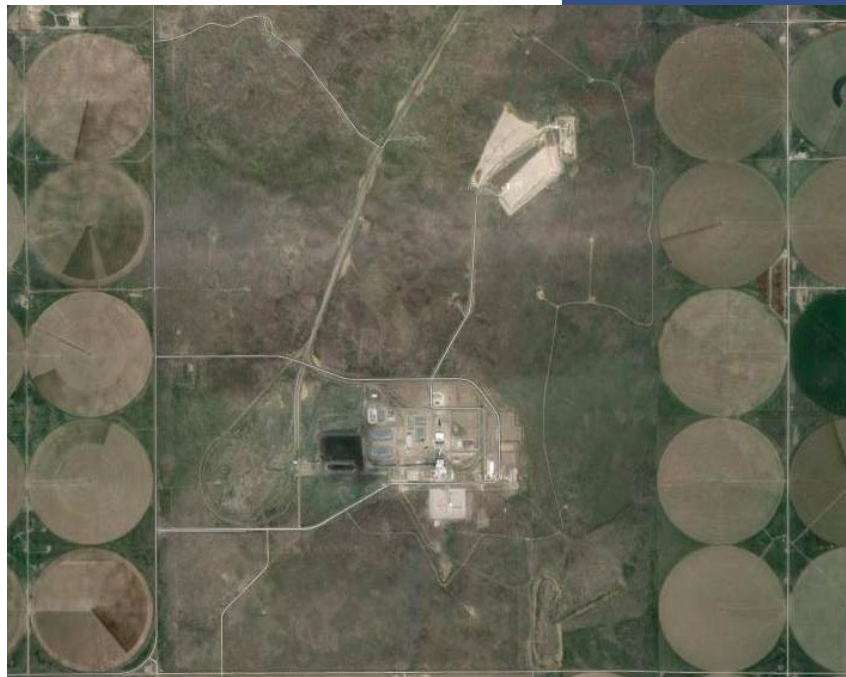




***2023 Annual Report 257.90(e)  
Sunflower Electric Power Corporation  
Holcomb Common Facilities, LLC***



***Prepared for:***



***AEC File No. 24002:4908  
January 25, 2024***

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**ATTEST**

In our professional judgment and to the best of our knowledge, the results and conclusions presented in this document are accurate, and the document has been prepared using sound scientific methods.

**ALLIED ENVIRONMENTAL CONSULTANTS, INC.**



**Paul R. Clark, P.G.**  
Project Manager



**Theodore B. Francis, P.E.**  
Project Engineer

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## 1.0 EXECUTIVE SUMMARY

Sunflower operated the CCR unit pursuant to the detection monitoring program under Code of Federal Regulations (CFR) Title 40 Section 257.94.

In the Fall 2022 event, there were three (3) detections of Appendix III constituents above the statistical prediction limits or statistically significant increase (SSI) above background for the event. In the Spring 2023 event, there were eight (8) exceedances over the prediction limits indicating SSIs for the event. In the Fall 2023 event there were four (4) exceedances over the prediction limits indicating SSIs for the event. A summary of the SSIs for the Fall 2022 and the Spring and Fall 2023 events are shown in Table 1-1, Table 1-2, and Table 1-3.

**Table 1-1: Fall 2022 Event - Exceedances of Prediction Limits**

Well	Parameter	Concentration	Prediction Limit	Location <sup>1</sup>	Action
H-4	Chloride	56.6 mg/L	53 mg/L	Up-gradient	None
H-5	Calcium	80.4 mg/L	66.99 mg/L	Side-gradient	ASD <sup>2</sup>
H-6	Sulfate	35.1 mg/L	34.21 mg/L	Down-gradient	ASD <sup>2</sup>

**Table 1-2: Spring 2023 Event - Exceedances of Prediction Limits**

Well	Parameter	Concentration	Prediction Limit	Location <sup>1</sup>	Action
H-5	Calcium	71.6 mg/L	66.99 mg/L	Side-gradient	ASD <sup>2</sup>
H-4	Chloride	60.6 mg/L	53 mg/L	Up-gradient	None
H-5	Chloride	23.9 mg/L	13.89 mg/L	Side-gradient	ASD <sup>2</sup>
H-1	Sulfate	39.2 mg/L	36.23 mg/L	Side-gradient	ASD <sup>2</sup>
H-3	Sulfate	1,550 mg/L	1,345 mg/L	Up-gradient	None
H-5	Sulfate	182 mg/L	52.29 mg/L	Side-gradient	ASD <sup>2</sup>
H-6	Sulfate	43.4 mg/L	34.21 mg/L	Down-gradient	ASD <sup>2</sup>
H-5	Total Dissolved Solids	440 mg/L	319.6 mg/L	Side-gradient	ASD <sup>2</sup>

**Table 1-3: Fall 2023 Event - Exceedances of Prediction Limits**

Well	Parameter	Concentration	Prediction Limit	Location <sup>1</sup>	Action
H-5	Calcium	87.5 mg/L	81 mg/L	Side-gradient	ASD <sup>2</sup>
H-2	Chloride	96.6 mg/L	93 mg/L	Up-gradient	None
H-5	Chloride	24.8 mg/L	23.9 mg/L	Side-gradient	ASD <sup>2</sup>
H-5	Total Dissolved Solids	468 mg/L	440 mg/L	Side-Gradient	ASD <sup>2</sup>

Note 1: Location relative to landfill and groundwater flow direction

Note 2: ASD – Alternate Source Demonstration

In accordance with 40 CFR 257.94(e), Sunflower has prepared an “Alternate Source Demonstration” (ASD) certified by a qualified professional engineer due to the SSIs in compliance wells H-1, H-5, and H-6. Regulation provides conflicting timing requirements for the ASD, with the ASD to be provided in the Annual Report (due by January 31) and prepared within 90 days of the detection of the SSI. The original SSIs in compliance wells were identified in the Fall 2022 Event Report dated November 29, 2022. Sunflower completed an ASD within 90 days of the Report (on February 23, 2023) and placed it in the operating record. Additional SSIs were identified in compliance wells in the Spring 2023 Event Report dated June 20, 2023. Sunflower revised the ASD within 90 days of the Spring 2023 Event Report (on September 18, 2023)

and placed it in the operating record. This version of the ASD is included with this 2023 Annual Report. Additional SSIs were identified in compliance wells in the Fall 2023 Event Report dated November 15, 2023. Sunflower will revise the ASD within 90 days of the Fall 2023 Event Report (by February 13, 2024) and place it in the operating record and provide in the next Annual Report.

The facility has been in detection monitoring since April 18, 2018, as required under the CCR Rule, and has not required corrective measures to date.

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## **2.0 APPLICABILITY UNDER 40 CFR 257.90**

### *2.1 CCR UNIT SUBJECT TO 40 CFR § 257.90(a)*

The Sunflower Electric Holcomb Landfill is a coal combustion residual (CCR) landfill subject to the requirements described under the 40 CFR §257.90 through §257.98.

### *2.2 ANNUAL REPORTING 40 CFR § 257.90(e)*

40 CFR §257.91 requires the installation of a groundwater monitoring system and 40 CFR §257.93 requires that groundwater sampling and analysis be conducted prior to October 17, 2017. As required in §257.94 the status of the groundwater monitoring is provided herein.

\*\_\*\_\*\_\*\_\*

### 3.0 DATA FOR 2023

#### 3.1 *SITE MAP 40 CFR § 257.90(e)(1)*

Appendix A, Figure 1 provides a map showing the unit and upgradient and downgradient monitoring wells. This information is also provided in the Monitoring Well Installation Report which is included in the facility's operating record as required by §257.105(h)(2).

#### 3.2 *WELL NETWORK STATUS 40 CFR § 257.90(e)(2)*

Sunflower did not install or decommission any monitoring wells during 2023. The Monitoring Well Installation Report included in the facility's operating record is current with the wells present at the landfill.

#### 3.3 *MONITORING WELL DATA 40 CFR § 257.90(e)(3)*

As required in §257.94(b), Sunflower collected semiannual samples from all background and downgradient monitoring wells. Table 1 in Appendix B summarizes the related information including the sample names, dates, and analytical results.

#### 3.4 *MONITORING PROGRAM STATUS 40 CFR § 257.90(e)(4)*

2023 was the sixth year of the detection monitoring program for Sunflower as shown in Appendix B, Table 1. As described in Section 1.0, the compliance wells exceeded the prediction limits in the Fall 2022 and 2023 events; however, the ASD shows the detections are from natural variations in groundwater quality and from an upgradient/off-site source.

The detections above prediction limits in the upgradient wells (H-2, H-3, and H-4) do not meet the criteria for corrective action or ASD as it does not represent the quality of groundwater passing the waste boundary of the CCR Unit [40 CFR 257.91(b)(2)].

Sunflower prepared an ASD in accordance with 40 CFR 257.94(e) due to the increases demonstrated in compliance wells H-1, H-5, and H-6.

#### 3.5 *OTHER INFORMATION 40 CFR § 257.90(e)(5)*

The 2023 Annual Report serves as the report for this CCR Unit and documents all activities that Sunflower conducted to comply with §257.90 through §257.94. None of the activities referenced in §257.90 through §257.98 are relevant to the activities completed in 2023 beyond the provisions of §257.90(e).

\*\_\*\_\*\_\*\_\*

## **4.0 RECORDKEEPING 40 CFR§ 257.90(f)**

To comply with the recordkeeping requirements:

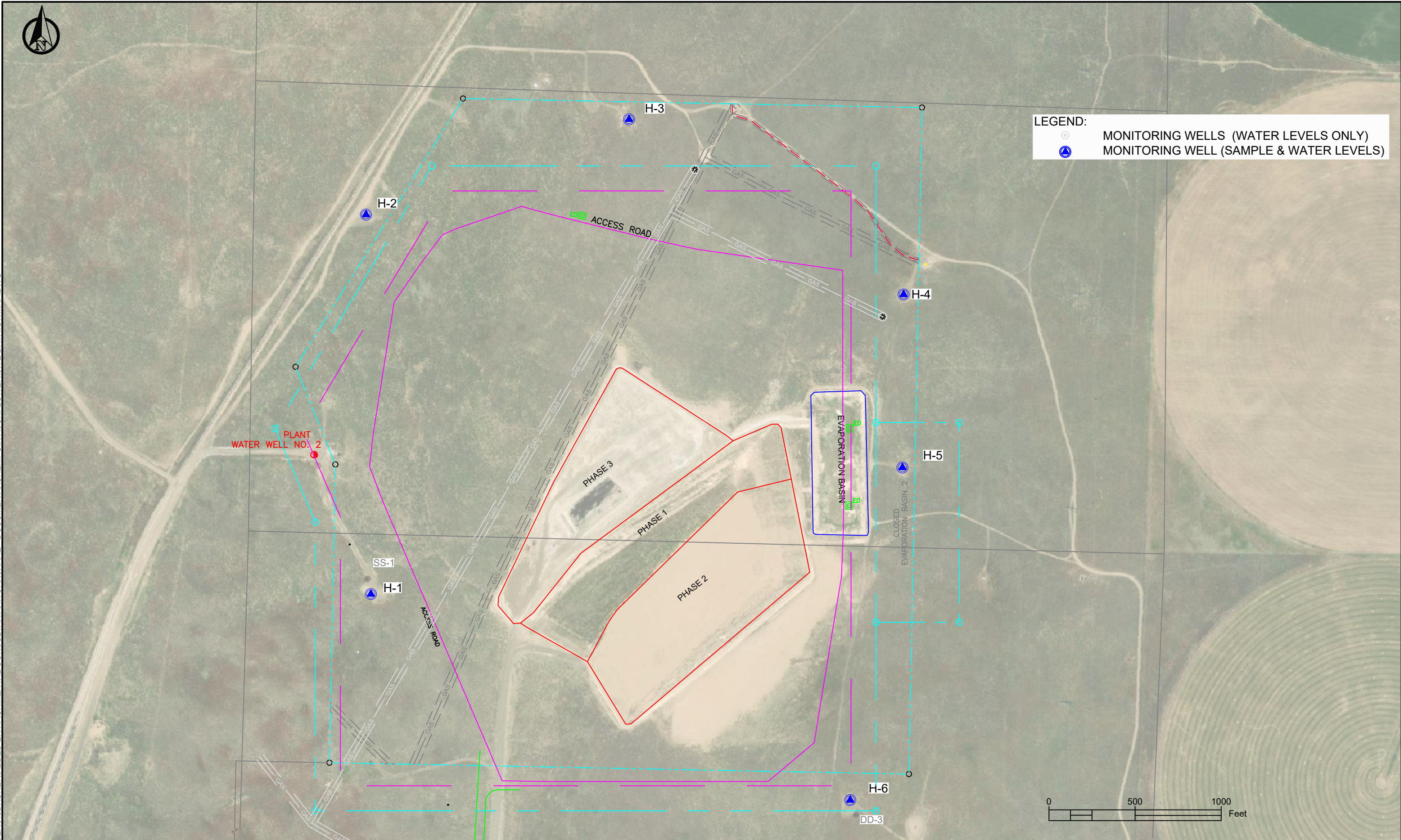
- The Annual Report must be placed in the facility's operating record, as required by §257.105(h)(1).
- Sunflower will notify the KDHE within 30 days of the Annual Report being placed in the facility's operating record, as required by §257.106(d).
- Sunflower will post the Annual Report on their CCR website within 30 days of the Annual Report being placed in the facility's operating record, as required by §257.107(d).

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**APPENDIX A**

**SITE MAP - HOLCOMB COMMON FACILITIES, LLC**

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LEGEND:  
 ○ MONITORING WELLS (WATER LEVELS ONLY)  
 ● MONITORING WELL (SAMPLE & WATER LEVELS)

SUNFLOWER ELECTRIC  
 HOLCOMB, KANSAS PLANT  
 INDUSTRIAL LANDFILL

214 N. ST. FRANCIS • WICHITA, KS 67202 • 316.262.5698

PROJECT: 24002-0:4908  
 SCALE: AS\_SHOWN  
 DATE: 1/3/2024  
 DWN BY: SMB  
 CHKD BY: TBF

LANDFILL SITE MAP  
 HOLCOMB COMMONS FACILITY, LLC

FIGURE  
 1

## **APPENDIX B**

### **DATA SUMMARY - HOLCOMB COMMON FACILITIES, LLC**

**Table 1: Summary of Semi-Annual Analytical Results**  
Sunflower Electric Power Corporation  
Holcomb Common Facilities, LLC.

