 District: Hays

**Project:** *City of Jennings Contamination Site*

**Site Location:** NW/4 of Section 25, Township 4 South, Range 27 West, Decatur County

**Impact/Immediacy:** Groundwater contaminated by poor oil field practices since the 1950's. Two city wells inside the city limits have experienced elevated chloride levels of varying intensity since this time. Immediacy level is rated as low to moderate.

**Site Description:** Brine contamination of a shallow aquifer. Poor oil field practices, spills, and brine line leaks have contributed to the problem since the 1950's. Water quality west and upstream of the tank battery site remains very good. Current city water supply is from a well located west and upstream of the tank battery area. The two contaminated wells in the city limits are used for purposes other than human consumption, such as watering public areas and farm use.

**Unusual Problems:** Very high concentrations of chlorides in produced brine.

**Status of Project:** : In 2008 the chlorides were at 500 ppm and increased to 600 in 2009 but are back down to 150 ppm in October of 2010. A sample taken in 2011 contained 100 ppm chlorides. A sample in 2012 were also at 100 ppm chloride. This area is directly affected by lease practices. Increased attention by KCC personnel pertaining to lease practices on this lease has contributed to the marked decrease in chloride levels.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

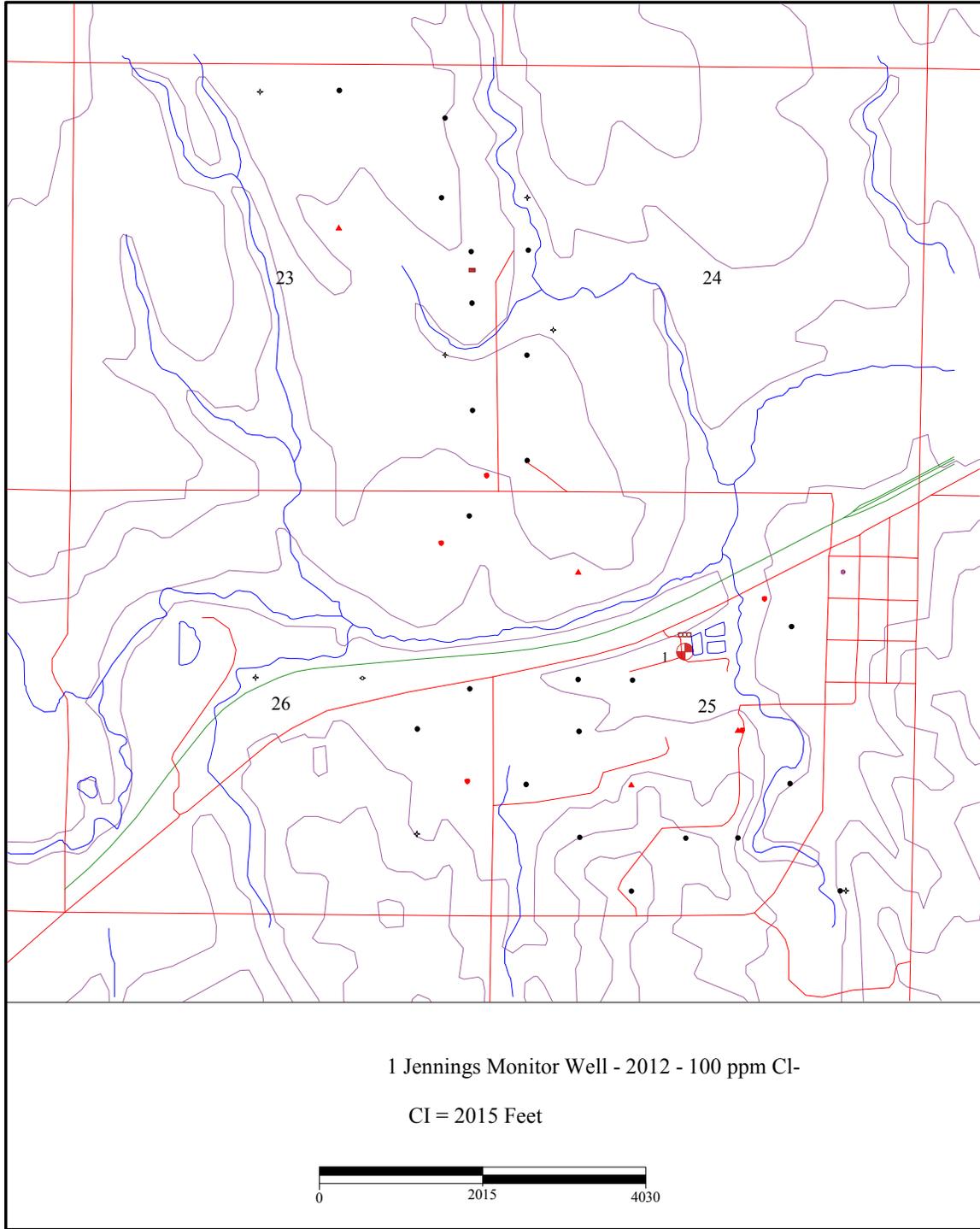
**Target:** 500 ppm Chloride

**Recommendations for Future Work:** Continue to monitor lease practices.

**Estimated Total Costs:** \$2000

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970054-00	15 Hrs. / \$364.11		
<b>Current Contaminate Level: 100 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 27 W

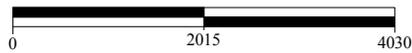


T  
04  
S



1 Jennings Monitor Well - 2012 - 100 ppm Cl-

CI = 2015 Feet



- |                            |                                     |                                      |  |
|----------------------------|-------------------------------------|--------------------------------------|--|
| ● Oil Well                 | ★ Oil & Gas Well                    | ⊕ Dry Hole                           | ○ Location   |
| ● Plugged Oil Well         | ★ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                    |
| ● TA Oil Well              | ★ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                            |
| ● Abandoned Oil Well       | ★ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ Pit  |
| ★ Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | ■ Tank Battery                                       |
| ★ Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ■ Gas Storage Monitoring Well                        |
| ★ TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | ■ Plugged Gas Storage Monitoring Well                |
| ★ Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ■ TA Gas Storage Monitoring Well                     |
| ▼ Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | ■ Abandoned Gas Storage Monitoring Well              |
| ▼ Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ■ Gas Storage Injection on Withdrawal Well           |
| ▼ TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | ■ Plugged Gas Storage Injection/Withdrawal Well      |
| ▼ Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ■ TA Gas Storage Injection/Withdrawal Well           |
| ▲ Inject on Well           | □ Water Supply Well                 | □ Abandoned Public Water Supply Well | ■ Abandoned Gas Storage Injection on Withdrawal Well |
| ▲ Plugged Inject on Well   | □ Plugged Water Supply Well         | □ Possible Location                  |  |
| ▲ TA Injection Well        | □ TA Water Supply Well              | +                                    |  |
| ▲ Abandoned Inject on Well | □ Abandoned Water Supply Well       | ×                                    |  |

**Kansas Corporation Commission**

Jennings

Sec. 25, Twn. 4 S., Rng. 27 W., Decatur County

Chloride Contaminated Groundwater

970054-00

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Date: 11 Oct 2004      District: Hays

**Project:** *Johnson/Ramsey Contamination Site*

**Site Location:** The project is located nine miles east and two and one half miles north of Sterling, Kansas. The site covers the SW quarter of 7-21-6W and SE quarter of 12-21-7W Rice County. The area is considered to be located within the sand hills. The site is in the drainage systems of the Cow Creek and Sand Creek. Cow Creek is a tributary of Arkansas River and flows in a southeasterly direction.

**Impact/Immediacy:** The contamination impacts a relatively small surface and shallow subsurface area. The immediacy level is rated as low, but there are four domestic water wells in the northwest of section 18-21-6W which could change the immediacy level if found to be impacted.

**Site Description:** The site is located in grazing pastureland. Sediments at the site consist mainly of unconsolidated Pleistocene, recent to Wisconsinan aged deposits of Dune Sand (KGS bulletin 206). The immediate area is topographically flat, with slopes ranging from 0-2 percent. Based on the site evaluation to date, the underlying material to a depth of approximately 40 feet was found to consist primarily of loose sand, overlying thick dense clay to approximately 35 feet near the eastern edge of the site. The clay shallows to the west and is only 20-22 feet near MW-6. The groundwater moves to the southwest and flows to the surface in section 12-21-7W. The spot where the contaminated groundwater seeps to the surface is approximately two acres in size and is historically barren of vegetation. Recent years have seen the scar shrink in total area but there is still a kill zone in section 13.

**Unusual Problem:** None

**Status of Project:** On October 9, 2012, six groundwater monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6) were gauged and sampled. Prior to sampling, groundwater levels were measured in each monitoring well using an electronic water level indicator. A submersible Proactive® Water-Spout water pump was used to purge a minimum of three well volumes of groundwater from each well before sampling. Purge water was tested for conductivity prior to being discharged onto the ground surface at the Site or contained in a 250 gallon poly-tank if conductivity was high before disposed of into a deep injection well. MW-6 was hand-bailed due to lack of vehicle access to power the pump.

Groundwater samples from each monitoring well were collected in one 250 (ml) polyurethane container for analysis at the KCC District #2 Laboratory. Each sample for this monitoring event was analyzed for the presence of Chloride by United States Environmental Protection Agency (USEPA) Method 8225 (Titrimetric, Silver Nitrate). Chlorides ranged from 20 mg/L in the eastern wells to 4100 mg/L in MW-6 in the western edge of the site.

MW-2 which was not found last year was found by KCC personnel and cleared and repaired for present and future monitoring use.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l Chloride

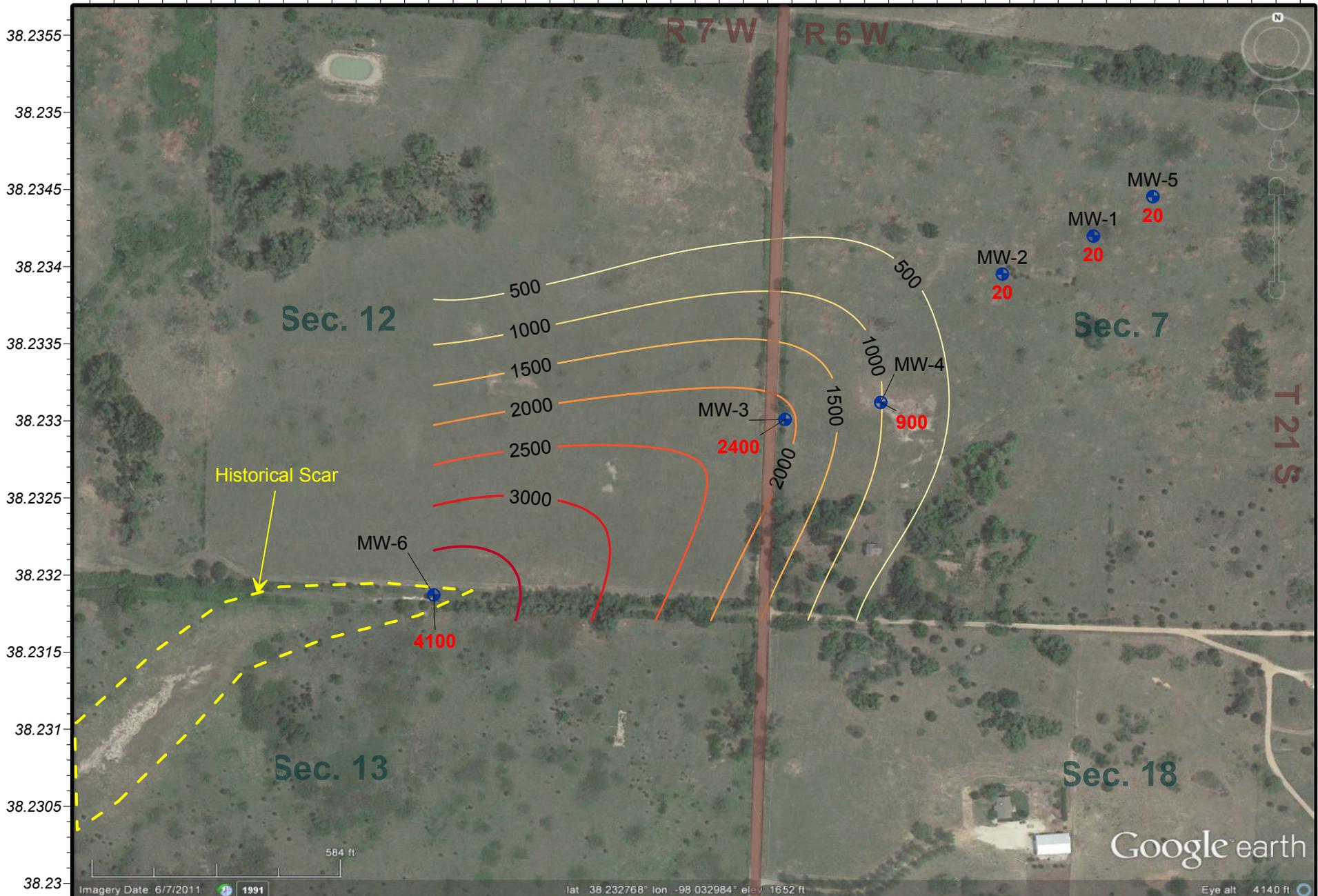
**Target:** 750 mg/l Chloride

**Recommendations for Future Work:** KCC district staff recommends continued sampling for the next few years as chlorides are as high as 2400 mg/L in section 7, and 4100 mg/L in section 12. These levels are lower than past sampling events but still very far away from the target levels originally set. Natural attenuation has been slow, and the only feasible remedial system for the shallow aquifer would entail a shallow interceptor trench. There is no brine disposal facility near-by, so water would have to be trucked from the site. Long-term monitoring is still the recommended remedial program for this site. There is a lack of delineation on the western half of the site, and new monitoring wells would be helpful in plotting the total size of the brine plume. Due to lower priority status KCC does not recommend installation of new wells at the Johnson Site unless higher brine levels are found in the monitoring wells in future events.

**Estimated Total Costs:** Total costs next year for annual water sampling, report writing and research: \$750

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970055-00	9 Hrs. / \$243.49		\$416.28
<b>Current Contaminate Level: 4100 @ MW-6 and 20 ppm @ MW-1</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-98.038 -98.037 -98.036 -98.035 -98.034 -98.033 -98.032 -98.031 -98.03 -98.029 -98.028



Imagery Date: 6/7/2011 1991

lat 38.232768° lon -98.032984° elev 1652 ft

Eye alt 4140 ft



**Johnson/Ramsey Monitoring Site - KCC Control # 970055-00**  
**Section 7 of T 21 S & R 6 W, and Section 12 of T 21 S & R 7 W, Rice County, Kansas**  
**2012 Groundwater Chloride Levels**  
**District #2 - Sampled 10/9/2012 - Map Drawn 10/18/2012 by D.Bollenback**

**Project: Knackstedt Site**

**Site Location:** The site is located eight miles west and four miles north of Inman. The legal location is N/2 N/2 NW NW of Section 30, Township 20 South, and Range 5 West, in McPherson County.

**Impact/Immediacy:** Potential exists for impacts on both rural domestic and stock water resources. Public safety issues have been mitigated with the re-routing of the local roadway affected by this site, the site is still ranked as moderate immediacy level due to the unknown extent of the dissolution.

**Site Description:** The site consists of an unplugged saltwater disposal well whose operation led to the development of an air filled underground void at an approximate depth of 430 feet. The size of the cavity has not been determined as of this date. The site is located immediately southeast of the intersection of Plum Street and Saxman Road. In 1995 the KCC agreed to provide funding for additional seismic efforts at this site by the Kansas Geological Survey. Land use is agricultural with oil and gas activities in the area.

**Unusual Problems:** The air filled nature of the cavity makes the design of an acceptable plugging project more difficult. The air filled nature of the cavity also restricts the nature and kind of investigatory methods applicable to this site.

**Status of the Project:** The cavity in the salt section of the Wellington Formation has been stable with only slight indication of any downward surface movement. Currently the site is under periodic monitoring of surface elevations with respect to possible surface movement. Survey was made of the control points in February, August, and October of 2012. Over all vertical movement seems to be toward the western points.

**Level of Remediation Sought:**

**Ideal:** Stabilize cavity and plug well bore in accordance with KCC rules and regulations.

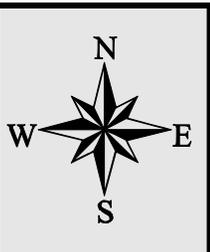
**Target:** Study results indicate a reduced need for further or complete cavity stabilization beyond the original well bore and an acceptable plugging procedure can be developed which adequately addresses both fresh water resources and public safety issues.

**Recommendations for Future Work:** KCC recommends hiring a survey company to perform the first survey in the 2013 year. It is also recommended that a new benchmark be placed in the eastern edge of the site which seems to be stable. The survey company should survey in the new benchmark as well as all the points. KCC also recommends continued monitoring of surface elevations in the area of the original well on a bi-annual schedule. One option could be to contract with the KGS for an additional seismic survey at the site including a possible long-term geophone to record shifting or settling strata/rock. The design of an adequate plugging procedure for the well is paramount. Resources should be given so that concrete pit area around SWDW is reconstructed for more security, as it is a safety hazard as of now. The cellar should be filled in with soil or sand with casing brought up to new surface elevation.

**Estimated Total Costs:** \$1500-2000 to have the benchmark resurvey and/or place a new on near-by benchmark by a licensed surveyor. It will be very costly to attempt to plug this void at this time.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970060-00	22 Hrs. / \$574.40		\$153.39
<b>Current Contaminate Level: Unstable well cavity</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.9255 -97.925 -97.9245 -97.924 -97.9235 -97.923 -97.9225 -97.922 -97.9215 -97.921 -97.9205 -97.92 -97.9195



**Knackstedt Depression Site**  
 NW - Sec. 30 - T 20 S & R 5 W, McPherson County, Kansas  
**2012-13 Survey Map**  
 Data Shown is Elevation change from 2011 Survey  
*KCC Project Code #970060-00 - District #2 - D. Bollenback - 10/11/2012*

**Project: John Lawless Contamination Site**

**Site Location:** The site is located 2 miles north and 2 miles west of Canton. The legal location of the site is NW of the NE of Section 7, Township 19 South, Range 1 West, McPherson, and County.

**Impact/Immediacy:** Low impact and immediacy. Impacts to a domestic water well. An alternative supply is a rural water district supply.

**Site Description:** The site is located in a sparsely populated rural area. Land use is agricultural. There is a moderate amount of oilfield activity in the area. The topsoil is sandy clay. Underlying the topsoil is a fresh water aquifer. Depth of water is approximately 12 feet. Direction of groundwater movement is northerly.

**Unusual problems:** None

**Status of Project:** A new house was built 200 yards to the northeast of the SWDW (1999) and they have satisfactory water supply and the water tested below 100 mg/l Chlorides since 2002. The ground around the salt-water disposal well, located south of the old house, appears to be contaminated by brine from old spills. The Lawless water well at the house has had chlorides fluctuating from 290 to 190 mg/l during 2010. The chloride values on the Lawless water well were generally going up until the last couple of years. Heavy seasonal precipitation in 2008 may have played a part in the lower values. A chloride pump test was performed to see what sort of chloride fluctuations occurs after prolong use of the Lawless water well. Levels appear to be stable around 200 until after approximately 20 minutes began to rise eventually hitting 300 ppm after 36 minutes. It appears that the Lawless well can be used for short periods of time with out pulling in the brine which is located in the lower aquifer. It is unclear if the plume has moved down gradient from the well or if other attenuation has occurred to lessen the chloride levels of the well. Due to illness of the landowner, KCC tried but was unable to get permission to sample during the 2011 or 2012 year.

**Recommendations for Future Work:** KCC attempted in 2012 to contact the landowners in attempt to perform another pump test on the Lawless house well but was unsuccessful. KCC recommends that the Lawless site be listed as resolved. The target level of 500 mg/L has been reached for multiple years. KCC District is currently processing this change in status in October 2012.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l Chloride

**Target:** 500 mg/l Chloride

**Total Costs:** \$2,923.39

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970063-00	7 Hrs. / \$190.91		
<b>Current Contaminate Level: Unable to sample</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input checked="" type="checkbox"/> 9. Resolved	



**Kansas  
Corporation  
Commission**



**Lawless House Well**

NE Sec 7 - T19S-R1W, McPherson County, Kansas  
**Site Map 2010-11**  
KCC # 970063-00 - District #2 - D.Bollenback - 11/2/2010

**Project:** *Leesburg Sink Hole Site*

**Site Location:** The site is located in Section 12, Township 25 South, Range 13 West, Stafford County.

**Impact / Immediacy:** Potential exists for impacts on stock and irrigation resources. Subsidence around the Leesburg #302 and Leesburg #303 may develop into a sinkhole. Worst-case scenario would be a catastrophic collapse taking several acres of farm ground. Probable action is a gentle downward movement of the area until stable. The site has a moderate to high rating.

**Site Description:** The site consists of a plugged saltwater disposal well whose operation led to the probable development of a solution cavity. The site is located in a rural setting approximately 990' FEL and 2310' FSL of section 12. Land use is agricultural with oil activities in the area. The subsidence at the site now covers an area of approximately 350'x400' in size.

**Unusual Problems:** A solution cavity is thought to exist under the existing location.

**Status of the Project:** Elevations were shot on April 27<sup>th</sup> 2012 by Advantage Elevations. Only the point on the west side of the sink was shot. The elevation at this point was 1901.5 feet ASL. This is a subsidence of 1.9 feet since elevations were last shot in May of 2009. The total subsidence of this point is 15.5 feet, original elevations of 1917' ASL were derived from a USGS topo map dated 1971.

**Recommendations for Future Work:** The PRP has been surveying the site irregularly. It is recommended the site be surveyed at least biannually to establish a subsidence rate. The ground level at the stake on the east side should be surveyed in addition to the Leesburg 302 if it is accessible (low/no water). Additional points on the north and south edges of the sink, as well as a point in the center of the sink should be added in order to more thoroughly describe the movement.

**Level of Remediation Sought:**

**Ideal:** Stabilize cavity.

**Target:** Safely monitor site.

**Estimated Total Costs:** RP -\$62,000, plugging costs, seismic and installation of monitor wells.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
2004003-001	7.5 Hrs. / \$204.06		\$6,266
<b>Current Contaminate Level: Unknown</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



## Leesburg Sinkhole

Sections 12-T25S-R13W  
Stafford County, Kansas

**Total Subsidence - Elevations shot on 4-27-2012**

*KCC Project Code #20040001-001- District #1 - D. Bernasconi - 11-5-2012*

**Project: Little River Site**

**Site Location:** The site is located 4 miles north and one east of the southwest edge of the city of Little River. The area of contamination is in the SE/4 of section 29 and NE/4 of section 32 T 18S R6W, Rice County.

**Impact/ Immediacy:** The impact is to the ground water supply for the city of Little River from unknown oil field source. The immediacy level is rated as high because of its potential impact to the existing public water supply wells.

**Site Description:** The Little River water well field is located in part of the Odessa Oil Field. The ground water table in this area is at a depth of thirty feet in a sandstone aquifer with an aquitard of blue shale at a depth of fifty to sixty feet. The sandstone has its highest increase in conductivity (chlorides) at a depth of 47 to 50 feet as indicated by a conductivity test in MW# 1. The source for the contamination may be from old core soundings, spills, pits or leaking wells.

**Unusual Problems:** Unknown source for the contamination.

**Status of Project:** There appears to be little to no migration of the plume in the SE corner of Section 29 where the highest chloride values are found in KCC MW #1 (650mg/L) and the out of use PWS #7 well (2500 mg/L). PWS #13 in the NE/4 of Section 32 has been brought back online for use by the city and chlorides in 2012 increased from 410 to 600 mg/L.

A review of historical chloride data from 1999 to present show water quality for this site has slightly improved to no change over the past five years. Five operating public water supply wells are well within target limits for chlorides ranging from 70 to 170 mg/l. PWS#13 to the west of the other wells is now online and utilized as a public water supply well for the town of Little River. It had a chloride level of 600 mg/l in 2011. This well is mixed with the other wells so the elevated chlorides are diluted before public consumption. If this well continues to increase in the future it maybe unusable by the city of Little River. The two monitoring wells established by the KCC showed slight changes chloride levels from 2011. MW-1 decreased in 2012 while MW-2 increased by a very small amount.

**Level of remediation Sought:**

**Ideal:** 60 mg/l

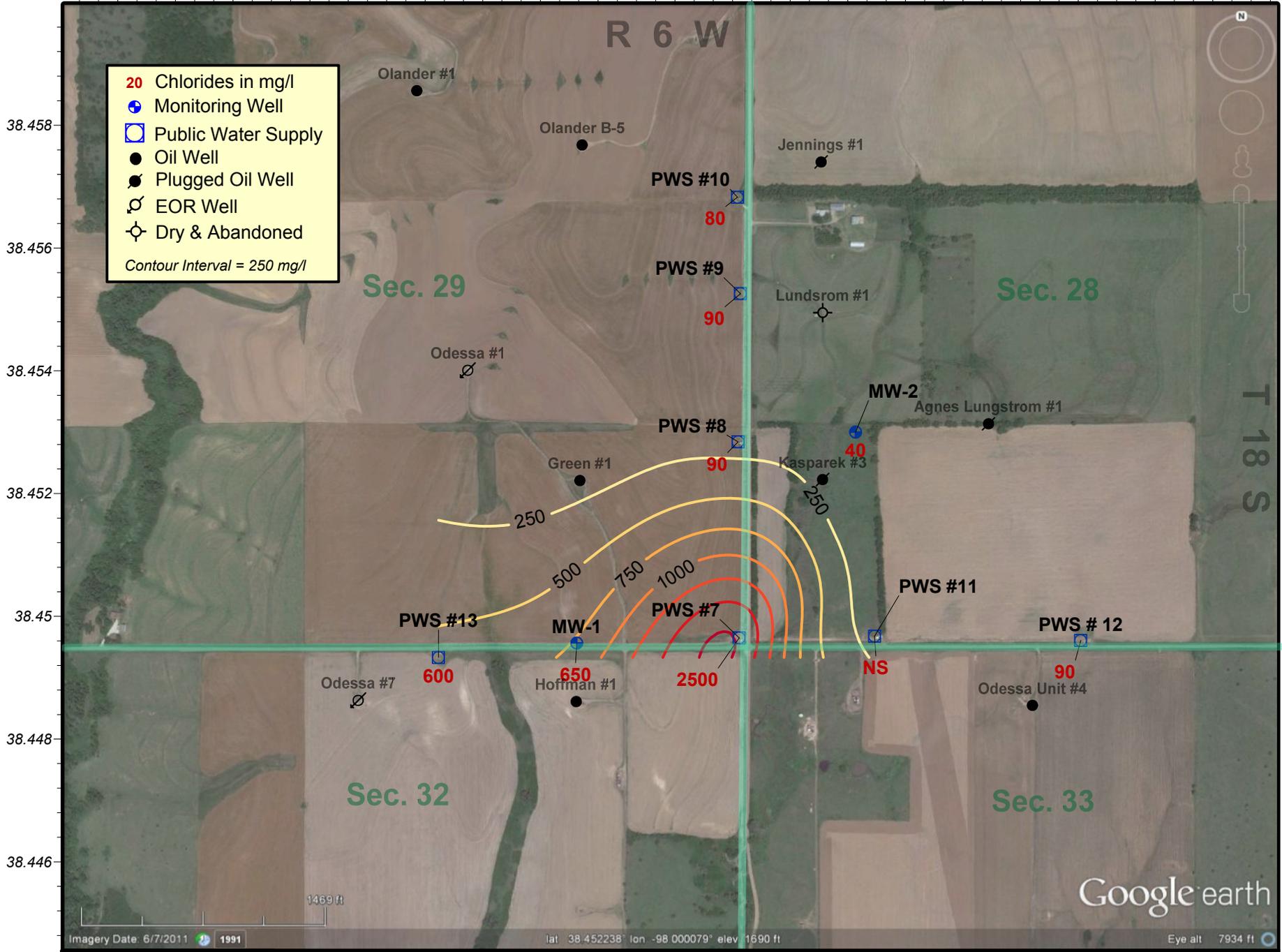
**Target:** 300 mg/l

**Recommendation for Future Work:** If the water quality at any of the existing PWS wells declines due to saltwater contamination staff would recommend that up to 4 monitoring wells/test holes be installed to help delineate the salt-water contamination. Once the plume is delineated a remediation plan can be developed to protect Little Rivers water supply. PMW#13 has increased in chlorides since 2011 and if this becomes a trend, KCC would recommend investigation in the western edge of the plume into chlorides that have migrated away from the crossroads.

**Estimated Total Costs:** The estimated cost for the installation of 4 monitoring wells would be \$10,000. This could be less if it is found in the field that a well is not warranted after testing the water in each boring. \$700.00 will be needed for staff time, which is including oversight for the installation.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20000057-001	10 Hrs. / \$269.78		\$3,112.20
<b>Current Contaminate Level: 2500 mg/l Cl- PWS 7</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-98.012 -98.01 -98.008 -98.006 -98.004 -98.002 -98 -97.998 -97.996 -97.994 -97.992 -97.99 -97.988



- 20 Chlorides in mg/l
  - Monitoring Well
  - Public Water Supply
  - Oil Well
  - Plugged Oil Well
  - EOR Well
  - Dry & Abandoned
- Contour Interval = 250 mg/l

Sec. 29

Sec. 28

Sec. 32

Sec. 33

R 6 W

T 18 S



**Little River Groundwater Monitoring Site**  
 Section 29 of Township 18 South & Range 6 West, Rice County, Kansas  
 2012 Groundwater Chloride Levels  
 District #2 - Sampled on 10/12/2012 - Map Drawn on 10/24/2012 by D. Bollenback

**Project: Macksville Contamination Site**

**Site Location:** Legal location of the site is in the S/2 SW Section 30, Township 23 South, Range 15 West, in Pawnee County.

**Impact/Immediacy:** An irrigation well is located in the NE/4 of this section which is in direct line with the natural flow of the groundwater. As the recovery wells have been down for several years, this well may have been impacted by chlorides, but recent samples have not been taken to confirm this. Immediacy level is rated at low.

**Site Description:** A sinkhole developed around an abandoned salt-water disposal well on July 21, 1988. Brine from the old well and possibly other sources entered the fresh water aquifer. The aquifer consists of sand and gravel overlying the Wellington Formation of Permian age. The salt-water plume is being monitored by thirty-seven wells. The plume is moving to the northeast from the sinkhole area towards an irrigation well.

**Unusual Problems:** Ground usage is lost over several acres due to the development of the sink. The depression is still increasing in size.

**Status of Project:** Thirty Seven monitoring wells and one surface water sample was taken in 2012. Chlorides at this site are below fresh water standards in all except one well, MW-16d where the chlorides are 640ppm. The chlorides at this site have been steadily declining due to natural attenuation, but will likely remain elevated over background chlorides due to the higher chlorides that still reside in the pond formed by the sink, which are 960ppm. The site was also surveyed in 2012 which showed subsidence between 0.26 and 3.21 feet since the last survey in 2004. The least amount of subsidence occurring on the east side, and the most movement occurred on the west side of the sink. Several wells were also repaired this year after a recent burn which had damaged the wells.

**Level of Remediation Sought:**

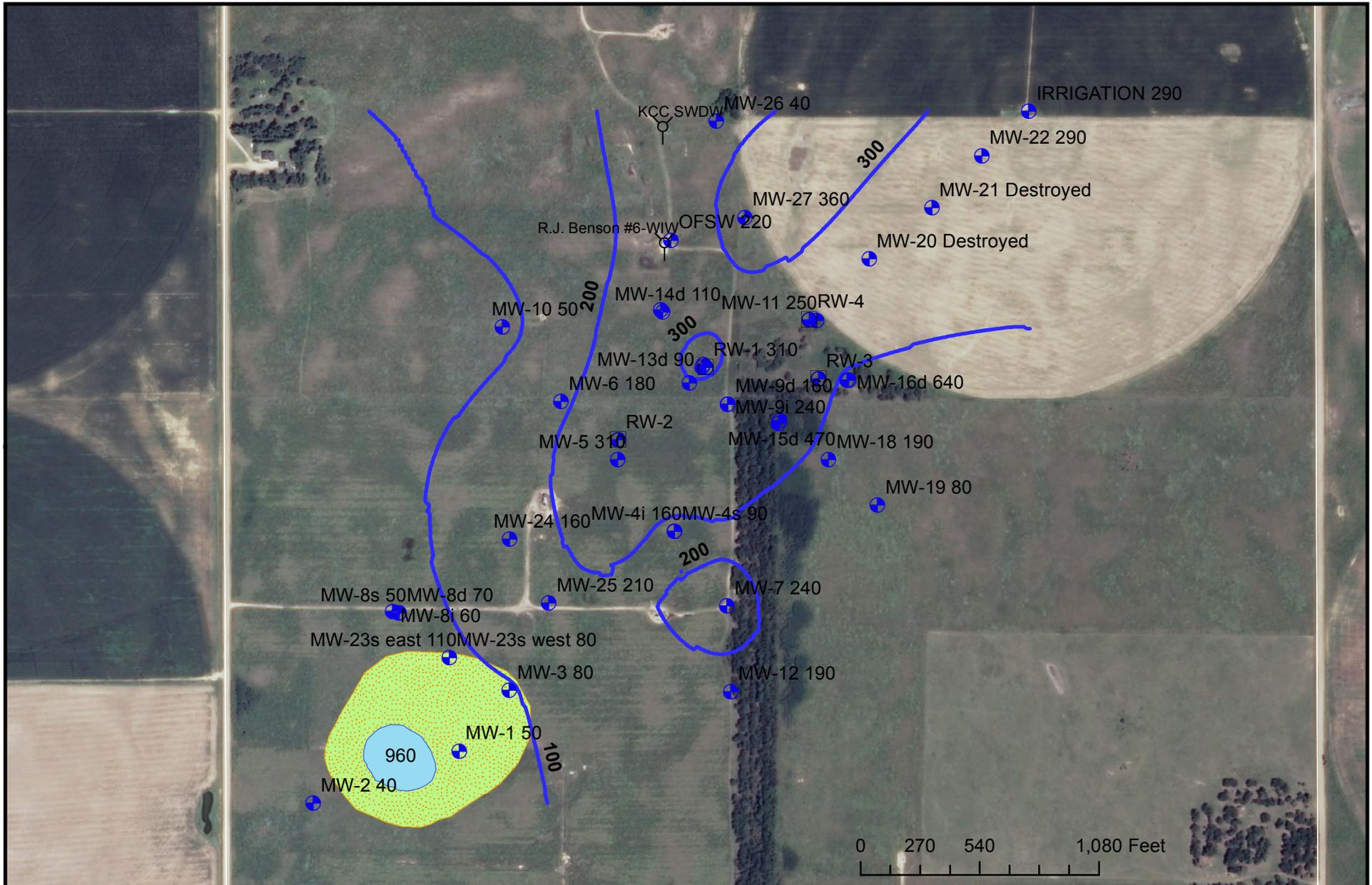
**Ideal:** 250 ppm Chloride

**Target:** 300 ppm Chloride

**Recommendations for Future Work:** Funds are sought to rebuild the cellar of the disposal well which has deteriorated, and to begin plugging the monitoring wells at the site. Since only one well currently remains above the fresh water standard it is recommended to begin plugging a majority of the wells at the location, starting with well in the NE/Q, and working back towards the sinkhole, potentially leaving MW-16d available for sampling until the chlorides have fallen below fresh water standards. The site should also continue to be surveyed on an annual basis to track the current rate of subsidence.