Location	Measure Point Elevation (TOC) *	Sample Date	Depth to Water (BTOC)	Groundwater Elevation (ft. AMSL)	Field Parameters				Detection Monitoring Appendix III Constituents						
					Temperature (deg F)	Conductivity (µS/cm)	Turbidity (NTU)	pH (su)	Boron, Total (µg/L)	Calcium, Total (µg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	
Up-Gradient	H-2	2914.71	4/18/2018	196.23	2,718.48	62.7	1588.0	0.55	7.33	ND (150)	260,000	93	0.39	810	1,400
			10/10/2018	200.80	2,713.91	59.0	1678.0	1.02	7.17	ND (150)	270,000	86	ND (0.50)	850	2,900
			4/10/2019	190.60	2,724.11	64.0	1755.0	1.08	7.38	ND (150)	280,000	91	0.32	950	1,500
			10/7/2019	200.00	2,714.71	62.0	1887.0	0.88	7.35	ND (150)	310,000	93	ND (0.5)	50	1,600
			4/7/2020	189.20	2,725.51	65.0	1966.0	0.79	7.24	ND (150)	310,000	84	0.31	860	1,600
			10/6/2020	199.40	2,715.31	66.0	1819.0	1.90	7.59	ND (150)	310,000	89	0.30	840	1,500
			4/6/2021	190.12	2,724.59	64.6	1994.0	1.70	7.26	ND (150)	330,000	89	ND (0.5)	900	1,200
			10/12/2021	200.80	2,713.91	65.6	1886.0	0.49	7.12	ND (150)	320,000	86	ND (0.5)	1,000	1700***
			4/26/2022	200.50	2,714.21	66.0	1698.0	0.41	7.66	ND (150)	360,000	85	ND (0.5)	1,100	1,700
			10/18/2022	206.60	2,708.11	58.4	2175.0	10.20	7.14	60.6	372,000	91.8	0.330	1,100	1,750
	4/25/2023	206.20	2,708.51	62.0	2040.0	19.90	7.13	59.6	187,000	70.3	0.326	952	1,410		
	10/12/2023	209.00	2,705.71	65.4	2183.0	20.30	7.04	67.7	336,000	96.6	0.319	1,230	2,030		
	H-3	2905.93	4/18/2018	188.43	2,717.50	62.6	2191.0	7.96	7.29	ND (150)	340,000	90	ND (1.0)	1,200	2,000
			10/10/2018	193.30	2,712.63	58.0	2005.0	3.26	7.23	ND (150)	320,000	87	ND (0.50)	1,100	1,800
			4/10/2019	182.70	2,723.23	64.8	2026.0	2.58	7.32	ND (150)	270,000	78	0.33	1,100	1,800
			10/7/2019	191.60	2,714.33	63.0	2180.0	4.34	7.27	ND (150)	310,000	84	ND (0.5)	1,100	1,700
			4/7/2020	181.20	2,724.73	66.0	2157.0	2.00	7.29	ND (150)	310,000	81	ND (0.5)	1,100	1,800
			10/6/2020	190.70	2,715.23	63.0	2248.0	8.00	7.20	ND (150)	350,000	88	0.30	1,100	1,900
			4/6/2021	182.90	2,723.03	64.8	2284.0	2.96	7.39	ND (150)	340,000	81	ND (0.5)	730**	1,500
			10/12/2021	192.60	2,713.33	65.5	2126.0	2.64	7.13	ND (150)	320,000	84	ND (0.5)	1,200	1600***
			4/26/2022	191.70	2,714.23	66.0	2000.0	2.29	7.30	ND (150)	340,000	81	ND (1.0)	1,200	1,900
			10/18/2022	198.20	2,707.73	58.4	2360.0	23.00	7.13	55.2	343,000	91.7	0.276	1,220	1,990
	4/25/2023	198.00	2,707.93	61.4	2320.0	17.10	7.22	51	252,000	93	0.28	1,550	1,840		
	10/12/2023	200.80	2,705.13	65.1	2388.0	90.10	7.10	65.8	365,000	96.0	0.342	1,390	1,950		
	H-4	2901.66	4/18/2018	190.00	2,711.66	62.6	829.3	2.37	7.47	ND (150)	130,000	33	0.51	300	620
			10/10/2018	195.50	2,706.16	58.0	857.0	1.37	7.47	ND (150)	130,000	33	0.46	310	330
			4/10/2019	185.10	2,716.56	63.8	1134.0	1.08	7.48	ND (150)	170,000	42	0.40	510	970
			10/7/2019	193.40	2,708.26	64.0	1162.0	1.07	7.45	ND (150)	170,000	46	0.41	490	910
			4/7/2020	183.90	2,717.76	66.0	1208.0	0.88	7.47	ND (150)	200,000	47	0.39	540	1,000
			10/6/2020	192.50	2,709.16	65.0	1186.0	1.40	7.41	ND (150)	190,000	50	0.38	520	960
			4/6/2021	185.10	2,716.56	64.1	1318.0	0.90	7.38	ND (150)	220,000	53	0.38	5**	1,100
			10/12/2021	193.90	2,707.76	66.0	1159.0	0.72	7.31	ND (150)	200,000	48	0.57	590	860***
			4/26/2022	192.30	2,709.36	66.0	1206.0	0.45	7.39	ND (150)	230,000	50	ND (0.5)	660	1,100
			10/18/2022	198.70	2,702.96	60.1	1590.0	2.07	7.18	33.9	169,000	56.6	0.348	661	1,160
	4/25/2023	198.00	2,703.66	60.7	1520.0	2.04	7.38	45	217,000	61	0.36	835	1,150		
	10/12/2023	200.00	2,701.66	65.8	1515.0	2.22	7.20	40.8	201,000	59.9	0.449	726	1,230		
Down-Gradient	H-1	2924.54	4/18/2018	217.00	2,707.54	64.3	385.3	0.47	7.62	ND (150)	47,000	5	0.57	33	240
			10/10/2018	222.40	2,702.14	58.2	382.0	0.40	7.37	ND (150)	45,000	5	0.53	30	240
			4/10/2019	213.00	2,711.54	65.7	387.7	1.67	7.76	ND (150)	42,000	4	0.51	29	250
			10/7/2019	222.60	2,701.94	62.0	400.0	0.57	7.68	ND (150)	46,000	5	0.48	32	240
			4/7/2020	212.30	2,712.24	65.0	400.0	0.51	7.54	ND (150)	48,000	5	0.49	28	240
			10/6/2020	222.90	2,701.64	64.0	399.0	0.63	7.62	ND (150)	46,000	5.5	0.48	28	140**
			4/6/2021	214.40	2,710.14	64.6	403.6	3.00	7.66	ND (150)	49,000	5.5	0.51	27	110**
			10/12/2021	222.80	2,701.74	66.2	398.7	0.63	7.36	ND (150)	46,000	5.2	0.54	30	37****
			4/26/2022	220.90	2,703.64	66.0	407.2	0.54	7.67	ND (150)	49,000	4	ND (0.5)**	26	240
			10/18/2022	227.10	2,697.44	59.0	397.0	0.85	7.65	41.0	50,200	4.54	0.570	32.6	244
	4/25/2023	225.20	2,699.34	61.9	397.0	1.02	7.29	42	40,700	5	0.282**	39	238		
	10/12/2023	228.50	2,696.04	64.5	398.0	0.47	7.25	51.5	44,500	4.93	0.543	35.9	1910**		
	H-5	2896.67	4/18/2018	187.80	2,708.87	64.0	409.1	0.97	7.63	ND (150)	59,000	12	0.54	36	250
			10/10/2018	192.70	2,703.97	59.0	425.0	0.52	7.61	ND (150)	56,000	13	0.49	40	280
			4/10/2019	183.90	2,712.77	65.0	425.2	0.83	7.70	ND (150)	57,000	12	0.47	41	280
			10/7/2019	191.10	2,705.57	62.0	426.0	0.62	7.64	ND (150)	57,000	11	0.48	40	220
			4/7/2020	182.70	2,713.97	65.0	432.0	0.54	7.57	ND (150)	57,000	9.6	0.47	39	280
			10/6/2020	190.20	2,706.47	64.0	428.0	1.10	7.59	ND (150)	60,000	10	0.46	41	290
			4/6/2021	182.80	2,713.87	64.1	440.1	1.30	7.60	ND (150)	61,000	10.0	0.49	39	220
			10/12/2021	191.10	2,705.57	65.2	429.5	0.35	7.50	ND (150)	57,000	9.7	0.49	41	240***
			4/26/2022	189.50	2,707.17	66.0	455.5	0.30	7.54	ND (150)	63,000	10	ND (0.5)**	45	280
			10/18/2022	194.70	2,701.97	61.7	651.0	2.37	7.30	29.3	80,400	22.0	0.515	145	426
	4/25/2023	194.20	2,702.47	60.5	649.0	1.18	7.56	36	71,600	24	0.42	182	440		
	10/12/2023	196.00	2,700.67	65.2	684.0	3.25	7.37	41.3	87,500	24.8	0.465	178	468		
	H-6	2940.37	4/18/2018	239.30	2,701.07	64.8	471.3	0.59	7.56	ND (150)	70,000	13	0.54	31	310
			10/10/2018	242.70	2,697.67	60.0	468.0	0.50	7.56	ND (150)	68,000	13	0.51	28	310
			4/10/2019	237.10	2,703.27	65.4	473.1	0.50	7.65	ND (150)	69,000	12	0.51	28	310
			10/7/2019	242.30	2,698.07	63.0	478.0	0.52	7.64	ND (150)	69,000	13	0.51	31	270
			4/7/2020	237.00	2,703.37	65.0	488.0	0.81	7.58	ND (150)	70,000	12	0.50	28	320
			10/6/2020	242.00	2,698.37	64.0	486.0	0.33	7.51	ND (150)	67,000	12	0.49	30	280
			4/6/2021	232.70	2,707.67	64.6	465.8	4.12	7.60	ND (150)	58,000	11.0	0.56	32	270
			10/12/2021	241.60	2,698.77	64.8	463.2	0.32	7.46	ND (150)	65,000	11.0	0.53	31	340***
			4/26/2022	240.40	2,699.97	66.0	460.6	0.44	7.55	ND (150)	69,000	10	ND (0.5)**	29	300
			10/18/2022	244.20	2,696.17	62.4	449.0	2.23	7.41	25.4	51,400	10.3	0.573	35.1	276
	4/25/2023	243.20	2,697.17	61.1	449.0	1.29	7.61	38	51,900	11	0.50	43	310		
	10/12/2023	245.00	2,695.37	66.4	458.0	0.63	7.39	35.9	53,800	11.1	0.582	38.3	306		

Notes & Abbreviations Key:

\* Measuring point elevation at top of well casing, from survey completed and sealed by Cornerstone Professional Services Inc. on February 12, 2016

\*\* Suspected outlier, removed from statistical analysis

\*\*\* The TDS values came from verification sampling conducted on 12/14/2021

TOC - Top of Casing

BTOC - below top of casing

ft. AMSL - Feet Above Mean Sea Level

deg F - Degrees Fahrenheit

µS/cm - microSeimens per centimeter

NTU - Nephelometric Turbidity Units

su - standard units

µg/L - micrograms per Liter

mg/L - milligrams per Liter

**APPENDIX C**

**REGULATORY CROSS  
REFERENCE- HOLCOMB COMMON FACILITIES, LLC**

**REGULATORY CROSS REFERENCE**  
**2023 Annual Report**  
Sunflower Electric Power Corporation  
Holcomb Common Facilities, LLC.

Regulatory Citation	Annual Report Section or Compliance Narrative
<p>§257.90 Applicability. (a)</p> <p>(a) All CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under §§257.90 through 257.98.</p>	<p>See Annual Report, Section 2.1</p>
<p>§257.90 Applicability. (b)(1)(i)</p> <p>(b) <i>Initial timeframes - (1) Existing CCR landfills and existing CCR surface impoundments.</i> No later than October 17, 2017, the owner or operator of the CCR unit must be in compliance with the following groundwater monitoring requirements:</p> <p>(b)(i) Install the groundwater monitoring system as required by §257.91;</p>	<p>Sunflower installed the required groundwater monitoring system in 2016. Sunflower has placed installation reports and certifications in the operating record.</p>
<p>§257.90 Applicability. (b)(1)(ii)</p> <p>(b)(ii) Develop the groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by §257.93;</p>	<p>Sunflower has prepared a groundwater sampling and analysis plan with accompanying statistical procedures as required by this subsection.</p>
<p>§257.90 Applicability. (b)(1)(iii)</p> <p>(b)(iii) Initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient well as required by §257.94(b); and</p>	<p>Sunflower completed the collection and analysis of a minimum of eight independent samples in 2017 for all wells at the subject landfill.</p>
<p>§257.90 Applicability. (b)(1)(iv)</p> <p>(b)(iv) Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in appendix III of this part as required by §257.94.</p>	<p>Sunflower has begun to evaluate the data using the procedures described in the groundwater sampling and analysis plan.</p>

Regulatory Citation	Annual Report Section or Compliance Narrative
<p>§257.90 Applicability. (b)(2)</p> <p>(2) <i>New CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units.</i> Prior to initial receipt of CCR by the CCR unit, the owner or operator must be in compliance with the groundwater monitoring requirements specified in paragraph (b)(1)(i) and (ii) of this section. In addition, the owner or operator of the CCR unit must initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background well as required by §257.94(b).</p>	<p>The subject landfill pre-dates the CCR regulations. This subsection does not apply to the subject facility at this time.</p>
<p>§257.90 Applicability. (c)</p> <p>(c) Once a groundwater monitoring system and groundwater monitoring program has been established at the CCR unit as required by this subpart, the owner or operator must conduct groundwater monitoring and, if necessary, corrective action throughout the active life and post-closure care period of the CCR unit.</p>	<p>Sunflower initiated a post-background detection monitoring in 2018.</p>
<p>§257.90 Applicability. (d)</p> <p>(d) In the event of a release from a CCR unit, the owner or operator must immediately take all necessary measures to control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment. The owner or operator of the CCR unit must comply with all applicable requirements in §§257.96, 257.97, and 257.98.</p>	<p>Sunflower will respond accordingly should a release occur at this facility.</p>

Regulatory Citation	Annual Report Section or Compliance Narrative
<p>§257.90 Applicability. (e)</p> <p>(e) <i>Annual groundwater monitoring and corrective action report.</i> For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by §257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:</p>	<p>(see below for Annual report content requirements)</p>
<p>§257.90 Applicability. (e)(1)</p> <p>(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;</p>	<p>See Annual Report, Section 3.1.</p>
<p>§257.90 Applicability. (e)(2)</p> <p>(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;</p>	<p>See Annual Report, Section 3.2.</p>
<p>§257.90 Applicability. (e)(3)</p> <p>(3) In addition to all the monitoring data obtained under §§257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;</p>	<p>See Annual Report, Section 3.3.</p>

Regulatory Citation	Annual Report Section or Compliance Narrative
<p>§257.90 Applicability. (e)(3)</p> <p>(4) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and</p>	<p>See Annual Report, Section 3.4</p>
<p>§257.90 Applicability. (e)(3)</p> <p>(5) Other information required to be included in the annual report as specified in §§257.90 through 257.98.</p>	<p>See Annual Report, Section 3.5</p>

§257.90 Applicability. (e)

See Annual Report, Section 1.0

(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e):

(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and

(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.

(iv) If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following:

(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;

(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;

(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and

(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.

(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and

(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

<p>§257.90 Applicability. (f)</p> <p>(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in §257.105(h), the notification requirements specified in §257.106(h), and the internet requirements specified in §257.107(h).</p>	<p>See Annual Report, Section 4.0</p>
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Source - [80 FR 21468, Apr. 17, 2015, as amended at 81 FR 53516, Aug. 28, 2020]

## **APPENDIX D**

### **ALTERNATE SOURCE DEMONSTRATION**



***Alternate Source Demonstration  
Sunflower Electric Power Corporation  
Holcomb Common Facilities, LLC***

***Prepared for:***



***AEC File No. 23004:4908  
September 18, 2023***

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**Certification**

This report presents a successful Alternative Source Demonstration per 40 CFR 257.94(e)(2), documenting that a source other than the Coal Combustion Residuals Unit is responsible for the Statistically Significant Increases. The information included in this report is accurate to the best of my knowledge.



**ALLIED ENVIRONMENTAL CONSULTANTS, INC.**

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## EXECUTIVE SUMMARY

Sunflower initiated the background monitoring program for the Holcomb Station Coal Combustion Residuals (CCR) Landfill in 2016, as required by 40 CFR 257.94. Certain statistical analyses since then have identified statistically significant increases (SSIs) for Calcium, Chloride, Sulfate, and Total Dissolved Solids in monitoring wells located upgradient, downgradient, and side-gradient to the landfill. This report successfully demonstrates that a source other than the landfill is responsible for the SSIs due to declines in groundwater elevations that are causing widespread salinity intrusion to the High Plains Aquifer from the Arkansas River. As discussed below, this alternative source demonstration (ASD) is supported by numerous studies of the Arkansas River and other information, including water quality monitoring data from the nearby City of Holcomb Public Water Supply Wells.

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## 1.0 INTRODUCTION

### 1.1 PURPOSE OF REPORT & BACKGROUND

The Holcomb Generating Station, located near Holcomb, Kansas, contains one coal combustion residuals (CCR) landfill located between the station and the Arkansas River (Figure 1: Topo Map of Site). The site performs groundwater detection monitoring in accordance with 40 CFR 257.94. Statistical analysis of each monitored parameter (found in Appendix III to 40 CFR 257) is performed using Sanitas Statistical Software, as outlined in the Holcomb Station CCR Landfill Groundwater Sampling and Analysis Plan (SAP)<sup>1</sup> and in accordance with the United States Environmental Protection Agency's (USEPA) Unified Guidance<sup>2</sup>. For each monitoring event, the statistical analysis determines prediction limits (at the 99% Confidence Level) for each parameter based on background data for each well by intrawell parametric analysis using a tolerance or prediction interval procedure, as authorized under 40 CFR 257.93(f)(3). Unless determined to be an outlier, sample results that occur above the prediction limit are considered a statistically significant increase (SSI) above the corresponding background levels. An SSI at any monitoring well at the waste boundary (specified under 257.91(a)(2)) triggers actions under 40 CFR 257.94(e)(2), which includes either (1) entering into Assessment Monitoring; or (2) performing an Alternate Source Determination (ASD).

The Landfill Monitoring Network consists of six wells, designated H-1 to H-6, which were installed in late 2015 and early 2016. Static water levels measured each April and October from these wells show that groundwater beneath the landfill flows from the north-northwest to the south-southeast. Water levels appear to show a "seasonality" with April water levels measuring at higher elevations than those measured in October. The seasonality may be accentuated by the pumping of large irrigation wells located relatively close to the landfill. The statistical plan for the landfill has yet to account for seasonality in monitoring results but will once the sample size is large enough to do so.

SSIs have been found in upgradient wells since Spring 2018 (with increasing trends since Spring 2019) but were only recently detected in down/side-gradient (compliance) wells during the Fall 2022 monitoring event<sup>3</sup>. SSIs in the wells upgradient from the landfill do not trigger actions under 40 CFR 257.94(e)(2). Table 1-1 summarizes statistically significant trends and increases that have been observed at the Landfill Monitoring Network<sup>4</sup>.

As shown in Table 1-1, Calcium, Chloride, Sulfate, and Total Dissolved Solids have all exhibited historical SSIs in upgradient wells while SSIs of these parameters were initially detected in compliance wells starting in Fall 2022. Time-series graphs for the constituents evaluated herein are shown in Graphs 1-1 through 1-4, indicating trends and spatial variability between wells.

This report serves as the ASD and shows that factors unrelated to the CCR Unit have contributed to the SSIs, including salinity intrusion from the Arkansas River and the underlying alluvial aquifer into the High Plains Aquifer (HPA). The salinity intrusion accounts for all constituents (Calcium, Chloride, Sulfate, and TDS) that have demonstrated SSIs at the Landfill.

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<sup>1</sup> Groundwater Sampling and Analysis Plan, Allied Environmental Consultants, June 23, 2016.

<sup>2</sup> Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March 2009.

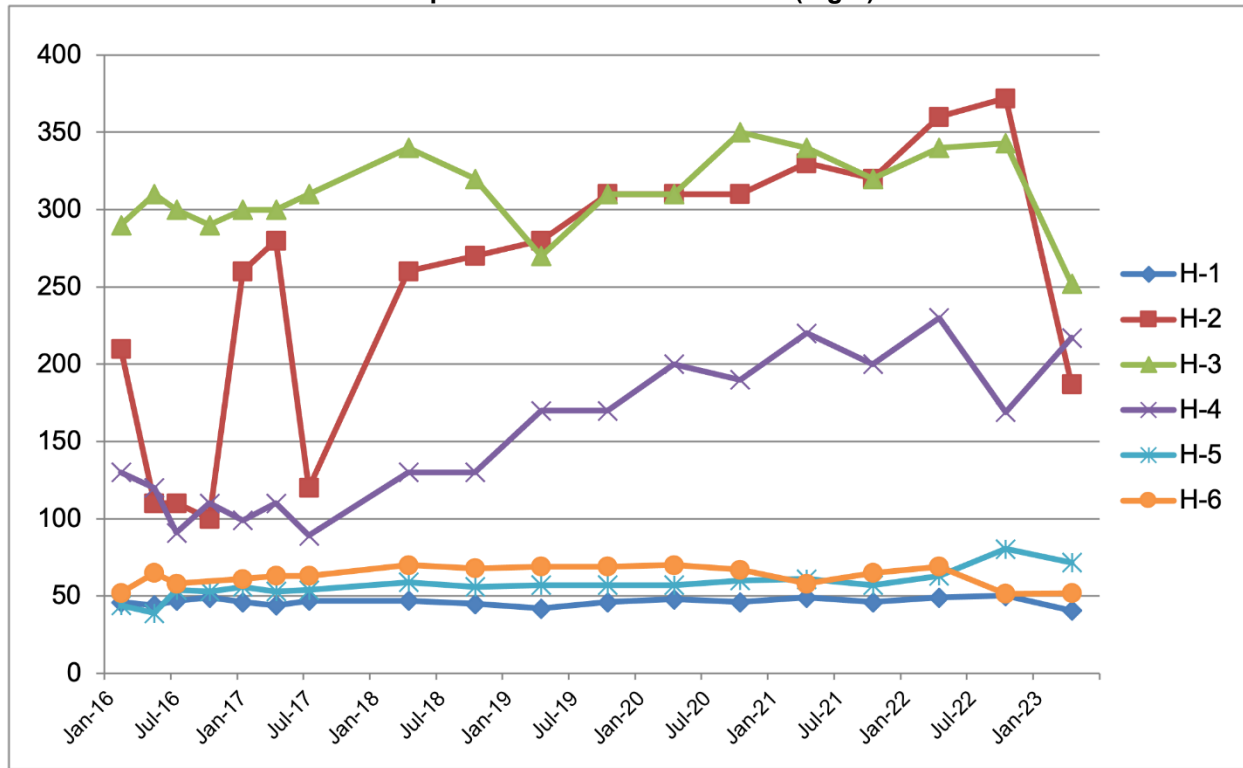
<sup>3</sup> Holcomb Common Facilities Industrial Landfill (CCR Unit) Fall 2022 Sampling Summary Report, Allied Environmental Consultants, November 29, 2022.

<sup>4</sup> It should also be noted that in Fall 2022 H-5 (the northern-most "down-gradient" well) also exhibits elevated levels of Chloride, Sulfate, and Total Dissolved Solids that likely would have exceeded prediction limits, but in accordance with the EPA 1989 Outlier Test the results were determined to be outliers and not included in the parametric analysis.

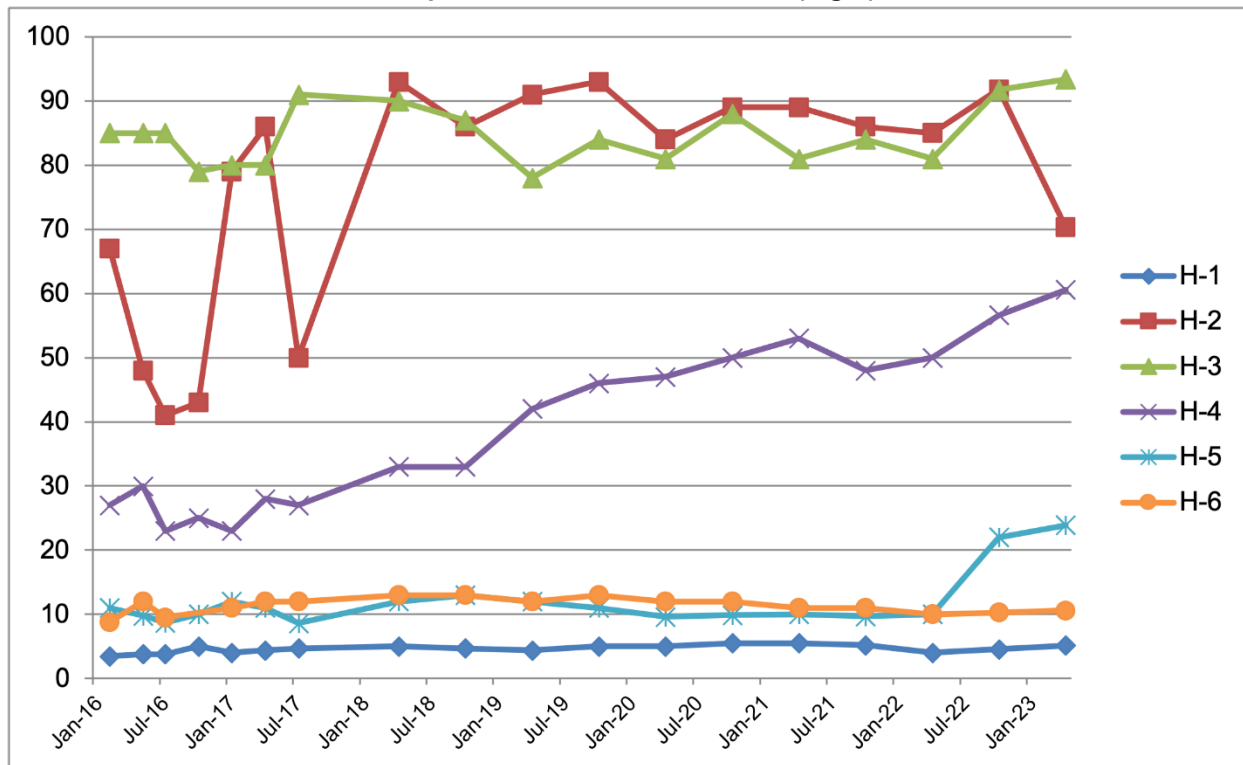
**Table 1-1: Monitoring Network SSIs**

Well	Parameter	Concentration (mg/L)	Prediction Limit (mg/L)	Well Type	Trend
<b>Spring 2018</b>					
H-2	Sulfate	810	770	Up-gradient / Background	No
H-3	Calcium	340	327.8	Up-gradient / Background	No
H-3	Sulfate	1,200	1,037	Up-gradient / Background	No
H-3	TDS	2,000	1,700	Up-gradient / Background	No
<b>Fall 2018</b>					
H-2	Sulfate	850	810	Up-gradient / Background	No
H-2	TDS	2,900	1,400	Up-gradient / Background	No
<b>Spring 2019</b>					
H-2	Sulfate	950	850	Up-gradient / Background	<b>Yes</b>
H-4	Calcium	170	158.4	Up-gradient / Background	No
H-4	Chloride	42	39.64	Up-gradient / Background	No
H-4	Sulfate	510	409.3	Up-gradient / Background	No
<b>Fall 2019</b>					
H-2	Calcium	310	280	Up-gradient / Background	<b>Yes</b>
H-2	Sulfate	1,000	960	Up-gradient / Background	<b>Yes</b>
H-4	Chloride	46	45.93	Up-gradient / Background	<b>Yes</b>
<b>Spring 2020</b>					
H-4	Calcium	200	197.7	Up-gradient / Background	<b>Yes</b>
<b>Spring 2021</b>					
H-2	Calcium	330	310	Up-gradient / Background	<b>Yes</b>
<b>Fall 2022</b>					
H-4	Chloride	56.6	53	Up-gradient / Background	<b>Yes</b>
H-5	Calcium	80.4	66.99	<b>Side-gradient / Compliance</b>	No
H-6	Sulfate	35.1	34.21	<b>Down-gradient / Compliance</b>	No
<b>Spring 2023</b>					
H-1	Sulfate	39.2	36.23	<b>Side-gradient / Compliance</b>	No
H-3	Sulfate	1,550	1,345	Up-gradient / Background	<b>Yes</b>
H-4	Chloride	60.6	53	Up-gradient / Background	<b>Yes</b>
H-5	Calcium	71.6	66.99	<b>Side-gradient / Compliance</b>	<b>Yes</b>
H-5	Chloride	23.9	13.89	<b>Side-gradient / Compliance</b>	No
H-5	Sulfate	182	52.29	<b>Side-gradient / Compliance</b>	<b>Yes</b>
H-5	TDS	440	319.6	<b>Side-gradient / Compliance</b>	No
H-6	Sulfate	43.4	34.21	<b>Down-gradient / Compliance</b>	<b>Yes</b>

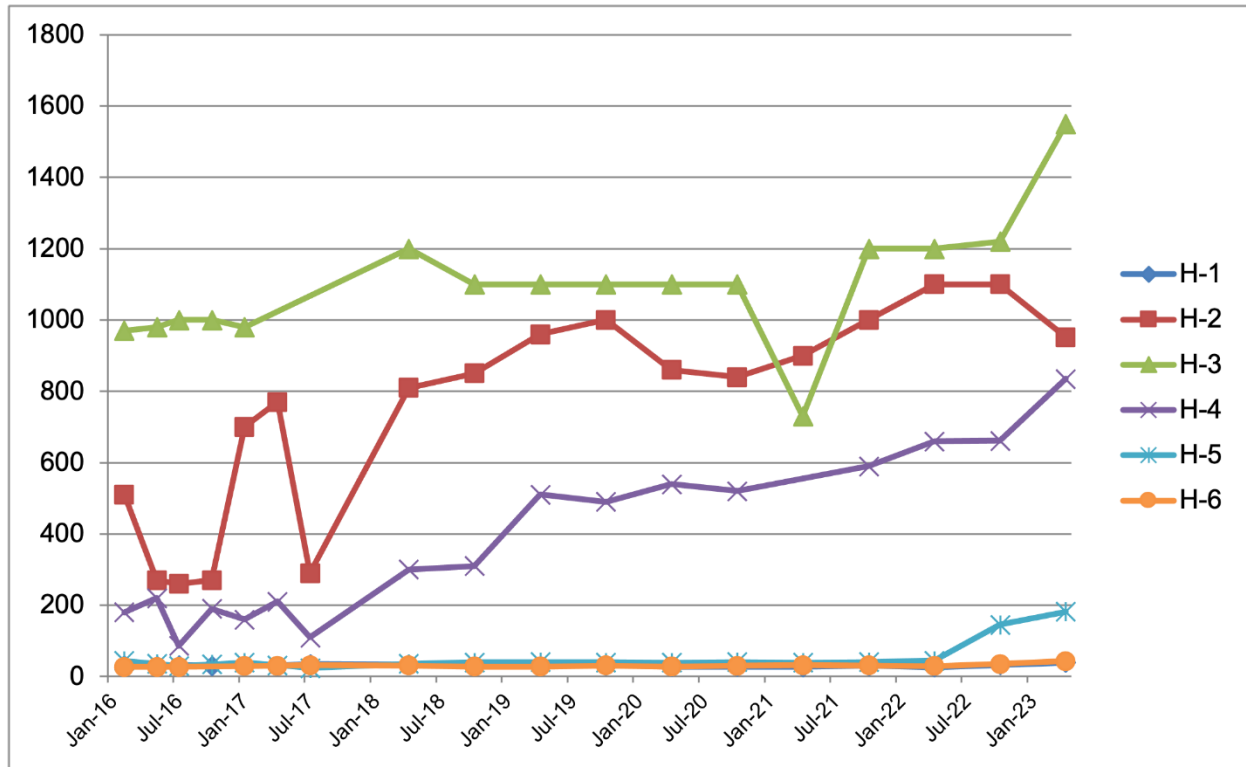
**Graph 1-1: Calcium Time-Series (mg/L)**



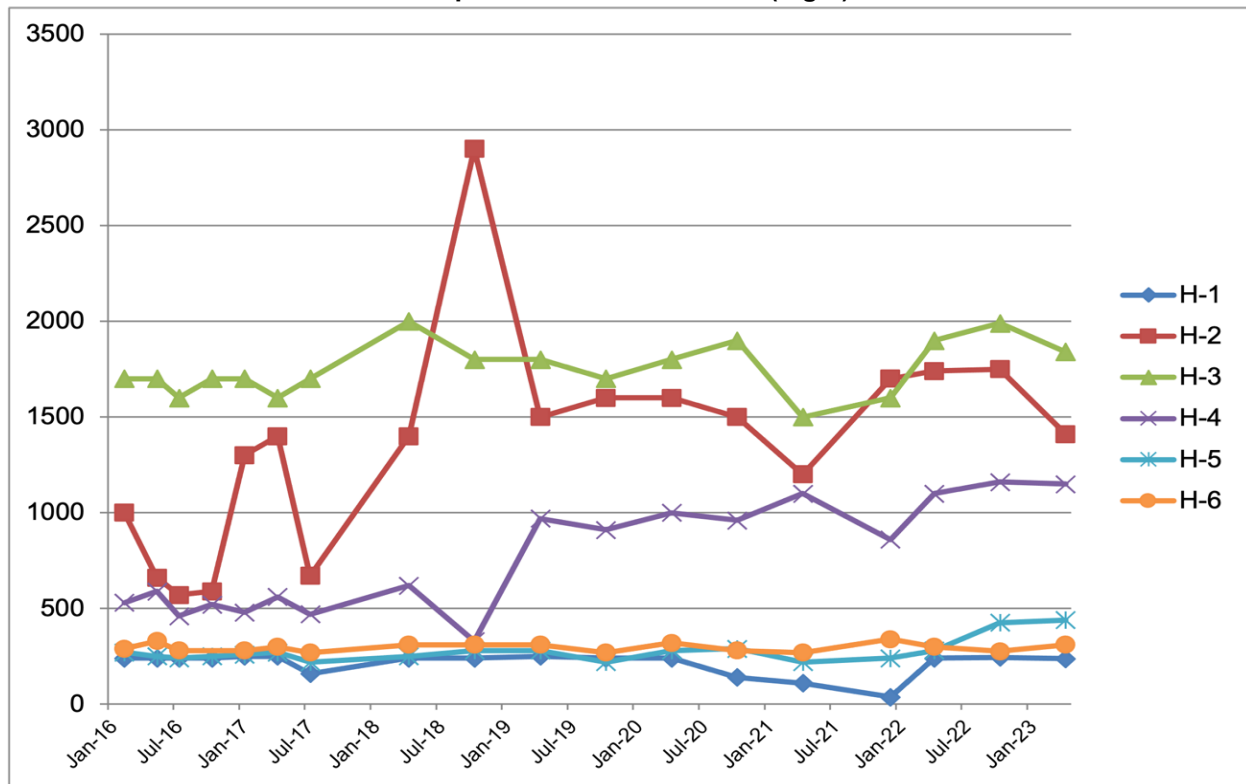
**Graph 1-2: Chloride Time-Series (mg/L)**



Graph 1-3: Sulfate Time-Series (mg/L)



Graph 1-4: TDS Time-Series (mg/L)



## 1.2 CCR RULE REQUIREMENTS

In accordance with 40 CFR 257.94(e)(2), if there is an SSI over background for any well at the waste boundary specified under 257.91(a)(2) (i.e., down-gradient), then:

*The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under this section. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority.*

As stated therein, the ASD may evaluate the following that may have caused an SSI:

- Alternative Sources;
- Error in Sampling;
- Error in Analysis;
- Error in Statistical Evaluation; and/or
- Natural Variation in Groundwater Quality.

This ASD documents the primary cause for the SSIs was Natural Variations in groundwater quality, likely resulting from anthropogenic influences to groundwater quality.

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## 2.0 ALTERNATIVE SOURCE DEMONSTRATION

### 2.1 ARKANSAS RIVER AND ALLUVIAL AQUIFER SALINITY INTRUSION

During the late 1990s and early 2000s, the Kansas Geological Society (KGS) studied and published several reports on groundwater quality in and around the Holcomb Station, which overlies a portion of the High Plains Aquifer (HPA) along the Arkansas River. The study area covers the Arkansas River corridor from the Kansas-Colorado border to east of Dodge City. The study was termed the Upper Arkansas River Corridor Study (UARCS)<sup>5</sup> and incorporates extensive information from the following reports:

- Groundwater Recharge in the Upper Arkansas River Corridor in Southwest Kansas, D.O. Whittemore, KGS Open File Report 2002-30, July 2002.
- Ground-water Quality of the Arkansas River Corridor in Southwest Kansas, D.O. Wittemore. KGS Open File Report 2000-73.
- Sulfate Concentration Maps, Upper Arkansas River Corridor, Southwest Kansas, D.O. Wittemore. KGS Open File Report 2000-72.
- Water Quality of the Arkansas River in Southwest Kansas, D.O. Wittemore. KGS Open File Report 2000-44.
- Multi-Level Observation Well Sites of the Upper Arkansas River Corridor Study, Whittemore et al., KGS Open File Report 2000-42.
- Upper Arkansas River Corridor Study: Maps of Surface Features, Groundwater Quantity, and Bedrock Elevation, Wittemore et al. KGS Open File Report 97-45. July 1997.
- Lithologic Characterization of Unconsolidated Deposits Along the Arkansas River Corridor in Southwest Kansas, Young et al. KGS Open File Report 2000-43. June 2000.