**Estimated Total Cost:** Costs to plug the wells have not yet been explored.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970066-00	71.5 Hrs. / \$1,703.34	\$1,343.71	\$71,668.02
<b>Current Contaminate Level: 960 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input checked="" type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



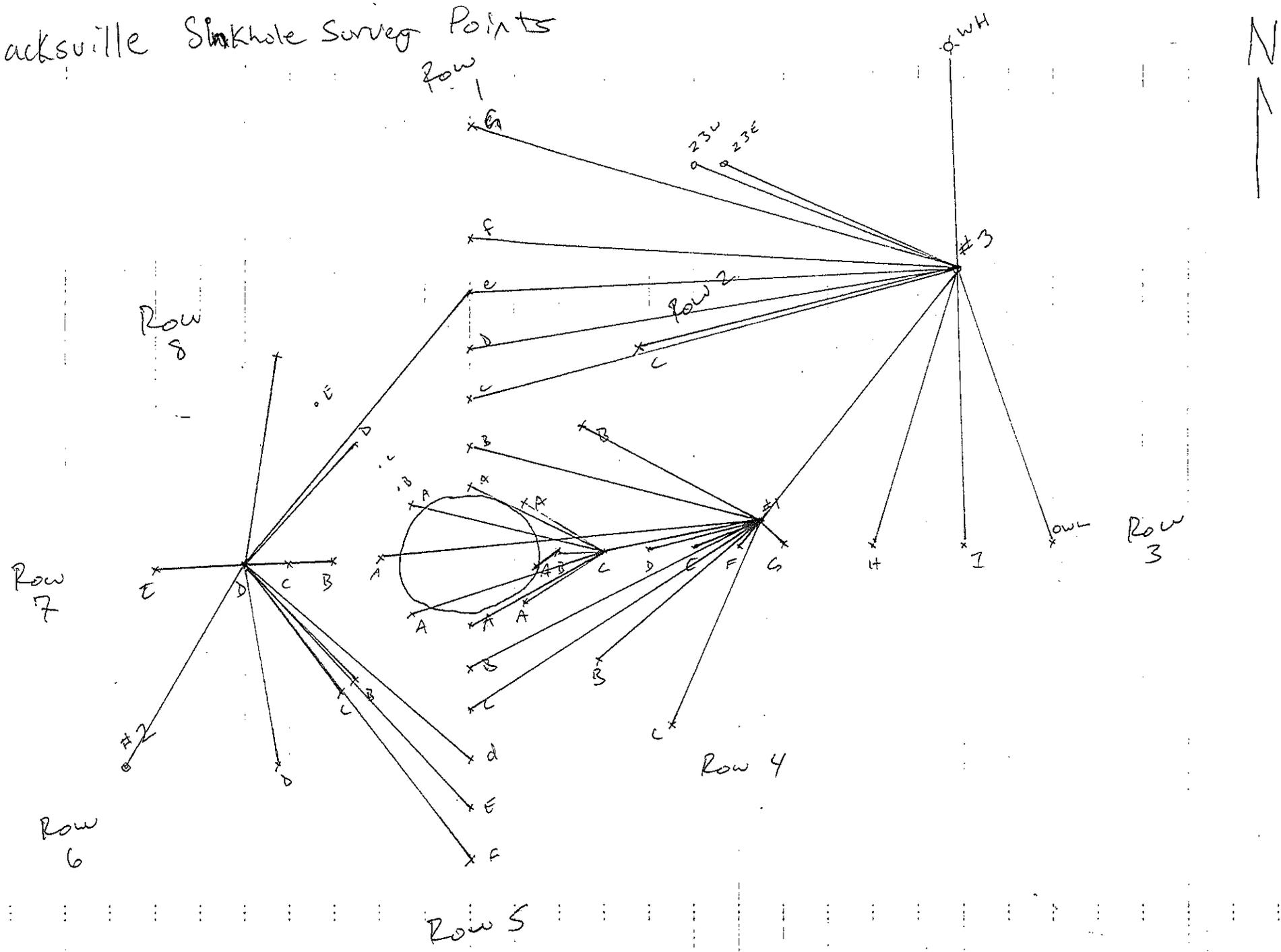
## Macksville Contamination Site

Section 30-T23S-R15W  
Pawnee County, Kansas

**Chloride Isopleth Map - sampled on 3-13 and 3-14-2012**

KCC Project Code #970066-00 - District #1 - D. Bernasconi - 11-06-12

# Macksville Sinkhole Survey Points



**Project: Mantooth Contamination Site**

**Site Location:** Section 29, Township 33 South, Range 14 East, Montgomery County.

**Impact/Immediacy:** Impact is to surface water and groundwater. The immediacy level is rated as moderate.

**Site Description:** The initial investigation was begun in May of 1996 by personal from the Chanute Office, in response to a complaint of brine in Deer Creek. At That Time the site consisted of an abandoned oil lease with as many as 41 abandoned well locations, some of which were leaking brine at or near the surface and effecting both surface water and groundwater resources. The site is situated immediately north of Deer Creek, a tributary of the Caney River in the Verdigris River Basin. In the spring of 1999 funds were approved for the excavation of abandoned well sites on this property. During that investigation 25 abandoned wells were confirmed and referenced by GPS.

**Unusual Problems:** Lack of detailed lease data concerning the number and location of wells drilled in the area is a significant problem in properly and completely assessing potential contaminates source areas for this site. However to date there have been 25 wells plugged with several possible locations to be further investigated in the near future. There are also several potential sources outside the physical lease boundaries of this site.

**Status of Project:** The Fee Fund Project for this site was completed in the summer of 2000. Twenty-five abandoned wells were plugged. Data gathered from the well plugging operations and monitoring well sampling indicates that the source of the salt water plume is most likely located in the south half of the project. Leases immediately bordering this site are being inventoried and referenced by GPS to identify further environmental threats outside the original area of concern. The overall Cl- concentrations are slowly trending down. Six additional monitoring wells were completed in early 2012 to further evaluate the extent and to help determine the possible brine source. One additional abandoned well located on the extreme SE portion of the project is in the approval process for fee funds as well as nine additional wells located immediately north of this site. The following are the Cl- concentrations of this year's sampling:

**MWE 01:** 600 ppm Cl- (03/02/2012); 4,900 ppm Cl- (06/13/2012); 4,700 ppm (09/13/2012); **MWE 02:** 400 ppm Cl- (03/02/2012); 2,400 ppm Cl- (06/13/2012); 3,300 ppm Cl- (09/13/2012); **MWE 03:** 3,800 ppm Cl-(03/02/2012); 4,200 ppm Cl- (06/13/2012); 3,400 ppm Cl- (09/13/2012); **MWE 04:** 200 ppm Cl- (03/02/2012); 7,500 ppm Cl- (06/13/2012); 10,400 ppm Cl- (09/13/2012); **MWE 05:** 600ppm Cl- (03/02/2012); 700 ppm Cl- (06/13/2012); 500 ppm Cl- (09/13/2012); **MWE 06:** 600 ppm Cl- (06/13/2012); 500 ppm Cl- (09/13/2012); **MWE07:** 500 ppm Cl- (03/02/2012); 700 ppm Cl- (06/13/2012); 400 ppm Cl- (09/13/2012); **MWE 10:** 600 ppm Cl- (03/02/2012).

**Level of Remediation Sought:**

**Ideal:** Less than 250 ppm Chloride

**Target:** 500 ppm Chloride

**Recommendation for Future Work:** Continue monitoring in order to verify whether plugging of the existing abandoned wells eliminates the current source of saltwater contamination within the ground and surface water in the project area. Adjoining leases are currently being mapped by GPS and information gathered for submittal for Fee Fund Plugging. Future work will be based upon the results of the sample analysis of the monitoring wells and Deer Creek. There have been 20 new CBM wells and associated SWD wells drilled in the last few years in section 20 & 29.

**Estimated Total Costs:** Construction of six new monitoring wells in 2012 cost \$12,294.00.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
980058-001	82.5 Hrs. / \$2,175.81	\$12,444	\$17,349
<b>Current Contaminate Level: 400 ppm to 10,400 ppm Cl-</b>			
<b>Status: Active</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

**KANSAS CORPORATION COMMISSION**

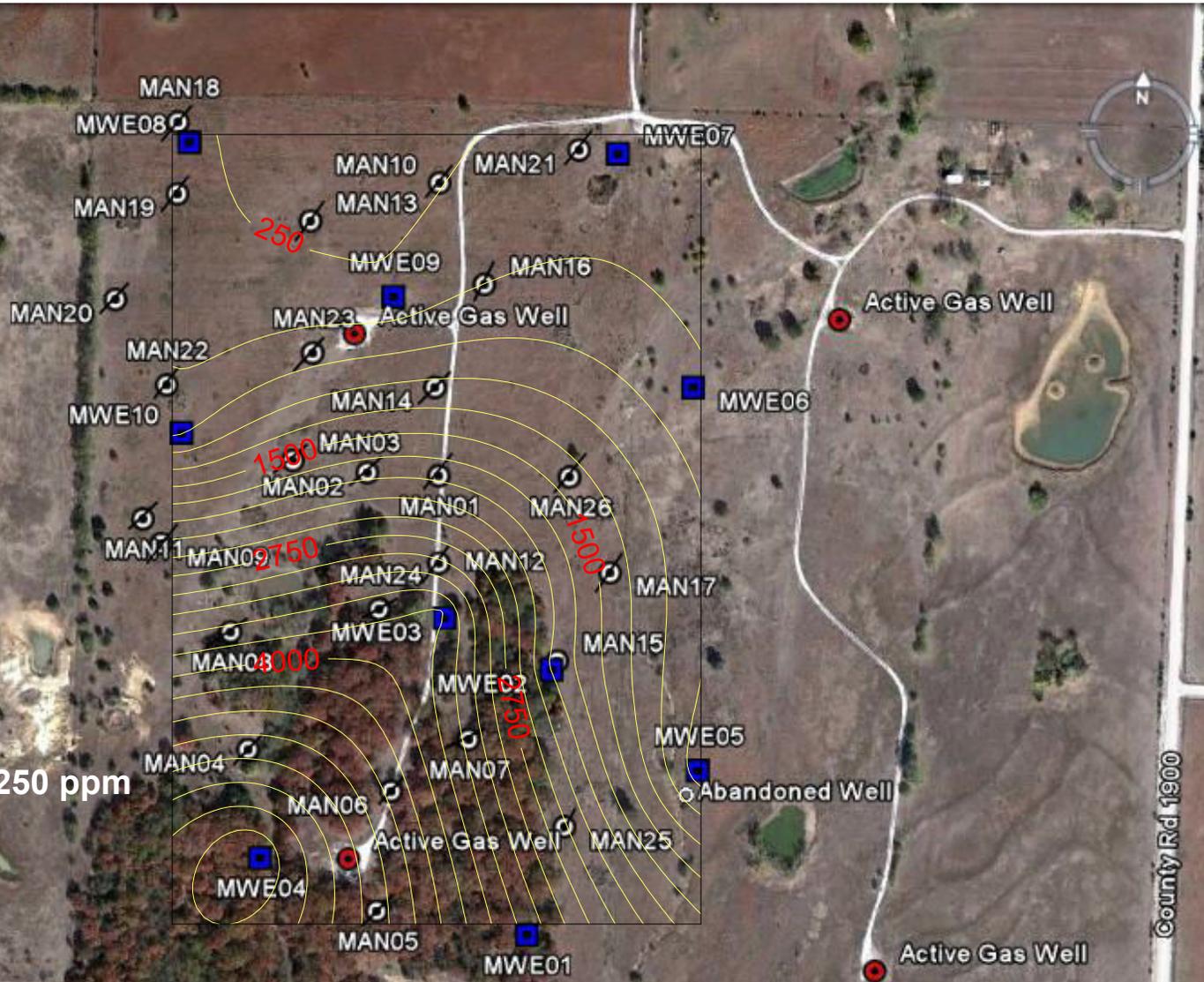
**Mantooth Remediation Site**  
Sec 20 & 29 - T33S - R14E  
Montgomery County, Kansas  
Project 980058-001

11/15/2015 District 3

-  Active Gas Well
-  Fee Fund Plugged Well
-  Abandoned Well
-  Monitoring Well

 CI- Concentration Contour = 250 ppm

900 ft



**Project: Tom Maupin Contamination Site**

**Site Location:** NE SE/4 of Section 9, Township 11 South, Range 15 West, Russell County

**Impact/Immediacy:** Groundwater. A domestic stock well was polluted by brine contamination. Immediacy level is rated as low to moderate.

**Site Description:** Brine contamination of a shallow aquifer. Source of chloride contamination is from old drill pits and old brine evaporation pits that have leached into the aquifer.

**Unusual Problems:** None

**Status of Project:** Monitoring at the present time. The only two monitoring wells left in the well net are monitor wells 3 and 5. These have always contained the highest chlorides.

Year	Well#	Chlorides	Year	Well#	Chlorides	Year	Well#	Chlorides
2010	MP 3	400 ppm	2011	MP 3	680 ppm	2012	MP 3	600 ppm
2010	MP 5	900 ppm	2011	MP 5	280 ppm	2012	MP 5	380 ppm

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

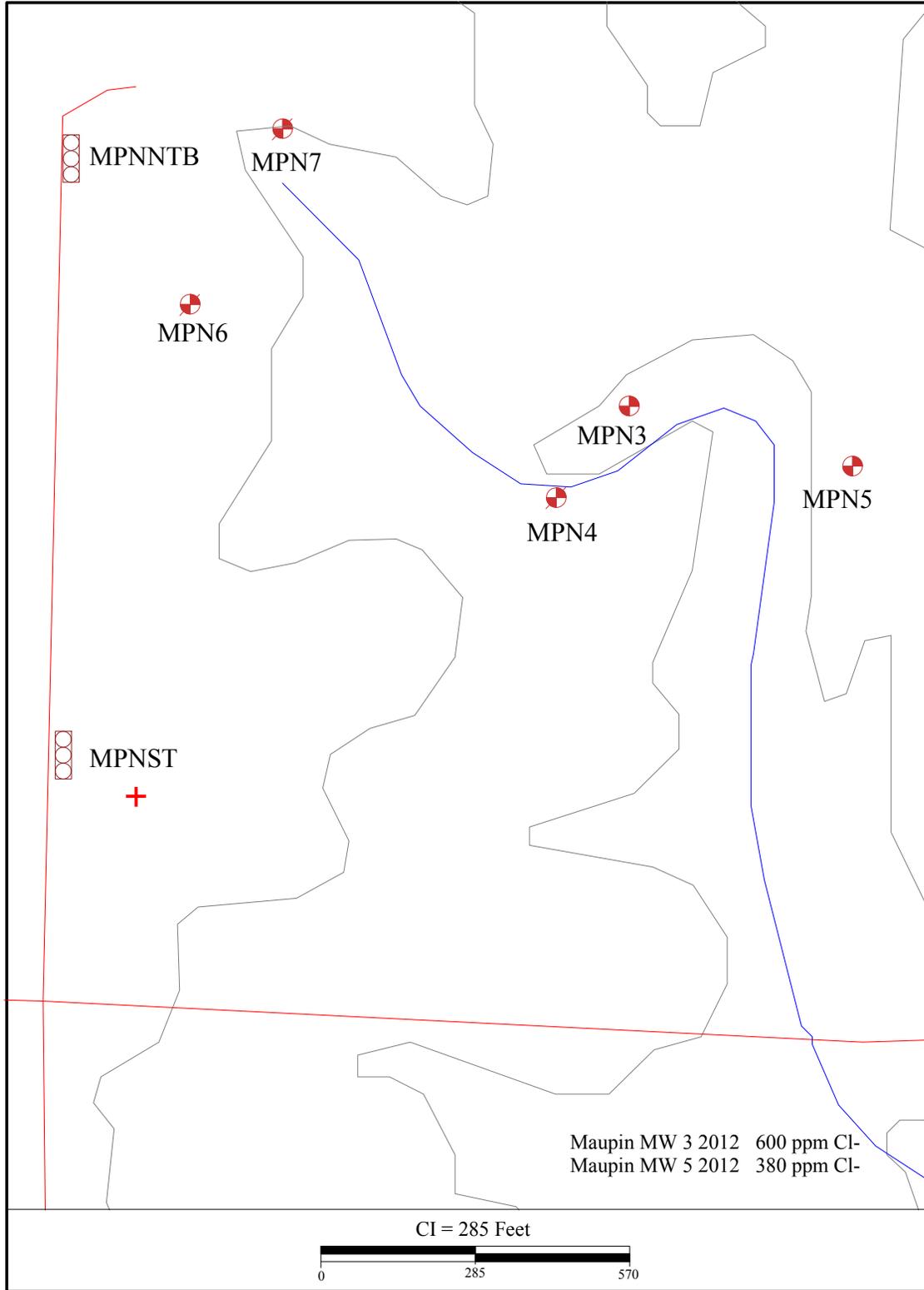
**Target:** 500 ppm Chloride

**Recommendations for Future Work:** Continue to monitor.

**Estimated Total Costs:** \$2000.00

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970068-00	10 Hrs. / \$251.22		
<b>Current Contaminate Level: 600 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 15 W



T  
11  
S



Maupin MW 3 2012 600 ppm Cl-  
Maupin MW 5 2012 380 ppm Cl-

CI = 285 Feet



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ★ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location                                      |
| ● Plugged Oil Well         | ★ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                               |
| ● TA Oil Well              | ★ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                       |
| ● Abandoned Oil Well       | ★ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ Pit   |
| ★ Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | ■ Tank Battery                                  |
| ★ Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ■ Gas Storage Monitoring Well                   |
| ★ TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | ■ Plugged Gas Storage Monitoring Well           |
| ★ Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ■ TA Gas Storage Monitoring Well                |
| ★ Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | ■ Abandoned Gas Storage Monitoring Well         |
| ★ Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ■ Gas Storage Inject on/Withdraw Well           |
| ★ TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | ■ Plugged Gas Storage Inject on/Withdraw Well   |
| ★ Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ■ TA Gas Storage Inject on/Withdraw Well        |
| ▲ Inject on Well           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | ■ Abandoned Gas Storage Inject on/Withdraw Well |
| ▲ Plugged Inject on Well   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ▲ TA Injection Well        | ● TA Water Supply Well              | +                                    |   |
| ▲ Abandoned Inject on Well | ● Abandoned Water Supply Well       | ×                                    |   |

**Kansas Corporation Commission**

Maupin

Sec. 9, Twn. 11 S., Rng. 15 W., Russell County

Chloride Plume

970068-00

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Date: 21 Oct 2004 District: Hays

**Project: McDonald-East Contamination Site**

**Site Location:** NW/4 of Section 27, Township 19 South, Range 22 East, Linn County

**Impact/Immediacy:** Impact is to the surface water. Immediacy level is rated as low.

**Site Description:** This site is located at the bottom of a small, fairly steep drainage in the Cherryvale Shale. A seep originating from this drainage tested 3,300 ppm chloride in 1991, 6,500 ppm chloride in 1992, 750 ppm chloride on September 26, 1995 and 380 ppm chloride on January 26, 1998. Seepage within the drainage is intermittent based on precipitation in the area.

**Unusual Problems:** None.

**Status of Project:** The State has made an agreement with a local Operator to put this lease back into production and plug several of the injection wells and older oil wells. There are six monitoring wells located on the McDonald East Site in the NW ¼ of section 27–T19S–R22E. The following Cl- concentrations of sample results were obtained on 03/30/2012; 06/15/2012 and 10/10/2012:

- Monitoring well#2 (MCDE02): 400; 600 and 400 ppm Cl-
- Monitoring well#3 (MCDE03): 600; 600 and 600 ppm Cl-
- Monitoring well#4 (MCDE04): 900; No Sample; and 900 ppm Cl-
- Monitoring well#5 (MCDE05): 700; 600 and 700 ppm Cl-
- Monitoring well#6 (MCDE06): 600; 600 and 600 ppm Cl-

All monitoring wells, except MCDE04, have tested near the target level for this years sampling. Further monitoring will be necessary as Operator continues to bring lease back into production and designated wells have been plugged.

**Level of Remediation Sought:**

- Ideal:** 200 ppm Chloride
- Target:** 500 ppm Chloride

**Recommendation for Future Work:** Continue sampling bi-annually and monitoring injection activity on this lease.

**Estimated Total Costs:** \$1,500.00 yearly.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970070-00	34 Hrs. / \$900.74		
<b>Current Contaminate Level: 400 ppm Cl- to 900 ppm Cl-</b>			
<b>Status: Active</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

# KANSAS CORPORATION COMMISSION

McDonald East Remediation Site  
NW 27 - T19S - R22E  
Linn County, Kansas  
Project 970070-00

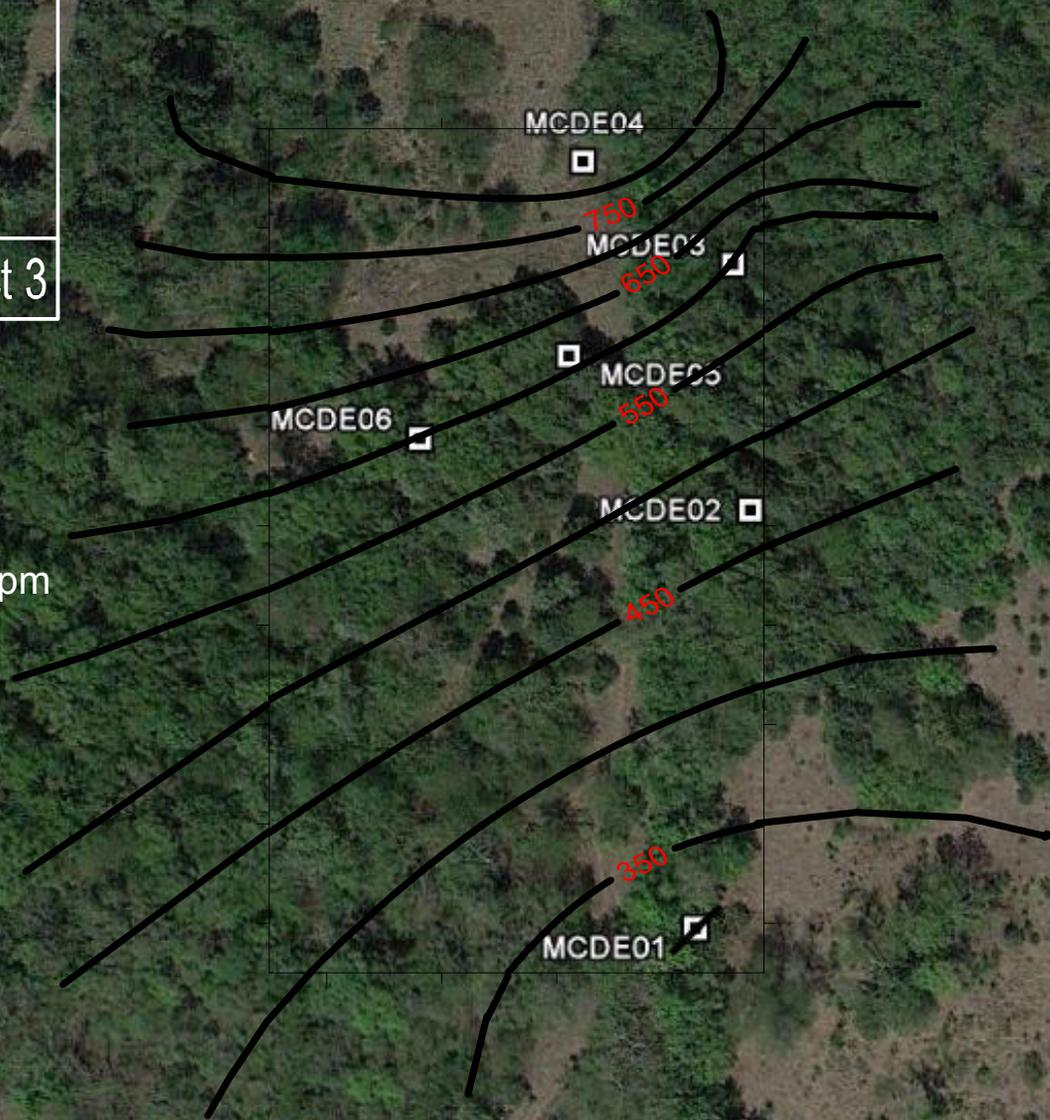
11/15/2012

District 3

□ Monitoring Well

~ CI- Concentration Contour = 50 ppm

200 ft



**Project: McPherson Landfill-Johnson Oil Field Contamination Site**

**Site Location:** The McPherson Landfill itself is located in Section 34, Township 19 South, Range 3 West, in McPherson County, approximately .75 miles southeast of the city of McPherson. The affected areas include Sections 33 & 34, Township 19 South, Range 3 West, and Sections 3,4 & 5, Township 20 South, Range 3 West.

**Impact/ Immediacy:** The contamination has impacted industrial water supply wells for National Cooperative Refinery Association (NCRA), as well as domestic rural water wells. This site has a moderate to high immediacy level.

**Site Description:** The site is located in rural McPherson County near the landfill. The area of contamination lies on the west side of the Johnson Oil Field, which is the probable source of the high salinity in the ground water.

**Unusual Problems:** None.

**Status of Project:** Since 2003 NCRA has annually provided a report on their East Refinery Groundwater Quality Improvement Project, and the Groundwater Monitoring Plan. A full report from the consulting company, Trihydro Corporation is on file with the KCC. The goals for this project include mitigating chloride impacted oil field brine water migrating from the Johnson Oil field east of the refinery, and preventing lateral movement of the identified hydrocarbon plume beneath the refinery toward the chloride remediation system. The remediation system consists of 12 recovery wells, RW-7 through RW-18, which are all screened in the lower portion of the Equus Beds aquifer. During 2011-2012 eight recovery wells were operated, RW-7 through RW-14. There are a total of 40 chloride monitoring wells screened at various depths within the aquifer, with the most elevated chlorides found at the base of the aquifer, or at the top of the Wellington formation. Chloride levels significantly dropped in all monitoring wells during 2012. Chloride levels dropped 21.5% in the most elevated portion of the plume in monitoring wells MW 123D and MW EB402C. Those two monitoring wells dropped from 3,770 mg/l to 2,960 mg/l and 4,700 mg/l to 3,690 mg/l respectively between 2011 to 2012. In 2008, KDHE informed KCC staff that since the old landfill was not a point source, the next sampling event at the landfill would be scheduled for 2013. There is no 2012 data from KDHE.

**Level of Remediation Sought:**

**Ideal:** 250 ppm chlorides

**Target:** 500 ppm chlorides.

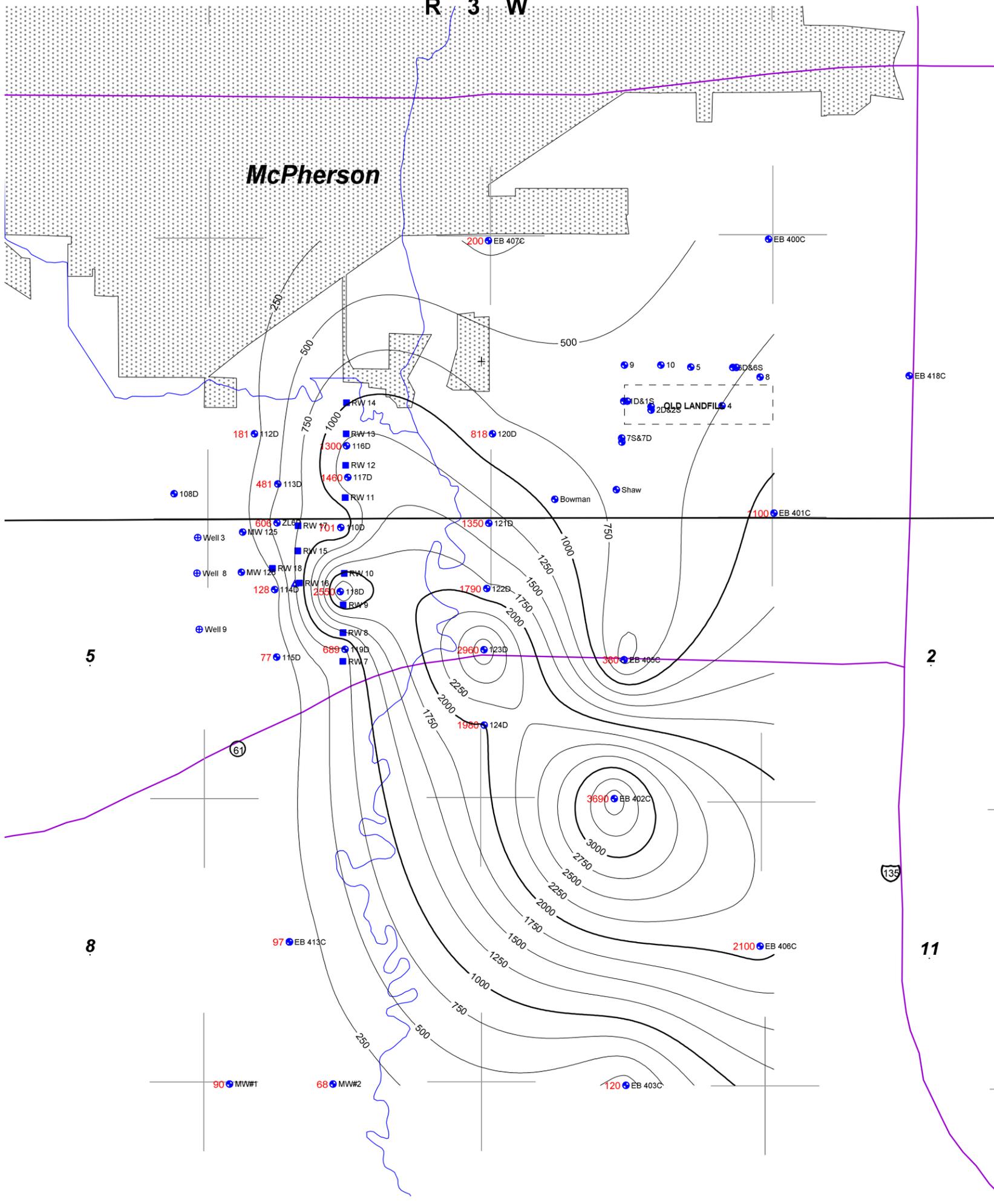
**Recommendations for Future Work:** Collect data on an annual basis from NCRA, and GMD2.

**Estimated Total Costs:** KCC provides funding to GMD2 for sampling surrounding monitoring wells.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
980034-001	17.5 Hrs. / \$507.67	\$534	\$18,505.98
<b>Current Contaminate Level: 68mg/l (MW-2) to 3,690 mg/l (EB 402C)</b>			
<b>Recovery wells ranged from 328mg/l (RW-7) to 1,770mg/l (RW-9)</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation (NCRA)	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 3 W

McPherson



T 19 S  
T 20 S

5

2

8

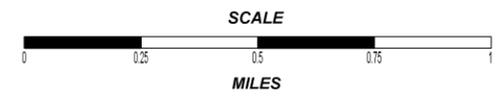
11

**LEGEND**

- Monitoring Well
- NCRA Recovery Well
- ⊕ NCRA Water Supply Well
- 1880 ● 118D *Numbers in RED are Chloride Values*  
*Numbers in BLACK are Monitoring Well Numbers*
- Contour Interval = 250 mg/l

**KANSAS CORPORATION COMMISSION**  
 McPherson Landfill-Johnson Oil Field 2010  
**2012 CHLORIDE CONTOUR MAP**  
 T19S & T20S-R3W, McPherson County, KS

Dist. 2	Project 980034-01	10-30-2012	J. Klock
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**Project: C. E Mount**

**Site Location:** The C.E.Mount Site is located 3 miles north of Haven, Kansas on the south bank of the Arkansas River. The legal location is in the SW ¼ of Section 20, Township 24 South, Range 4 West, in Reno County.