The UARCS presents historical data for the salinity of the Arkansas River and its impact on the HPA. The Arkansas River is hydraulically connected to an alluvial aquifer, termed the Arkansas River Alluvial Aquifer (ARAA), that is perched above the HPA. The ARAA and the HPA are separated by a clayey layer of varying thickness, but the ARAA is likewise hydraulically connected to the HPA.

The UARCS demonstrates that due to regional drawdown over time due to irrigation, the HPA has increasingly received saline recharge from the ARAA and the salinity from this recharge has spread in the aquifer system from the river. Sulfate, one component of total salinity, is studied in detail in the UARCS; Calcium, Chloride, and Total Dissolved Solids are also shown to be components of total salinity of the Arkansas River. Based on the mass and volume budget for groundwater in the Arkansas River corridor, the study finds that river water seepage has the potential to result in Sulfate concentrations exceeding 1,000 mg/L in all areas of the HPA by 2050. While not specifically analyzed in that report the other total salinity parameters will likely also have similar increases.

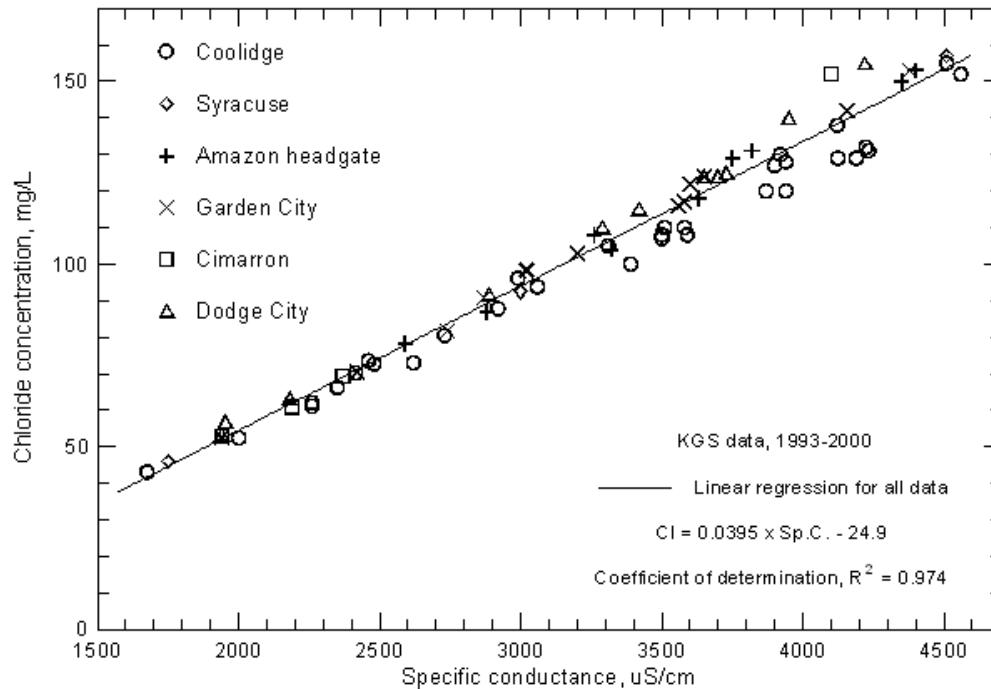
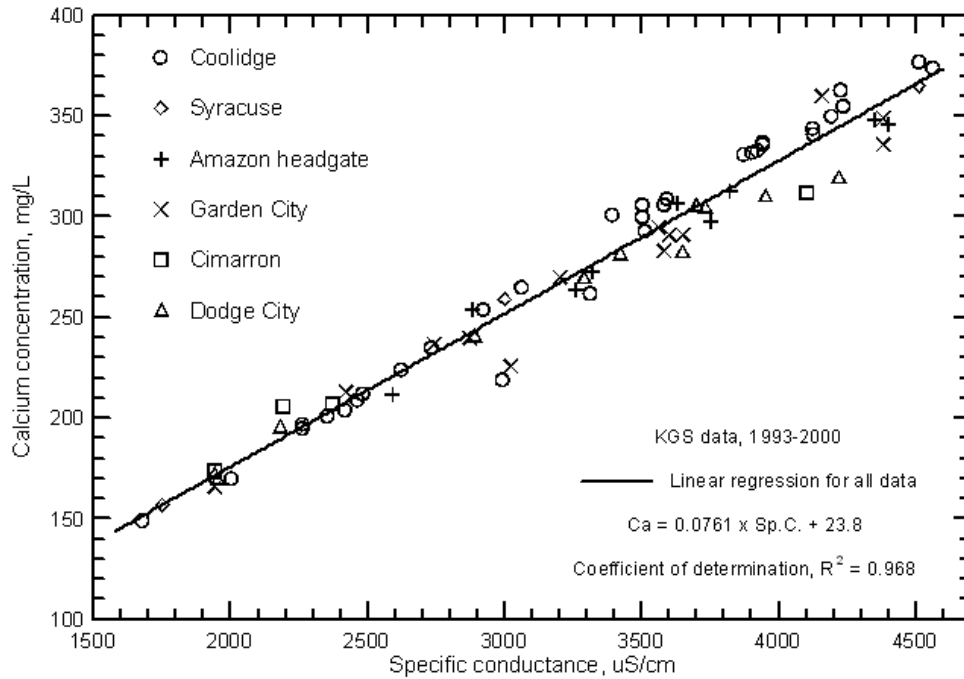
This ASD summarizes the relevant information from the UARCS completed in 2002 and presents more recent information showing the effects of drawdown and salinity intrusion, and their current effects on the wells at the Landfill.

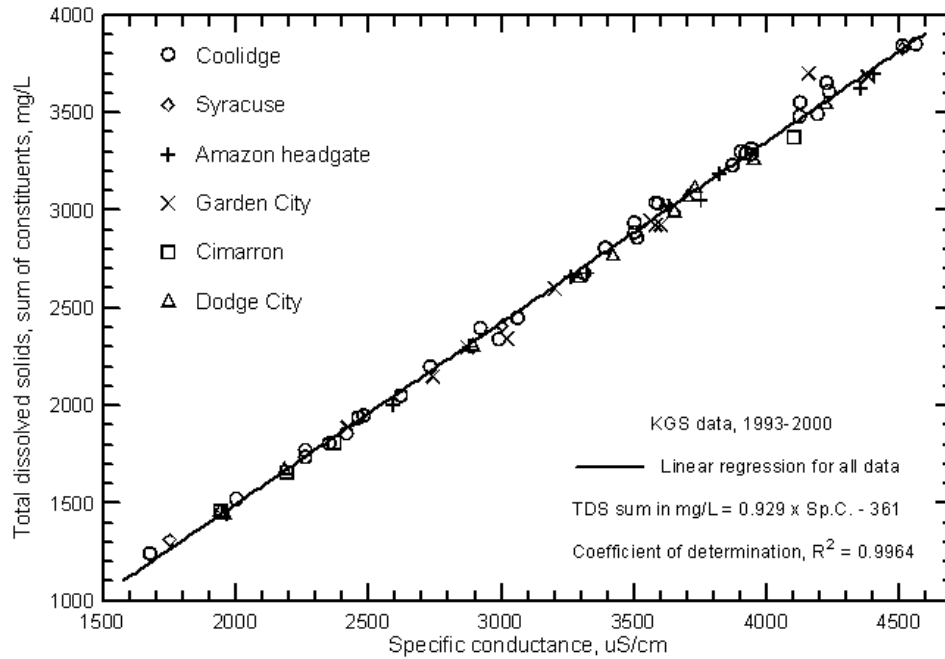
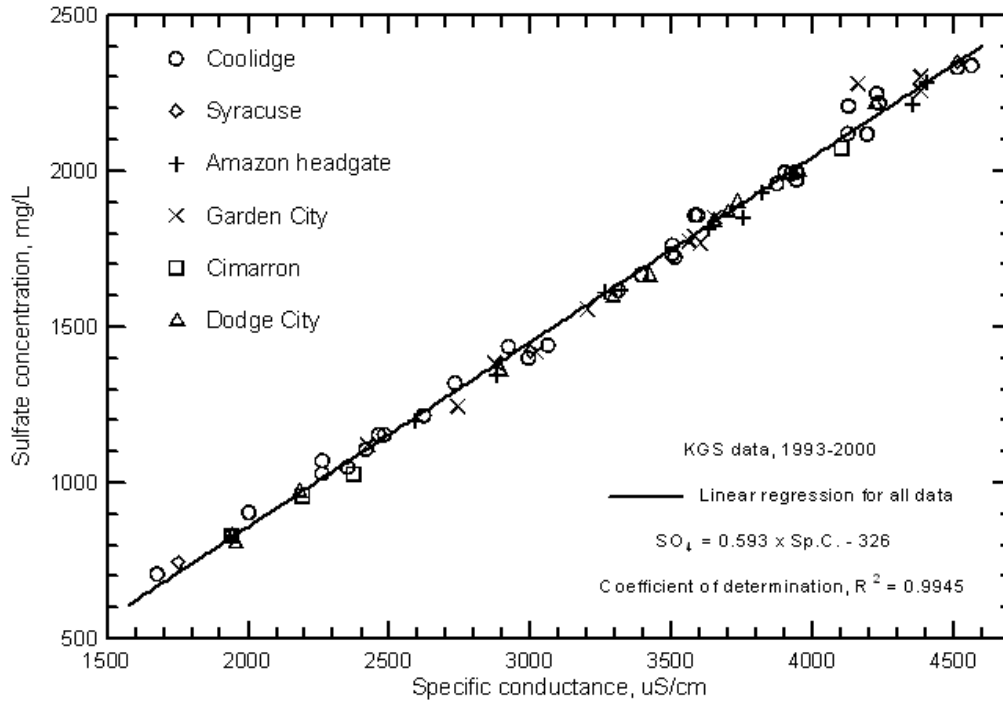
The salinity of the Arkansas River in eastern Colorado began increasing soon after the start of substantial irrigation diversions in the 1870s. The salinity originates from soils and bedrock in Colorado and the more recent increases in salinity are attributed to concentration cycles from evapotranspiration losses that are increased through agricultural activities and surface impoundments (from UARCS). The major dissolved constituents in the river water, in the order of typical decreasing mass are Sulfate, Sodium, Bicarbonate,

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<sup>5</sup> <https://www.kgs.ku.edu/Hydro/UARC/index.html>

Calcium, Magnesium, Chloride, and Silica, all of which contribute to Total Dissolved Solids (TDS) concentrations. Correlations of these parameters with Specific Conductance (Sp. Cond.) have been shown to have a very good fit (see charts). The relationships between Sp. Cond. and Chloride, Calcium, Sulfate and TDS are shown below (from UARCS).





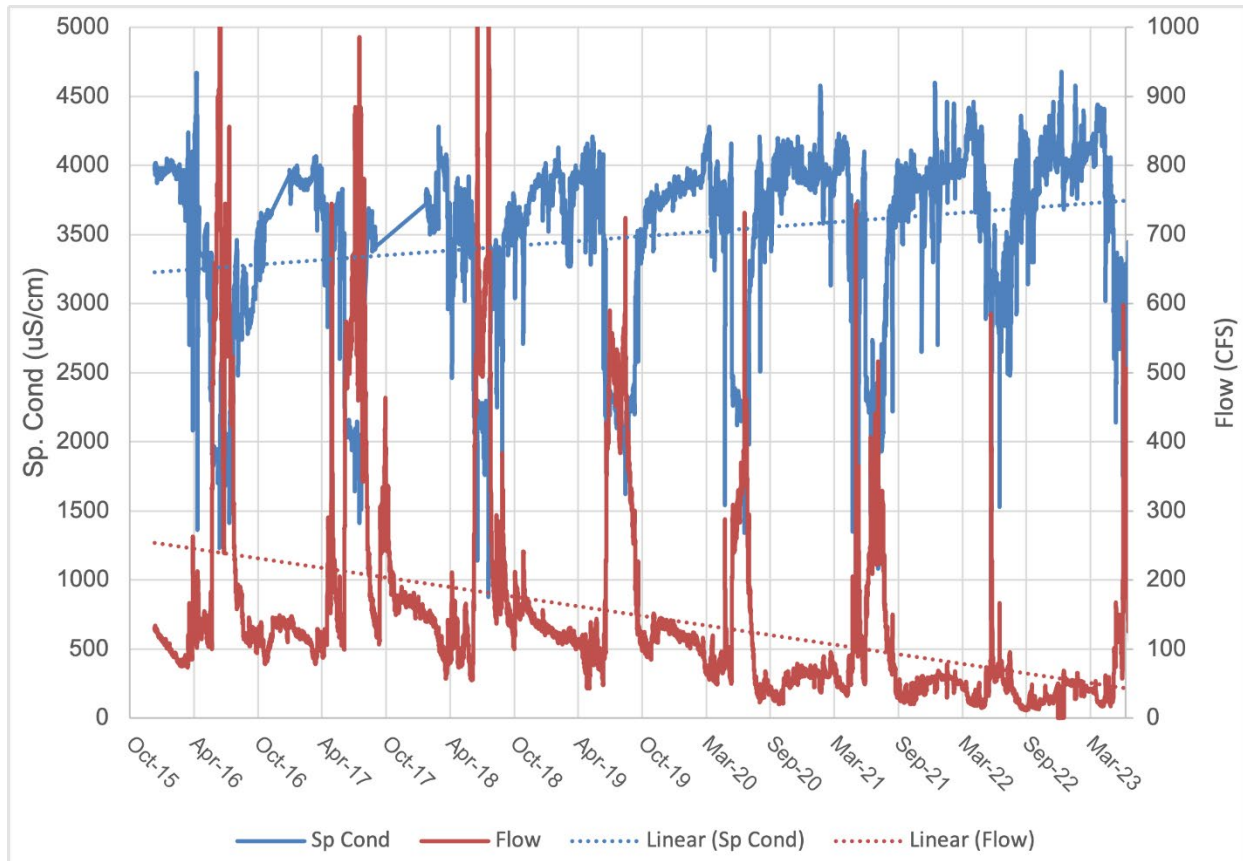
A continuous water quality meter is located in the Arkansas River at the Colorado border that measures Sp. Cond. with data available from October 2007 to the present<sup>6</sup>. Table 2-1 shows the range of water quality of the river for the available data at the time of this report. Dilution likely plays a role in the low values which occur with high flow events.

**Table 2-1: Arkansas River Water Quality Parameter Ranges**

Parameter	Low Values	High Values
Sp. Cond. (uS/cm)	1,000	4,000
Calcium (mg/L)	100	300
Chloride (mg/L)	15	130
Sulfate (mg/L)	250	2,000
TDS (mg/L)	550	3,350

Graph 2-1 below shows the Sp. Cond. (which is correlated to all parameters under evaluation) in the Arkansas River versus the river flow during the period since the landfill monitoring wells were installed. As shown, there is a slight increasing trend of concentrations since 2020, along with an increasing trend of lower flow periods during that same time period.

**Graph 2-1: Arkansas River Sp. Cond. And Flow**



<sup>6</sup> <https://nrtwq.usgs.gov/ks/>

Substantial declines in the water levels of the HPA changed the average flow condition of groundwater providing base flow to the river recharging the aquifer. The recharge or seepage occurs from the ARAA and also to the HPA where river water is transported by irrigation canals and irrigation systems (UARCS). The UARCS suggests the possibility that there may be additional transport of saline waters to the HPA via improperly sealed wells that penetrate both the ARAA and the HPA. It is also likely that the observed clayey confining layer between the overlying ARAA and HPA is not continuous or has interbedding planes that allow for hydraulic communication between the ARAA and the HPA. Whatever the case, as HPA water levels fall, there is an increase in the head gradient which causes more saline water to move from the ARAA and enter the HPA. Induced gradients from irrigation wells also cause the saline water to spread away from the river. Figure 2 in Appendix A shows the ranges of Sulfate concentrations in the HPA from 1987 to 2000, based on data collected during that time period.

The UARCS also modeled the Sulfate concentrations from 2000 to 2040 as shown in Figure 3. This shows the spread of Sulfate concentrations greater than 500 mg/L in 2000 and predicted in 2040, with 500 mg/L assumed to be the revised secondary MCL in the future. As shown, the Sulfate expands mostly in the southerly direction from the river, with some spread easterly from the irrigation canals. Also as shown, the predicted elevated sulfate concentrations do not increase in the area of the landfill and its monitoring wells. According to the modeling report (2002-30), “drilling logs for some Holcomb area wells showed a thick confining layer with over 150 feet of clay separating the ARAA from the HPA.” In light of the actual sulfate values recently measured in the upgradient landfill wells, it is likely that the logs were inaccurate, the extent of the confining layer was overpredicted, and/or the predicted drawdown of the HPA in the 2040 model was lower than was experienced .