**Impact/Immediacy:** The impact at the site is mainly to the groundwater with some impact to both soil and vegetative resources in the area. There are domestic and irrigation wells, which could be affected, in the area. This site should be classified at a moderate immediacy level at this time.

**Site Description:** The topography is a drainage area associated with riverbank deposits. The area is so heavily vegetated to the point it is difficult to move equipment with out damage to the trees. A break occurred in a nine-inch transit disposal line, which crosses under the Arkansas River to a disposal well. This line break spilled saltwater into a drainage area and then into Arkansas River. The bedrock in the area is at an approximate depth of 240 feet. The alluvial material above the bedrock is mostly sand and gravel. The first aquitard is encountered at a depth of 128 feet and it is approximately ten feet thick. The material below the aquitard is sand and gravel with some silty sand.

**Unusual Problems:** The location of the site in close proximity to the Arkansas River and a private recreation area, as well as the heavy vegetation in the area is problematic. The site was shut down from May 8 thru June 18, 2007 due to floodwaters.

**Status of the Project:** A recovery system has been installed and went into the operational status in June of 2004. Tom Hansen with Bittersweet Energy representing the PRP requested a rebound test be conducted at the site during the 2012 year, which was approved by district staff. Results have been positive and KCC is recommending full closure of this site due to low chloride levels.

**Level of Remediation Sought:**

**Ideal:** 650 mg/l (chloride level in Arkansas River)

**Target:** 1000 mg/l

**Recommendation for Future Work:** KCC District #2 will oversee the clean up and plugging of water wells done by the PRP. Once the site has been returned to an acceptable condition final closure paperwork will be submitted.

**Estimated Total Costs:** Costs of time for district staff to visit site during clean-up and plugging operations, communication with PRP/Consultant.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20030036-001	12 Hrs. / \$315.12		
<b>Current Contaminate Level: 35 ppm Cl- to 1000 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input checked="" type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.795 -97.794 -97.793 -97.792 -97.791 -97.79 -97.789 -97.788 -97.787 -97.786

37.9505  
37.95  
37.9495  
37.949  
37.9485  
37.948  
37.9475  
37.947  
37.9465  
37.946  
37.9455  
37.945



**Comments**

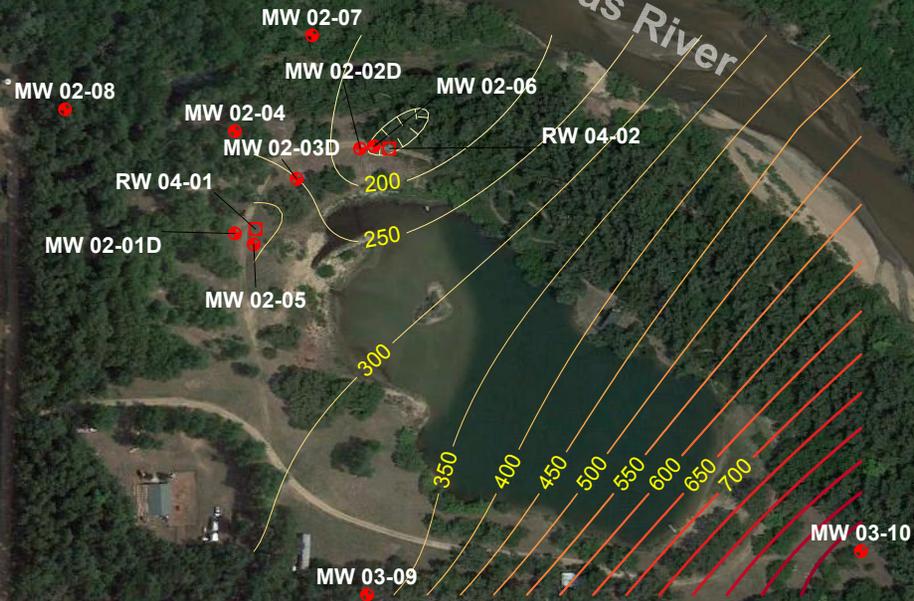
Well sampled by GSI - 6/17/2012

Contour Interval = 50'

Recovery Well

Monitoring Well

Arkansas River



587 ft

Google earth

Imagery Date: 6/7/2011 1991

lat 37.947526° lon -97.790372° elev 1469 ft

Eye alt 4009 ft



**C.E. Mount Remediation Site - Carl Allam Oil Co. - PRP**  
**Section 20 of Township 24 South and Range 4 West, Reno County, Kansas**  
**2012 Groundwater Chloride Levels**  
**District #2 - Sampled on 6/12/2012 - Map Drawn on 10/25/2012 by D. Bollenback**

**Project: Nikkel-Epps**

**Site Location:** The Nikkel-Epps contamination site is located in the NE/4 of Section 18, Township 20 South, Range 1 West, in McPherson County.

**Impact/Immediacy:** Medium-high immediacy level. Chlorides here affect a shallow groundwater aquifer with multiple residences within a half mile some of which use the aquifer as the sole source of water. There is crop irrigation in the area side and down gradient as well.

**Site Description:** The aquifer consists of two to three sand units separated by clay layers. At the base of the aquifer lies the Wellington Shale. The aquifer appears to contain several possible aquitards, which could be impermeable clays separating the sands. It is unknown if these clays are continuous throughout the area. Due to the depth that the saltwater has been found it is assumed that potential pathways down to the Wellington formation exist. The land surface is flat irrigated farmland. Chlorides seem to be settling along the Wellington Shale contact. The top of the Wellington is an erosional disconformity which can allow for high relief channels and bumps with in the shallow aquifer.

**Unusual Problems:** Like many other chlorides problems in the area, the chlorides can be hit and miss and contained in 'hot spots' down-gradient of old evaporation pits and settling in deeper pockets within the aquifer.

**Status of Project:** Research done by Jeff Klock on the Epp's complaint in 2007 found that historically there have been other complaints and records of contamination around the Epp Site. On 3/6/2007 Mike Peterson, of Peterson Irrigation, called the KCC to report that the four irrigation wells he had installed for Ted Nikkel on the Epp's Property had become salty. On 3/7/2007, Jeff Klock with the KCC was onsite to investigate and took samples of the water from the irrigation wells. The Main well tested over 5,000 ppm chlorides. Samples sent to Dr. Donald Whitemore, at the Kansas Geological Survey, were found to have oil field brine as the source of the chlorides. On 8/26/2008, David Bollenback with the KCC returned to the site and sampled the three remaining irrigation wells. Sampling results ranged from 4,500 to 400 ppm chlorides increasing towards the south and the main well. Data from the irrigation logs indicate this maybe due to greater sand development towards the center of the site, which could account for the sinking saltwater plume. A composite sample of all the irrigation wells tested to be 2,300-ppm chlorides and is unusable for agricultural use. KCC recommended that the irrigation well not be used at this time. 6/4/09 KCC sampled the Ratzlaff house well just south of the irrigation wells and lab results at the KCC lab showed that chlorides were 890 ppm. The Ratzlaff's house well is their only source of water at this time.

New monitoring well drilling commenced on November 30<sup>th</sup> 2011 where MW-1, MW-2, and MW-4 were drilled and completed. Heavy rains limited Rig and truck access until February 1, 2012. MW-3, MW-5, MW-3S, and MW-4S were drilled and installed between February 1 and 2, 2012.

On September 19, 2012, all the new groundwater monitoring wells were gauged and sampled for chloride levels. Prior to sampling, groundwater levels were measured in each monitoring well using an electronic water level indicator. Air-lift technology was used to purge a minimum of three well volumes of groundwater from each well before sampling. Conductive measurements were taken during purging to indicate stabilization before sampling. Purge water tested for conductivity was either discharged onto the ground surface or containerized in a 250 gallon ploy tank for disposal depending on salt content. Groundwater samples from each monitoring well were collected in one 250 (ml) polyurethane container for analysis at the KCC District #2 Laboratory. Each sample for this monitoring event was analyzed for the presence of Chloride by United States Environmental Protection Agency (USEPA) Method 8225 (Titrimetric, Silver Nitrate). Chloride levels ranged from 100 mg/L to 5,000 mg/L in MW-1 indicating that the brine is invading section 18 from the north.

**Level of Remediation Sought:**

**Ideal:** <250 ppm

**Target:** 500 ppm

**Recommendations for Future Work:** Further soil borings and monitoring wells is need to the north of the site. It is apparent that the main brine plume has a source/s in section 7. KCC has been notified that the Irrigation wells to the northeast brought in salt contaminated water last in 2011. Investigation in this direction will also be needed to delineate the plume and then possible remedial actions could be planned if possible. Plan for this Phase II should begin as soon as possible.

**Estimated Total Costs:** \$10,000 to \$30,000 to drill the new wells during a Phase II investigation. The KCC District #2 will also need funding for sampling, research, and report preparation.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20100082-001	181.5 Hrs. / \$4,794.44	\$8,318.75	\$8,318.75
<b>Current Contaminate Level: NDA</b>			
<b>Status:</b>			
<input checked="" type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.486 -97.484 -97.482 -97.48 -97.478 -97.476 -97.474 -97.472 -97.47 -97.468 -97.466 -97.464 -97.462 -97.46 -97.458 -97.456 -97.454 -97.452 -97.45



**Legend**

- 150 Chloride Level
- + Monitoring Well
- # Well Number



**Nikkel- Epps Contamination Site**  
 NE Section 18 of T20S & R1W, McPherson County, Kansas  
 2012 Shallow Monitoring Well Chlorides  
 District #2 - Control # 2010082-001 - Drawn on: 10/8/2012 by D.Bollenback

Figure  
2

-97.486 -97.484 -97.482 -97.48 -97.478 -97.476 -97.474 -97.472 -97.47 -97.468 -97.466 -97.464 -97.462 -97.46 -97.458 -97.456 -97.454 -97.452 -97.45



**Legend**

**150** Chloride Level

Monitoring Well

**MW-1** Well Number

Contour interval = 1000'

Imagery Date: 8/24/2011 1991

lat 38.317687° lon -97.467689° elev 1567 ft

Eye alt 10921 ft



**Nikkel- Epps Contamination Site**  
 NE Section 18 of T20S & R1W, McPherson County, Kansas  
 2012 Deep Monitoring Well Chlorides  
 District #2 - Control # 20100082-001 - Drawn on: 10/8/2012 by D.Bollenback

Figure  
1

**Project: Packard Contamination Site**

**Site Location:** Legal location is Section 15, 22, 23 Township 31 South, Range 13 West, in Barber County. 7 miles west of Medicine Lodge on river road.

**Impact/Immediacy:** The ground water has been contaminated, and a very good water well has been contaminated with chlorides. Immediacy level is rated as moderate.

**Site Description:** The salt-water plume is moving to the south away from the Packard #1 oil well. It has contaminated the water supply well and could possibly damage the domestic well at the abandoned house, the supply well in the SE/4 of section 23, and the spring to the southwest.

**Unusual Problems:** The contamination could be from multiple sources.

**Status of Project:** A total of nine samples were taken in 2012. Five monitoring wells samples were taken in addition to three supply wells and one surface sample from a spring. Chloride data shows the plume continuing to move to the southeast towards the Medicine Lodge River from the Packard #1. Chlorides in the northern area of the site have trended lower, while chlorides in the southern area have increased during the last sampling event. MW-4 which has historically been fresh, which provided delineation of the plume to the west, has been destroyed since the site was last sampled in 2009.

**Level of Remediation Sought:**

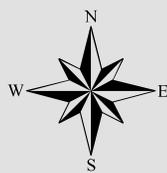
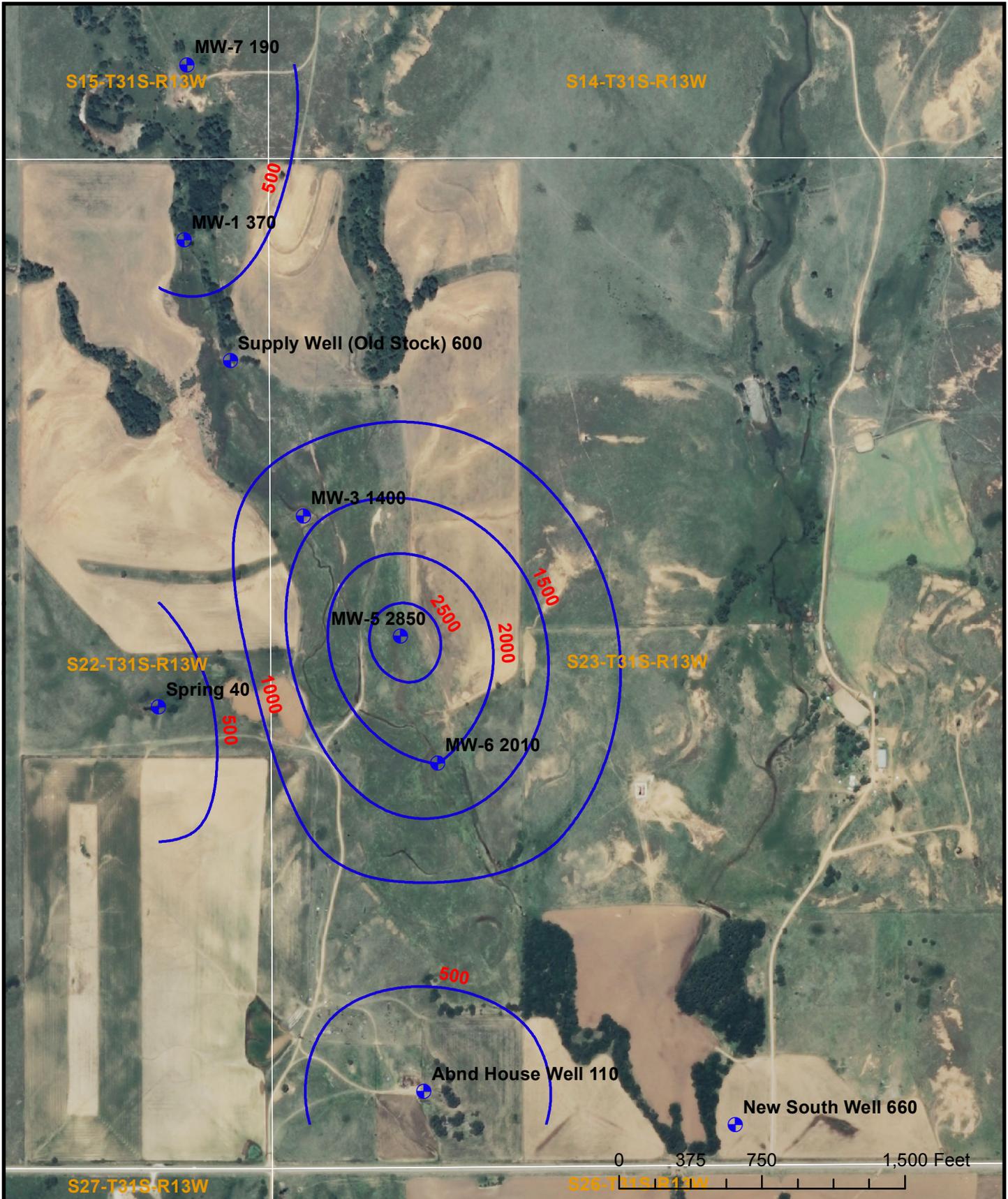
**Ideal:** 250 ppm Chloride

**Target:** 1000 ppm Chloride

**Recommendation for Future Work:** Monitoring will continue on an annual basis as the area continues to be remediated by natural attenuation. As the groundwater in this area is relatively shallow, several holes may be augured in order to gather more comprehensive data on the size and whereabouts of the chlorides. Depending on the information gathered, additional permanent monitoring wells may need to be installed. Analytical may need to be run on the new south supply well in order to determine the if the chlorides are of a natural source, or from oilfield activities.

**Estimated Total Costs: \$10,000**

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970075-00	10 Hrs. / \$269.78		\$310.09
<b>Current Contaminate Level: 40ppm CL- 2850 ppm CL-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



## Packard Contamination Site

Sections 15/22/23-T31S-R13W  
Barber County, Kansas

**Chloride Isopleth Map - sampled on 7-16-2012**

KCC Project Code #970075-00 - District #1 - D. Bernasconi - 9-13-12

**Project: Ruder Creek Contamination Site**

**Site Location:** Section 8 of Township 15 South, Range 18 West, Ellis County

**Impact/Immediacy:** Groundwater. Immediacy level is rated as moderate.

**Site Description:** Alluvial valley fill contaminated by brine ponds and poorly constructed shallow Cheyenne disposal wells. Affected creek drains into the Smokey Hill River upgradient (west) of the City of Hays water supply well field.

**Unusual Problems:** No exact locations of the shallow disposal wells given in the documentation on this site.

**Status of Project:** Well net drilled along Ruder Creek in the summer of 1999. Chloride levels have in 2011 to were 1200 in the north and up to 240 in the south of the well net. Levels in 2012 have not changed much since 2011. They range from 1060 in the north to 300 ppm in the south.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

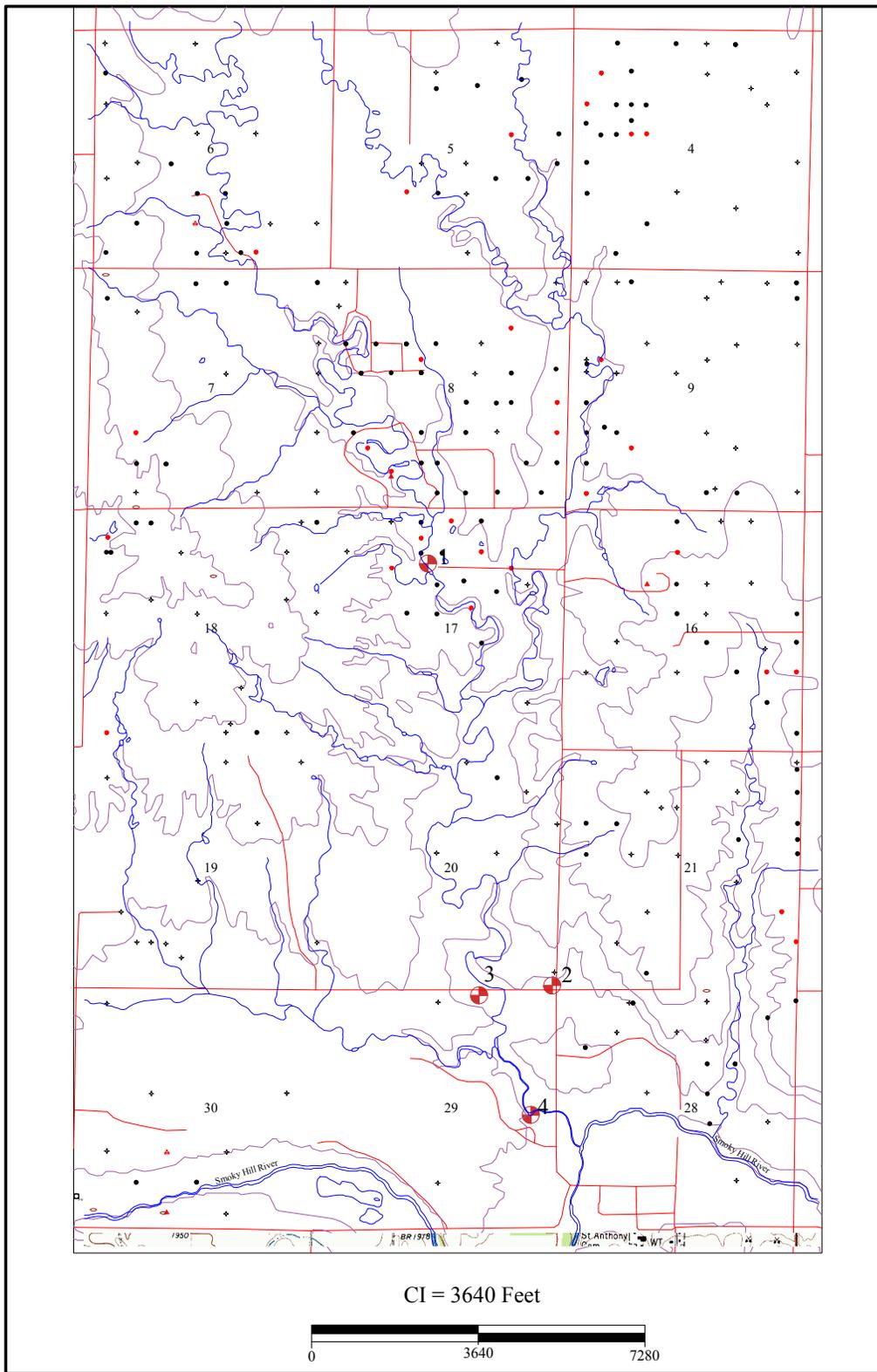
**Target:** 500 ppm Chloride

**Recommendations for Future Work:** Monitor site.

**Estimated Total Costs:** \$29,000

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970082-00	7 Hrs. / \$172.35		\$12,960
<b>Current Contaminate Level: 300 ppm to 1060 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

# R 18 W



Ruder MW 1 2012 1060 ppm Cl-  
 Ruder MW 2 2012 520 ppm Cl-  
 Ruder MW 3 2012 420 ppm Cl-  
 Ruder MW 4 2012 300 ppm Cl-

T  
 15  
 S



CI = 3640 Feet



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Local on                                      |
| ● Plugged Oil Well         | ✱ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                               |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                       |
| ● Abandoned Oil Well       | ✱ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ P 1   |
| ● Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | ■ Tank Battery                                  |
| ● Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ■ Gas Storage Monitoring Well                   |
| ● TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | ■ Plugged Gas Storage Monitoring Well           |
| ● Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ■ TA Gas Storage Monitoring Well                |
| ● Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | ■ Abandoned Gas Storage Monitoring Well         |
| ● Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ■ Gas Storage Injection/Withdraw Well           |
| ● TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | ■ Plugged Gas Storage Injection/Withdraw Well   |
| ● Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ■ TA Gas Storage Injection/Withdraw Well        |
| ● Injection Well           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | ■ Abandoned Gas Storage Injection/Withdraw Well |
| ● Plugged Injection Well   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ● TA Injection Well        | ● TA Water Supply Well              | ● Test Hole                          |   |
| ● Abandoned Injection Well | ● Abandoned Water Supply Well       | ● Sample Site                        |   |

**Kansas Corporation Commission**

Ruder Creek

Sec. 8, Twn. 15 S., Rng. 18 W., Ellis County

**Elevated Chlorides In Drainage**

970082-00

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Date: 21 Oct 2004      District: Hays

**Project: Running Turkey Creek**

**Site Location:** The area of contaminated surface and ground water is in the Running Turkey drainage pattern and extends from the N/2 of 26-19S-2W to the SW/4 of 3-21S-3W. This area is from the Ritz Canton oil field, east of Galva, to the junction of Turkey creek with Running Turkey Creek south of Elyria, in McPherson County.

**Impact/Immediacy:** Oil field impact to the soil can be seen through out the area of the oil fields along the drainage basin. Due to the age of the area oil fields many spills, line leaks and old brine pits has caused damage to soil and water resources. Ground water used for domestic, irrigation and potential public water supplies is the largest and problematic resource affected by the contamination zones. The major source of contamination to the ground water appears to be the past use of evaporation pits. The immediacy rating is moderate to high.

**Site Description:** The topography of the area is flat to gently rolling hills. Most of the land is under cultivation. Running Turkey Creek runs from the north to the south-southwest to the point where it joins Turkey Creek. The ground water also flows in a south to southwest direction with minor hydrologic anomalies. The ground water contamination is highest near the bedrock contact.

**Unusual Problems:** This site could easily be broken up into minimum two or three sites as they are geographically far apart and it appears that there are multiple plumes.

**Status of the Project:** Forty monitoring wells have been installed in the deepest aquifer in area of Running Turkey Creek. The monitoring wells were sampled using submersible pumps or air-lift technology depending on the depth of the well. The monitoring wells which were drilled in 2005 by Ground Water District 2 on the Voshell Site are located on west side of RTC. This winter KCC plans on performing a monitoring well plugging program to remove wells that are broken or not needed at the site. Overall the north and south plumes within this site have remained stable over 2012. Research is currently being conducted on the best placement of future monitoring wells and other ways of data collection for delineation of the many plumes inside the boundaries of the site.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l mg/l

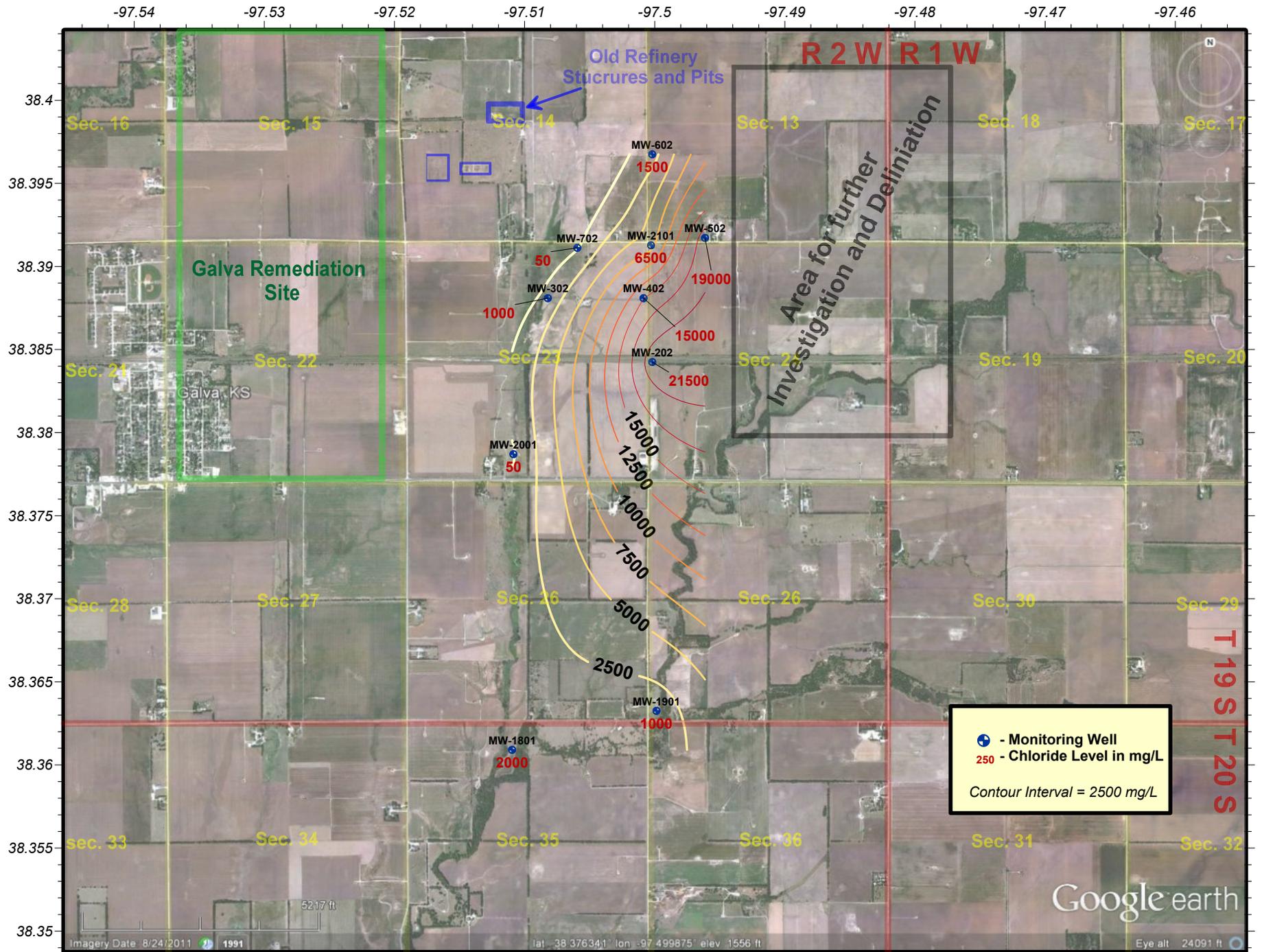
**Target:** 500 mg/l

**Recommendation for Future Works:** Better delineation is needed in many areas of the project area. In the Northern plume area, KCC recommends the installation of no less than 5 monitoring wells to the east and north of the plume for delineation purposes. The southern plume should be integrated with the Voshell contaminated site and delineated to the west. Additional monitoring wells will be needed to replace older damaged wells that are not salvageable, and which are located within the plume areas or in important delineation locations. Remediation could be done utilizing a pump and dump system at the north plume, as that area has the highest chloride readings across the whole site. Unfortunately costs associated with a new remediation system would be comparable to if not more than the system used at the near-by Galva Site. There needs to be continued research into delineation of the plumes inside the site boundaries.

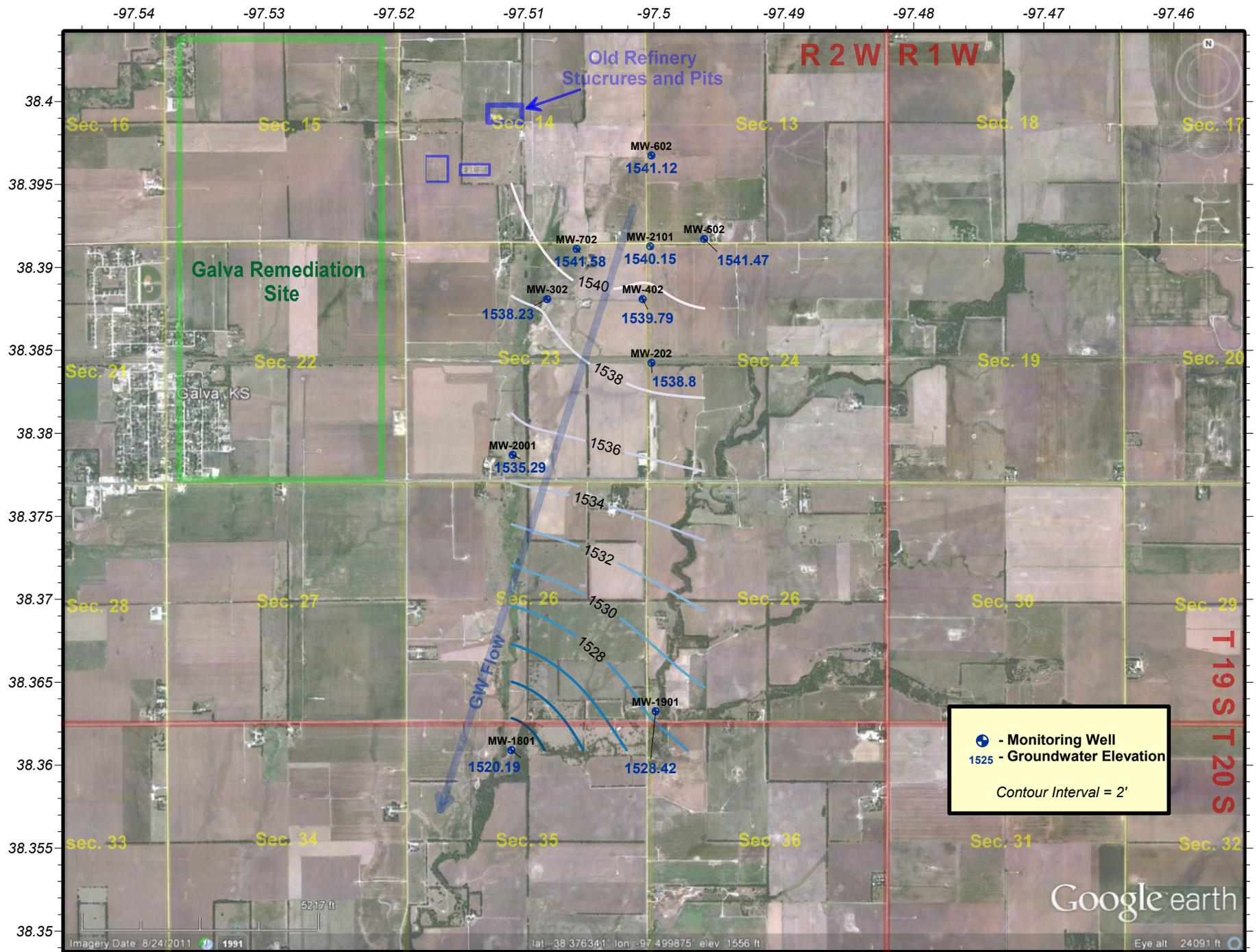
KCC plans to separate the Northern and Southern Plumes into two unique sites. Paperwork will be filed for this change during the winter of 2012-13.

**Estimated Total Cost:** \$50,000+for additional wells, more if a remedial plan is initiated.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20010033-001	71 Hrs. / \$1,815.55		\$61,603.07
<b>Current Contaminate Level: 20 mg/l Cl<sup>-</sup> MW 106 to 21,500mg/l Cl<sup>-</sup> MW202 (Aquifer)</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Northern Running Turkey Creek Contamination and Monitoring Site - KCC Control #20030059-001**  
**Multiple sections in Township 19 & 20 South and Range 2 West, McPherson County, Kansas**  
**2012 Groundwater Chloride Levels**  
**District #2 - Sampled multiple days in October of 2012 - Map Drawn on 10/26/2012 by D.Bollenback**



**Northern Running Turkey Creek Contamination and Monitoring Site - KCC Control #20030059-001**  
**Multiple sections in Township 19 & 20 South and Range 2 West, McPherson County, Kansas**  
**2012 Groundwater Elevation Map**  
**District #2 - Sampled multiple days in October of 2012 - Map Drawn on 10/26/2012 by D.Bollenback**

**Project: City of Russell Contamination Site**

**Site Location:** City of Russell

S/2 of Section 22, Township 13 South, Range 14 West  
SW/4 of Section 23, Township 13 South, Range 14 West  
E/2 E/2 of Section 28, Township 13 S., Range 14 West  
Sec. 26, 27, 34, 35, Township 13 South, Range 14 West  
NE/4 NE/4 Section 3, Township 14 South, Range 14 West  
W/2 NW/4 NW/4 Section 2, Township 14 S, Range 14 W, Russell County

**Impact/Immediacy:** Domestic wells used for irrigation of lawns. Immediacy level is rated as moderate.

**Site Description:** Brine contamination of very shallow aquifer. Potential sources include the approximately 334 wells drilled either in the city limits or in close proximity to the city limits. The associated drill pits, lead lines, tank battery sites, brine tanks, brine lines, disposal and injection wells, and emergency pits have all contributed to the brine contamination. In addition, there are 36 oil wells and brine disposal wells within this site that are either abandoned or have little or no documentation as to having been plugged.

**Unusual Problems:** The number of potential contamination sources. Disposal of contaminated water if remediated may be a problem as there are few disposals in the area.

**Status of Project:** Test holes were drilled in the area during the summer of 2001. The major contributor to the chloride pollution seems to be an old brine pit located to the northwest of the city. However, as the map reveals, there has been extensive drilling in the northwest of Russell, and the contribution from old drill pits and old line leaks cannot be determined. In September of 2004, the monitor well tested at 2200 ppm chloride. No sample taken since this time due to inaccessibility of the monitoring well. No sample in 2012.

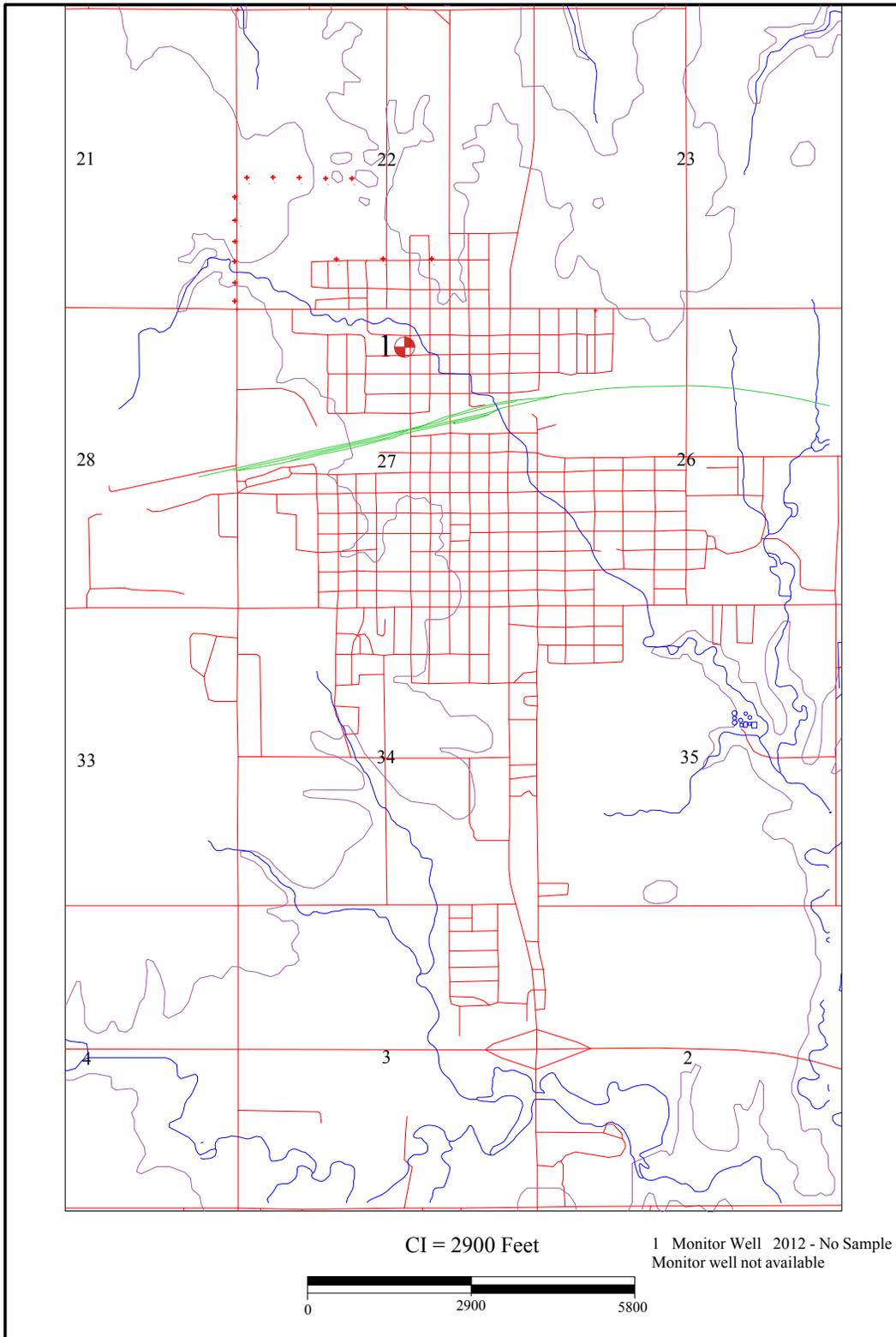
**Level of Remediation Sought:**

**Ideal:** 500 ppm Chloride  
**Target:** 1000 ppm Chloride

**Recommendations for Future Work:** Test hole drilled to the northwest of the city. Further research may be needed to determine whether remediation is feasible, and what action should be taken. Possibilities include a French drain installed to intercept chloride laden water before it enters the city of Russell. The French drain would be approximately 1700' long to a depth of 12 to 17 feet deep. Another consideration may be digging out the 100' X 100' brine pit and hauling it off to a landfill.

**Estimated Total Costs:** \$400,000.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970083-00	3 Hrs. / \$85.75		\$1,192.60
<b>Current Contaminate Level: Unknown</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input checked="" type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



T  
13  
S

T  
14  
S



CI = 2900 Feet

1 Monitor Well 2012 - No Sample  
Monitor well not available



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas Well                    | ⊕ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | ✱ Plugged Oil & Gas Well            | ⊖ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | ⊖ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ✱ Abandoned Oil & Gas Well          | ⊖ Abandoned Domestic Well            | ○ Pit   |
| ● Gas Well                 | ⊙ Dual Completed Oil Well           | ⊖ Agriculture Well                   | ⊖ Tank Battery                                    |
| ● Plugged Gas Well         | ⊙ Plugged Dual Completed Oil Well   | ⊖ Plugged Agriculture Well           | ⊖ Gas Storage Monitoring Well                     |
| ● TA Gas Well              | ⊙ TA Dual Completed Oil Well        | ⊖ Abandoned Agriculture Well         | ⊖ Plugged Gas Storage Monitoring Well             |
| ● Abandoned Gas Well       | ⊙ Abandoned Dual Completed Oil Well | ⊖ Irrigation Well                    | ⊖ TA Gas Storage Monitoring Well                  |
| ● Disposal Well            | ⊙ Dual Completed Gas Well           | ⊖ Plugged Irrigation Well            | ⊖ Abandoned Gas Storage Monitoring Well           |
| ● Plugged Disposal Well    | ⊙ Plugged Dual Completed Gas Well   | ⊖ Abandoned Irrigation Well          | ⊖ Gas Storage Injection/Withdrawal Well           |
| ● TA Disposal Well         | ⊙ TA Dual Completed Gas Well        | ⊖ Public Water Supply Well           | ⊖ Plugged Gas Storage Injection/Withdrawal Well   |
| ● Abandoned Disposal Well  | ⊙ Abandoned Dual Completed Gas Well | ⊖ Plugged Public Water Supply Well   | ⊖ TA Gas Storage Injection/Withdrawal Well        |
| ● Inject on Well           | ⊖ Water Supply Well                 | ⊖ Abandoned Public Water Supply Well | ⊖ Abandoned Gas Storage Injection/Withdrawal Well |
| ● Plugged Inject on Well   | ⊖ Plugged Water Supply Well         | ⊖ Possible Location                  |   |
| ● TA Injection Well        | ⊖ TA Water Supply Well              | ⊖ Test Hole                          |   |
| ● Abandoned Inject on Well | ⊖ Abandoned Water Supply Well       | ⊖ Sample Site                        |   |

**Kansas Corporation Commission**

City of Russell

Sec. 22, Twn. 13 S., Rng. 14 W., Russell County

**Elevated Chlorides in Cities Domestic Wells**

970083-00

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Date: 21 Oct 2004 District: Hays

**Project: Russell Rural Water District #1**

**Site Location:** Section 34, Township 14 South, Range 14 West, Russell County

**Impact/Immediacy:** Public Water Supply Well. Immediacy level is rated as moderate to high.

**Site Description:** Public water supply well in alluvial filled valley. Dakota Formation subcrops in this valley.

**Unusual Problems:** Chloride source could be oil field related, or could be a factor of proximity to the Dakota Formation. During World War II, the Dakota Formation in this area was used as a disposal zone for produced brine waters.

**Status of Project:** Monitoring. Last chlorides were taken in September of 2001. Chloride levels in the affected well were 600 ppm. The following is a listing of the wells sampled.

Well	Cl-2008	Cl-2009	Cl-2010	Cl-2011	CL-2012
MW01	300 ppm	200 ppm	700 ppm	500 ppm	700 ppm
MW02	Plugged	Plugged	Plugged	Plugged	Plugged
MW03	1100 ppm	1200 ppm	700 ppm	900 ppm	800 ppm
MW05	1000 ppm	950 ppm	900 ppm	800 ppm	900 ppm

**Level of Remediation Sought:**

**Ideal:** 100 ppm Chloride

**Target:** 250 ppm Chloride

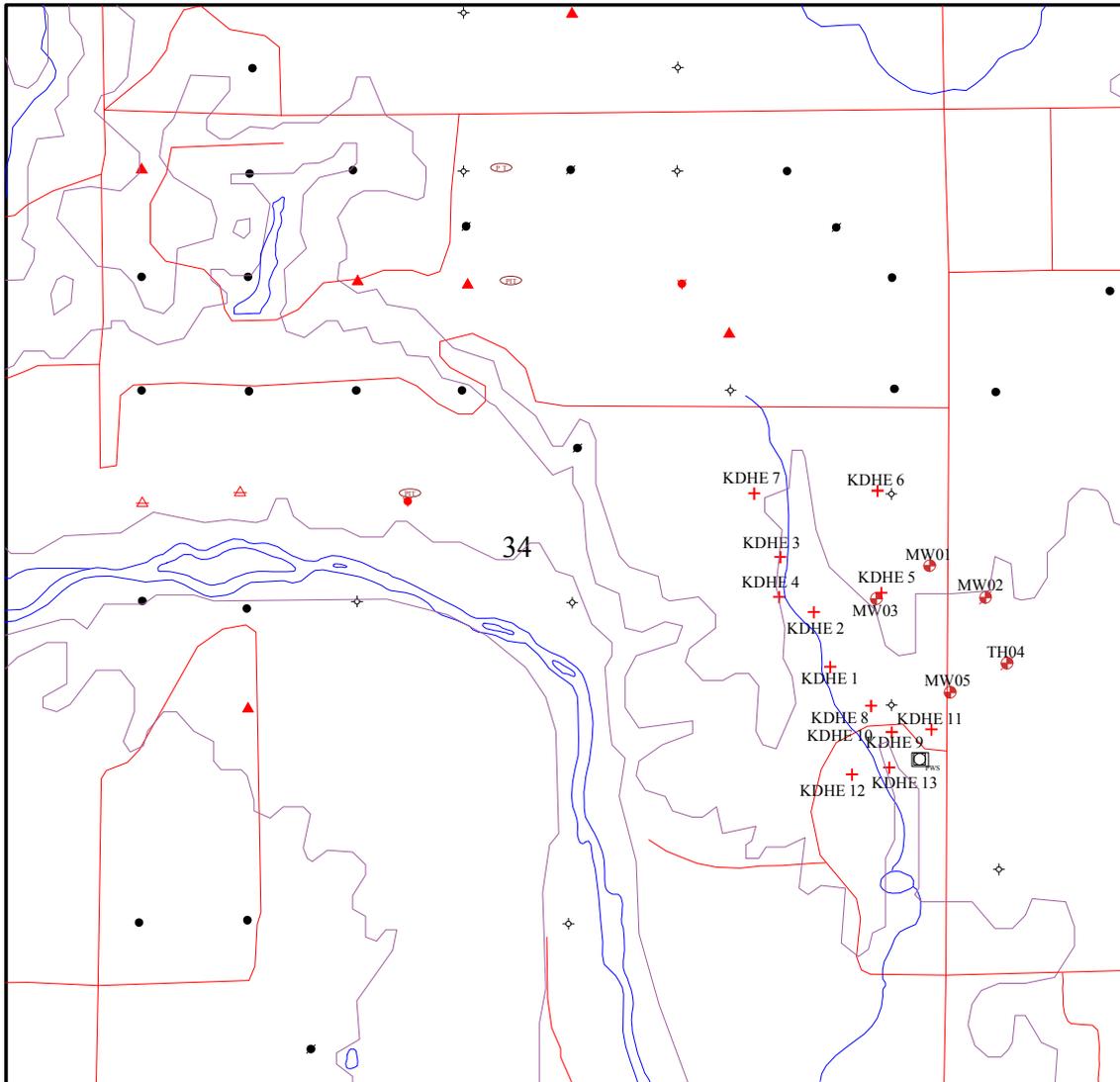
**Recommendations for Future Work:** Continue monitoring.

**Estimated Total Costs:** This site has been studied extensively. The estimated costs from KCC and KDHE have been \$30,000.00+. Continued monitoring costs will be \$3,000.00.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
<b>970084-00</b>	<b>11 Hrs. / \$277.51</b>		
<b>Current Contaminate Level: 700 ppm to 900 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

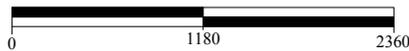
R 14 W

T  
14  
S



Russell RWD MW1 2012 - 700 ppm Cl-  
 Russell RWD MW2 2005 - Plugged  
 Russell RWD MW3 2012 - 800 ppm Cl-  
 Russell RWD MW5 2012 - 900 ppm Cl-

CI = 1180 Feet



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ★ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | ★ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ★ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ★ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ P1  |
| ⊙ Gas Well                 | ⊙ Dual Completed Oil Well           | □ Agriculture Well                   | ⊞ Tank Battery                                    |
| ⊙ Plugged Gas Well         | ⊙ Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ⊞ Gas Storage Monitoring Well                     |
| ⊙ TA Gas Well              | ⊙ TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | ⊞ Plugged Gas Storage Monitoring Well             |
| ⊙ Abandoned Gas Well       | ⊙ Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ⊞ Abandoned Gas Storage Monitoring Well           |
| ▽ Disposal Well            | ⊙ Dual Completed Gas Well           | □ Plugged Irrigation Well            | ⊞ Gas Storage Injection/Withdrawal Well           |
| ▽ Plugged Disposal Well    | ⊙ Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ⊞ TA Gas Storage Injection/Withdrawal Well        |
| ▽ TA Disposal Well         | ⊙ TA Dual Completed Gas Well        | □ Public Water Supply Well           | ⊞ Plugged Gas Storage Injection/Withdrawal Well   |
| ▽ Abandoned Disposal Well  | ⊙ Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ⊞ TA Gas Storage Injection/Withdrawal Well        |
| △ Injection Well           | ⊙ Water Supply Well                 | □ Abandoned Public Water Supply Well | ⊞ Abandoned Gas Storage Injection/Withdrawal Well |
| △ Plugged Injection Well   | ⊙ Plugged Water Supply Well         | □ Possible Location                  |   |
| △ TA Injection Well        | ⊙ TA Water Supply Well              | +                                    |   |
| △ Abandoned Injection Well | ⊙ Abandoned Water Supply Well       | x                                    |   |

**Kansas Corporation Commission**

Russell Rural Water District

Sec. 34, Twn. 14 S., Rng. 14 W., Russell County

Elevated Chlorides in Public Supply Well

970084-00

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Date: 21 Oct 2004      District: Hays

**Project: *Sample Contamination Site***

**Site Location:** The contamination area is located one mile north of Wichita, adjacent to the intersection of 45<sup>th</sup> Street North and Rock Road. The legal location is the NW of the NW of Section 29 Township 26 South Range 2 East, Sedgwick County.

**Impact/Immediacy:** KCC District #2 has raised this site to medium immediacy level from low. The chloride intrusion affects a groundwater aquifer that is low volume. Housing development in the area could see rise in water well installation for domestic and heating/cooling systems.

**Site Description:** The site is located on the outskirts of a metropolitan housing development, but is being encroached on from all sides. The topsoil is hard clay (Wellington formation). The underlying aquifer is a thin low volume zone that is directly affected by precipitation. Total depth of the monitor well is nineteen feet.

**Unusual problems:** A portion of the chlorides is natural and could not readily be remediated. The aquifer is low volume and difficult to clean up. The urban setting logistically makes remediation difficult. Continued residential development could see increased attempts of use of the groundwater in the area.

**Status of Project:** A water sample was collected on July 11, 2012, which tested 5,000-mg/l chlorides. The chlorides have decreased from 2011 by 500 ppm but are still higher than years before 2011. Such low change in chlorides can be considered stable.

**Level of Remediation Sought:**

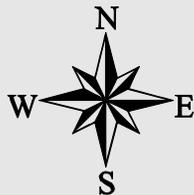
**Ideal:** 250 mg/l Chloride

**Target:** 500 mg/l Chloride

**Recommendations for Future Work:** Continue to monitor site. Site is located only one mile north of the District #2 Field Office so limited resources are needed to continue monitoring this site. Remediation of this site could be started by pumping fluid from the monitoring well to the oil field salt-water tank located on site. Research and investigate any new domestic wells in the area for contamination and begin sampling domestic wells in the area for annual report.

**Estimated Total Costs:** \$500 per year for site inspection, sample collection, and research.

<b>Control No.</b>	<b>Staff Hours/Expenditures</b>	<b>Fund Expenditures</b>	
		<b>FY 2012/13</b>	<b>Total</b>
<b>970088-00</b>	<b>16 Hrs. / \$402.18</b>		
<b>Current Contaminate Level: 5000 mg/l collected 7/11/2012</b>			
<b>Status:</b>			
<input type="checkbox"/> <b>1. Site Assessment</b>	<input type="checkbox"/> <b>2. Short Term Monitoring</b>	<input checked="" type="checkbox"/> <b>3. Investigation</b>	
<input checked="" type="checkbox"/> <b>4. Long Term Monitoring</b>	<input type="checkbox"/> <b>5. Remediation Plan</b>	<input type="checkbox"/> <b>6. Installation</b>	
<input type="checkbox"/> <b>7. Remediation</b>	<input type="checkbox"/> <b>8. Post Rem. Monitoring</b>	<input type="checkbox"/> <b>9. Resolved</b>	



## Sample 'A' Contamination Site

NW - Sec. 29 - T 26 S - R 2 E, Sedgwick County, Kansas

2012-13 Area Map with Chlorides

KCC Project Code #970088-00 - District #2 - B. Milner - 10/18/2012

**Project:** *Louis Sander Contamination Site*

**Site Location:** NW/4 of Section 03, Township 14 South, Range 15 West, Russell County

**Impact/Immediacy:** Domestic, stock well. Immediacy level is rated as low.

**Site Description:** Shallow aquifer affected by oilfield activity. Stock well only.

**Unusual Problems:** No primary source identified.

**Status of Project:** Chloride levels at 1650 ppm in stock well located in the S2 SE NW NW of section 3 as of October 2005. Chloride levels in this well were 1500 ppm as of September 2007. These levels dropped to 1250 in 2008. No sample was taken in 2012 due to well being inaccessible.

**Level of Remediation Sought:**

**Ideal:** 500 ppm Chloride

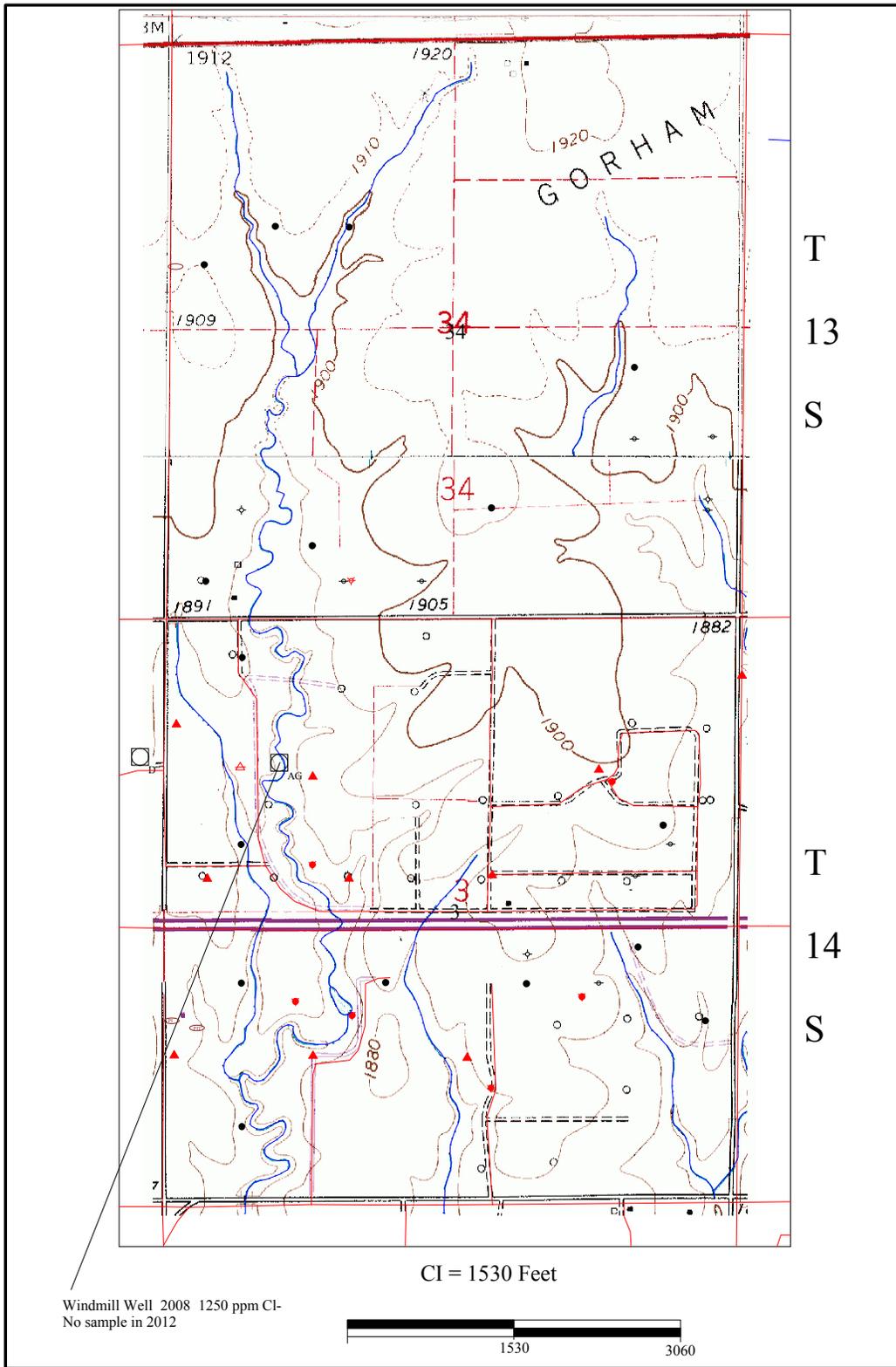
**Target:** 1000 ppm Chloride

**Recommendations for Future Work:** Monitor site.

**Estimated Total Costs:** \$300.00

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970089-00	2 Hrs. / \$59.46		
<b>Current Contaminate Level: Unknown</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 15 W



- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ★ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location  |
| ● Plugged Oil Well         | ★ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ★ TA Oil & Gas Well                 | □ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ★ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ Pit   |
| ★ Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | □ Tank Battery                                    |
| ★ Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | □ Gas Storage Monitoring Well                     |
| ★ TA Gas Well              | ● TA Dual Completed Oil Well        | □ Abandoned Agriculture Well         | □ Plugged Gas Storage Monitoring Well             |
| ● Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | □ Abandoned Gas Storage Monitoring Well           |
| ★ Disposal Well            | ● Dual Completed Gas Well           | □ Plugged Irrigation Well            | □ Abandoned Gas Storage Monitoring Well           |
| ★ Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | □ Gas Storage Injection/Withdrawal Well           |
| ★ TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | □ Plugged Gas Storage Injection/Withdrawal Well   |
| ● Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | □ TA Gas Storage Injection/Withdrawal Well        |
| ▲ Injection Well           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | □ Abandoned Gas Storage Injection/Withdrawal Well |
| ▲ Plugged Injection Well   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ▲ TA Injection Well        | ● TA Water Supply Well              | +                                    |   |
| ▲ Abandoned Injection Well | ● Abandoned Water Supply Well       | ×                                    |   |

**Kansas Corporation Commission**  
 Louis Sander  
 Sec. 3, Twn. 14 S., Rng 15 W., Russell County  
 Chloride Plume 1963  
 970089-00

Date: 21 Oct 2004      District: Hays

**Project: Schraeder Contamination Site**

**Site Location:** Legal location is E/2 of Section 3 and W/2 of Section 2, Township 24 South, Range 24 West, Hodgeman County.

**Impact/Immediacy:** Contamination to groundwater, stock wells and possibly an irrigation well in the future. Immediacy level is rated as low.

**Site Description:** The chloride concentration of the Ogallala formation water supplying a stock well has been high in chlorides.

**Unusual Problems:** None.

**Status of Project:** Eight groundwater samples were taken in 2012. Chlorides in these samples ranged from 40ppm chlorides at Well K, to 1620ppm chlorides in Well C. These values are slightly increased this from the 2011 samples. There has been a slow decline in the chlorides at this site due to natural attenuation; this trend is expected to continue in the future. Irrigation well I is no longer in use and the water being pumped to the pivot is from Irrigation well H. Irrigation wells B and J are no longer being used so no samples were retrieved from these wells. Windmill F is damaged and not capable of pumping so no sample was taken, windmill D, at the landowner's residence, was inoperable at the time of sampling but there are plans to rework the well. The landowner has recently drilled a new stock well in the NW/Q of section 2, this well was added to the sampling plan this year and current chlorides are 80ppm.

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride

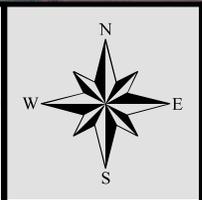
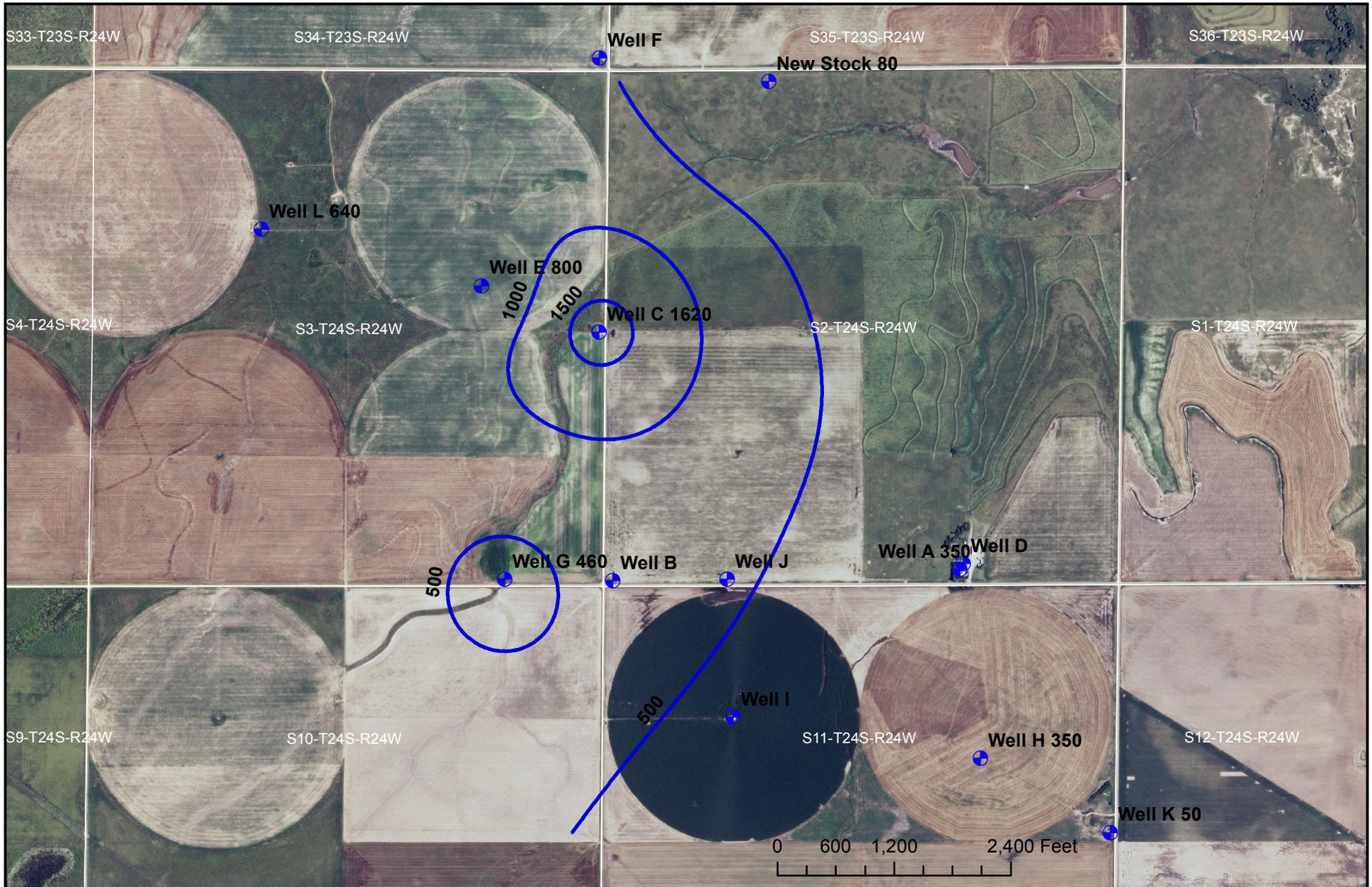
**Target:** 350 ppm Chloride

**Recommendations for Future Work:** The landowner should be contacted to see if access can be granted to enter irrigation wells B and J to obtain a current sample as these wells are up gradient from the residence on the property.

The landowner for Windmill F should be contacted to see if repairs are going to be made, if not, the idea of pulling the rods should be explored so the KCC can resume sampling this well.

**Estimated Total Costs:** \$30,000.00.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970013-00	25.5 Hrs. / \$640.16		\$1,590.90
<b>Current Contaminate Level: 50ppm Cl- to 1620 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



**Schraeder Contamination Site**  
 Sections 2/3/11-T24S-R24W  
 Hodgeman County, Kansas  
**Chloride Isopleth Map - sampled on 6-28 and 7-9-2012**  
*KCC Project Code #970013-00 - District #1 - D. Bernasconi - 11-6-12*

**Project: *Leo Schruben-Rogers Contamination Site***

**Site Location:** SE/4 of Section 18, Twn. 7 S., Rng. 17 W., Rooks County

**Impact/Immediacy:** Groundwater. Domestic well is the sole source of water for the residence but a reverse osmosis unit is installed. Immediacy level is rated as low.

**Site Description:** The groundwater was contaminated by oil field brine on two separate occasions. The site is located within terrace alluvium of the South Fork of the Solomon River. Land use in the area is agricultural and oil field production. Area wells consist of domestic water wells.

**Unusual Problems:** None.

**Status of Project:** Samples taken in 2011 were at 600 ppm chloride. In 2012 they had fallen to 500 ppm.

**Level of Remediation Sought:**

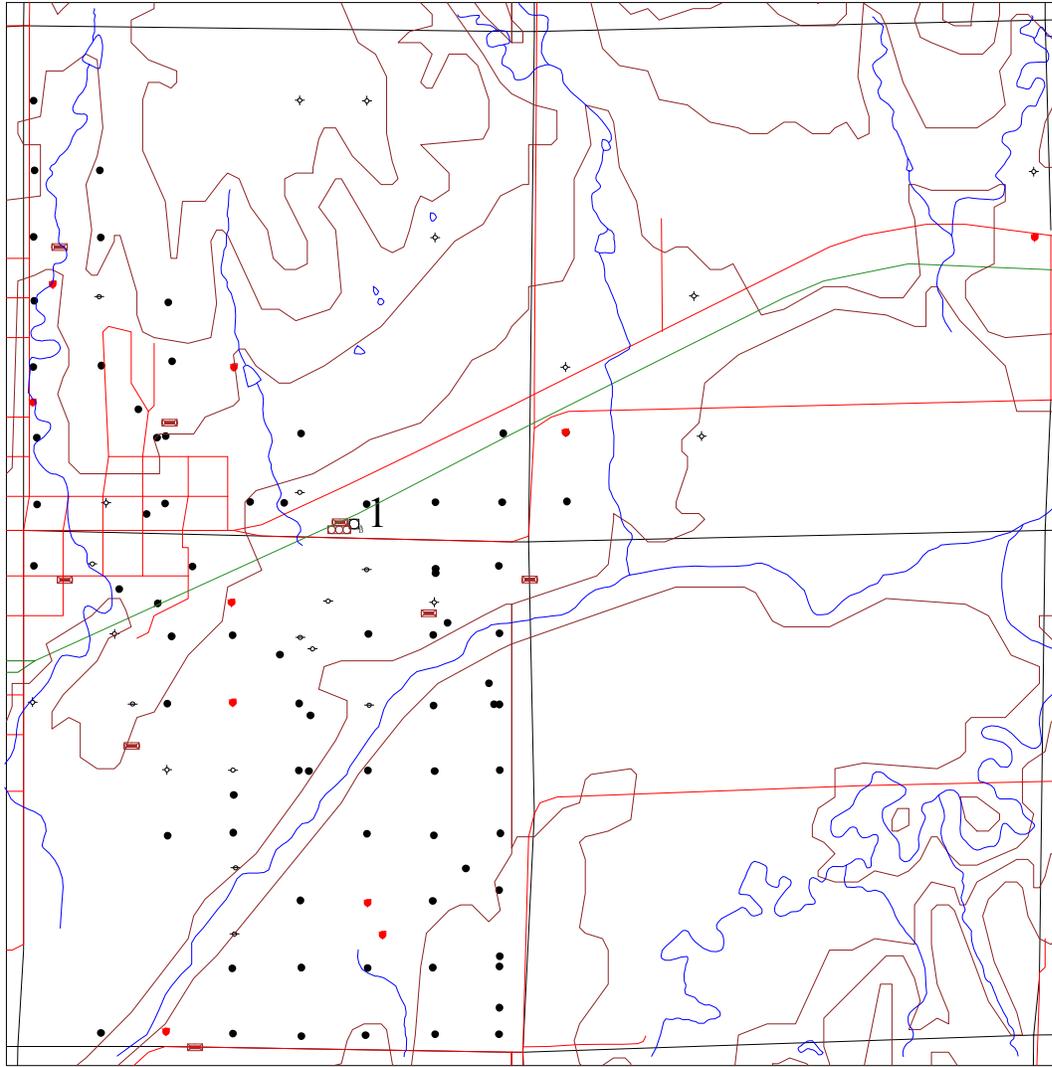
**Ideal:** 100 ppm Chloride (background level)

**Target:** 250 ppm Chloride

**Recommendations for Future Work:** Continue to monitor. Domestic well is being used to water cattle. This continued use of the water well helps eliminate the chloride contamination.