The Public Water Supply (PWS) well data for the City of Holcomb<sup>7</sup> shows that Sulfate levels have risen substantially in the City wells since 2000. Inspection of Figure 2, in Appendix A, shows that the concentrations of Sulfate as evaluated by the KGS in 2000 was similar for the City of Holcomb PWS Wells #1, #2, and #5 and the northern portion of the Landfill area; as indicated by both these areas being shaded with the light green 100 – 250 mg/L Sulfate concentration range in Figure 2, in Appendix A. This correlation has continued, as the concentrations of Sulfate, Calcium, Chloride, Sp. Cond. and TDS are similar for City of Holcomb PWS Wells (Graphs 2-2 through 2-6) and Landfill upgradient wells (H-2, H-3, and H-4) (See Graphs 1-1 through 1-4). The 2022 average results for the City of Holcomb Wells and the Upgradient Landfill Wells are shown in Table 2-2 below.

**Table 2-2: 2022 Well Averages**

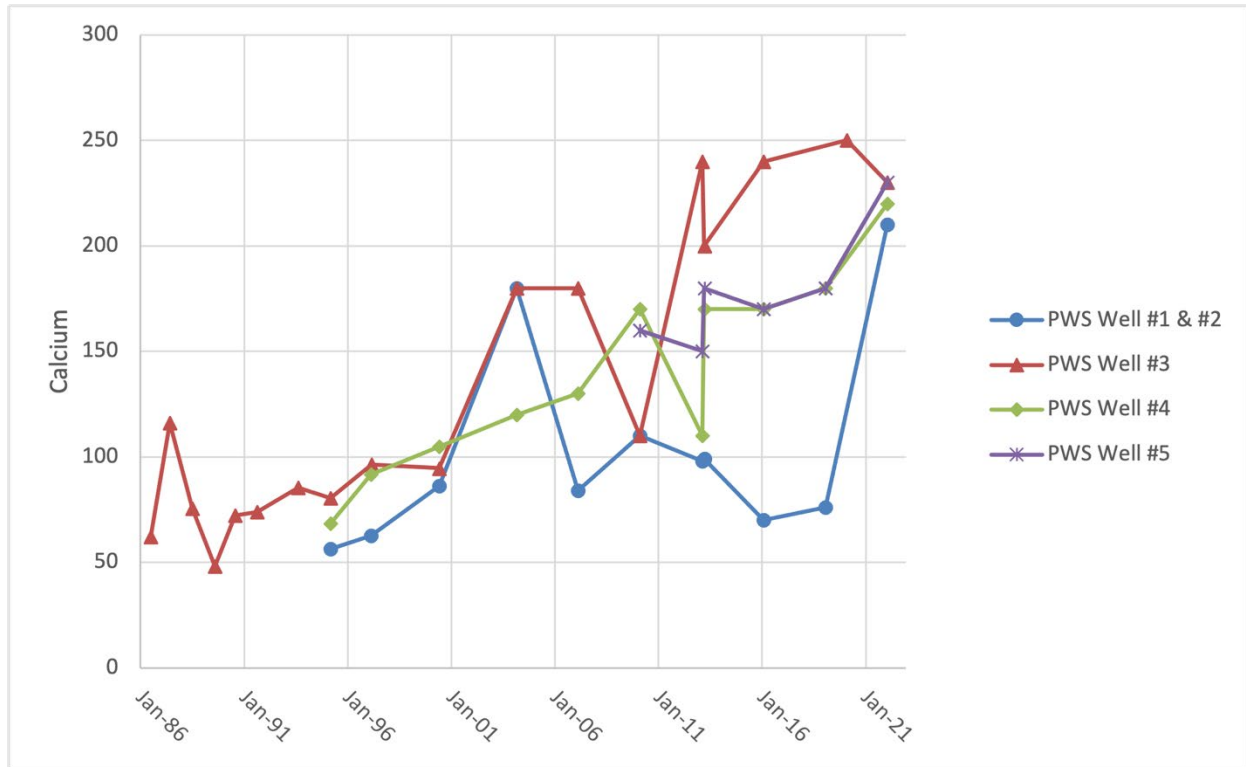
<b>Parameter</b>	<b>City of Holcomb PWS Wells<sup>1</sup></b>	<b>Upgradient Landfill Wells<sup>2</sup></b>
Sp. Cond. (uS/cm)	2,025	1,634.7
Calcium (mg/L)	222.5	310
Chloride (mg/L)	93.5	72
Sulfate (mg/L)	930	986.6
TDS (mg/L)	1,825	1,580

Note 1: Well data from February 15, 2022

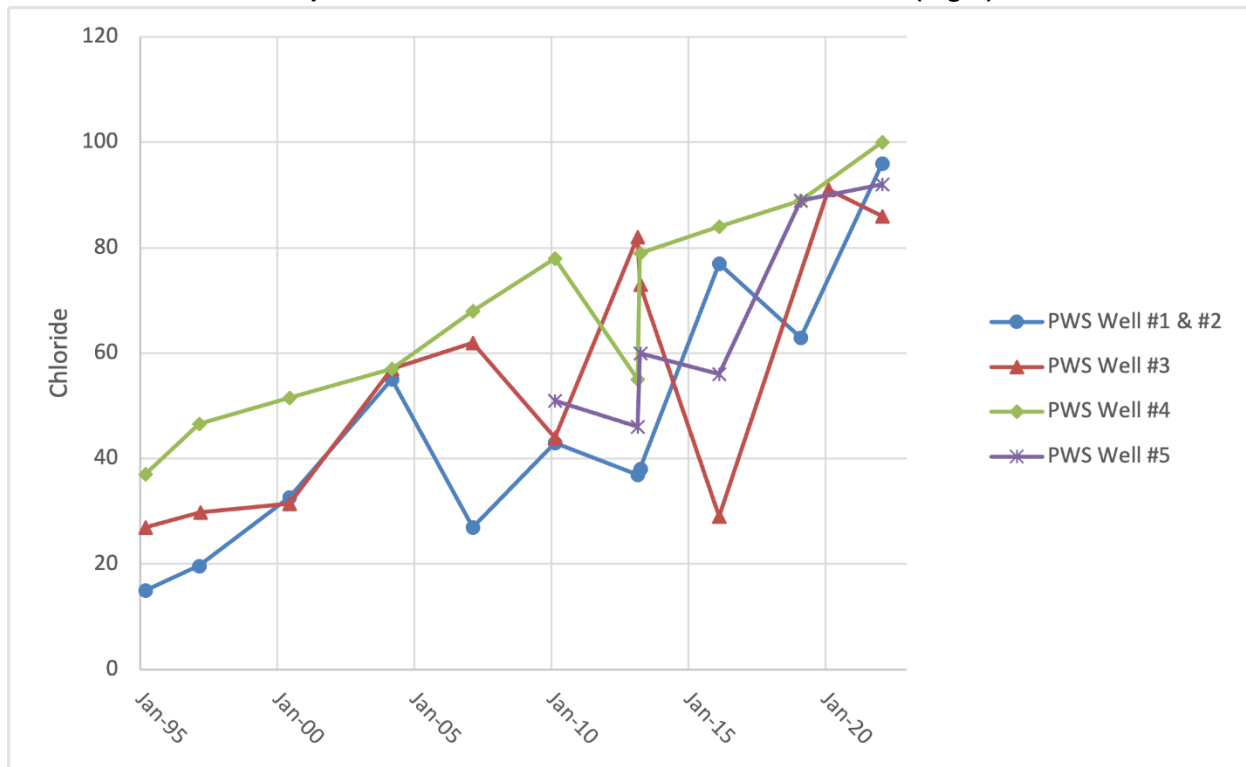
Note 2: Well data from April 26, 2022

<sup>7</sup> <https://dww.kdhe.ks.gov/DWWW/Login>

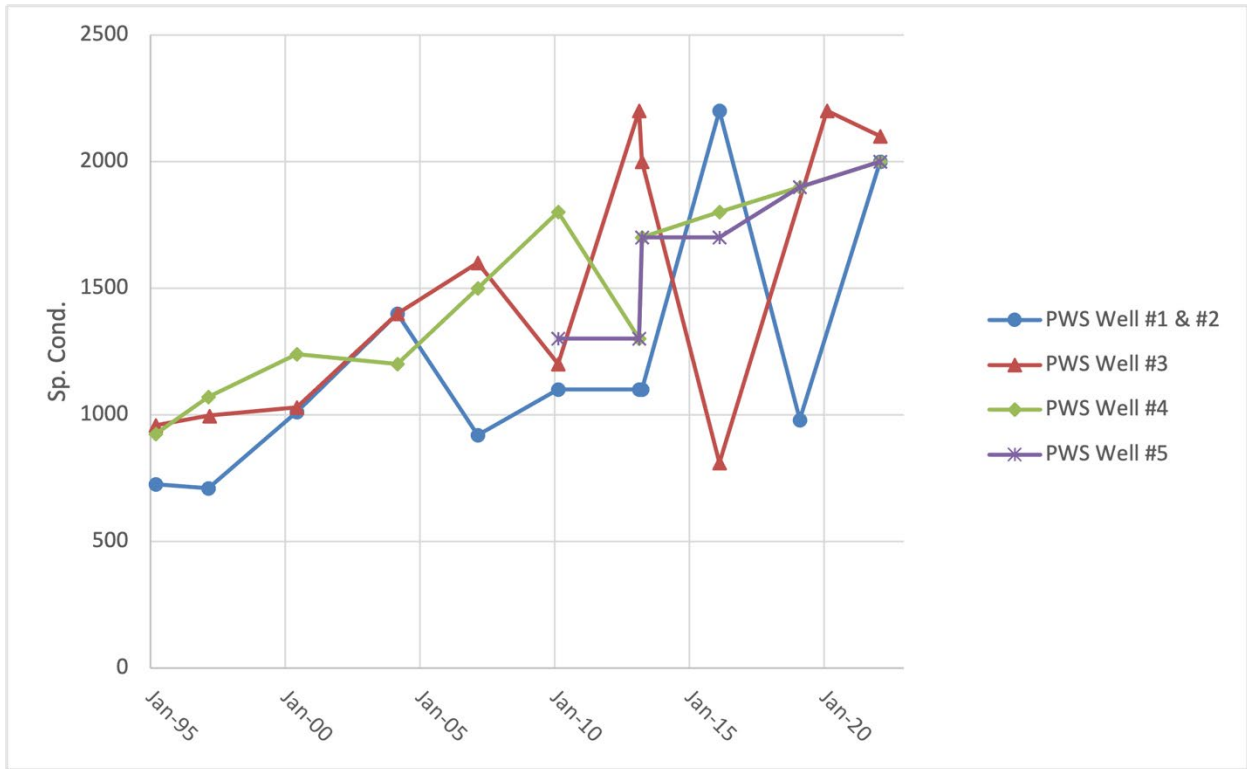
**Graph 2-2: Holcomb PWS Calcium Concentrations (mg/L)**



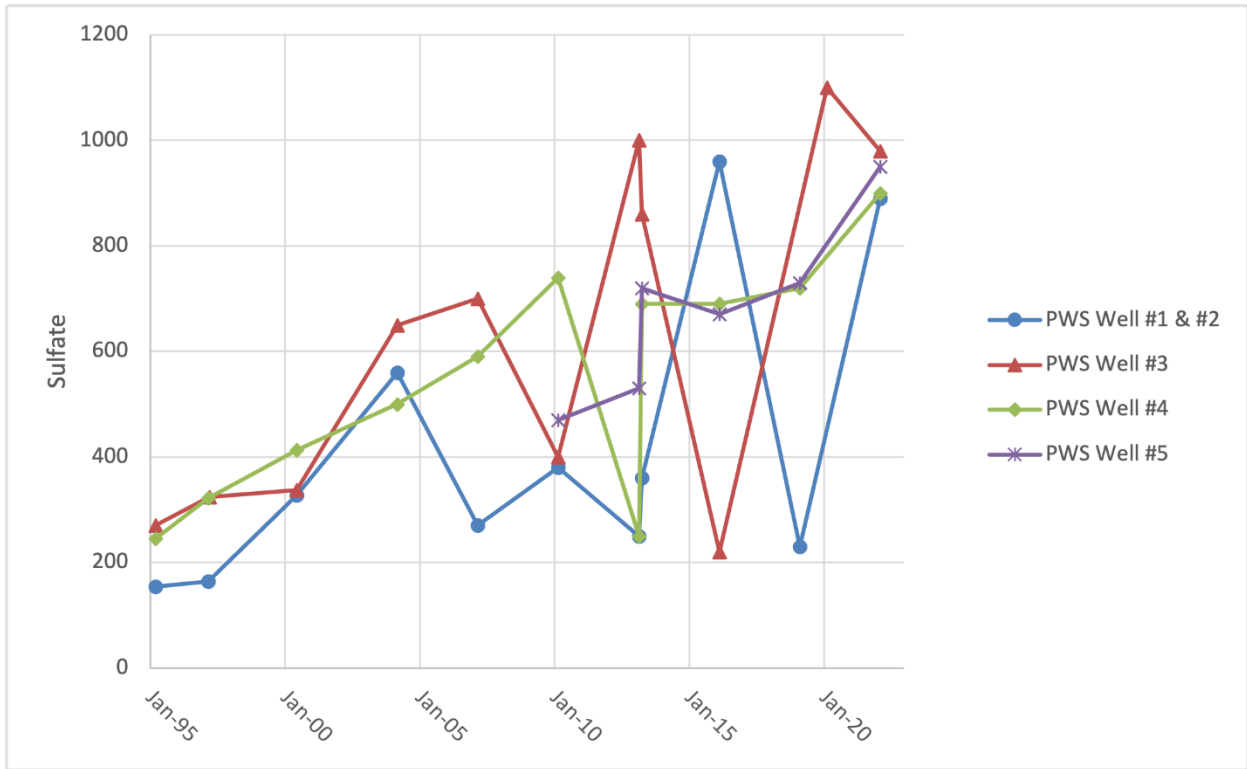
**Graph 2-3: Holcomb PWS Chloride Concentrations (mg/L)**



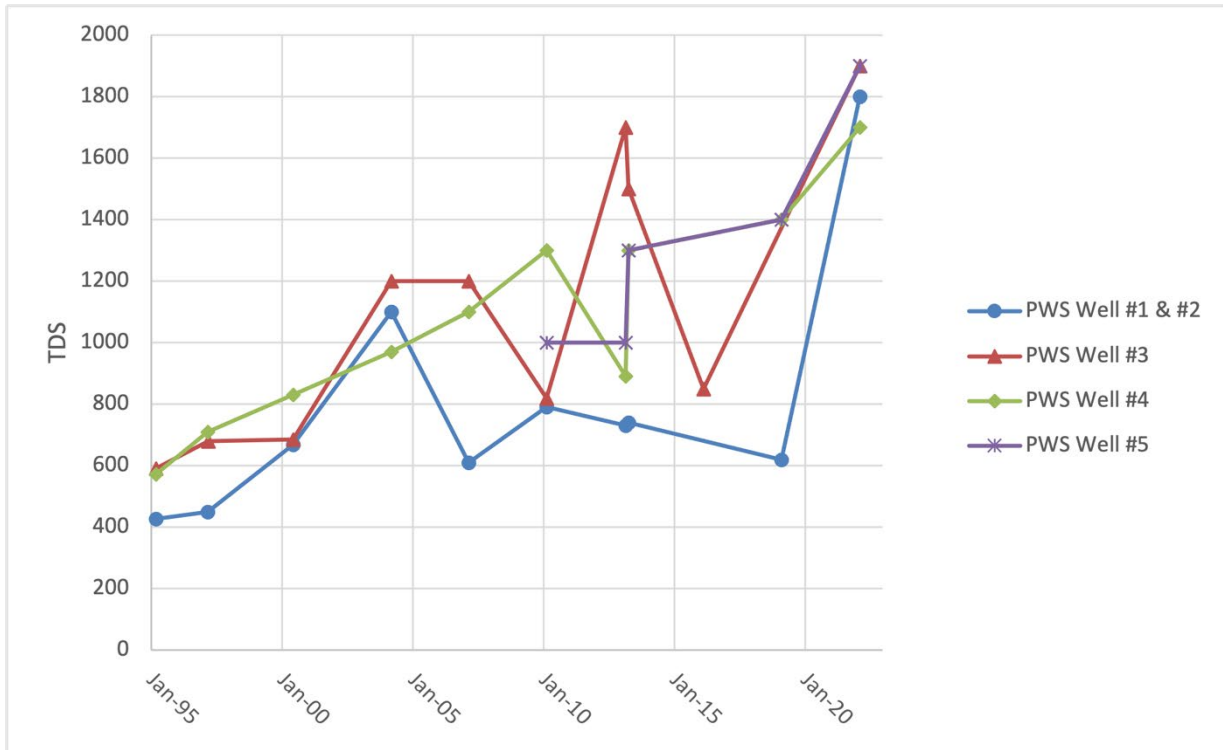
**Graph 2-4: Holcomb PWS Sp. Cond. (umho/cm)**