**Estimated Total Costs:** \$2000.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970014-00	7 Hrs. / \$172.35		
<b>Current Contaminate Level: 500 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



Schruben-Rogers Domestic Well 2012 500 ppm Cl-

- |                            |                                     |                                      |   |
|----------------------------|-------------------------------------|--------------------------------------|---|
| ● Oil Well                 | ✱ Oil & Gas Well                    | ◇ Dry Hole                           | ○ Location  |
| ✱ Plugged Oil Well         | ✱ Plugged Oil & Gas Well            | □ Domestic Well                      | ● Monitoring Well                                 |
| ● TA Oil Well              | ✱ TA Oil & Gas Well                 | ⊠ Plugged Domestic Well              | ● Plugged Monitoring Well                         |
| ● Abandoned Oil Well       | ✱ Abandoned Oil & Gas Well          | □ Abandoned Domestic Well            | ○ P1  |
| ✱ Gas Well                 | ● Dual Completed Oil Well           | □ Agriculture Well                   | ☐ Tank Battery                                    |
| ✱ Plugged Gas Well         | ● Plugged Dual Completed Oil Well   | □ Plugged Agriculture Well           | ☐ Gas Storage Monitoring Well                     |
| ✱ TA Gas Well              | ● TA Dual Completed Oil Well        | ⊠ Abandoned Agriculture Well         | ☐ Plugged Gas Storage Monitoring Well             |
| ✱ Abandoned Gas Well       | ● Abandoned Dual Completed Oil Well | □ Irrigation Well                    | ☐ TA Gas Storage Monitoring Well                  |
| ▽ Disposal Well            | ● Dual Completed Gas Well           | ⊠ Plugged Irrigation Well            | ☐ Abandoned Gas Storage Monitoring Well           |
| ▽ Plugged Disposal Well    | ● Plugged Dual Completed Gas Well   | □ Abandoned Irrigation Well          | ☐ Gas Storage Injection Withdrawal Well           |
| ▽ TA Disposal Well         | ● TA Dual Completed Gas Well        | □ Public Water Supply Well           | ▽ Plugged Gas Storage Injection/Withdrawal Well   |
| ▽ Abandoned Disposal Well  | ● Abandoned Dual Completed Gas Well | □ Plugged Public Water Supply Well   | ▽ TA Gas Storage Injection/Withdrawal Well        |
| ▲ Injection Well           | ● Water Supply Well                 | □ Abandoned Public Water Supply Well | ▽ Abandoned Gas Storage Injection/Withdrawal Well |
| ▲ Plugged Injection Well   | ● Plugged Water Supply Well         | □ Possible Location                  |   |
| ▲ TA Injection Well        | ● TA Water Supply Well              | +                                    |   |
| ▲ Abandoned Injection Well | ● Abandoned Water Supply Well       | ×                                    |   |

**Kansas Corporation Commission**  
 Schruben-Rogers  
 Sec. 18, Twn. 7 S., Rng. 17 W.  
 Contaminated Domestic Well  
 970014-00  
 Date: 21 Oct 2004      District: Hays

**Project: Schulte Brine Contamination Site**

**Site Location:** The legal description is eastern half of sections 7 & 18, and all of Sections 8 and 17, Township 28 South, and Range 1 West of Sedgwick County, Kansas. To the northeast lies the Wichita Mid-Continent Airport. The site is in the drainage systems of the Cowskin Creek and Dry Creek. Dry Creek is a tributary of Cowskin Creek and flows in an easterly direction across the southern part of the site. The confluence of the two creeks is approximately three miles to the southeast of Schulte.

**Impact/Immediacy:** The impact is to groundwater resources including public supply wells and domestic water wells. The immediacy level is rated as moderate.

**Site Description:** The project area consists of a groundwater plume contaminated by oilfield brine moving in an east-southeasterly direction. The apparent source for the contamination is salt-water disposal ponds that were associated with activities in the Schulte oil field and some wells in section 6. The site is situated between Wichita Mid-Continent Airport to the northeast and the unincorporated town of Schulte to the west. The land use is a combination of light industrial, agricultural and residential. The aquifer consists of unconsolidated sand, clay and gravel deposits. New construction of commercial/industrial complexes have occurred directly east of the recovery wells at the site. Local geology consists of topsoil underlain by a brown to reddish clay to silty clay inter mixed with sand lenses. Upper clay thickness ranges from 8.5 feet to 33 feet from east to west. Below the top clay there is poorly sorted sand and gravel beds intermixed with thin clay and silt lenses. This sand unit thins to the west unlike the clays above. Under that top sand unit is a brown to red clay silty-clay aquatard that can be up to 60 feet in thickness near the west end of the site. Below the middle clay aquatard is another sand unit. This sand unit is poorly sorted fine to coarse grained with gravel and inter-bedded clay and silt layers. A bottom clay layer separates the sand from the blue Wellington Formation bedrock.

Local hydrology is based within the two sand units that reside above the Permian bedrock but in between substantial clay layers. The middle clay aquatard separates the two aquifers and historical investigations suggest that the brine plume has in the past migrated along the top of this aquatard. Groundwater below the aquatard in the area of the plume has been tested and appears to be historically uncontaminated. The groundwater movement is to the east south-east, with almost easterly movement along the eastern edge of the site.

**Unusual Problems:** The construction of new structures over the possible plume down-gradient of the recovery system limits future recovery in that direction. Much of the area is for sale for future industrial expansion and could complicate continuance of the remediation of the site.

**Status of Project:** Remediation by the KCC began at this site on November 1, 2001. The site currently consists of 2 recovery wells, 11 monitoring wells, and one saltwater disposal well that is used to dispose of brine impacted water. On May 21, 2012, ten groundwater monitoring wells (MW-1, MW-6, MW-7, MW-8, MW-9, MW-15, MW-101, MW-201, MW-301, MW-401) were gauged and sampled. Prior to sampling, groundwater levels were measured in each monitoring well using an electronic water level indicator. A submersible Proactive® Water-Spout water pump was used to purge a minimum of three well volumes of groundwater from each well before sampling. Purge water was tested for conductivity prior to being discharged onto the ground surface at the Site or contained in a 250 gallon poly-tank if conductivity was high before disposed of into a deep injection well. The vault at MW-1 has sunk and J-plugs no longer fit underneath the lid. MW-4 was not sampled due to the high amount of Poison Ivy encircling the well. KCC plans to spray the area and return for sampling at a later date. Groundwater samples from each monitoring well were collected in one 250 (ml) polyurethane container for analysis at the KCC District #2 Laboratory. Each sample for this monitoring event was analyzed for the presence of Chloride by United States Environmental Protection Agency (USEPA) Method 9253 (Titrimetric, Silver Nitrate).

Groundwater levels below the ground surface ranged from approximately 14.02 to 27.96 feet in the sampled wells during the May 21, 2012 event, and decreased an average of 0.85 feet since the August 12, 2011 gauging event. Groundwater flow direction flows to the southeast towards the center of the site before turning to an easterly direction. The western hydraulic gradient was found to be 0.000669759 ft/ft between MW-1 and MW-9, and the eastern gradient was 0.0011875 ft/ft from MW-401 to MW-301. This indicates a slower water movement to the southeast before the gradient increases to the east as it approaches the Cowskin Creek.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l Chloride  
**Target:** 500 mg/l Chloride

**Recommendations for Future Work:** The East Recovery Well Pump has been replaced. Continue to notify the local water-well contractors of the dangers of constructing wells through both aquifers is needed. KCC plans to approach many of the domestic well owners for permission to sample their well water for Chlorides. The disposal well seems to be taking water at a very slow rate, the well needs to be acidized to increase the capability of the well to dispose of fluids. Work is underway to acidize the Lamp #1.

The data resulting from the May 2012 groundwater sampling event show slight increases in the monitoring wells located down gradient in the center of the plume. Slight increases occurred along the outskirts of the plume in the southern delineation well. It is expected that this trend will continue in the future as the plume slowly migrates to the southeast then to the east towards Cowskin creek. The industrial area to the southeast of the plume has many large groundwater wells that could pull the plume to the south further, but this possibility has not been confirmed. Addition down gradient wells would be beneficial for monitoring the plume migration as well as its delineation.

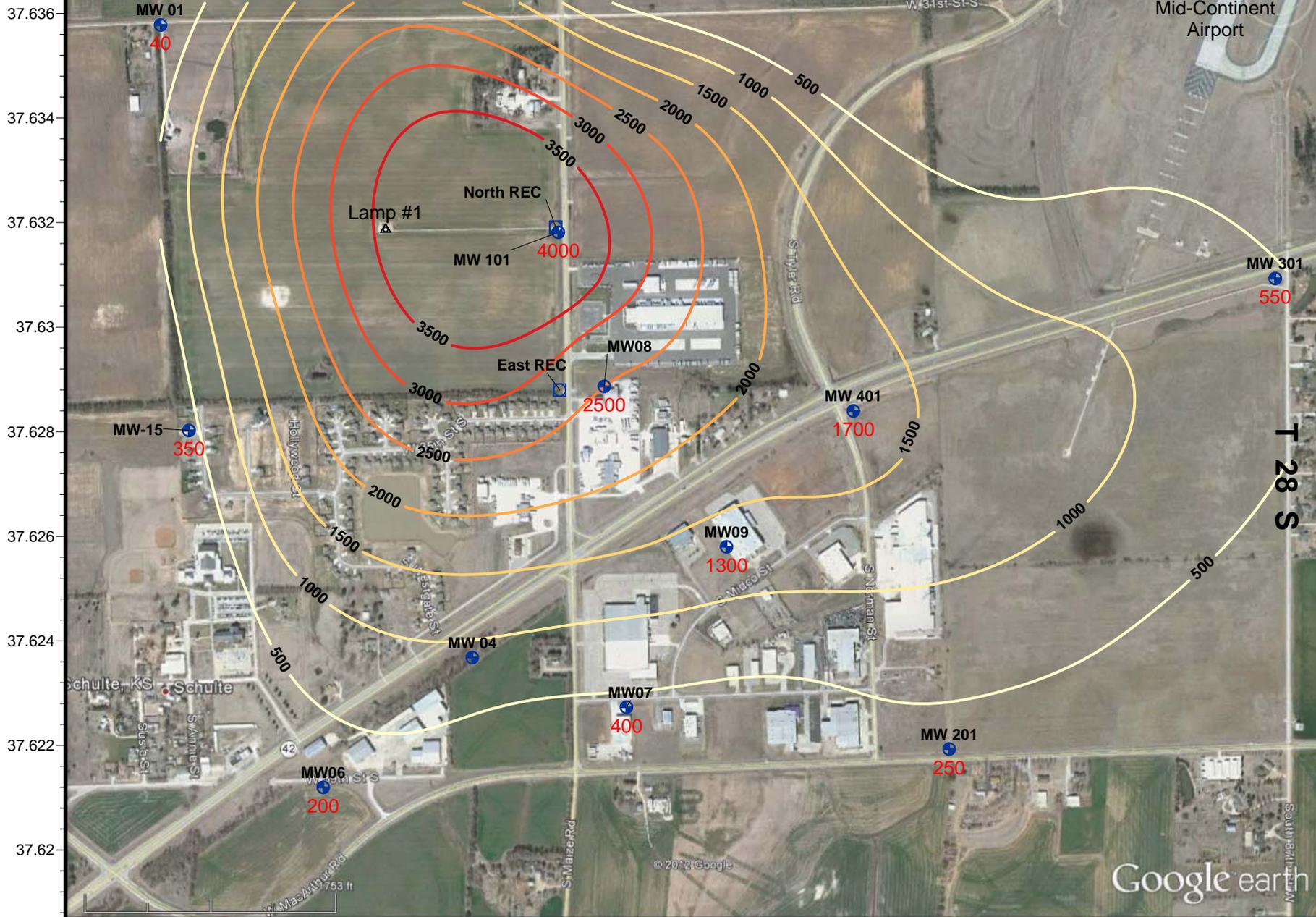
**Estimated Total Costs:** \$8,000-10,000 to upkeep the remediation system, perform annual groundwater sampling, and continue investigation of new water wells currently being installed inside the known plume.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970015-00	202 Hrs. / \$5,207.88	\$2,223.15	\$142,595.03
<b>Current Contaminate Level: 40 mg/l in MW #1 to 4,000 mg/l in MW# 101</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.472 -97.47 -97.468 -97.466 -97.464 -97.462 -97.46 -97.458 -97.456 -97.454 -97.452 -97.45 -97.448 -97.446 -97.444

R 1 W

Wichita  
Mid-Continent  
Airport



Imagery Date: 2/25/2012 1996

Lat: 37.627821° Lon: -97.458391° elev: 1330 ft

Eye alt: 8903 ft



### Schulte Contamination Site - Monitoring and Remediation Wells

Sections 7 & 8, T 28 S & R 1 W, Sedgwick County, Kansas

Groundwater Chloride Concentrations May 2012

KCC Project Number #970015-00 - District #2 - D. Bollenback - Map Drawn: 6/4/2012 - Site Sampled: 5/21/2012



**Project: Selzer -Bitikofer Contamination Site**

**Site Location:** The Selzer-Bitikofer Site is two miles east and 2 miles south of Canton, McPherson County, Kansas, centered approximately at the corner of Iron Horse Road and 29nd Avenue, in Sections 35 and 36, Township 19 South, Range 1 West and sections 1 and 2, Township 20 South, Range 1 West. The Selzer-Bitikofer Site currently comprised of agricultural fields, pastures, and residences.

**Impact/Immediacy:** The site affects West Emma Creek and local groundwater. The immediacy level of the site is listed as moderate.

**Site Description:** Geologically, the site is located in far eastern edge of the Lower Arkansas River basin, and is characterized by fine textured soil with a silty clay loam surface soil and a strong clay pan development. Sediments at the site consist mainly of unconsolidated Pleistocene deposits of the McPherson Formation (KGS bulletin 79). The immediate area is topographically flat, with slopes ranging from 0-3 percent. Based on the site evaluation to date, the underlying material to a depth of approximately 35 feet was found to consist primarily of stiff clay and/or sandy clay, overlying fine to coarse sands of varying thickness. The sand member is underlain by an impermeable dense clay layer that is consistent throughout the site. Bedrock in the area consists of the Kiowa Shale Formation and lies approximately 50-70' below ground surface (KGS Bulletin 79). Bedrock was never encountered during site activities.

Based on groundwater data from the present site investigation, shallow groundwater is found at depths ranging from approximately 9 to 14 feet bgs at the site, and groundwater flow in the surface aquifer beneath the site to the south and southwest and nearly west closer to West Emma Creek. The principal water-bearing formation in the subject site area is thin varying thickness unconsolidated sand that lies between clay layers. This sand varies from fine to coarse grained and pinches off in some locations.

Based on information obtained from the Kansas Rural Water Association, the subject site area is serviced by Marion Rural Water District (RWD) #4. Based on information obtained from the KGS WWC5 Database, there no public water supply (PWS) wells located within 1-mile from the subject site. There are three domestic wells (Bitikofer, Selzer and Huebert) located within ¼-mile from the subject site, but there known unregistered and open water wells in the area. Static water levels in these wells range from approximately 10 to 15 feet bgs.

**Unusual Problems:** An aggressive withdrawal system could render the local water wells and West Emma Creek dry.

**Status of Project:** KCC mobilized to the site and performed Phase II Investigation on June 26, 27, and 28, 2012. Continuous soil samples were collected from 14 logged probe locations and blind pushes in 5 locations. Groundwater was generally encountered at depths ranging from 9 to 14 feet below ground surface (bgs) during the probing investigation. A 6620DT Geoprobe® direct-push, track-mounted drilling unit was utilized to collect soil samples for field logging and/or laboratory analyses from the prescribed probe locations. All probes were advanced to the base of the sand member and into the aquatard. A full written report including scope of work, tables, maps, 3-D models, and conclusions was generated by KCC District #2.

On July 7, 2012, eight groundwater monitoring wells (MW-1, MW-3, MW-4, MW-5, MW-6, MW-7, Klaassen East, Klaassen West) were gauged and sampled. Prior to sampling, groundwater levels were measured in each monitoring well using an electronic water level indicator. A submersible Proactive® Water-Spout water pump was used to purge a minimum of three well volumes of groundwater from each well before sampling. Purge water was tested for conductivity prior to being discharged onto the ground surface at the Site or contained in a 250 gallon poly-tank if conductivity was high before disposed of into a deep injection well. Groundwater samples from each monitoring well were collected in one 250 (ml) polyurethane container for analysis at the KCC District #2 Laboratory. Each sample for this monitoring event was analyzed for the presence of Chloride by United States Environmental Protection Agency Silver Nitrate Buret Titration Method 8225. All monitoring wells were found to be above 250 mg/L chlorides, ranging from 1,700 to 5,000 mg/L. There are currently no monitoring wells capable of delineating either plume.

**Level of Remediation Sought:**

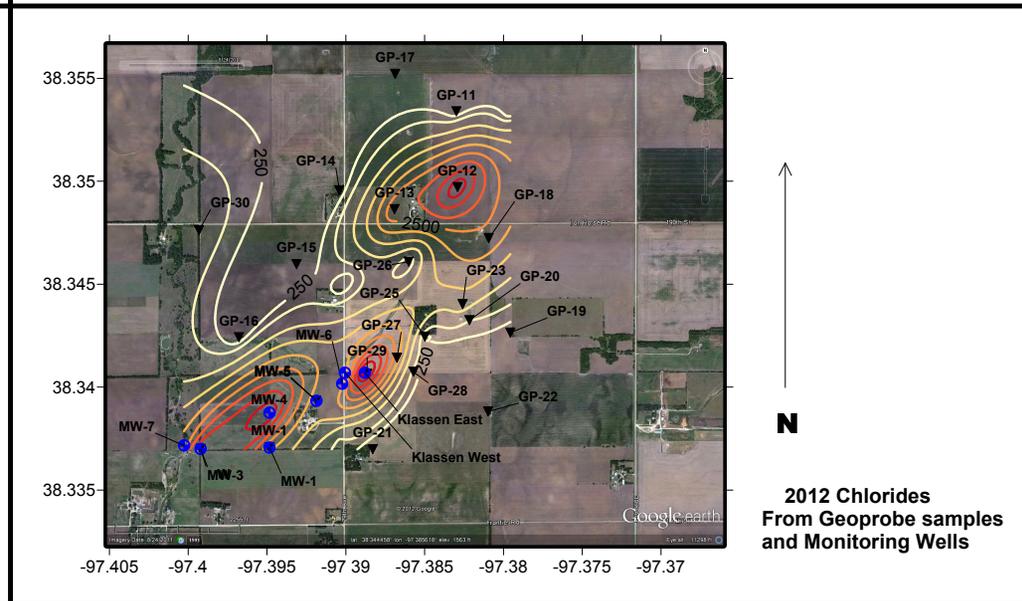
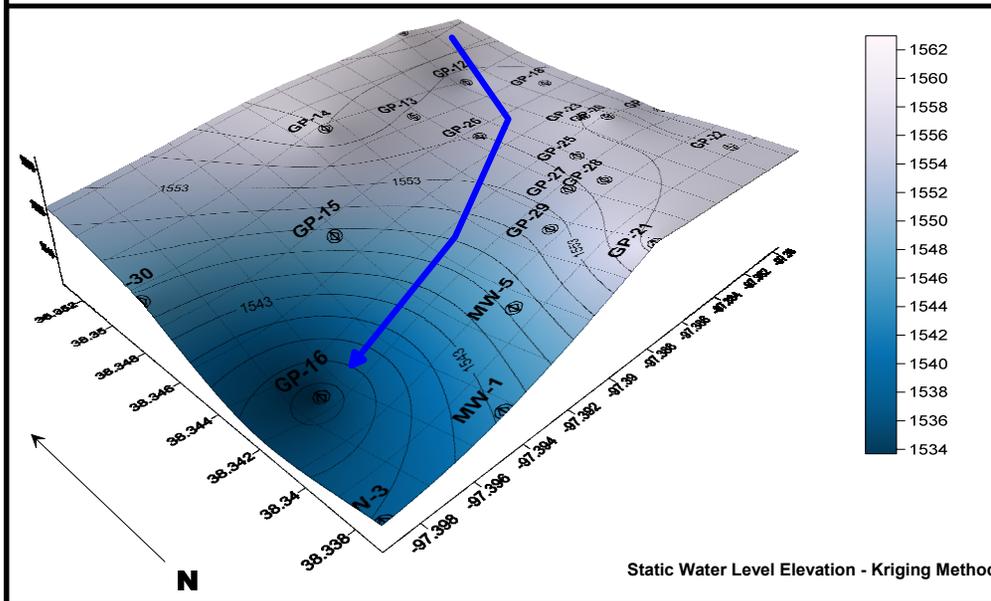
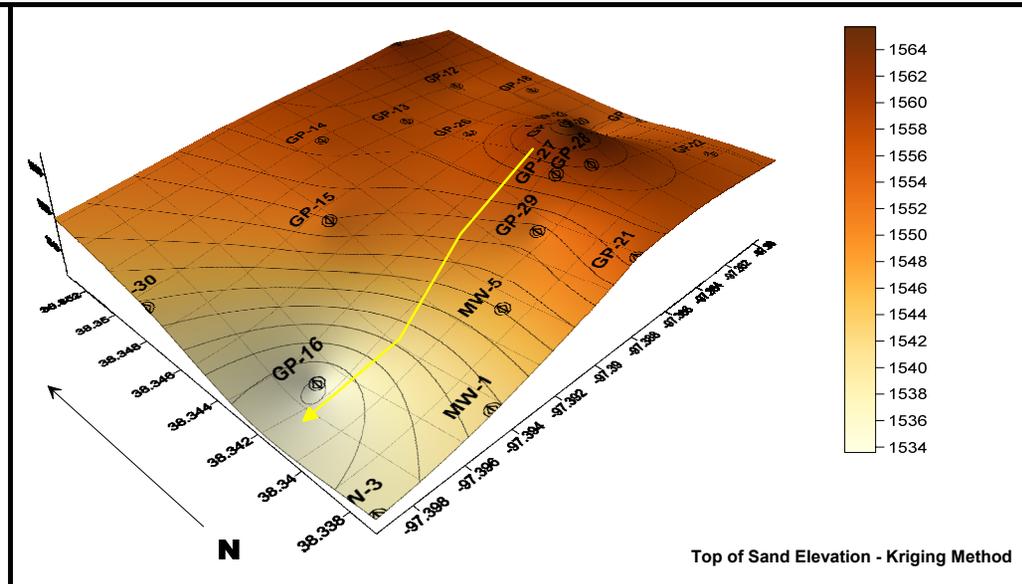
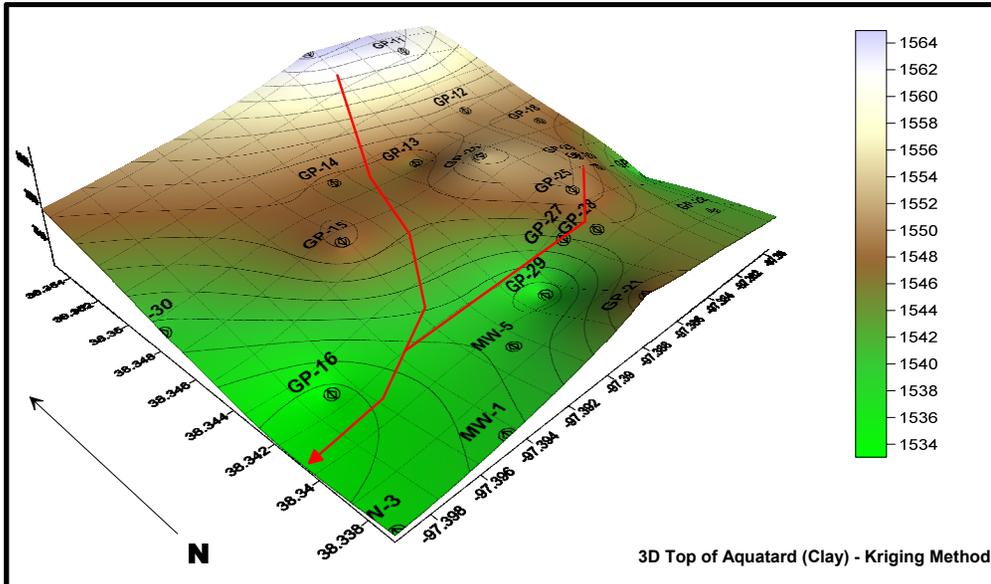
**Ideal:** 250 mg/l Chloride

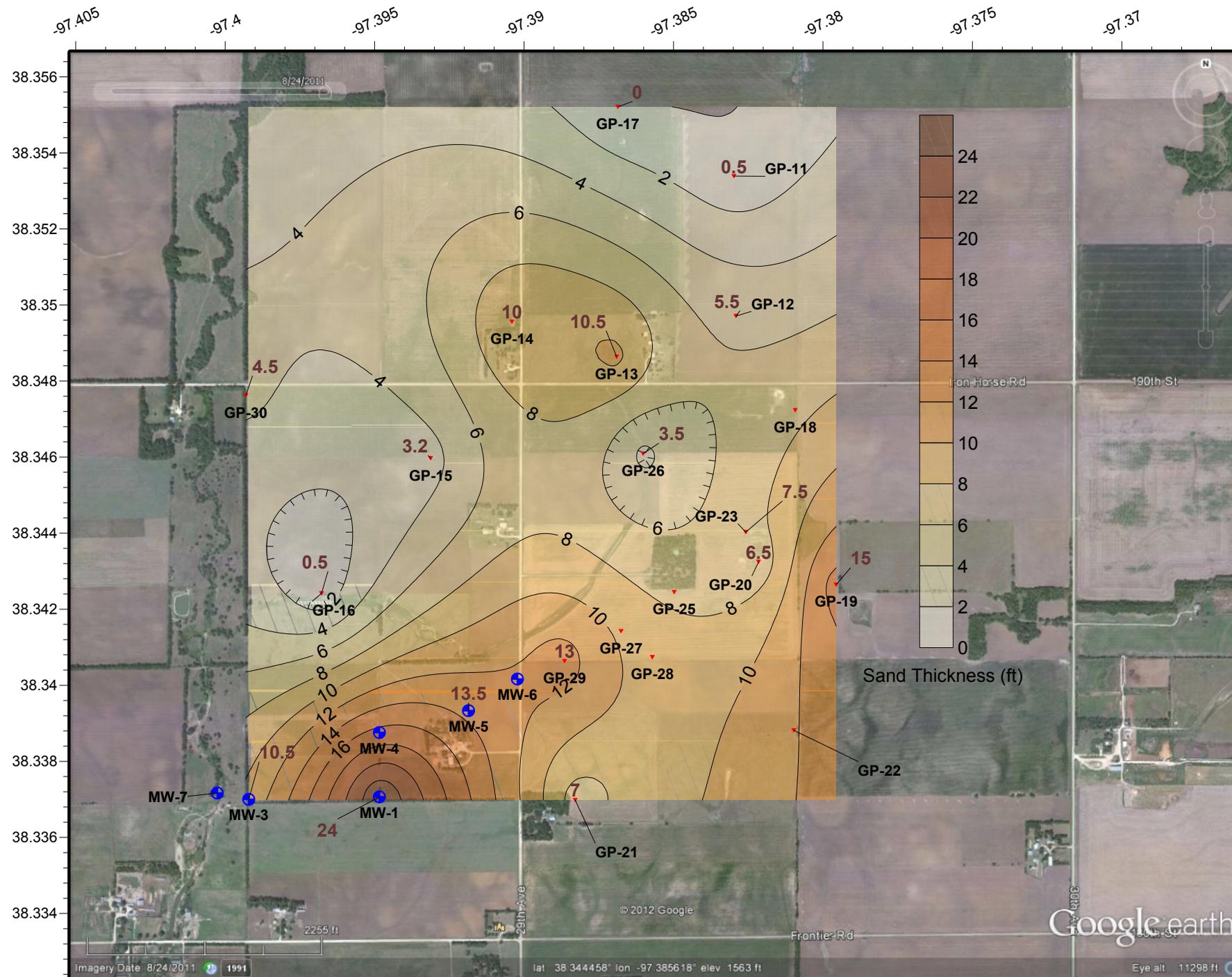
**Target:** 500 to 750 mg/l Chloride

**Recommendations for Future Work:** Continue to sample monitoring wells, Klaassen wells, and West Emma Creek. The Phase II investigation has found that multiple sources are present in the area. Continued research, planning, and field activities is needed to find the point source of the northern brine plume. Multiple monitoring wells are needed throughout the area to delineate the brine plume near the Bitikofer farm and the northern plume approaching from section 36.

**Estimated Total Cost:** \$20,000 to 25,000 to perform routine sampling, research into the northern plume, and installation of multiple monitoring wells.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970093-00	212.5 Hrs. / \$5,518.04	\$5,204.25	\$6,929.25
<b>Current Contaminate Level: 1700 mg/l to 5000 mg/l Cl</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	





**Legend**

- ▼ - Geoprobe Point
- - Monitoring Well
- 3.5 - Sand Thickness

**Comments**

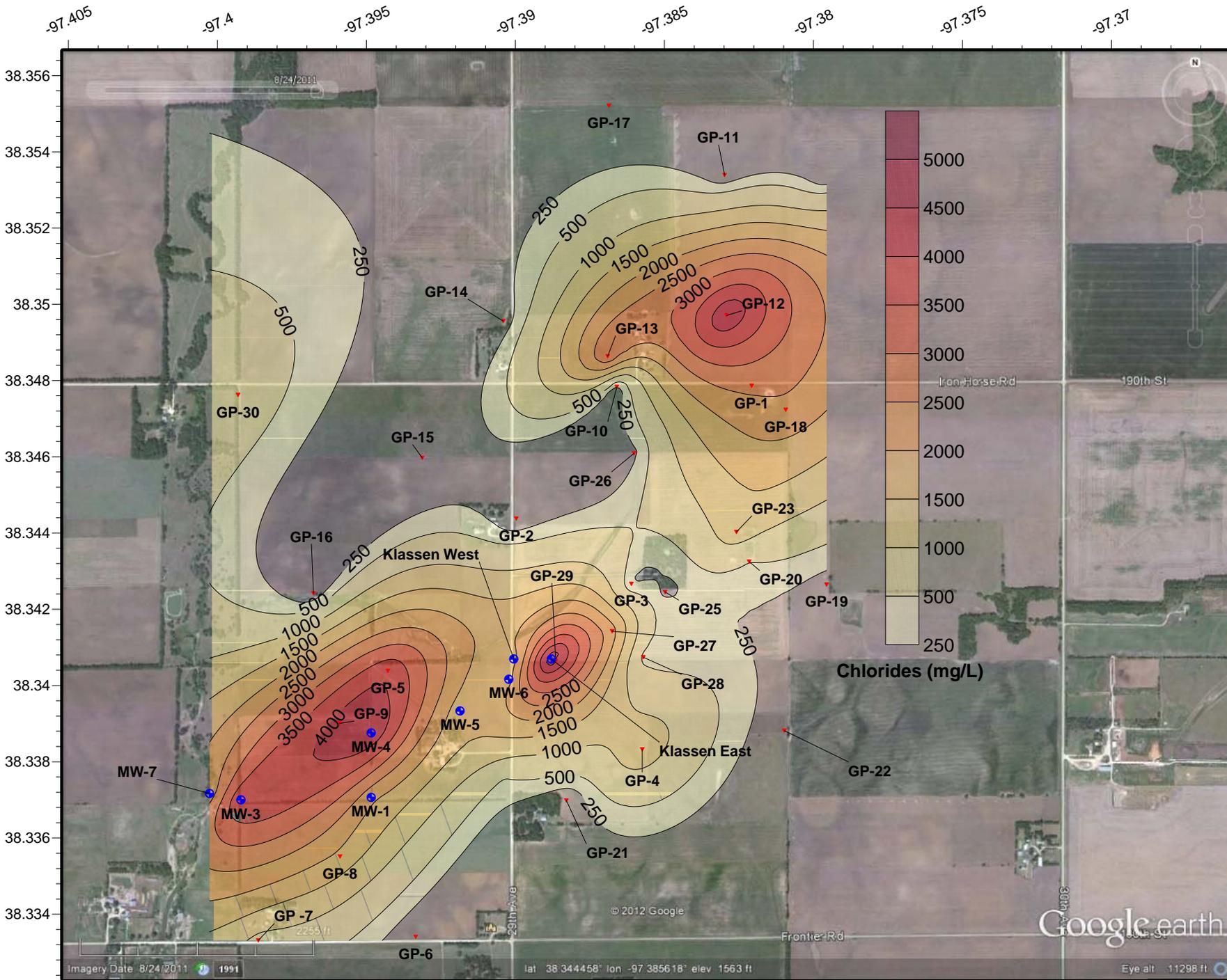
6620DT Tracked Geoprobe used in borings

5' Macrocore used for sampling



**Selzer-Bitikofer Contamination Site**  
 Phase II Geoprobe Investigation - Sand Isopact - Projected Utilizing Kriging Method of Gridding  
 Event Dates: 6/26/2012 thru 6/28/2012 - Map Drawn: 7/6/2012 - KCC District #2 - Drawn by: D. Bollenback

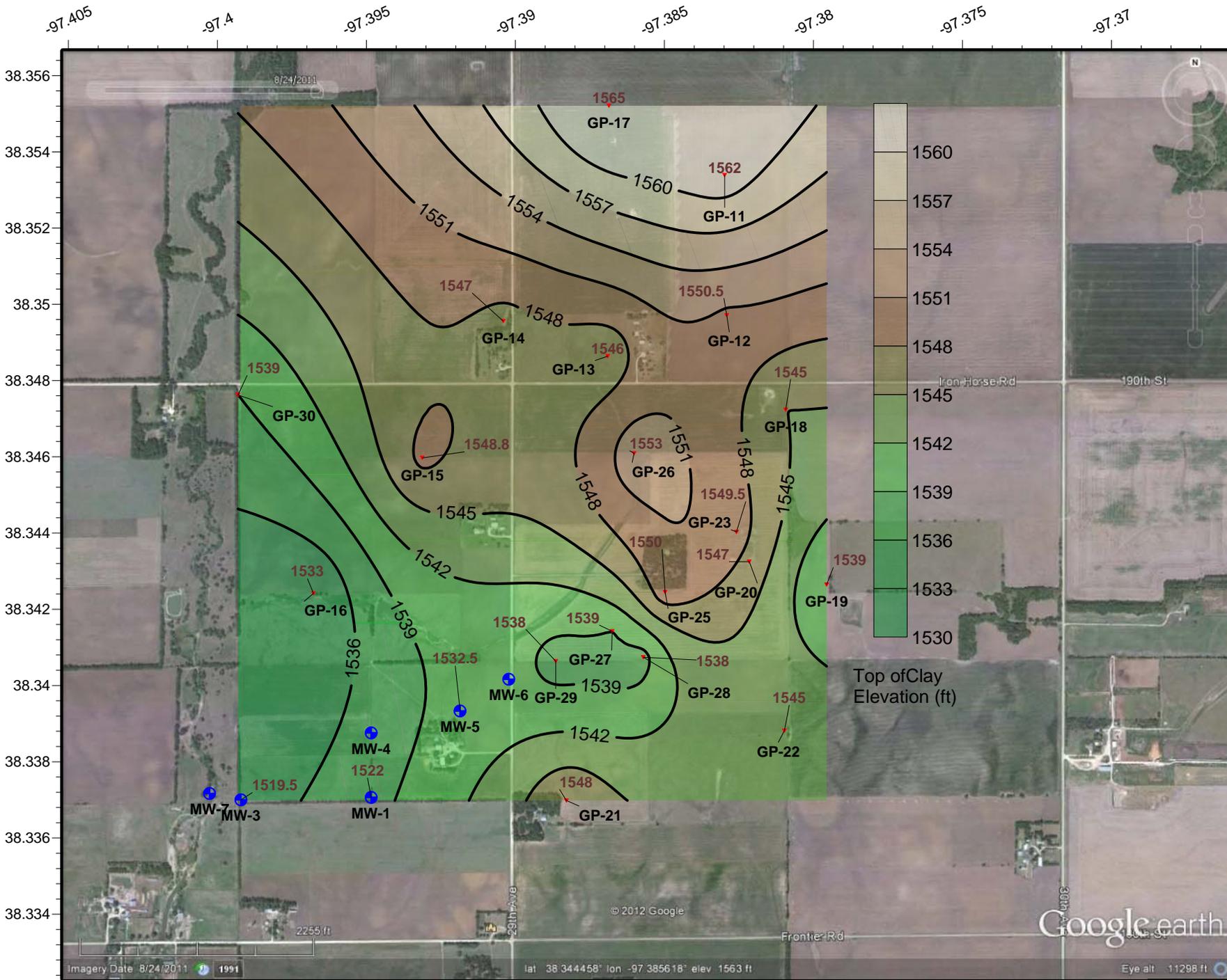
Figure  
**7**



**Legend**

- ▼ - Geoprobe Point
- - Monitoring Well

**Comments**



**Legend**

- ▼ - Geoprobe Point
- - Monitoring Well
- 1545 - Top of Clay Elevation

**Comments**

6620DT Tracked Geoprobe used in borings

5' Macrocore used for sampling



**Selzer-Bitikofer Contamination Site**

Phase II Geoprobe Investigation - Top of Clay Elevation - Projected using Minimum Curvature Gridding

Event Dates: 6/26/2012 thru 6/28/2012 - Map Drawn: 7/5/2012 - KCC District #2 - Drawn by: D. Bollenback

Figure  
**5**

**Project: Smith Finn Contamination Site**

**Site Location:** Legal location is SE/4 of Section 8 Township 34 South, Range 43 West, in Morton County.

**Impact/Immediacy:** The impact is to a house domestic well, which has exhibited high chloride levels. The PRP (Anadarko) drilled a new domestic well in January of 1989. This site has a moderate immediacy level.

**Site Description:** The project consists of a localized pollution of the groundwater in the Ogallala Formation. The area is on the south edge of the high plains as the terrain begins to break downward to the Cimarron River valley, which is located one and one-half miles to the south.

**Unusual Problems:** The threat of contaminated groundwater moving from the Smith-Finn property to land owned by the BLM. Multiple sand layers with different levels of contamination.

**Status of Project:** PW-3 which was drilled in 2010 in order to remove and dispose of the high chloride water has been shut in. The well was extremely effective in reducing the localized chlorides in the aquifer and is now being used as a monitoring well to watch for any rebound. During a meeting with Anadarko and ARCADIS on March 12<sup>th</sup> 2012, it was determined that another recovery well needed to be installed in order to bring the site to closure sooner. PW-4 was installed just south of the MW 13-8, MW 14-8, MW 15-8 well cluster. This well was installed on June 5<sup>th</sup> and samples have been taken, however the well has not been operational long enough to develop a trend. During this same event, investigation was performed on MW-9, a carbon steel well, which included a rehabilitation of the well and a down hole camera inspection. The investigation showed that MW-9 is no longer a viable monitoring well due to mineralization and corrosion. Chlorides at this site have been steadily in decline and are situated in the southern area near where PW-4 was installed.

**Level of Remediation Sought:**

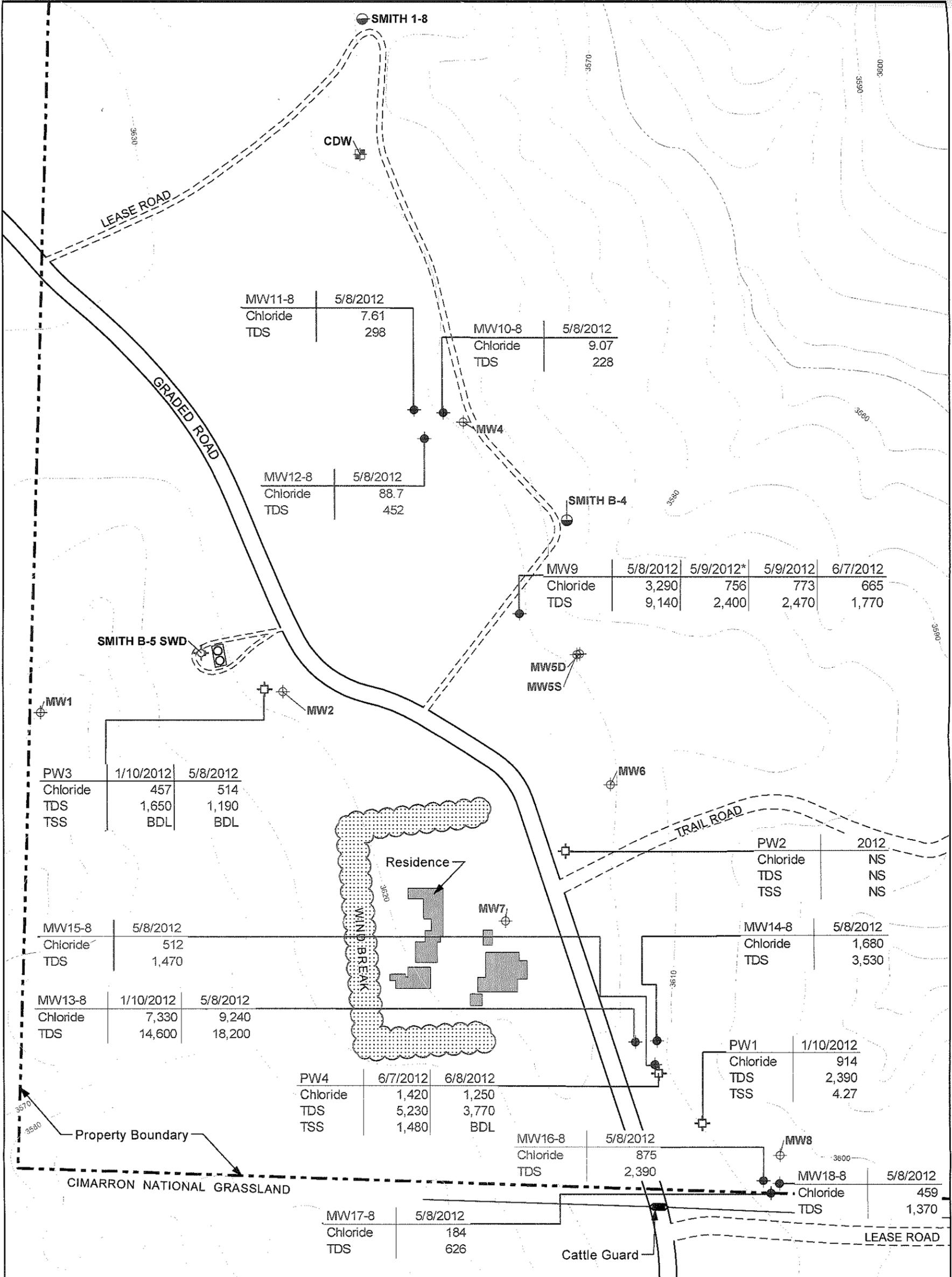
**Ideal:** 250 ppm Chloride

**Target:** 500 ppm Chloride

**Recommendation for Future Work:** It is likely that MW-9, along with MW 10-8, MW 11-8, and MW 12-8 will be plugged in the coming year. PW-4 will remain operational until chlorides have dropped close to or into the fresh water standard. The KCC has been in discussion with ARCADIS to determine if a replacement well for MW-9 needs to be installed when it is plugged. If a decision is made to install a well, it will likely be to the southeast of where MW-9 is currently located. As the site has continued to make significant progress in the removal of chlorides, the project may begin to transition out of a remedial phase, into a monitoring phase.

**Estimated Total Costs: \$200,000 for PRP.**

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970095-00	71.5 Hrs. / \$1,759.02		
<b>Current Contaminate Level: 7.61 ppm Cl- to 9,240 ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input checked="" type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



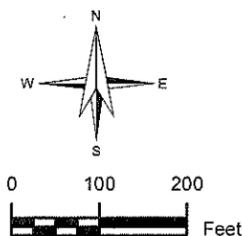
**LEGEND**

- Shallow Zone Monitoring Well
- Intermediate Zone Monitoring Well
- Deep Zone Monitoring Well
- ⊕ Plugged and Abandoned Monitoring Well
- ⊕ Current Domestic Well
- ⊕ Recovery Well
- ⊕ Salt Water Disposal Well
- Oil & Gas Well
- Plugged and Abandoned Oil & Gas Well

**NOTE**

1. MW9 originally screened three water bearing zones. April 2006 monitoring network modifications included plugging off the lower 2 intervals. For the purposes of these figures, MW9 is effectively considered as a shallow zone well.
2. Extraction wells PW1 and PW2 screen both the shallow and intermediate zones. Extraction well PW3 and PW4 screen the shallow, intermediate, and deep zones.
3. Average operational pumping rates in 2012 were 2.3 gpm (PW1), 18.7 gpm (PW3). PW1 was offline since February, 2012. PW2 was offline since November, 2009.
4. All values are in milligrams per liter (mg/L).
5. \* Indicates that sample was collected without the packer and is representative of the entire screened interval.

6. TDS = Total Dissolved Solids
7. TSS = Total Suspended Solids
8. NS = Not Sampled
9. gpm = gallons per minute
10. BDL = Below Detection Limit



Prepared For:



Title:

**2012 Analytical Data**

Smith Finn - Elkhart, Kansas

Q2 2011 Data Package

File: Q:\GC002026\Fig6\_Analytical Data.mxd



Designed:

JLB

Drawn:

JC

Checked:

DDG

Revised:

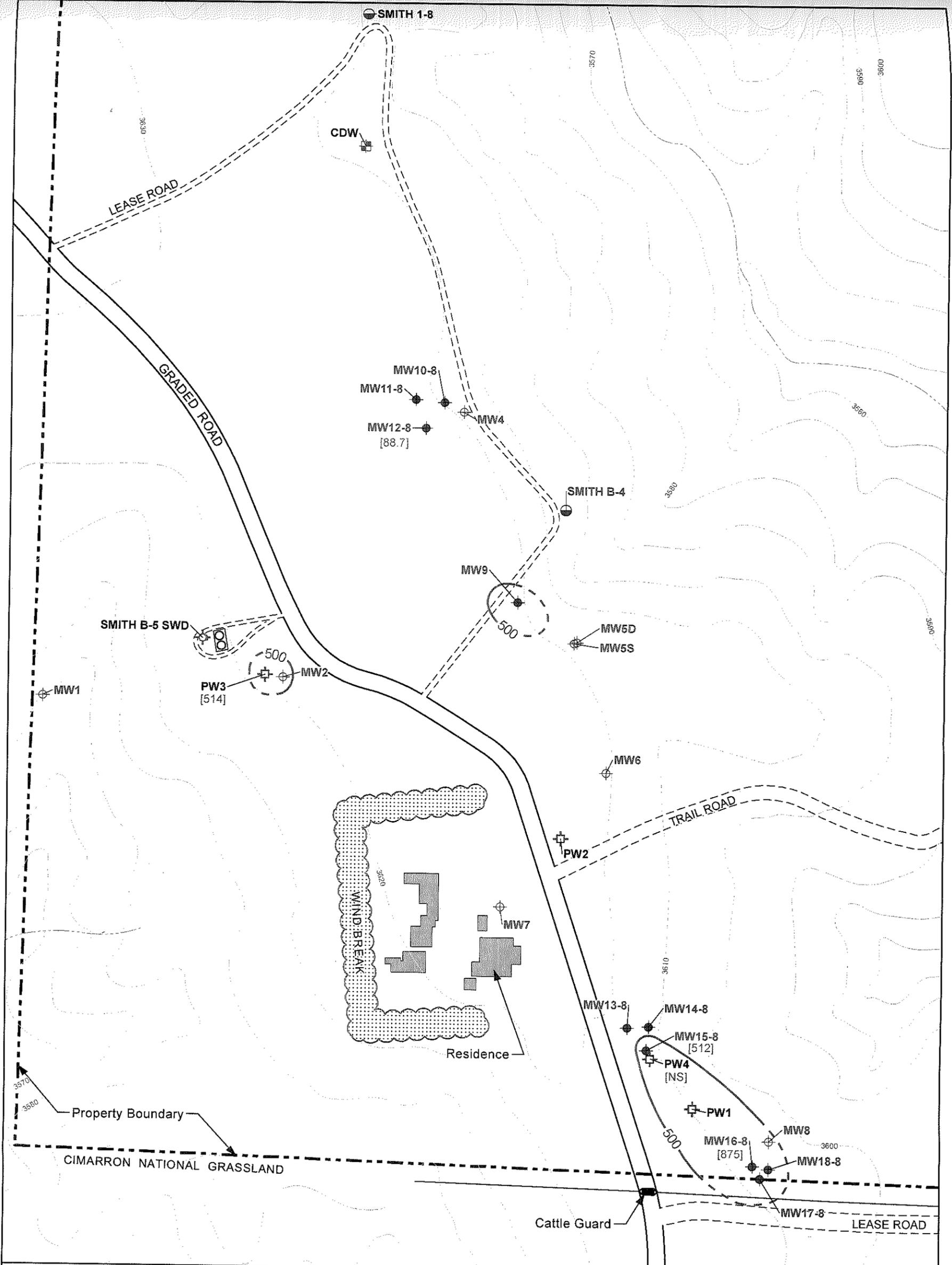
NA

Date:

7/19/2012

Figure:

6



**LEGEND**

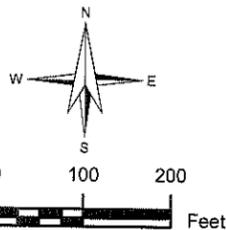
- Shallow Zone Monitoring Well
- Intermediate Zone Monitoring Well
- Deep Zone Monitoring Well
- ⊕ Plugged and Abandoned Monitoring Well
- ⊕ Current Domestic Well
- ⊕ Recovery Well
- ⊕ Salt Water Disposal Well
- Oil & Gas Well
- Plugged and Abandoned Oil & Gas Well

— 500 Chloride isoconcentration contour for deep wells, dashed where inferred  
 [512] Deep well chloride concentration (mg/L)

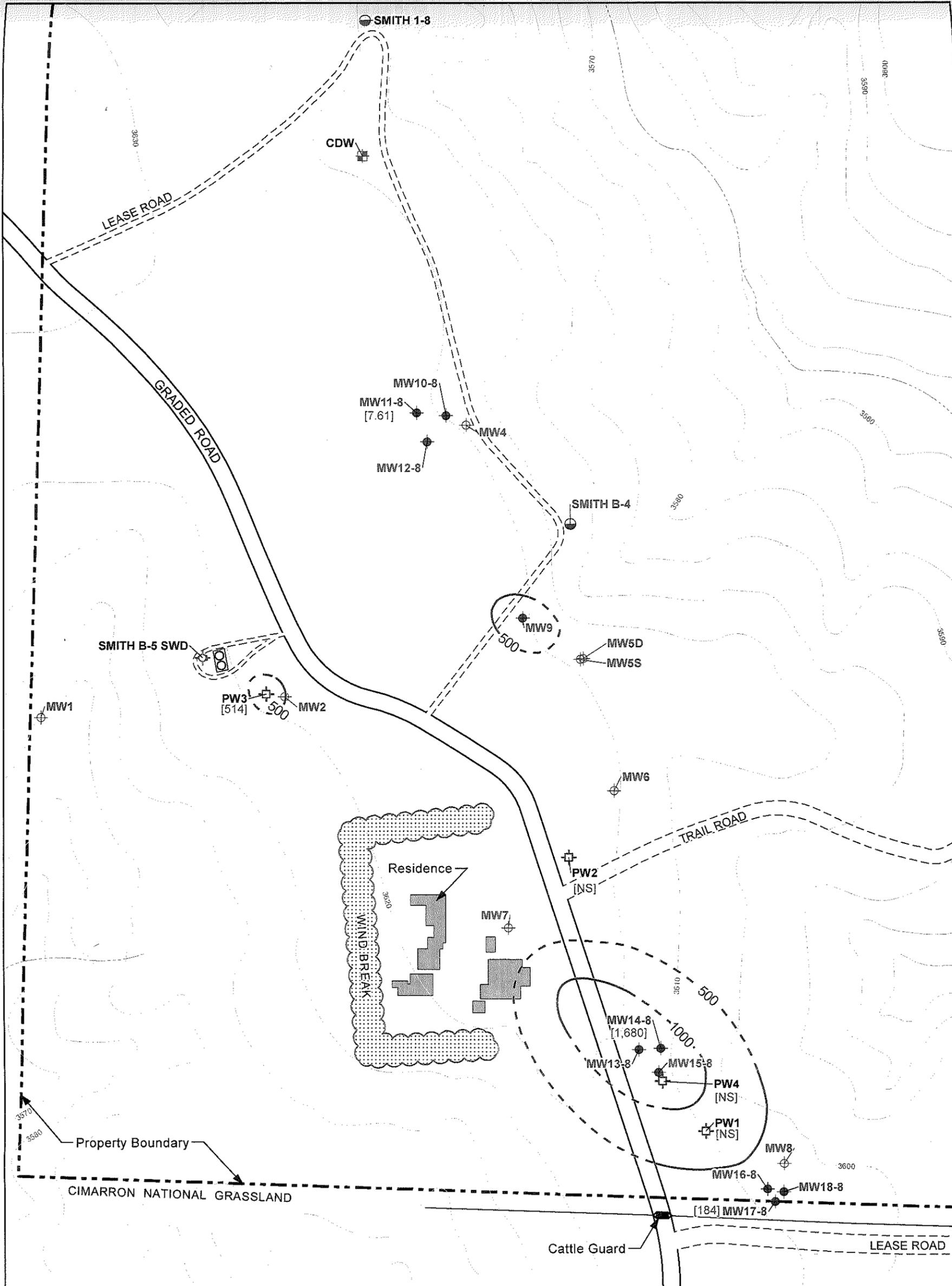
**NOTE**

1. MW9 originally screened three water bearing zones. April 2006 monitoring network modifications included plugging off the lower 2 intervals. For the purposes of these figures, MW9 is effectively considered as a shallow zone well.
2. Extraction wells PW1 and PW2 screen both the shallow and intermediate zones. Extraction well PW3 and PW4 screen the shallow, intermediate, and deep zones.
3. All values are in milligrams per liter (mg/L).

4. Chloride isoconcentration maps are interpreted from groundwater analytical results and the geophysical electrical resistivity survey.



Prepared For:	<b>Anadarko</b> Petroleum Corporation	Designed:	JLB
Title:	<b>Chloride Isoconcentration Map for Deep Wells</b> May 2011 Smith Finn - Elkhart, Kansas	Drawn:	JC
		Checked:	DDG
Q2 2012 Data Package	Morton County, Kansas	Revised:	NA
File: Q:\GC002026\Fig9_Chloride_DZ.mxd	Date:	Figure:	9
<b>ARCADIS</b>			



**LEGEND**

- Shallow Zone Monitoring Well
- Intermediate Zone Monitoring Well
- Deep Zone Monitoring Well
- ⊕ Plugged and Abandoned Monitoring Well
- ⊕ Current Domestic Well
- ⊕ Recovery Well
- ⊕ Salt Water Disposal Well
- ⊕ Oil & Gas Well
- ⊕ Plugged and Abandoned Oil & Gas Well

— 500 Chloride isoconcentration contour for intermediate wells, dashed where inferred

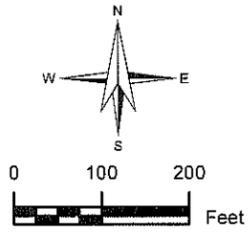
[514] Intermediate well chloride concentration (mg/L)

[NS] Well not sampled

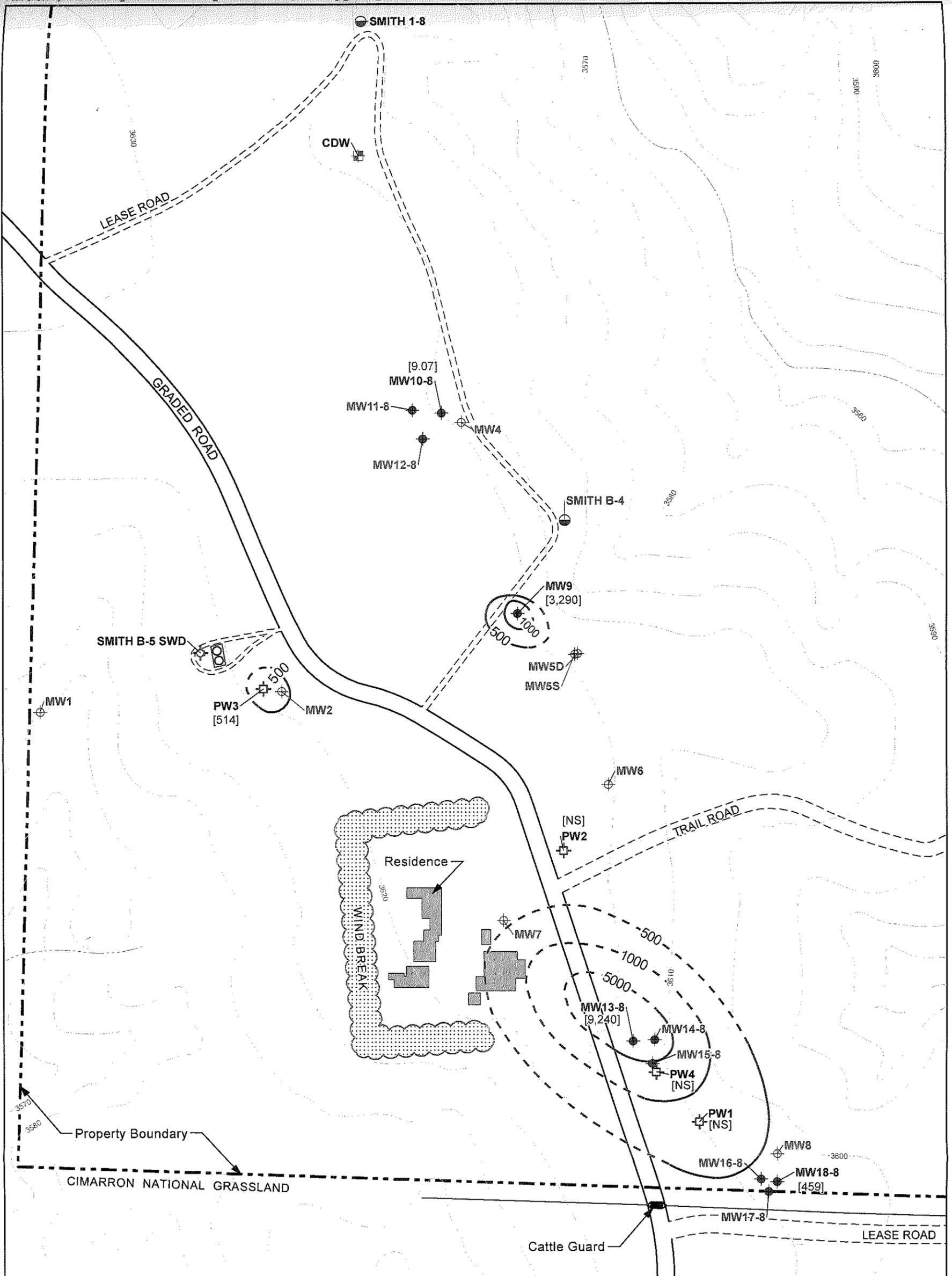
**NOTE**

1. MW9 originally screened three water bearing zones. April 2006 monitoring network modifications included plugging off the lower 2 intervals. For the purposes of these figures, MW9 is effectively considered as a shallow zone well.
2. Extraction wells PW1 and PW2 screen both the shallow and intermediate zones. Extraction well PW3 and PW4 screen the shallow, intermediate, and deep zones.
3. All values are in milligrams per liter (mg/L).

4. Chloride isoconcentration maps are interpreted from groundwater analytical results and the geophysical electrical resistivity survey.



Prepared For:	<b>Anadarko</b> Petroleum Corporation	Designed:	JLB
Title:	<b>Chloride Isoconcentration Map for Intermediate Wells</b> May 2012 Smith Finn - Elkhart, Kansas	Drawn:	JC
		Checked:	DDG
Q2 2012 Data Package	Morton County, Kansas	Revised:	NA
File: Q:\GC002026\Fig8_Chloride_IJ.mxd	Date:	7/19/2012	Figure:
<b>ARCADIS</b>			<b>8</b>



**LEGEND**

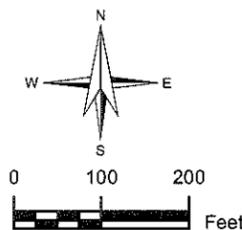
- Shallow Zone Monitoring Well
- Intermediate Zone Monitoring Well
- Deep Zone Monitoring Well
- ⊕ Plugged and Abandoned Monitoring Well
- ⊕ Current Domestic Well
- ⊕ Recovery Well
- ⊕ Salt Water Disposal Well
- Oil & Gas Well
- Plugged and Abandoned Oil & Gas Well

- 500 Chloride isoconcentration contour for shallow wells, dashed where inferred
- [459] Shallow well chloride concentration (mg/L)
- [NS] Well not sampled

**NOTE**

1. MW9 originally screened three water bearing zones. April 2006 monitoring network modifications included plugging off the lower 2 intervals. For the purposes of these figures, MW9 is effectively considered as a shallow zone well.
2. Extraction wells PW1 and PW2 screen both the shallow and intermediate zones. Extraction well PW3 and PW4 screen the shallow, intermediate, and deep zones.
3. All values are in milligrams per liter (mg/L).

4. Chloride isoconcentration maps are interpreted from groundwater analytical results and the geophysical electrical resistivity survey.



Prepared For:		<b>Anadarko</b> Petroleum Corporation		Designed:	JLB
Title:		<b>Chloride Isoconcentration Map for Shallow Wells</b> May 2012		Drawn:	JC
		Smith Finn - Elkhart, Kansas		Checked:	DDG
Q2 2012 Data Package	Morton County, Kansas	Revised:	NA		
File: Q1GC002026\Fig7_Chloride_SZ.mxd	Date:	7/19/2012	Figure:	7	
ARCADIS					

**Project: South Spivey Contamination Site**

**Site Location:** The site area is located 3.5 miles south of the city of Spivey, near an unnamed tributary of the Chikaskia River. The legal location is in Sections 27 and 34 of Township 30 South, Range 8 West, in Kingman County.

**Impact:** The impacts are to groundwater resources associated with local domestic wells. The site is rated as low immediacy level.

**Site Description:** The project area lies within an intermittently flowing creek bed within the large Spivey-Grabs oil and gas field. The area is remote and the surface use is primarily the grazing of cattle. The surface geology is composed of unconsolidated sand and silt. Underlying this upper layer are fine-grained sands and silts that form the aquifer. The aquifer delivers a small amount of water, but the fluid level is very shallow making the aquifer easily accessible. The depth to the first confining layer is roughly 9 to 12 feet. In December 1994 General Atlantic Resources implemented a remediation plan and began withdrawing contaminated groundwater in the SE quarter of section 27. Due to low water yields the recovery system was shut down in 2000 and the K.C.C. is doing post remediation monitoring.

**Unusual problems:** Withdrawal rate is low due to low permeability of aquifer.

**Status of Project:** The KCC has placed the South Spivey Site in an annual sampling program. Natural attenuation of the site is occurring but chloride readings have varied somewhat over the years with the annual precipitation amounts. The contaminated aquifer is so shallow chlorides levels seem to be in direct correlation with precipitation. The highest chloride concentration was from well A-2 with 1,400 ppm.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l Chloride

**Target:** 750 mg/l Chloride

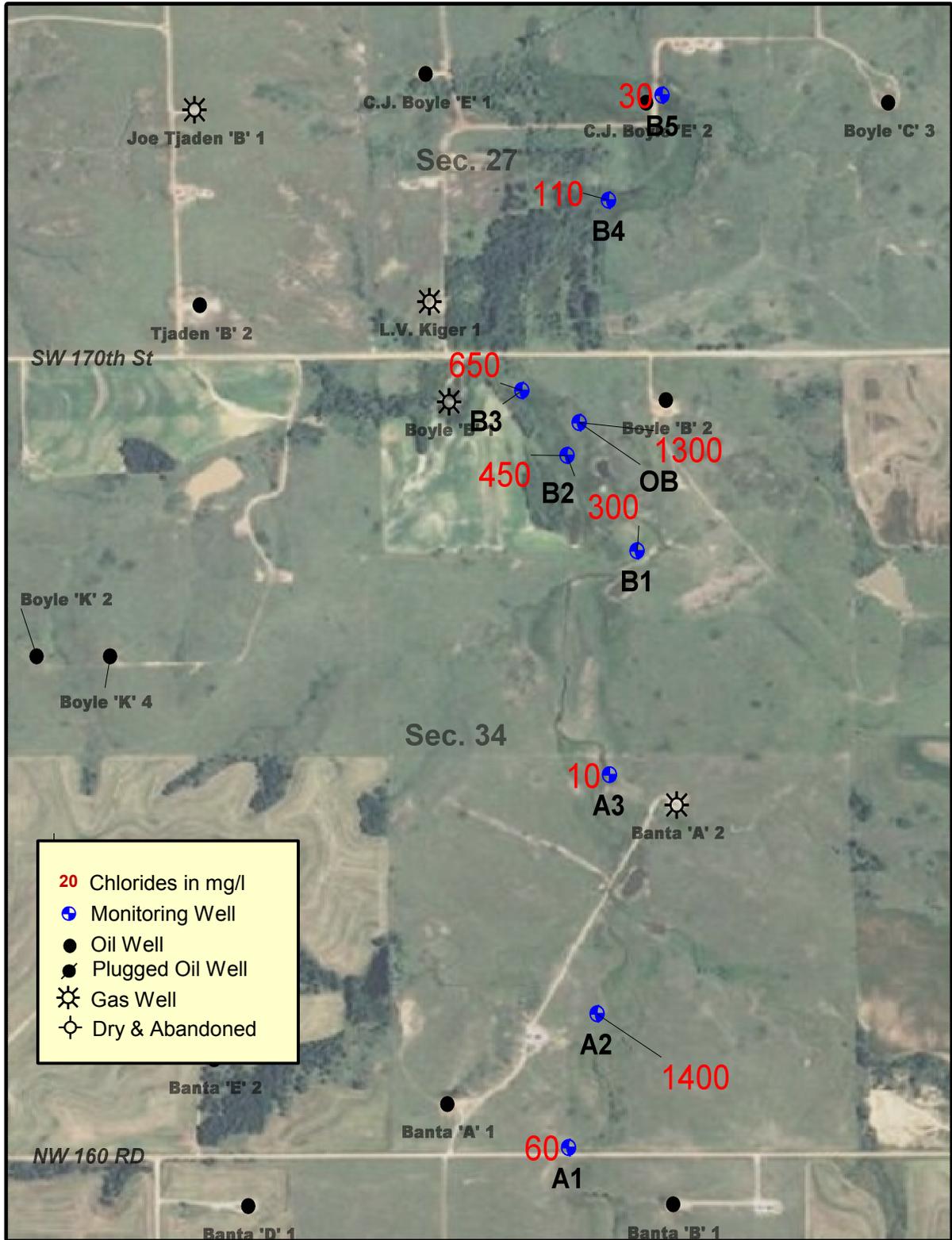
**Recommendations for Future Work:** Continue sampling all monitoring wells and surface waters on an annual basis. No other action is needed at this time.