**Graph 2-5: Holcomb PWS Sulfate Concentrations**

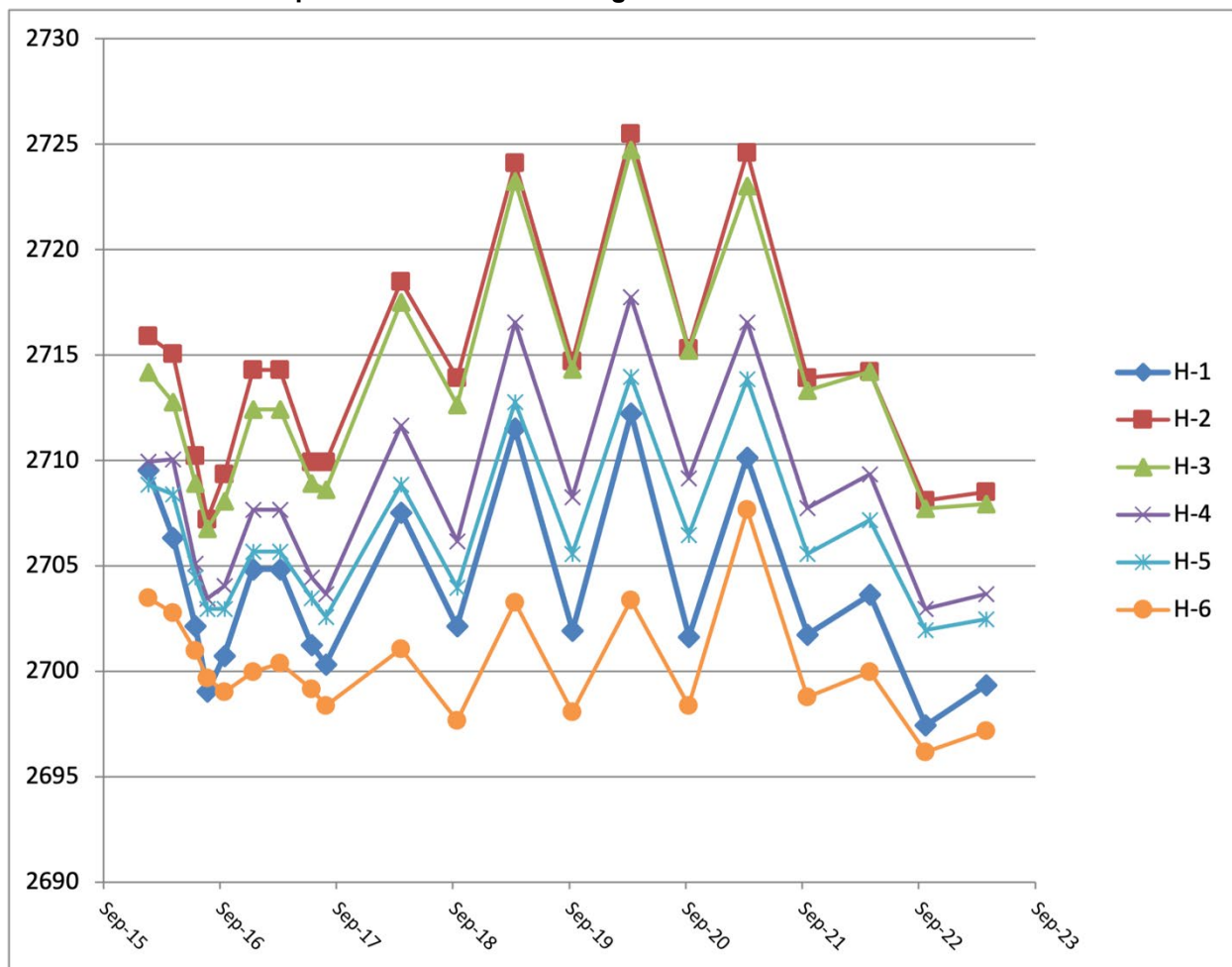


Graph 2-6: Holcomb PWS TDS Concentrations (mg/L)



Drawdown of the HPA is well documented through the Kansas High Plains Aquifer Atlas<sup>8</sup>. As shown in the Atlas and in Figure 4 in Appendix A, the water level has declined over 70 feet in the area of Holcomb and the adjacent area south of the Arkansas River, including the Landfill site, since 2000. Allied Environmental Consultants (AEC) performed a study of drawdown during the siting of the current Landfill Monitoring Network<sup>9</sup>. The study showed water levels dropped around 40 feet in the 1970's with a plateau and some rebound up until the late 1990's and early 2000's, then a continuous, steady decline for about 15 years of 70 to 80 feet. As shown on Graph 2-7, the Landfill Monitoring Network Wells (installed in 2016) show a slight increasing trend until April 2021 with the Fall 2022 recording the lowest groundwater elevation for all wells with the exception of H-3 (minimum occurred August 2016).

**Graph 2-7: Landfill Monitoring Network Groundwater Levels**



Encroachment of saline water from the north and the ARAA has caused saline levels to rise in the upgradient wells of the Landfill monitoring well network and will likely increase salinity in the downgradient wells over time, in light of expected increases in salinity intrusion and the continued drawdown of the HPA.

<sup>8</sup> [https://www.kgs.ku.edu/HighPlains/HPA\\_Atlas/index.html](https://www.kgs.ku.edu/HighPlains/HPA_Atlas/index.html)

<sup>9</sup> Groundwater Occurrence Technical Study – Drilling Plan Solid Waste Permit No. 420, Holcomb Station Landfill, Holcomb, Kansas, Allied Environmental Consultants, Inc., November 23, 2015

## 2.2 OTHER ALTERNATIVE CAUSES EVALUATED

Other alternatives evaluated during this ASD included causes potentially associated with analytical laboratory analyses and statistical methods. Sunflower was forced to submit samples to the ALS Houston laboratory for the Fall 2022 event due to the shuttering of the ALS Fort Collins laboratory. The Fort Collins laboratory had performed the Spring 2022 analysis as well as all sample analysis since Sunflower initiated background sampling in 2016. While several differences are observed in method detection limits and reporting limits, none of the differences were identified as a source or cause of the SSIs, as the data was fully validated for use in meeting the requirements of the CCR rules. It is noted that the Houston laboratory has lower practical quantitation limits (PQLs) which may result in more detections of the parameters during future events.

Likewise, a review of the statistical methods used for the Fall 2022 event show the methods conform to the SAP and statistical plan for the CCR Unit; especially for the outlier determination performed prior to prediction limit review. There is spatial variability for the parameters of concern (Calcium, Chloride, Sulfate, and TDS) evidenced by box-and-whiskers plot comparisons (See Appendix B) between upgradient and downgradient wells. This spatial variability precludes the use of interwell statistical analysis for the parameters of concern. However, due to less spatial variability, interwell analyses were performed on parameters (Boron & Borates, Fluoride, and pH) that appear un-affected by the Alternate Source. No SSIs were detected using interwell analyses on these parameters (note substantial non-detections caused non-parametric analyses for Boron & Borates and Fluoride) (See Appendix B). In addition, due to increasing trends, the background data set was abbreviated for the parameters of concern to determine the effects on prediction limits. Adjusting the background data set had no appreciable effect to SSIs detected. The statistically significant increasing trends in upgradient wells support an off-site alternate source to compliance well SSIs.

The statistical method employed, and the laboratory analysis methods used for the sample results do not present a cause for the SSIs covered by this ASD. In the future, seasonality review by statistical method, due to be available in 2023 or early 2024, will likely further support the determination of natural variation in groundwater quality as the cause of the SSIs. 40 CFR 257.94(e)(2).

\*\_\*\_\*\_\*\_\*

### 3.0 CONCLUSION

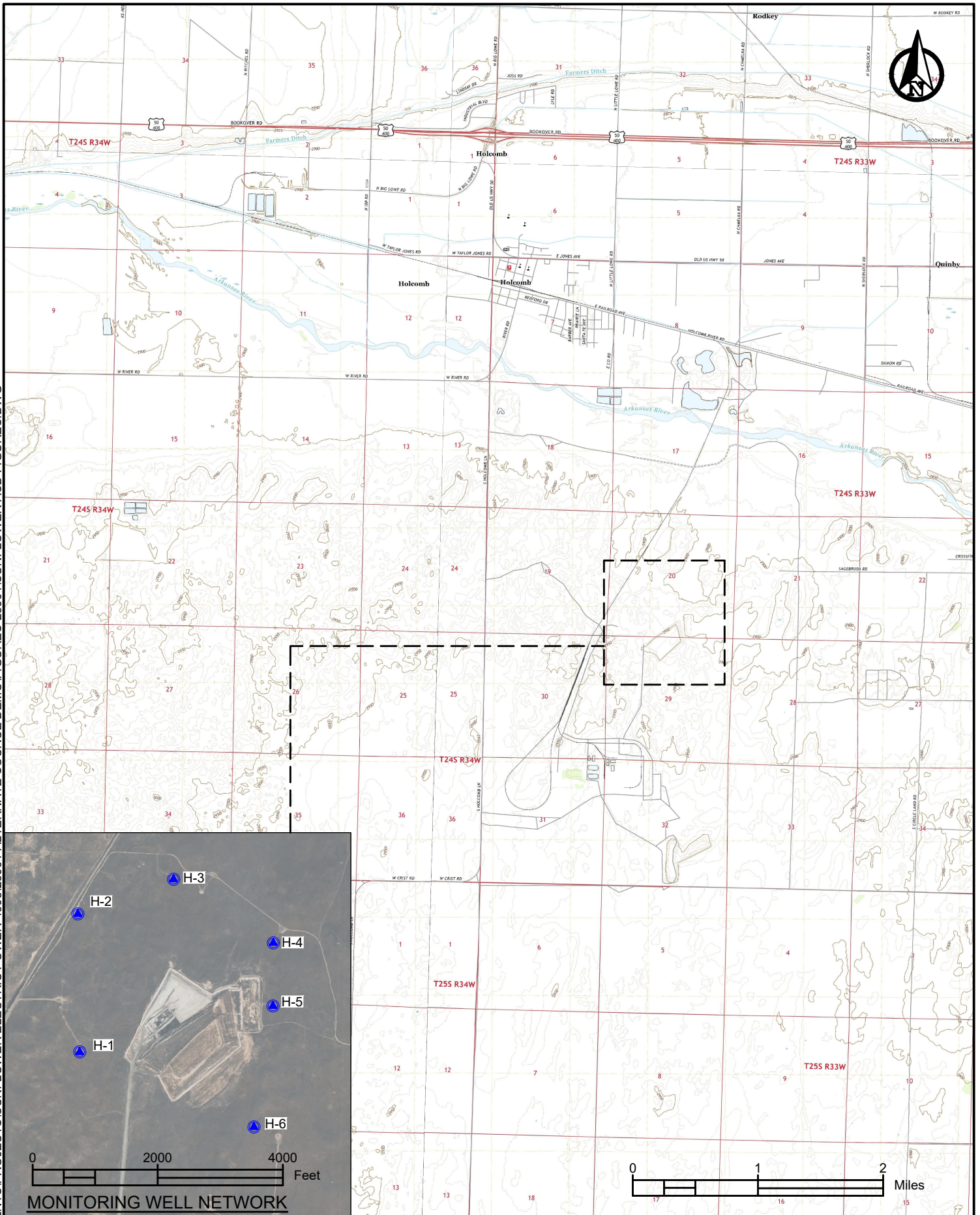
This ASD has documented the Arkansas River as an upgradient source of contamination to the Holcomb Station CCR Landfill Monitoring Network. Various studies completed by public agencies has identified that seepage from the Arkansas River imparts the same chemical parameters to the aquifer being monitored at the CCR Unit, including Calcium, Chloride, Sulfate and TDS which have statistically significant increases in compliance wells. Accordingly, with this successfully completed demonstration during the 90-day period prescribed in 40 CFR 257.94(e)(2), Sunflower may continue with the detection monitoring program, as outlined in the facility's SAP. The benefits of doing so will allow Sunflower to statistically evaluate for seasonality and monitor the continued encroachment of salinity from the north, which has been demonstrated to come from the Arkansas River.

\*\_\*\_\*\_\*\_\*

## **APPENDIX A**

### **FIGURES**

FILENAME: C:\DOCUMENTS\PROJECTS\SUNFLOWER ELECTRIC POWER-4908\23004-ALTERNATE SOURCE DEMO\FIGURES-23004\SUNFLOWER ASD FIGURES.DWG