**Estimated Total Costs:** \$1000 per year for sampling, testing, and research.

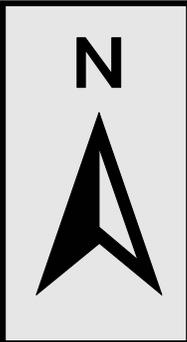
Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970096-00	38 Hrs. / \$955.22		
<b>Current Contaminate Level: 10 mg/l to 1,400 mg/l Cl</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

R 8 W

T 30 S



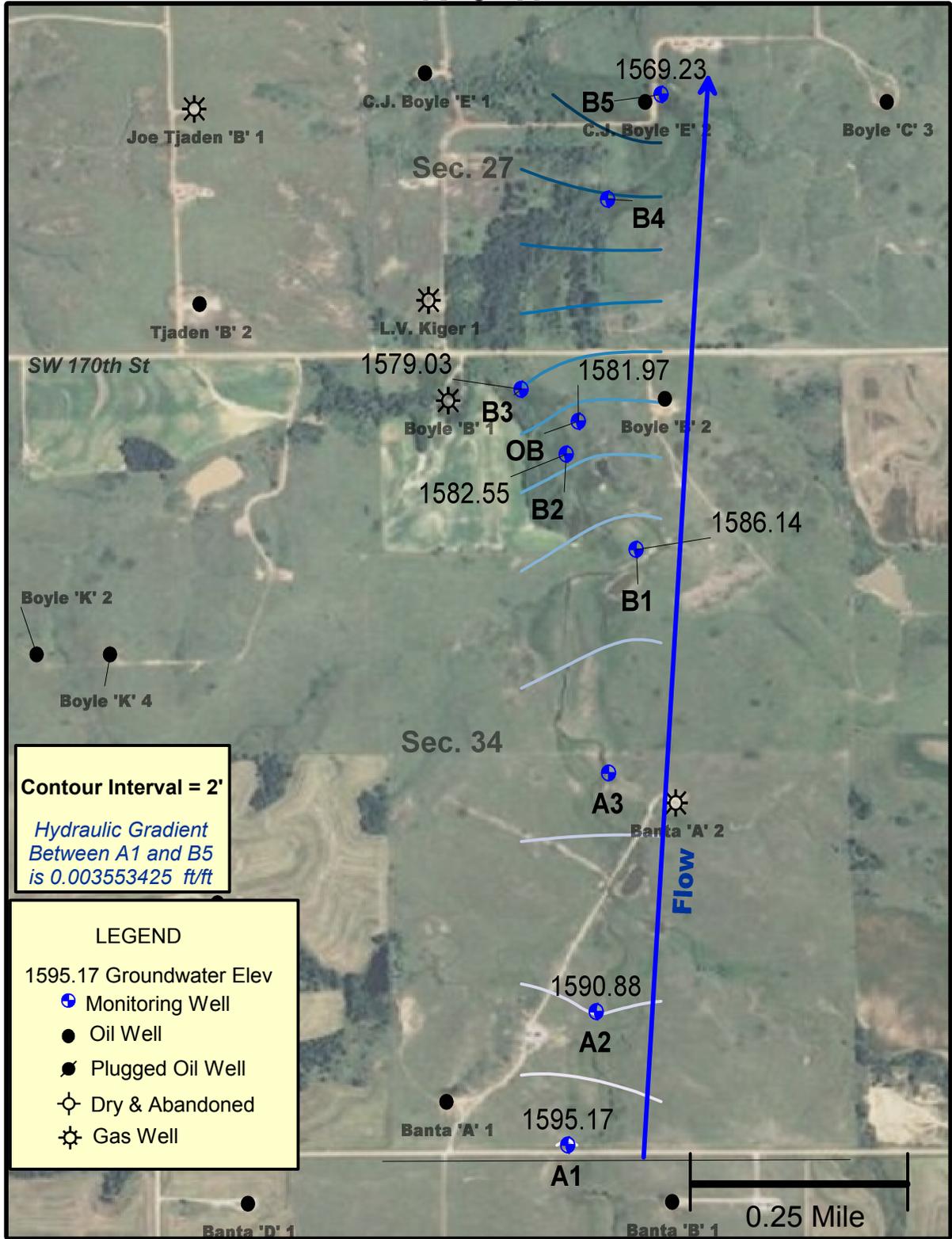
20	Chlorides in mg/l
⊕	Monitoring Well
●	Oil Well
●/	Plugged Oil Well
☼	Gas Well
⊕/	Dry & Abandoned



**SOUTH SPIVEY SITE**  
 Control No. 970096-00  
**2012-2013 Chloride Concentration Map**  
 Section 27 & 34 - T30S -R8W, Kingman County  
*District #2 - B. Milner 9/20/2012*

R 8 W

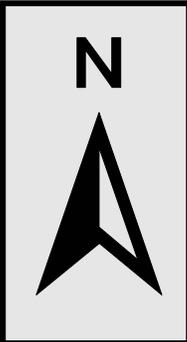
T 30 S



Contour Interval = 2'

Hydraulic Gradient  
Between A1 and B5  
is 0.003553425 ft/ft

- LEGEND
- 1595.17 Groundwater Elev
  - Monitoring Well
  - Oil Well
  - Plugged Oil Well
  - Dry & Abandoned
  - Gas Well



**SOUTH SPIVEY SITE**

Control No. 970096-00

2012-13 Groundwater Elevation Map

Section 27 & 34 - T30S -R8W, Kingman County

District #2 - B. Milner - 9/20/2012

**Project: South Wichita Chloride Study**

**Site Location:** The South Wichita site is located near the intersection of the Kansas Turnpike and the Wichita Valley Center Floodway. The site is centered roughly near the intersection of 63rd St. South and Broadway, in south Wichita. The legal location is as follows: Sections 28, 29, 31, 32, 33, and 34 of Township 28 South, Range 1 East and Sections 3 and 4 of Township 29 South, Range 1 East.

**Impact:** The impacts or potential impacts are to irrigation, domestic and municipal water uses. A low to moderate level of immediacy is warranted for this site due to the low levels of Chlorides. The area has a very high demand for water resources.

**Site Description:** The project area consists of a groundwater plume contaminated by oilfield brine moving in a southeasterly direction. The Hydraulic Gradient between Monitoring Wells MW K-10 and MW-399 is 0.000756893 ft/ft as recorded in 2012. The site is situated in an area that is residential, agricultural, commercial and light industrial many of which utilize the local groundwater aquifer for water. The surface geology is composed of unconsolidated sand and silt. Underlying this zone are sands and gravels that form the aquifer. Historically, the aquifer has delivered large quantities of variable quality drinking water. The depth of most of the domestic water wells in the area range from 30 to 50 feet.

**Unusual Problems:** The urban setting restricts the placement of monitoring wells and any warranted disposal equipment/wells. Even after 20-plus years many of the public still remember and are interested in the brine pollution in the area. The site was originally discovered at the historically popular Blood Orchard which was ruined by brine contamination and the associated death of the fruit trees, which were never been brought back. The brine pollution has caused lingering hard feelings from many of the area residents.

**Status of Project:** This chloride plume from the Blood Orchard spill of 1983 has moved to the east-southeast at a very slow rate and has continued to decrease in chloride levels every year. Chloride levels in 2012 have continued in the downward trend that we recorded in 2011. Monitoring well K-17 was destroyed by vandals and could not be found and repaired. MW-K-8 was not sampled due to a pile of junk being pushed into the well area. Only monitoring wells 11A, MW 11-B and MW-801 were above the KDHE standard of 250 mg/l Chlorides and if this trend continues it could be possible to close this site in the next couple of years or move it into a biennial program. Due to the huge public demand for water resources in the immediate area and the lingering but limited petroleum production, it is recommended that after closure that the monitoring well network should be maintained as a proactive measure in case of new or unforeseen saltwater contamination.

**Level of Remediation Sought:**

**Ideal:** 250 mg/l Chloride

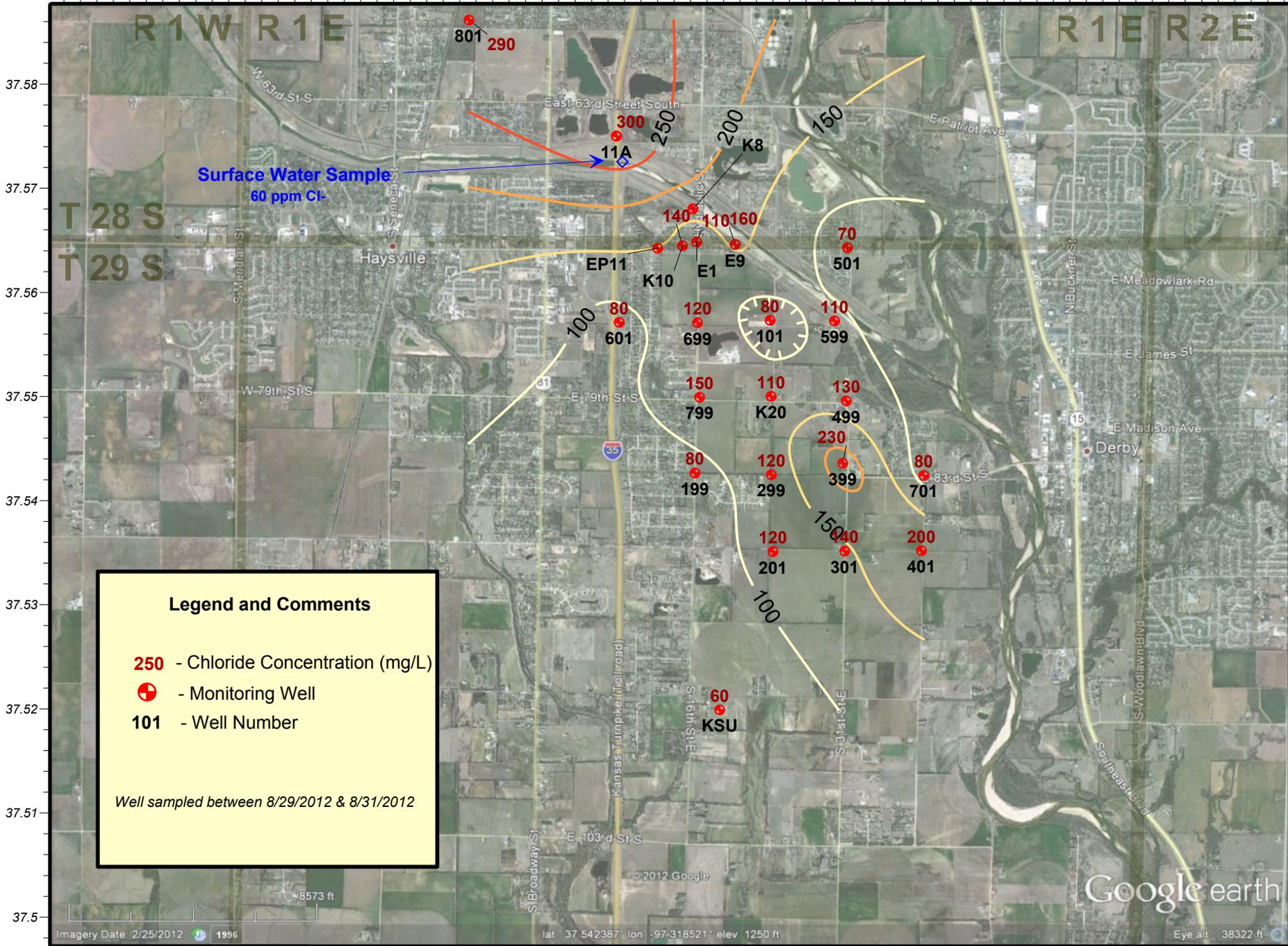
**Target:** 500 to 750 mg/l Chloride

**Recommendations for Future Work:** Collect samples for one more year and then K.C.C recommends possible closure in 2014.

**Estimated Total Costs:** \$6,000 yearly to sample all monitoring wells and perform water analysis.

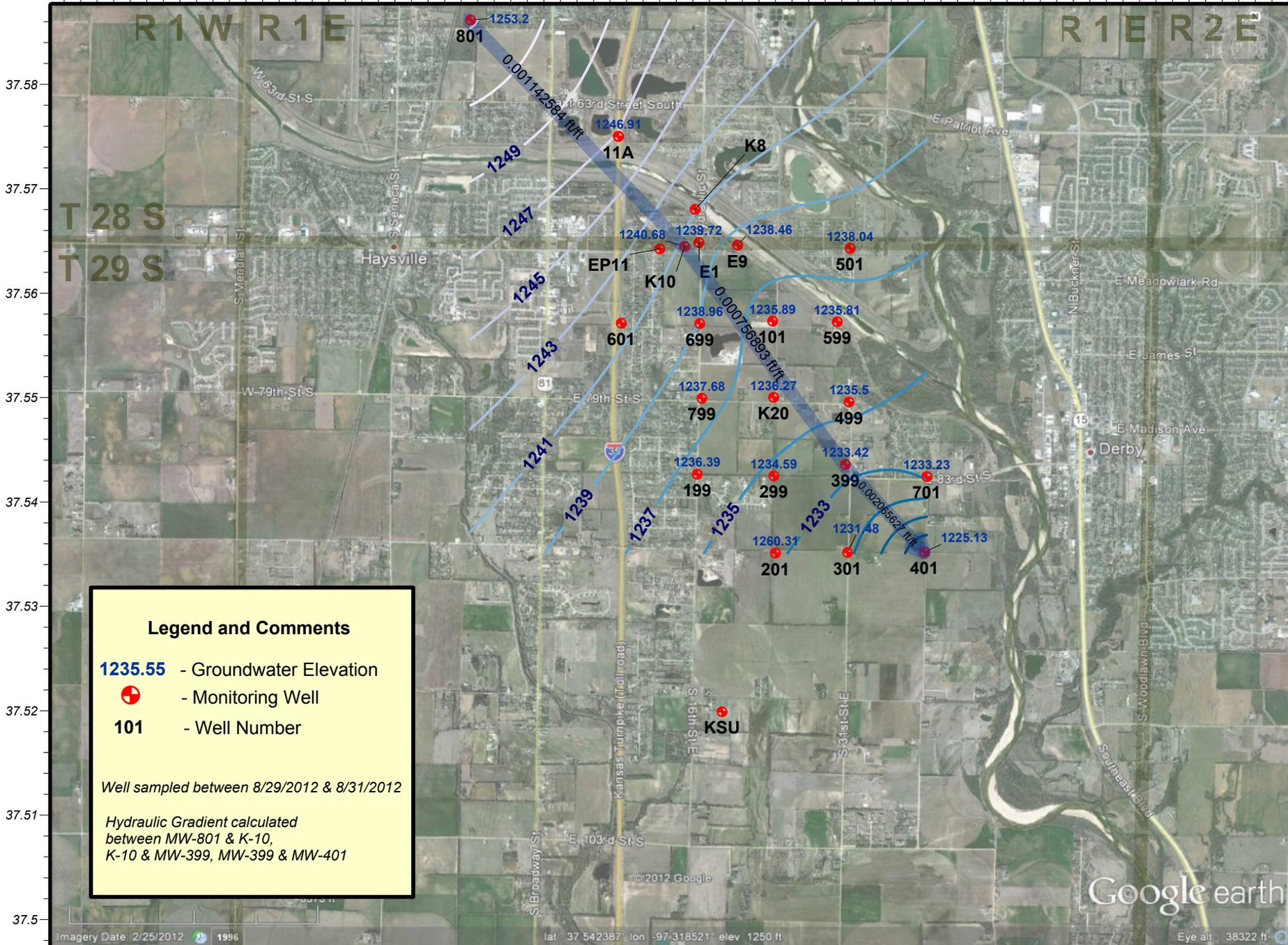
Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970016-00	51 Hrs. / \$1,318.71		\$10,767.02
<b>Current Contaminate Level: Highest level is 300 mg/l @ MW #11A</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-97.39 -97.38 -97.37 -97.36 -97.35 -97.34 -97.33 -97.32 -97.31 -97.3 -97.29 -97.28 -97.27 -97.26 -97.25



**South Wichita Contamination Site - #970016-00**  
**Multiple Section of T28 & 29 S and R 1 E, Sedgwick County, Kansas**  
**2012 Annual Groundwater Sampling Event - Chloride Concentrations**  
**KCC District #2 - Drawn by: D. Bollenback on 9/20/2012**

-97.39 -97.38 -97.37 -97.36 -97.35 -97.34 -97.33 -97.32 -97.31 -97.3 -97.29 -97.28 -97.27 -97.26 -97.25



**Legend and Comments**

**1235.55** - Groundwater Elevation  
 - Monitoring Well  
**101** - Well Number

*Well sampled between 8/29/2012 & 8/31/2012*

*Hydraulic Gradient calculated  
 between MW-801 & K-10,  
 K-10 & MW-399, MW-399 & MW-401*



**South Wichita Contamination Site - #970016-00**  
 Multiple Section of T28 & 29 S and R 1 E, Sedgwick County, Kansas  
 2012 Annual Groundwater Sampling Event - Groundwater Elevations  
 KCC District #2 - Drawn by: D. Bollenback on 9/20/2012

**Project: Stowe- Zaid Contamination Site**

**Site Location:** The site is five miles south of the intersection of US 56 and Plume Street on the east side of Rice County. This site is in northwest part of Welch-Bornholdt oil field, and the lease has no production at the present time. The location is the SE/4 NE/4 Section 24, Township 20 South, Range 6 West, Rice County.

**Impact/Immediacy:** Impact is to the soil and groundwater. This site should be classified as low immediacy with the possibly of effecting domestic and stock wells and the aquifer of the Little Arkansas River. There is a rural water line in the area, which can provide service to the homes.

**Site Description:** Vegetation throughout the scar area has remained the same over the past year. Shallow groundwater levels and underflow are keeping the scar in place, as heavy rains might be pushing chlorides up onto the surface. The farmer planted wheat and milo on the land in 2012; large areas of scar were still clearly visible. The Little Arkansas River is located half mile to the southwest of the site and that is the direction of the ground water flow, northeast to southwest. Investigations have shown that drilling pits and a tank battery could be the sources of the pollution.

**Unusual Problems:** The ground water table is very shallow due to the close proximity to the Arkansas River.

**Status of the Project:** The auger data from 2001 along with old aerial photos indicates the source area to be located northeast of the scar area. Up gradient and down gradient delineation has not been achieved to this date. The 2012 water sampling was done August 17, 2012. The lower aquifer tested at 200 mg/l chlorides. The upper water horizon was dry in shallow MW 1, so there is no data for MW-1S in this report. MW-2 at the toe of the scar tested higher for the third year in a row at 1,000 mg/l. Evidence appears to show that an aquatard is preventing the chlorides from moving down to the lower aquifer. Trees along the property line at the MW-2 location have been removed without harming MW-2.

**Recommendation for Future Work:** Continue to sample monitoring wells. Due to the shallow nature of the contaminated aquifer it maybe possible to recover chloride polluted water via shallow recovery wells or trench system, but there is no disposal scenario available near by to dispose of the fluids. In light of this fact long term monitoring is suggested for the site. Protection of MW-2 should be an addition project for this site during the next year.

**Level of Remediation Sought:**

**Ideal:** 50 mg/l

**Target:** 350 mg/l

**Estimated Total Costs:** \$800 annually for field inspection and monitoring, and research into ideas/alternatives to remediating the site or at least expediting the attenuation.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20000035-001	24 Hrs. / \$605.26		\$4,057.85
<b>Current Contaminate Level: 1,000 mg/l, MW #2, 08/17/2012</b>			
<b>200 mg/l Cl- Deep Aquifer 08/17/2012</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	



### Stowie-Zaid Contamination Site

NE - Sec. 24 - T 20 S - R 6 W, Rice County, Kansas

### 2012-13 Chloride Concentrations

KCC Code #20000035-001 - District #2 - B. Milner - 10/4/2012

**Project: Trostle Contamination Site**

**Site Location:** The site area is 2.3 miles west and 2.75 miles south of the town of Murdock, Kansas. The legal description is northeastern quarter of section 33, Township 28 South, and Range 6 West of Kingman County, Kansas. The site is in the drainage systems of Sand Creek which is located 1 mile north of the site. Sand Creek is a tributary of the South Fork Ninnescah River.

**Impact/Immediacy:** The high chlorides will impact the ground water affecting stock wells in the immediate area, as well as low lying draws which are usually dry, but containing water with high chlorides after a rainfall. The aquifer is very low yielding. There are erosion effects to the terrain where there is no vegetation. Site is classified as low immediacy.

**Site Description:** The area most affected is around the Trostle salt-water disposal well. There are seven monitoring wells below the Trostle salt-water disposal well that also have elevated chlorides. The most likely cause was something related to the salt-water tank such as discharges. This site was historically remediated via an interceptor trench but the system was abandoned after the holding tanks failed and the site was placed into the monitoring phase of investigation. There has only been one reported spill at the SWDW since 2005. Local hydrology is a perched aquifer system. Precipitation that infiltrated the Pleistocene Alluvium moves downward until it hit the impermeable red Ninnescah shale. Groundwater then flows down gradient on top of the shale. The general movement of fluids in the perched water table flows to the northwest.

**Unusual Problems:** None.

**Status of Project:** On July 22, 2012, eleven groundwater monitoring wells were gauged and sampled. Prior to sampling, groundwater levels were measured in each monitoring well using an electronic water level indicator. A polyethylene disposable bailer was used to attempt purge a minimum of three well volumes of groundwater from each well before sampling. Almost all wells bailed dry before 3 well volume could be purged, and those wells were sampled after recharge had taken place. Purge water was tested for conductivity prior to being discharged onto the ground surface at the Site or contained in a 250 gallon poly-tank if conductivity was high before disposed of into a deep injection well. MW-8 was full of rotten tree roots and bacteria, KCC attempted to remove most of the roots while onsite. Groundwater samples from each monitoring well were collected in one 250 (ml) polyurethane container for analysis at the KCC District #2 Laboratory. Each sample for this monitoring event was analyzed for the presence of Chloride by United States Environmental Protection Agency USEPA Silver Nitrate Buret Titration Method - Method 8225

The data resulting from the August 2012 groundwater sampling event show a marked increase in chlorides in MW-1, MW-3, MW-8, and MW-10. All other monitoring wells were similar levels to 2011. Groundwater levels below the ground surface ranged from approximately 4.25 to 21.33 feet in the sampled wells during the August 22, 2012 event, and decreased an average of 0.26 feet since the July 6, 2011 gauging event. Groundwater flow direction flows to the northwest. The western hydraulic gradient was found to be 0.008314961 ft/ft between MW-4 and MW-9.

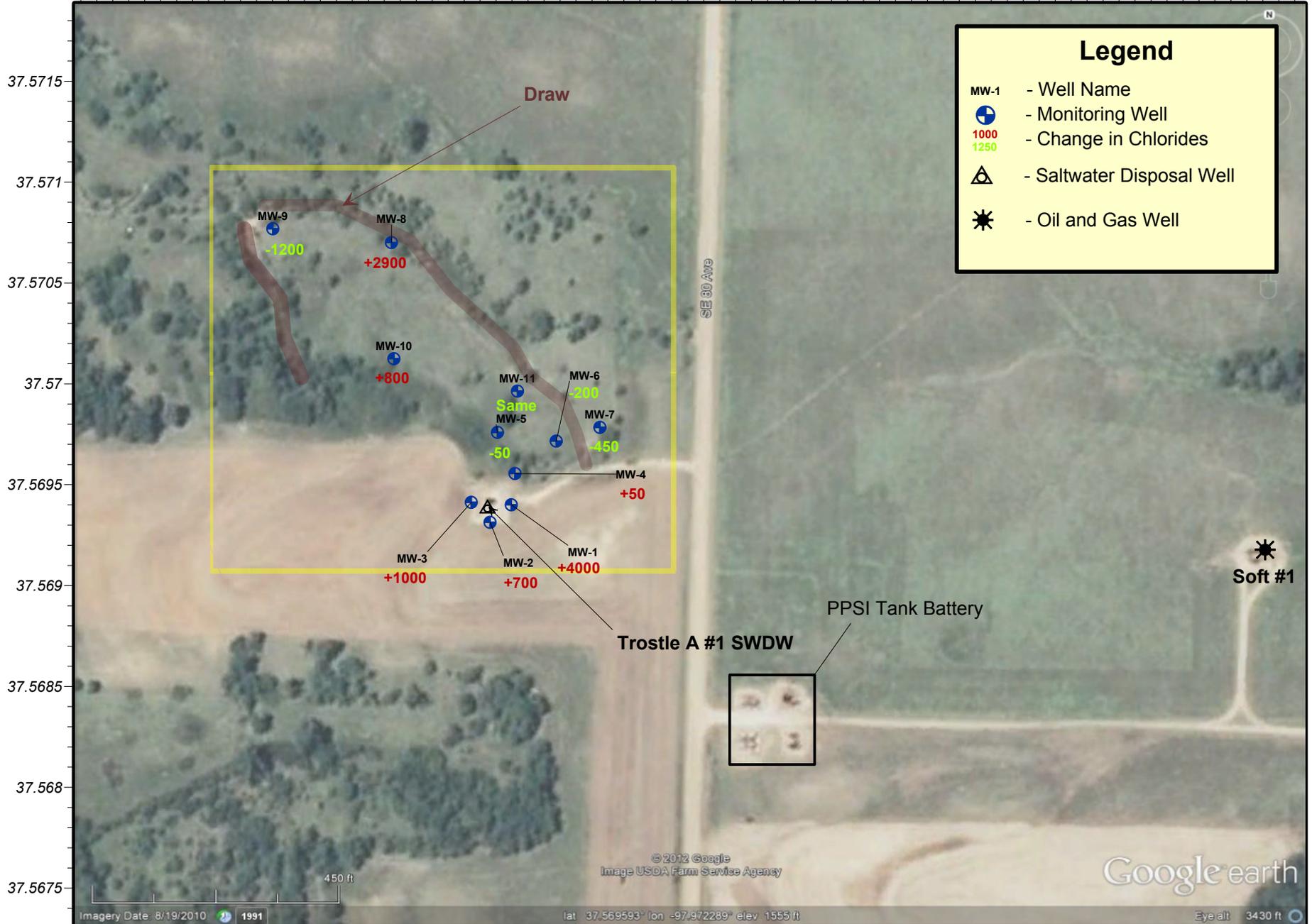
**Level of Remediation Sought:**

Ideal: 250 mg/l Chloride  
Target: 500 mg/l Chloride

**Recommendations for Future Work:** The KCC should sample all monitoring wells and two surface water locations annually over the 2013-14 year in continuance of the current monitoring phase of this site. Due to the isolated nature of this site remediation is not recommended.

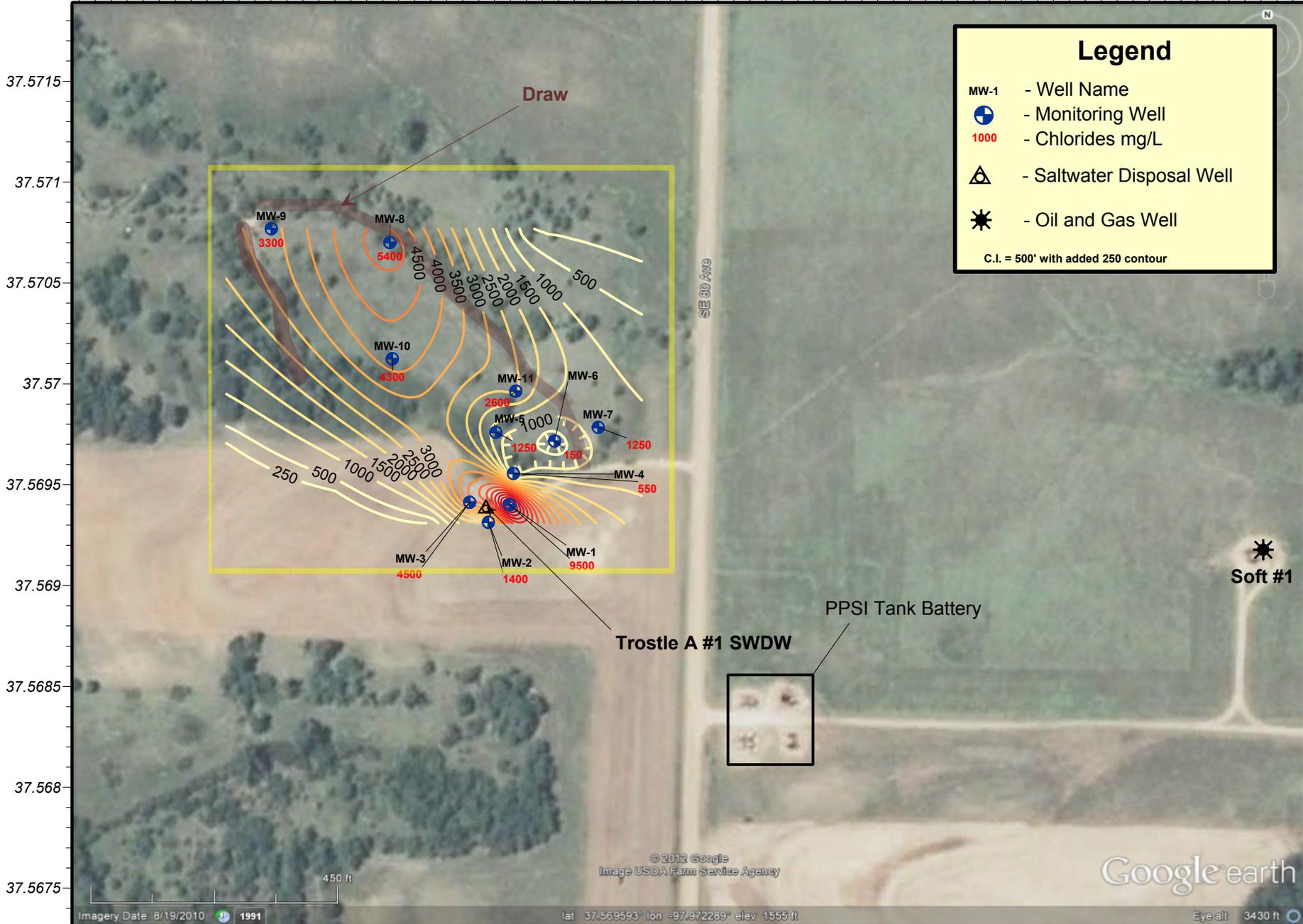
**Estimated Long Term Cost:** The estimated cost to the KCC will be \$800 per year for inspection of site, running an analysis of the water, repair MW-10, and data and report preparation.