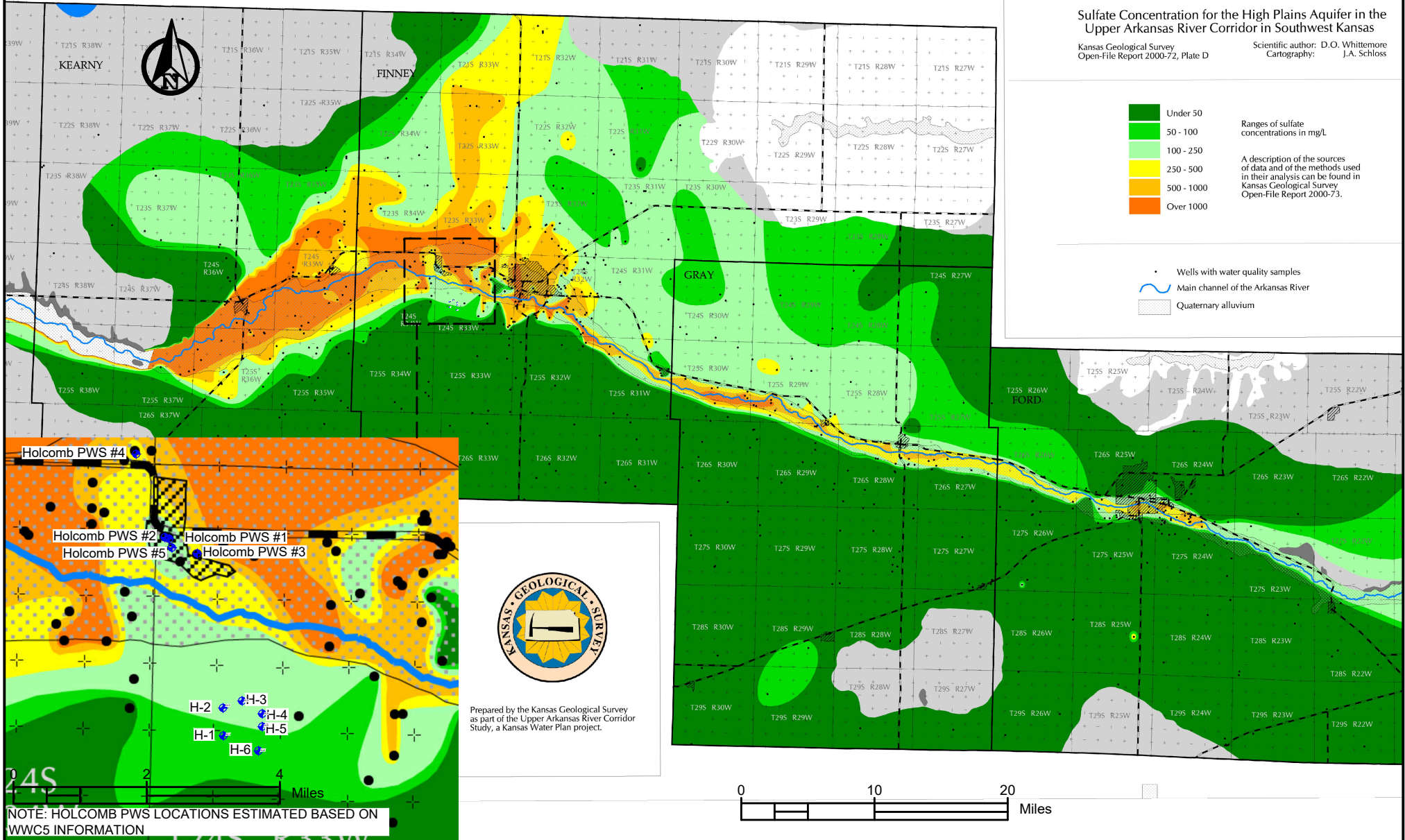


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**HOLCOMB COMMON FACILITIES, LLC  
CCR LANDFILL  
LOCATION MAP**

PROJECT: 4908:23004  
SCALE: AS\_SHOWN  
DATE: 1/24/2023  
DWN BY: TBF    CHKD BY: PRC

**FIGURE  
1**



HOLCOMB COMMON FACILITIES, LLC  
 CCR LANDFILL



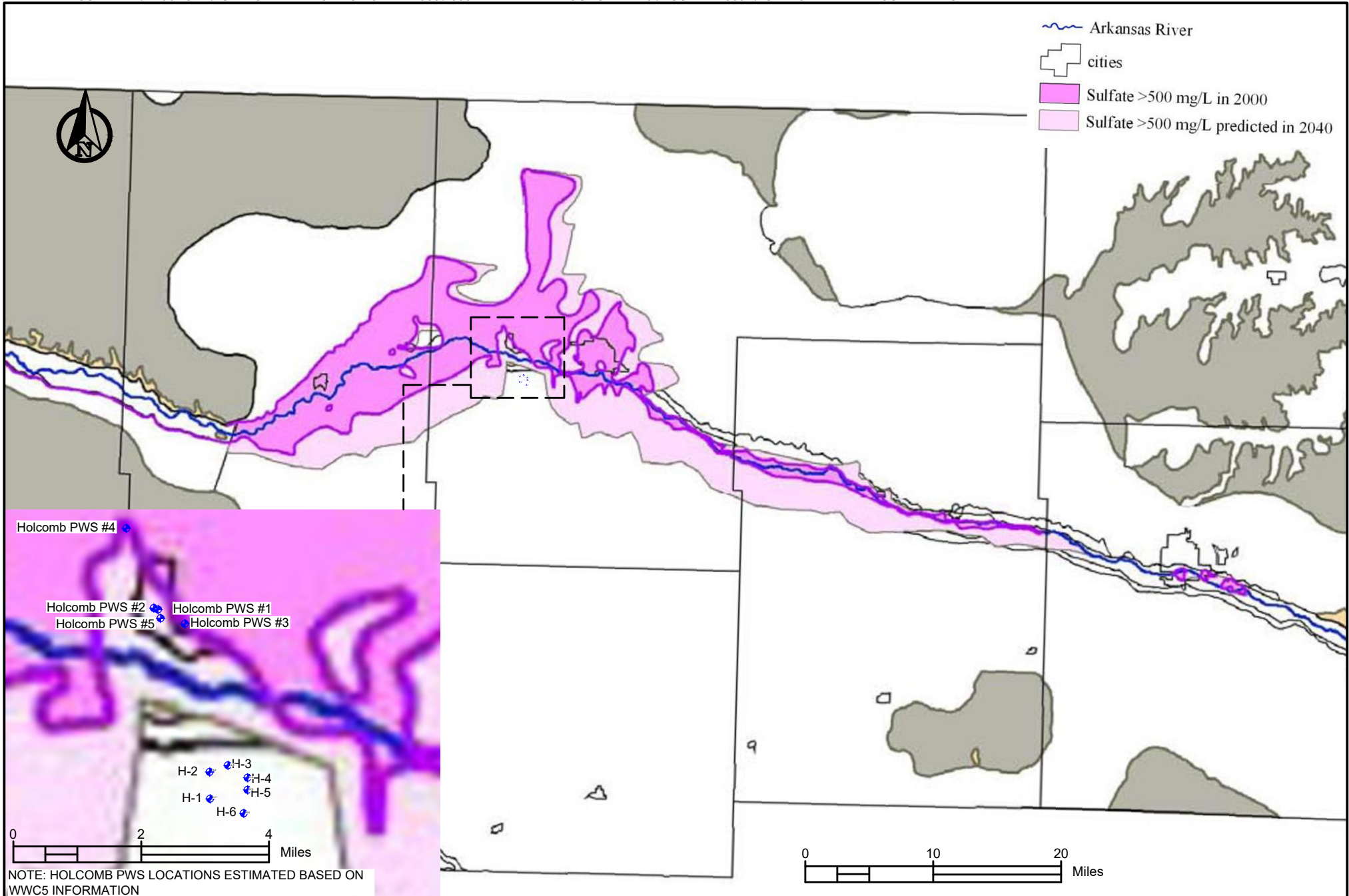
214 N. ST. FRANCIS • WICHITA, KS 67202 • 316.262.5698

PROJECT: 4908:23004  
 SCALE: AS\_SHOWN  
 DATE: 1/24/2023

DWN BY: TBF | CHKD BY: PRC

KGS SULFATE CONCENTRATIONS IN  
 HIGH PLAINS AQUIFER - 2000

FIGURE  
 2



NOTE: HOLCOMB PWS LOCATIONS ESTIMATED BASED ON WWC5 INFORMATION

HOLCOMB COMMON FACILITIES, LLC  
CCR LANDFILL



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PROJECT: 4908:23004

SCALE: AS\_SHOWN

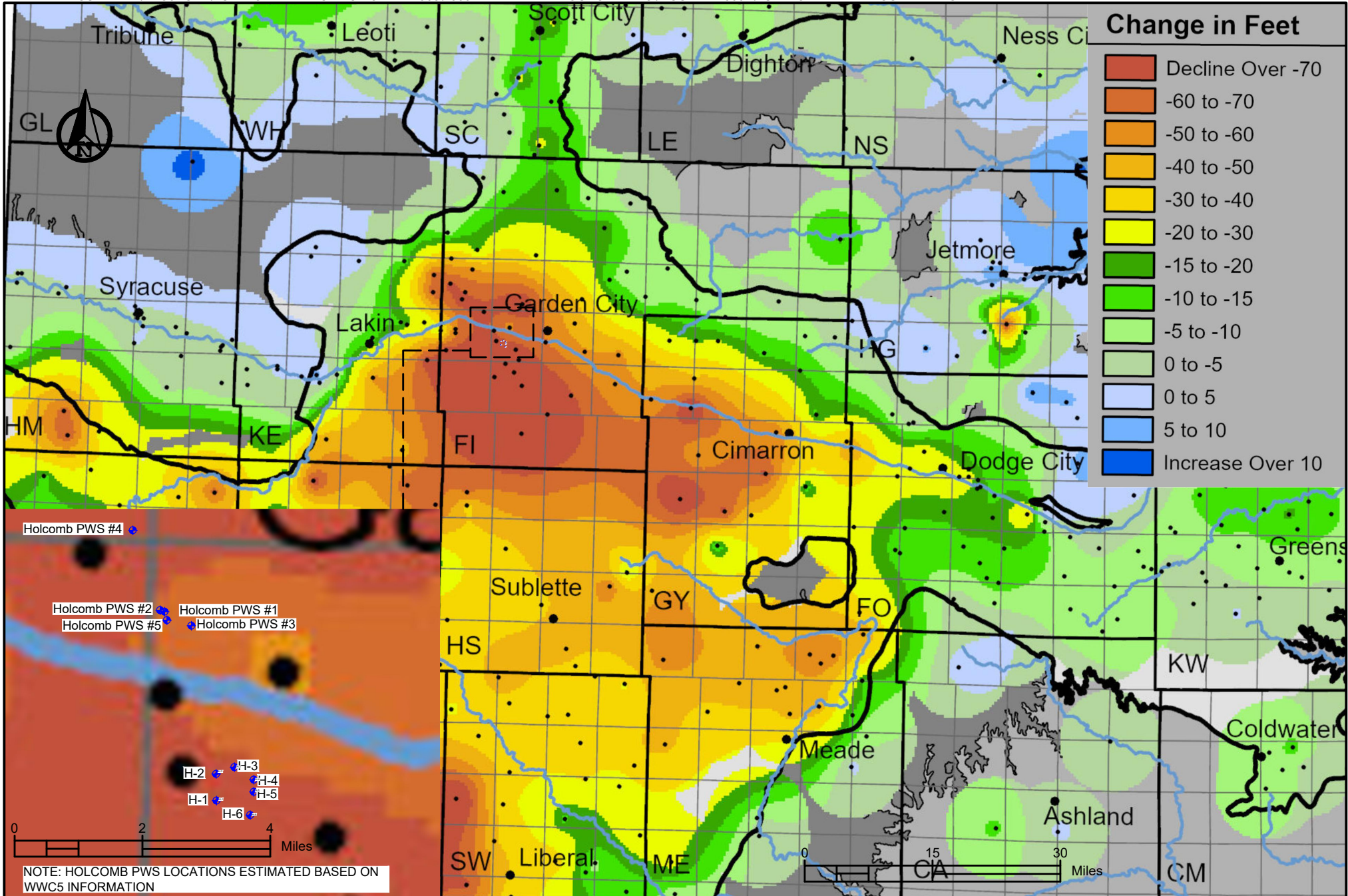
DATE: 1/24/2023

DWN BY: TBF | CHKD BY: PRC

KGS PREDICTED SULFATE LEVELS  
2040

FIGURE

3



HOLCOMB COMMON FACILITIES, LLC  
CCR LANDFILL



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PROJECT: 4908:23004

SCALE: AS\_SHOWN

DATE: 1/24/2023

DWN BY: TBF | CHKD BY: PRC

KGS HIGH PLAINS AQUIFER  
DRAWDOWN 2000 TO 2020

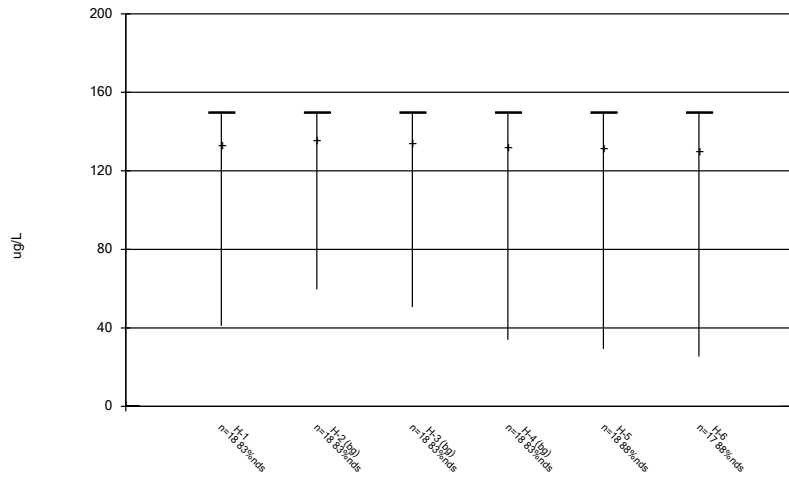
FIGURE

4

## **APPENDIX B**

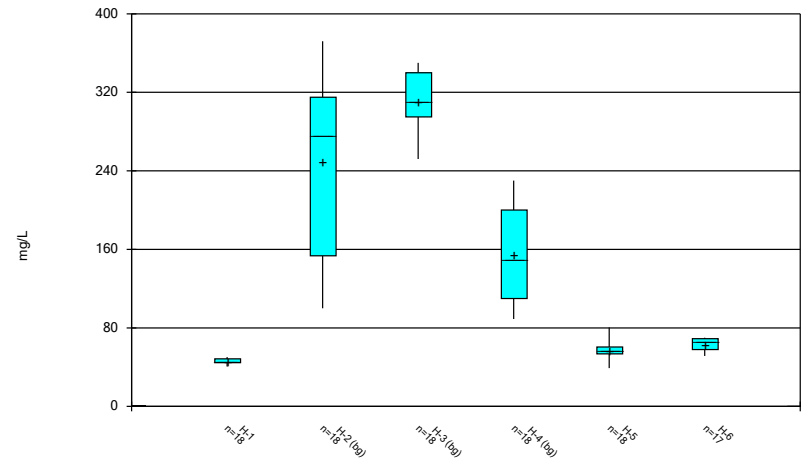
### **SANITAS STATISTICS RESULTS**

Box & Whiskers Plot



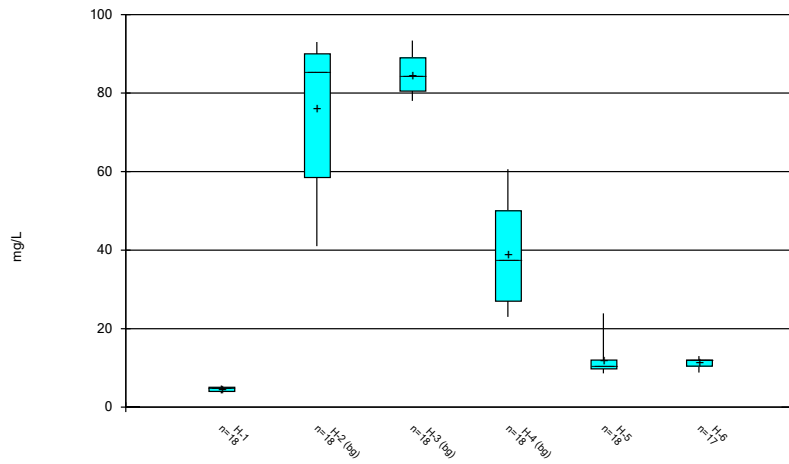
Constituent: Boron And Borates Only Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

Box & Whiskers Plot



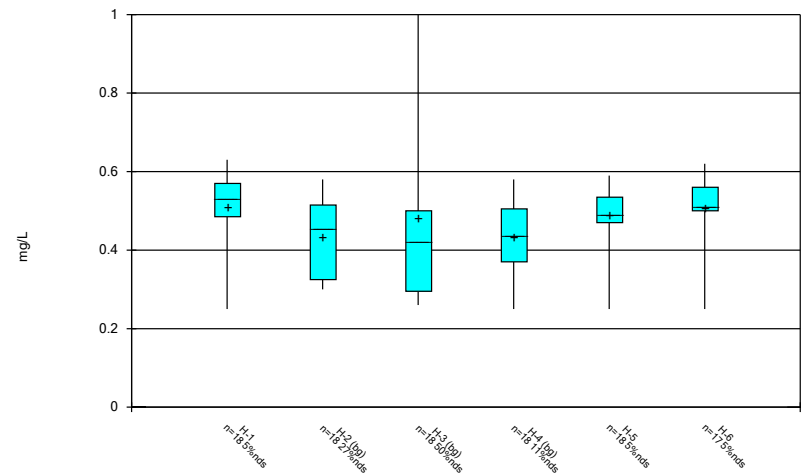
Constituent: Calcium Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

Box & Whiskers Plot



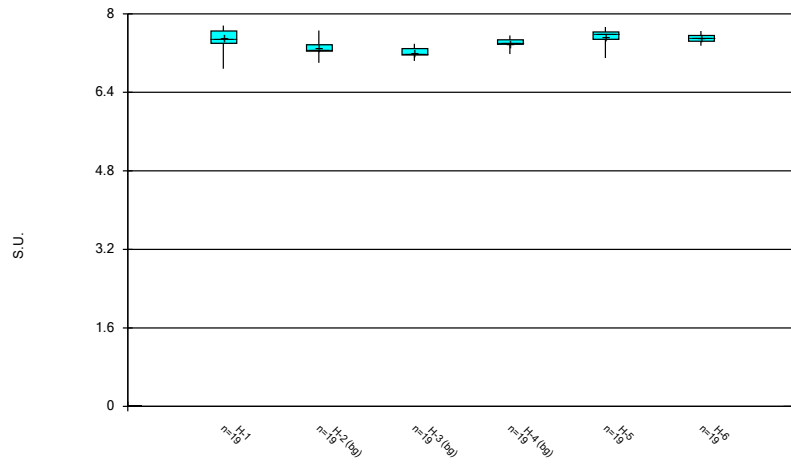
Constituent: Chloride Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

Box & Whiskers Plot



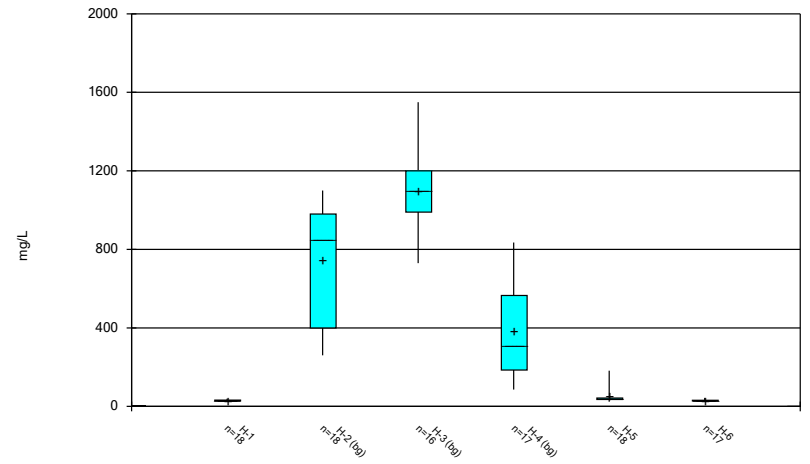
Constituent: Fluoride Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

Box & Whiskers Plot



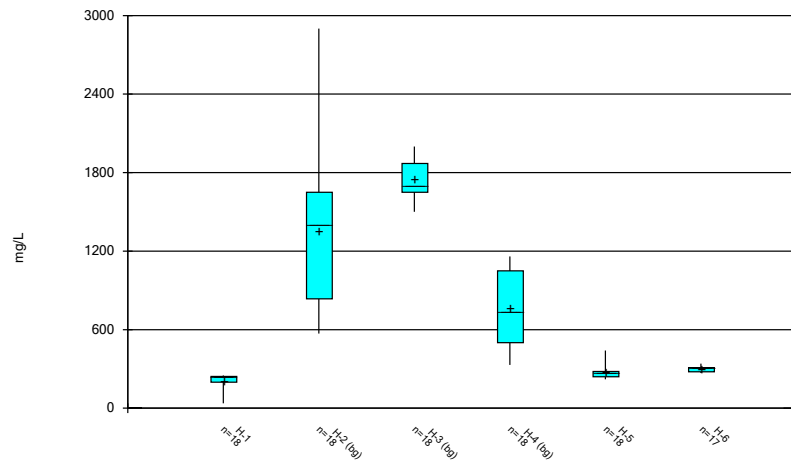
Constituent: pH Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

Box & Whiskers Plot



Constituent: Sulfate Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

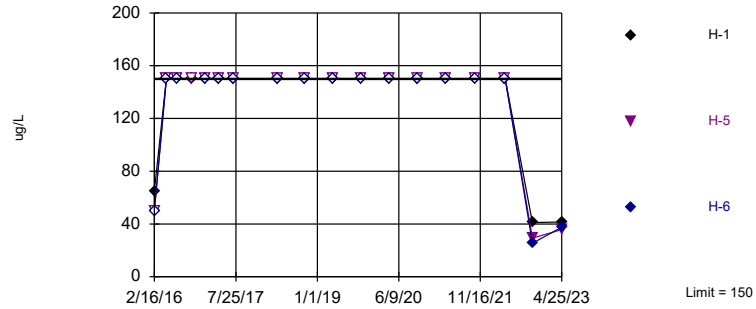
Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 6/19/2023 1:34 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

Within Limit

Prediction Limit  
 Interwell Non-parametric

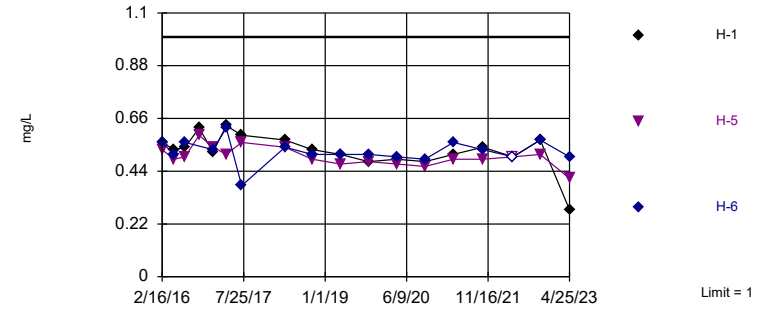


Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 54 background values. 83.33% NDs. Report alpha = 0.05263. Individual comparison alpha = 0.01786. Most recent point for each compliance well compared to limit. Seasonality was not detected with 95% confidence.