<b>Control No.</b>	<b>Staff Hours/Expenditures</b>	<b>Fund Expenditures</b>	
		<b>FY 2012/13</b>	<b>Total</b>
<b>980038-001</b>	<b>28.5 Hrs. / \$748.91</b>		
<b>Current Contaminate Level: 150 mg/l to 9,500 mg/l chlorides in MW-1</b>			
<b>Status:</b>			
<input type="checkbox"/> <b>1. Site Assessment</b>	<input type="checkbox"/> <b>2. Short Term Monitoring</b>	<input type="checkbox"/> <b>3. Investigation</b>	
<input checked="" type="checkbox"/> <b>4. Long Term Monitoring</b>	<input type="checkbox"/> <b>5. Remediation Plan</b>	<input type="checkbox"/> <b>6. Installation</b>	
<input type="checkbox"/> <b>7. Remediation</b>	<input type="checkbox"/> <b>8. Post Rem. Monitoring</b>	<input type="checkbox"/> <b>9. Resolved</b>	



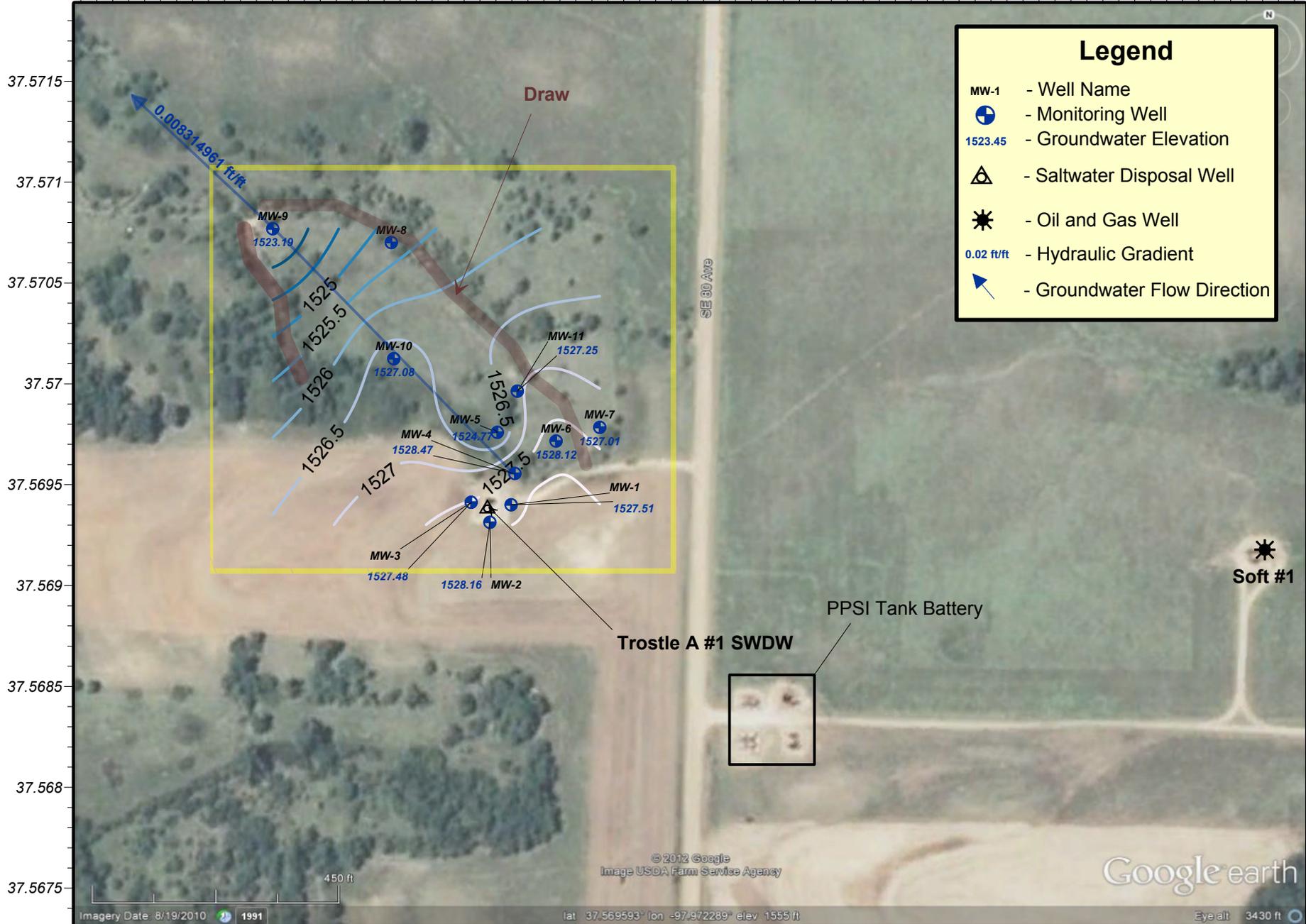
**Trostle Contamination and Monitoring Site**  
 2012 Groundwater Sampling - Change in Chlorides from 2011  
 Section 33 of T28S and R6W, Kingman County, Kansas  
 KCC Control Number:#980038-001 - Map Drawn 9/4/2012 by D. Bollenback

**Figure 4**



**Trostle Contamination and Monitoring Site**  
 2012 Groundwater Sampling - Chloride Concentration Isopact  
 Section 33 of T28S and R6W, Kingman County, Kansas  
 KCC Control Number:#980038-001 - Map Drawn 9/4/2012 by D. Bollenback

**Figure 1**



**Trostle Contamination and Monitoring Site**  
 2012 Groundwater Sampling - Static Water Elevations  
 Section 33 of T28S and R6W, Kingman County, Kansas  
 KCC Control Number:#980038-001 - Map Drawn:8/28/2012 by D. Bollenback

**Figure 2**



**Project: Voshell Site**

**Site Location:** The Voshell site includes a portion of the Voshell Oil Field, which extends to the west one mile past the field boundary forming a grid 3 miles across and six miles in length. The legal description includes Sections 27, 28, 29, 32, 33, 34 of T20S, R3W and Sections 3, 4, 5, 8, 9, 10, 15, 16, 17, 20, 21, 22 of T21S, R3W, McPherson County, Kansas.

**Impact/Immediacy:** Impact is to the shallow Equus Beds underlying the Voshell Oil Field, which has been affected by elevated chloride levels. Resources impacted include domestic and irrigation wells. The site is classified as moderate immediacy level.

**Site Description:** The land surface is flat irrigated farmland, which is dissected by Dry Turkey Creek and Running Turkey Creek. The aquifer ranges in thickness from eighty feet in the east of the site area to approximately two hundred feet in the west. The axis of the relatively thick McPherson channel can be mapped from the center of Section 31, T21S, R3W to the NW corner of Section 19 to the center of Section 5, and then northward from that point. The aquifer appears to contain several aquitards, which may or may not be continuous throughout the area.

**Unusual Problems:** Movement of the chloride plume toward irrigation wells has been somewhat accelerated by the effect of well pumping. The plume will continue to migrate toward the McPherson channel located to the west of the Voshell Oil Field as long as there is deep pumping of the Equus Bed aquifer.

**Status of the Project:** In May of 2004, a cooperative agreement between the Kansas Corporation Commission (KCC) and the Equus Beds Groundwater Management District No. 2 (GMD 2) was entered into for the drilling of 10 groundwater monitoring wells in the Voshell oil field. The GMD 2 is responsible for water sampling and providing water quality data to the KCC. The initial seven wells were drilled north to south through the project area, and were drilled down to the Wellington shale bedrock. Water samples were collected by GMD 2 in late 2012, and analyzed by Servi-Tech Laboratories. The site map was combined with the South Running Turkey Creek map to give a broader view of the Voshell Oil Field area. KCC is moving the southern monitoring wells historically associated with The Running Turkey Site under the Voshell Control Number.

**Level of Remediation Sought:**

**Ideal: 250 ppm Chloride**

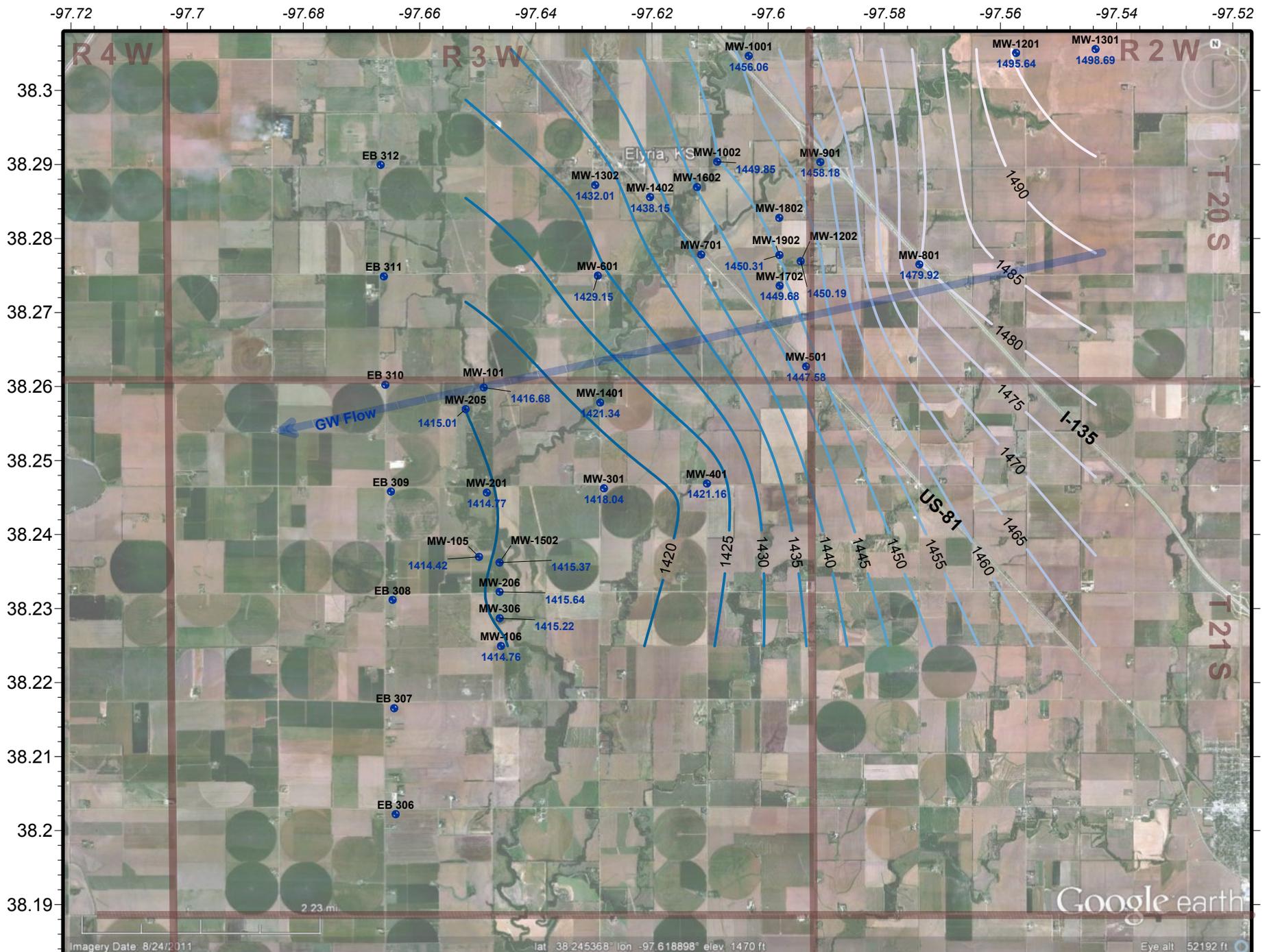
**Target: 500 ppm Chloride**

**Recommendation for Future Work:** KCC recommends the installation of a minimum of 5 wells west of the Voshell monitoring wells in 2013.

**Estimated Total Costs:** Funding provided by the KCC for this monitoring program will not exceed \$20,000 without written mutual agreement of both parties. Cost estimate of \$10,000-\$25,000 dollars for the installation of new monitoring wells to delineate the site to the west during 2013.

Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20030059-001	28 Hrs. / \$699.56	\$311.50	\$18,596.44
<b>Current Contaminate Level: 7,000 mg/l Cl- MW 1502</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	





Imagery Date: 8/24/2011

lat: 38.245368° lon: -97.618898° elev: 1470 ft

Eye alt: 52192 ft



**Voshell & Running Turkey Creek Contamination Sites**  
 Multiple Section of Townships 20 & 21 South and Range 2 & 3 West, McPherson County, Kansas  
 2012 Groundwater Elevation Map  
 District #2 - Control Numbers #20030059-001 & 20010033-001 - Sampled in 10/2012 - Drawn on 10/30/2012 by D.Bollenback

**Project:** *Wildboy's Land & Cattle Contamination Site*

**Site Location:** Legal location is NE/4 of Section 28, Township 33 South, Range 11 West, Barber County. 9 miles S of Medicine Lodge on Hwy 281, 1E, 1S, 1E into farmstead.

**Impact/Immediacy:** The impact is to the groundwater and surface water of the area. Immediacy level is rated at moderate to high.

**Site Description:** The site is located within the Medicine Lodge River Valley.

**Unusual Problems:** None.

**Status of Project:** During 2012, a total of six samples were taken, three from monitoring wells, one from an oil field supply well, and two from stock wells. In general, the chlorides at this site have been quite variable. Since the last sampling event in 2009, chlorides have seen a slight decrease, but prior to 2009 chlorides had been on the rise. Current chlorides at the site are between 140ppm in the western most stock well, and 4000ppm in MW-3, the eastern most sampling point. Current number of monitoring wells does not provide adequate coverage of the plume in order to evaluate the extent to the south and southeast. MW-1 has been destroyed since the last time it was sampled in 2007, when the chlorides were 1000ppm.

**Level of Chloride Sought:**

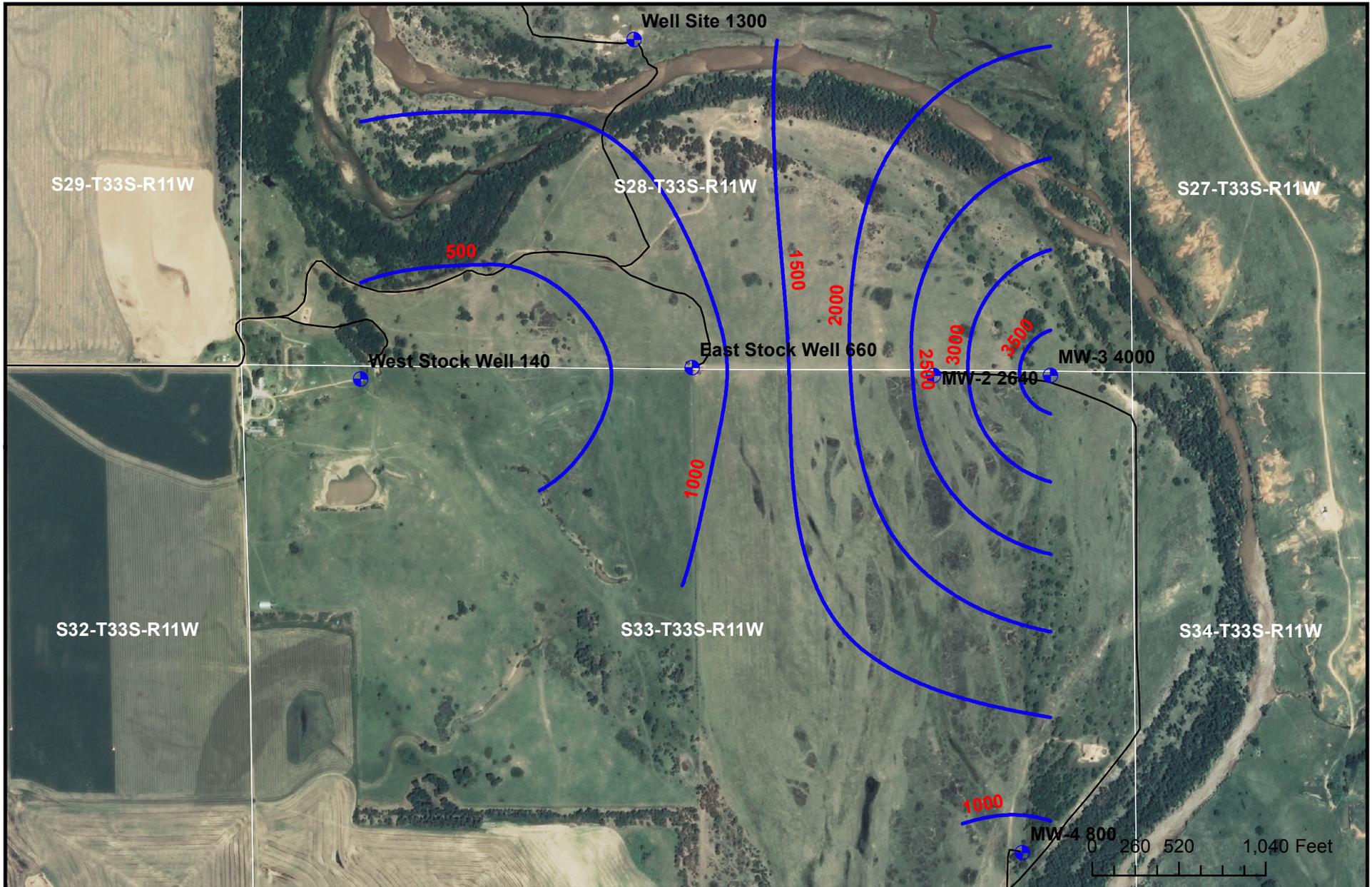
**Ideal:** 250 ppm Chloride

**Target:** 500 ppm Chloride

**Recommendations for Future Work:** Additional monitoring wells or temporary sampling points (auger holes) should be added to the site in order to evaluate the extent of the plume to the east and southeast. The site will be assessed to determine where additional sample points are needed, and for the installation of a permanent down gradient monitoring well. Should chloride levels change significantly in future sampling, implementation of a remedial system will be investigated.

**Estimated Total Cost:** Installation of recovery system and disposal facility with long term monitoring. Costs associated with the installation of the disposal well are attached to the Harbaugh site.

<b>Control No.</b>	<b>Staff Hours/Expenditures</b>	<b>Fund Expenditures</b>	
		<b>FY 2012/13</b>	<b>Total</b>
<b>970017-00</b>	<b>16 Hrs. / \$411.28</b>	<b>See Harbaugh</b>	
<b>Current Contaminate Level: 140ppm Cl- 4000ppm Cl-</b>			
<b>Status:</b>			
<input type="checkbox"/> <b>1. Site Assessment</b>	<input type="checkbox"/> <b>2. Short Term Monitoring</b>	<input type="checkbox"/> <b>3. Investigation</b>	
<input checked="" type="checkbox"/> <b>4. Long Term Monitoring</b>	<input type="checkbox"/> <b>5. Remediation Plan</b>	<input type="checkbox"/> <b>6. Installation</b>	
<input type="checkbox"/> <b>7. Remediation</b>	<input type="checkbox"/> <b>8. Post Rem. Monitoring</b>	<input type="checkbox"/> <b>9. Resolved</b>	



## Wildboys

Sections 28/33-T33S-R11W  
Barber County, Kansas

**Chloride Isopleth Map - sampled on 7-16-2012**

KCC Project Code #970017-00 - District #1 - D. Bernasconi - 9-17-12

**Project:** *Wingate Contamination Site*

**Site Location:** NE/4 of Section 17, Township 29 South, Range 17 East, Wilson County

**Impact/Immediacy:** Impact is to the groundwater and soil. Immediacy level is rated as low.

**Site Description:** This site is located on gently sloping land used for agriculture. Much of the scar is located in a low-lying drainage area next to or within a waterway. Brine seepage originates from the Thayer coal bed or Cottage Grove Sandstone Member, which overlies the Chanute Shale in the higher areas.

**Unusual Problems:** This property is leased by Quest Cherokee. The Mary Douglas property located in the next ¼ section east contains 22 abandoned wells, many of which have high fluid levels and are old style completions. These abandoned wells are contributing to the source of the brine commingling with the shallow aquifer impacting the Wingate property. These wells were plugged by the State and the project was completed in February of 2009.

**Status of Project:** Four new monitoring wells were constructed on this project in early 2012. These wells were sampled three times in 2012 on the following dates: 03/02/2012; 06/15/2012 and 09/11/2012. The results of these samples are as follows:

WIN1: 11,300; 4,700 and 9,700 ppm Cl-                      WIN2: 1,800; 2,000 and 9,200 ppm Cl-  
WIN3: 1,700; 1,800 and 900 ppm Cl-                      WIN4: 2,300; 2,800 and 2,500 ppm Cl-

**Level of Remediation Sought:**

**Ideal:** 250 ppm Chloride  
**Target:** 500 ppm Chloride

**Recommendation for Future Work:** Sample semi annually. This site should possibly be expanded to include the Mary Douglas property located in NW 16-T29S-R17E WL Co. Sampling in 2012 indicates that the primary source of brine is coming from the SSE of this project. Further monitoring of existing wells and possible additional monitoring wells will help to delineate the extent and condition of this aquifer.

**Estimated Total Costs:** Four new monitoring wells were completed at a cost of \$8,196 in 2012.

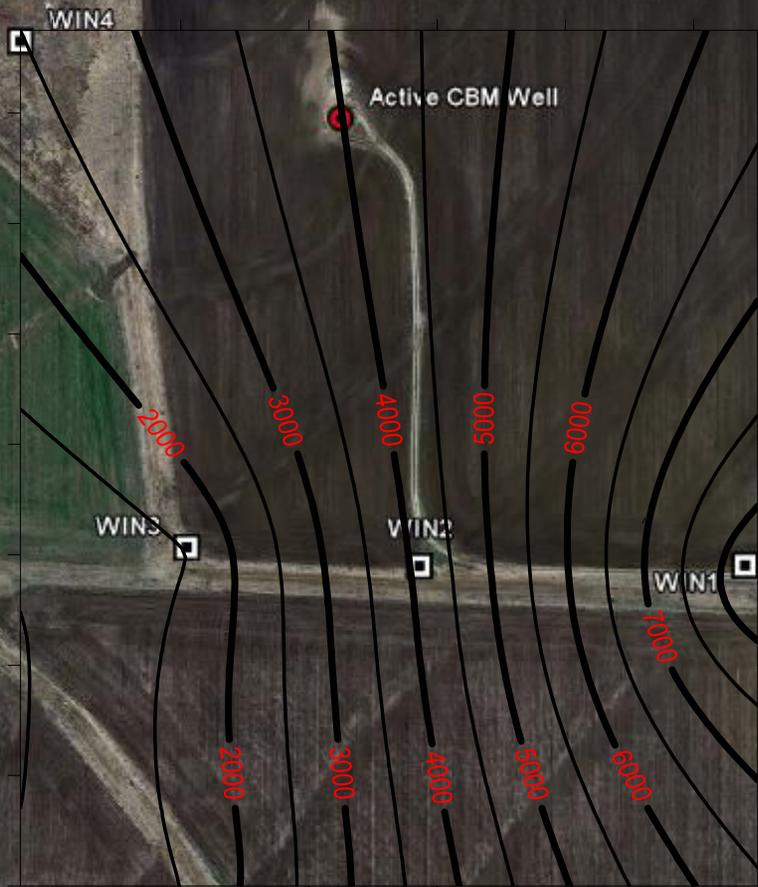
Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
970107-00	35 Hrs. / \$927.03	\$8,296	\$8,296
<b>Current Contaminate Level: 1,700 ppm Cl- to 9,700 ppm Cl-</b>			
<b>Status:Active</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input checked="" type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

# KANSAS CORPORATION COMMISSION

Wingate Remediation Site  
NE 17 - T29S-R17E  
Wilson County, Kansas  
Project 970170-00

11/14/2012

District 3



- Active SWD Well
- Active CBM Well
- Fee Fund Plugged Well
- Monitoring Well
- Cl- concentration contour = 500 ppm



**Project: Yeoman Site**

**Site Location:** The Yeoman site is located in the center of the southeast quarter of section 35 T 28S R7W. This area is five miles south and three miles east of the city of Kingman in Kingman County.

**Impact/Immediacy:** The abandoned Yeoman #1 located in the center of the SE/4 has charged up shallow zones in the Permian Red Beds with gas. The site classification is high due to the remaining gas in place even after producing the gas from 5 monitoring / recovery wells.

**Site Description:** The Yeoman #1 is located in pasture used for grazing cattle. The Permian Red Beds are encountered at a depth of 50' consisting of very soft, sandy weathered red shale. The unconsolidated alluvium above the Red Beds consists of a fine to medium grain sand that is the primary shallow aquifer for this area. There are five monitoring /recovery wells offsetting the abandoned Yeoman #1 that were drilled to a total depth of 150 feet with gas encountered as shallow as 110 feet. Each monitoring / recovery well has approximately 90 feet of 7 inch surface casing set.

**Unusual Problems:** In early 2009, KCC staff became aware of gas coming up an abandoned water well in the SW corner of Sec. 30-28-6W, over a mile away from the Yeoman #1. The property owner is Harold Reid, and the water well is referred to as the Reid water well.

**Status of the Project:** Currently there are five monitoring / recovery wells directly offsetting the Yeoman #1 that are being produced by Don Graber (Gra Ex LLC, KCC Lic. #33921) under an agreement with the KCC. Mr. Graber has been producing the recovery wells since November 2009 and has recovered a total of 65,730 Mcf as of October 1, 2012. For the past 12 months the five monitoring / recovery wells have averaged 67.13 Mcf per day into the sales line. A total cumulative amount of 175,360 Mcf of gas has been recovered from these 5 recovery wells starting back in April 2006.

In April 2010 the KCC District 2 office drilled an additional 6 monitoring wells around the perimeter of section 36 in the section east of the Yeoman site. This was done in an attempt to delineate the escaped gas, and follow the upward trend of the Permian red beds to the northeast. Gas was found at all 6 locations with small initial shut-in pressures varying from 15 to 37 psi. The Permian red beds were encountered as shallow as 14 feet in MW #8 in the NE corner of section 36 as compared to 44 feet in MW #6 that was drilled in the SE/4 of section 35 and is the closest monitoring well drilled to the 5 recovery wells.

Even though consistent recovery has occurred over the last 2 years, recovery amount are remaining steady with an approximately 1 Mcf a day increase. KCC is researching the area for possible new monitoring/recovery wells to help elevate the shallow gas issue.

**Level of Remediation Sought:**

**Ideal:** N/A

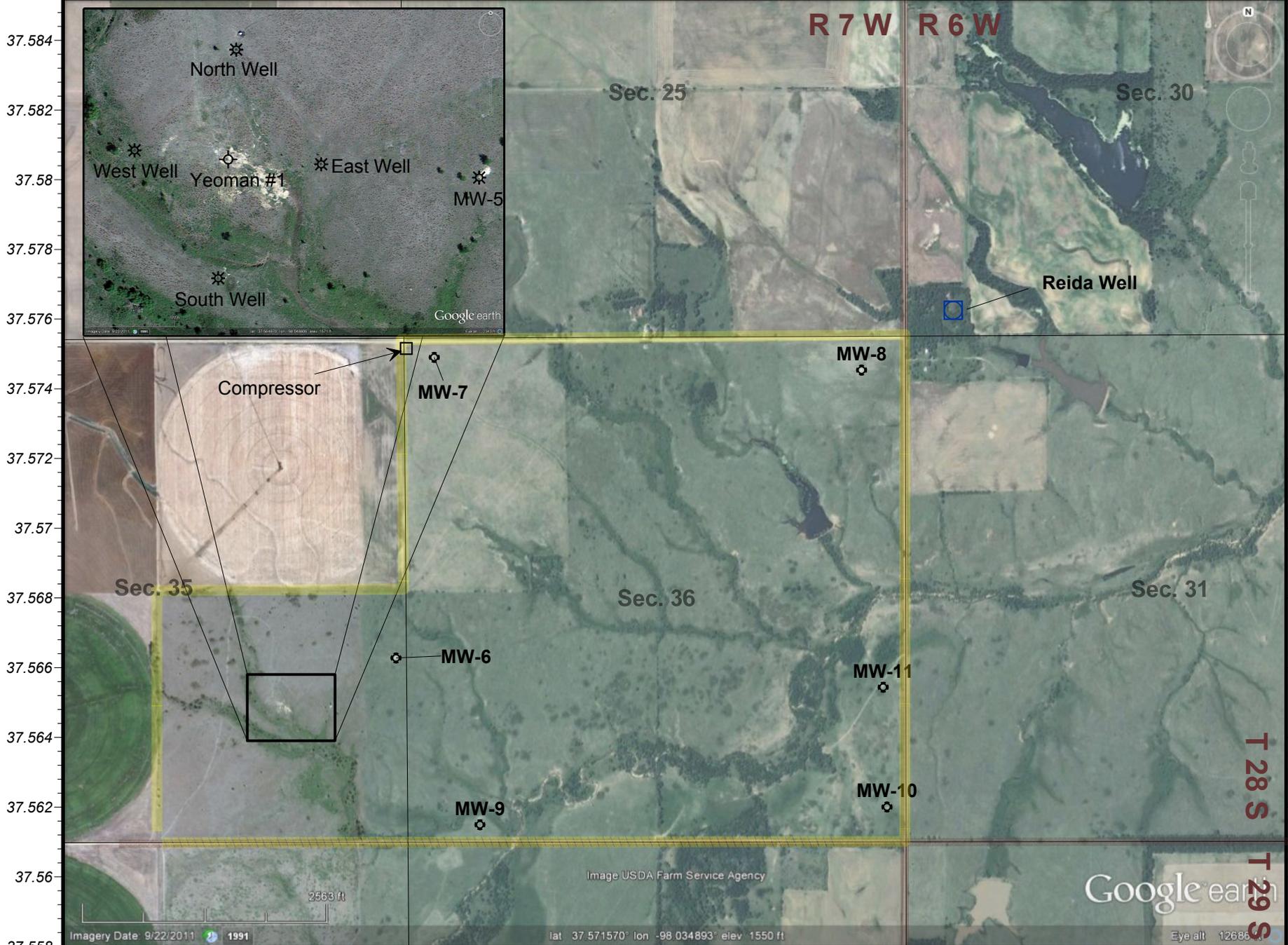
**Target:** N/A Complete the plugging of the Yeoman #1 once escaped gas has been depleted from the Red Beds.

**Recommendation for Future Work:** Continue to monitor gas production very closely with Don Graber. KCC staff recommends that Mr. Graber produce gas from MW #6, the closest MW to the 5 recovery wells in an attempt to accelerate the depletion of the gas in the charged up zone. KCC also recommends that additional monitoring/recovery wells be installed to delineate and investigate the extents and amounts of gas in the local area.

**Estimated Total Costs:** Plugging of the Yeoman #1 will be less than \$25,000 and can be done through KCC fee fund. Additional installation of wells plus staff time on research and investigation would be an estimated \$20,000.

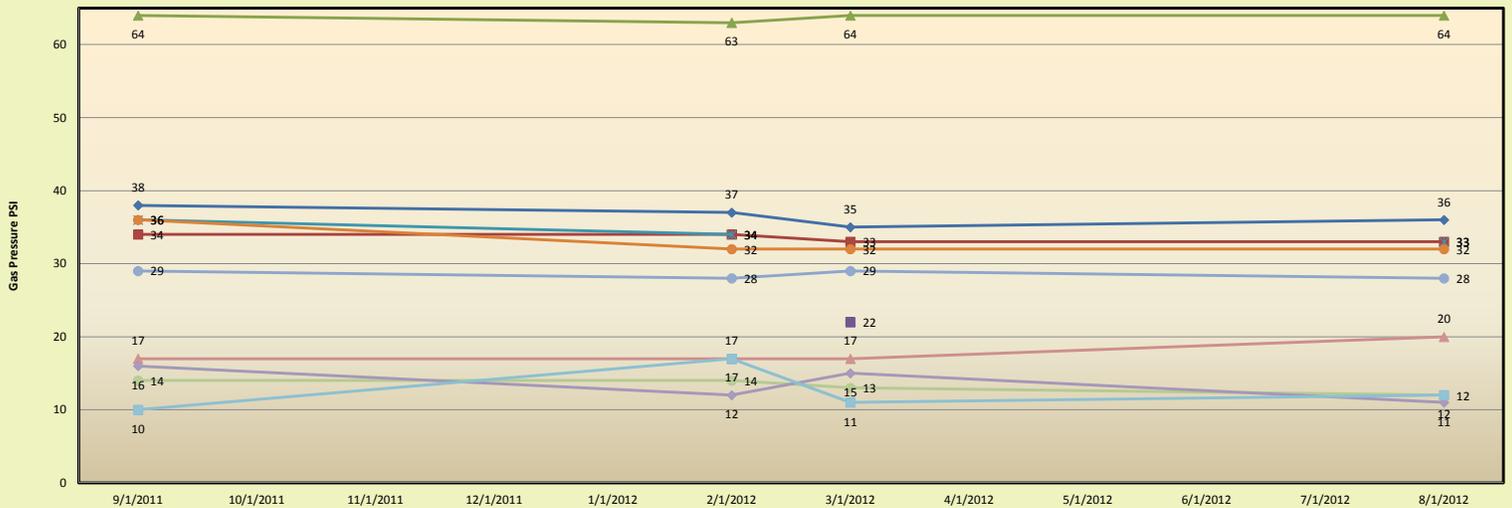
Control No.	Staff Hours/Expenditures	Fund Expenditures	
		FY 2012/13	Total
20060021-001	23.5 Hrs. / \$617.46		\$93,690.76
<b>Current Contaminate Level: Shallow Aquifer &lt;70 ppm Cl- Water from Permian Red Beds tested 625 ppm Cl- in well #5 at 150' TD Total Gas Produced to date: 175,360 mcf</b>			
<b>Status:</b>			
<input type="checkbox"/> 1. Site Assessment	<input type="checkbox"/> 2. Short Term Monitoring	<input type="checkbox"/> 3. Investigation	
<input checked="" type="checkbox"/> 4. Long Term Monitoring	<input type="checkbox"/> 5. Remediation Plan	<input type="checkbox"/> 6. Installation	
<input checked="" type="checkbox"/> 7. Remediation	<input type="checkbox"/> 8. Post Rem. Monitoring	<input type="checkbox"/> 9. Resolved	

-98.055    -98.05    -98.045    -98.04    -98.035    -98.03    -98.025    -98.02    -98.015



**Yeoman Escaped Shallow Gas Site**  
**Section 35 of Township 28 South and Range 7 West, Kingman County, Kansas**  
**Site Map for 2012-13 Legislative Reports**  
**District #2 - Drawn on 10/23/2012 by D. Bollenback**

### Yeoman Pressure Readings 2012



	9/28/2011	2/12/2012	3/26/2012	8/22/2012
North	38	37	35	36
West	34	34	33	33
South	64	63	64	64
East			22	
MW-5	36	34		33
MW-6	36	32	32	32
MW-7	29	28	29	28
MW-8	17	17	17	20
MW-9	14	14	13	12
MW-10	16	12	15	11
MW-11	10	17	11	12