Constituent: Boron And Borates Only Analysis Run 6/15/2023 4:25 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower

Within Limit

Prediction Limit  
 Interwell Non-parametric

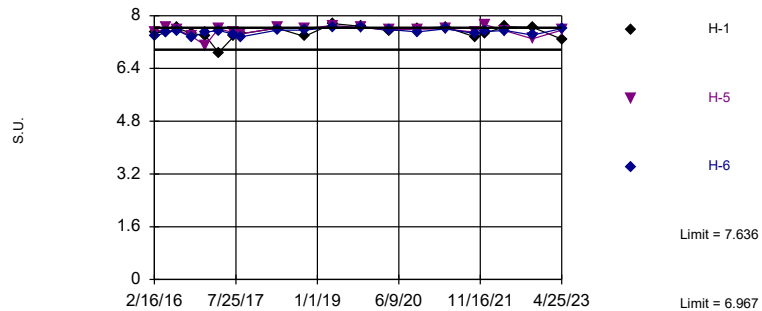


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.05 alpha level. Limit is highest of 54 background values. 29.63% NDs. Report alpha = 0.05263. Individual comparison alpha = 0.01786. Most recent point for each compliance well compared to limit. Seasonality was not detected with 95% confidence.

Constituent: Fluoride Analysis Run 6/15/2023 4:25 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower

Within Limits

Prediction Limit  
 Interwell Parametric

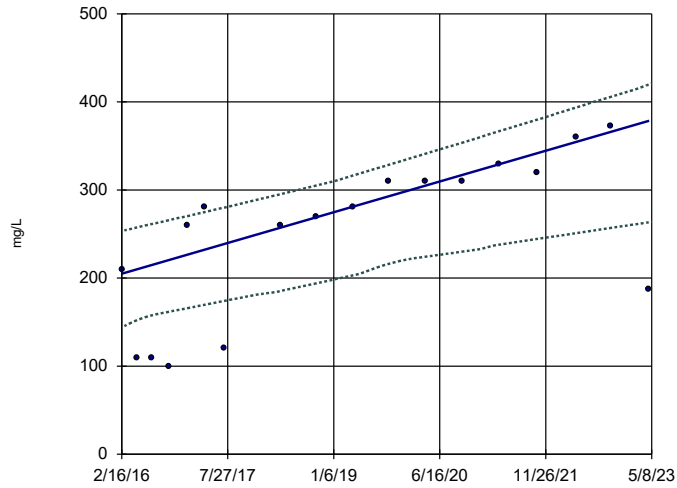


Background Data Summary: Mean=7.302, Std. Dev.=0.1346, n=60. Seasonality was not detected with 95% confidence. Normality test: Shapiro Francia @alpha = 0.05, calculated = 0.9856, critical = 0.962. Report alpha = 0.05. Individual comparison alpha = 0.008333. Most recent point for each compliance well compared to limit.

Constituent: pH Analysis Run 6/15/2023 4:25 PM  
 Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower

### Sen's Slope and 95% Confidence Band

H-2 (bg)



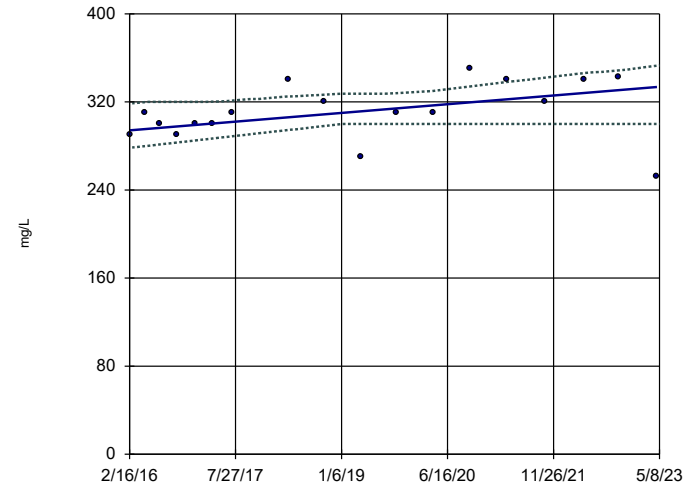
n = 18  
 Slope = 24.14  
 units per year.  
 Mann-Kendall  
 statistic = 99  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Calcium Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-3 (bg)



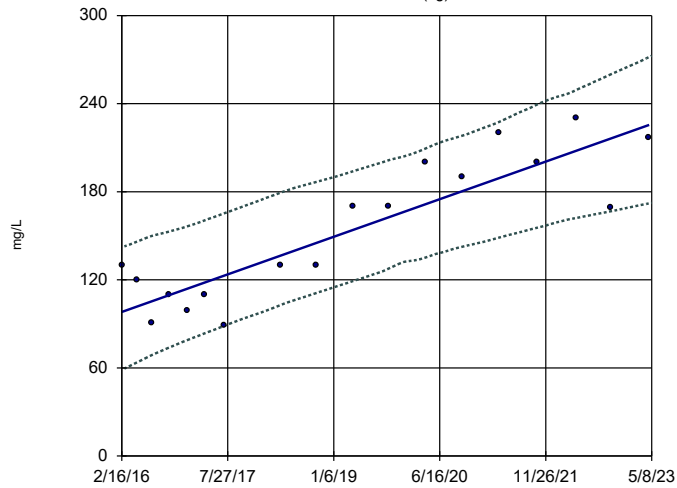
n = 18  
 Slope = 5.489  
 units per year.  
 Mann-Kendall  
 statistic = 55  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Calcium Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-4 (bg)



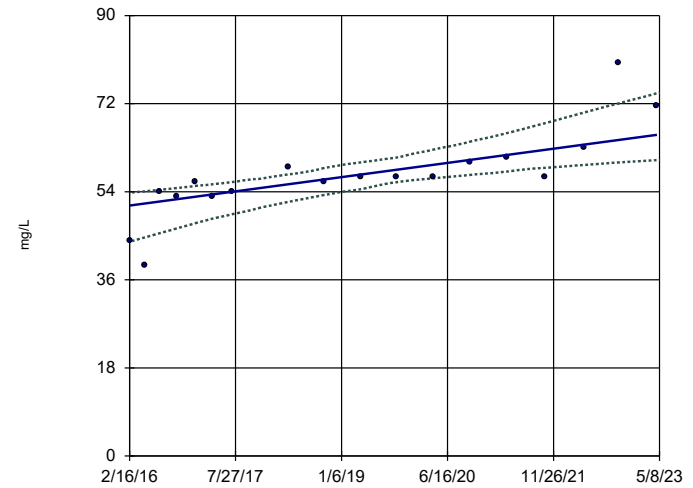
n = 18  
 Slope = 17.71  
 units per year.  
 Mann-Kendall  
 statistic = 93  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Calcium Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-5



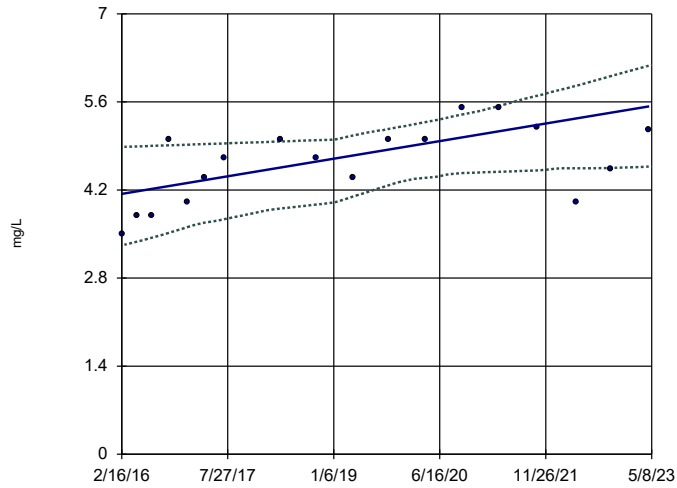
n = 18  
 Slope = 2.008  
 units per year.  
 Mann-Kendall  
 statistic = 118  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Calcium Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-1



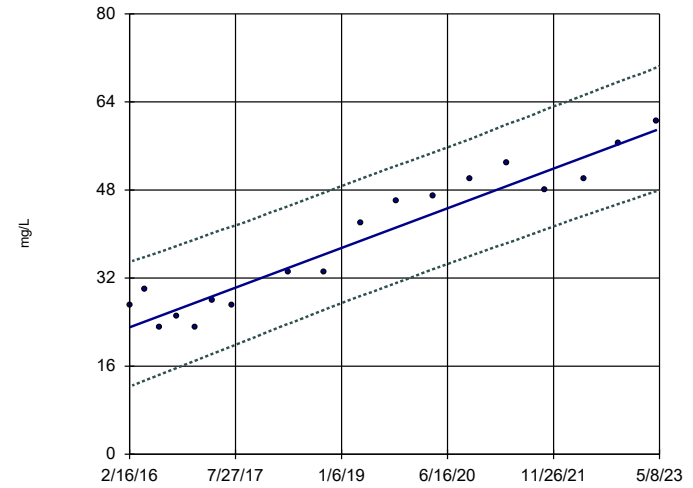
n = 18  
 Slope = 0.1934  
 units per year.  
 Mann-Kendall  
 statistic = 74  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Chloride Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-4 (bg)



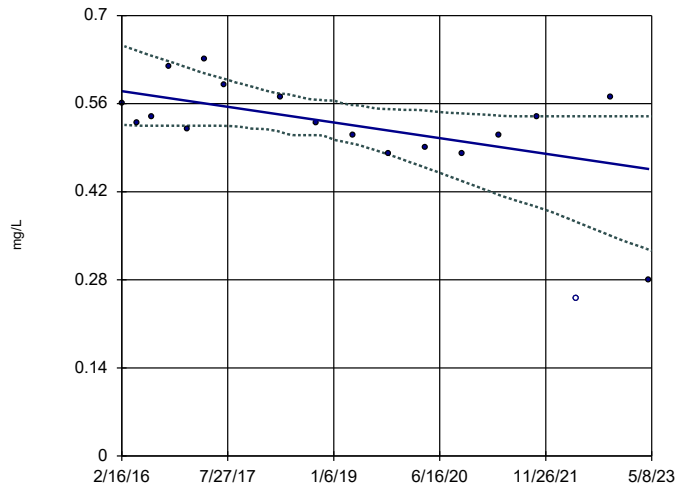
n = 18  
 Slope = 4.986  
 units per year.  
 Mann-Kendall  
 statistic = 123  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Chloride Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-1



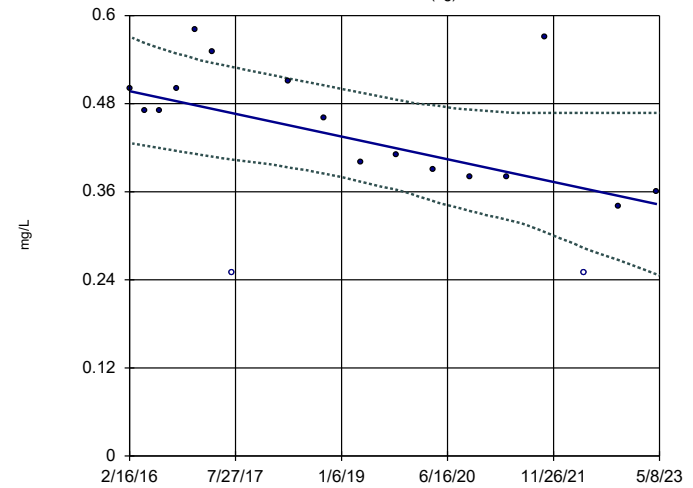
n = 18  
 Slope = -0.01724  
 units per year.  
 Mann-Kendall  
 statistic = -62  
 critical = -53  
 Decreasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Fluoride Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-4 (bg)



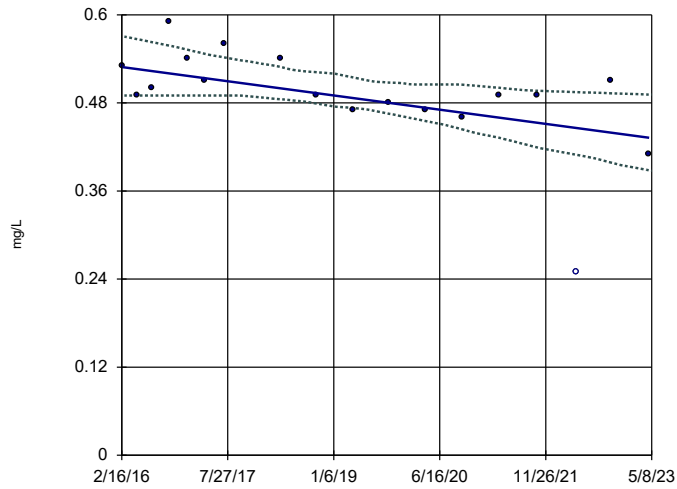
n = 18  
 Slope = -0.02141  
 units per year.  
 Mann-Kendall  
 statistic = -69  
 critical = -53  
 Decreasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Fluoride Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

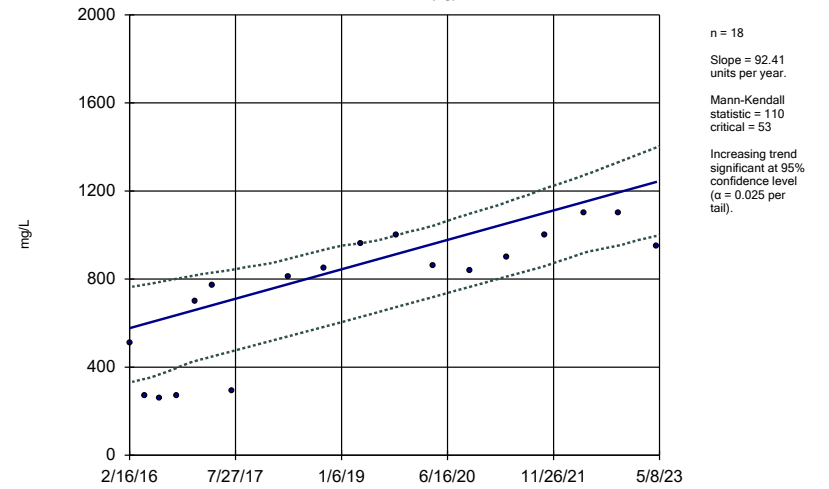
H-5



Constituent: Fluoride Analysis Run 6/19/2023 1:32 PM  
Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

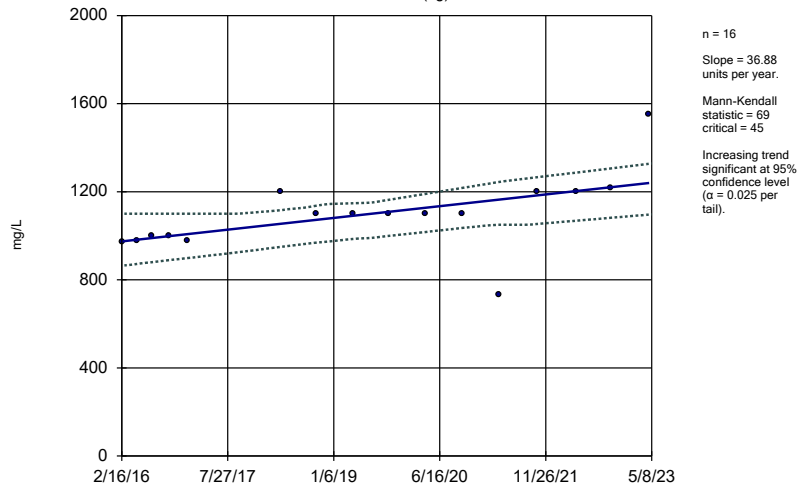
H-2 (bg)



Constituent: Sulfate Analysis Run 6/19/2023 1:32 PM  
Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

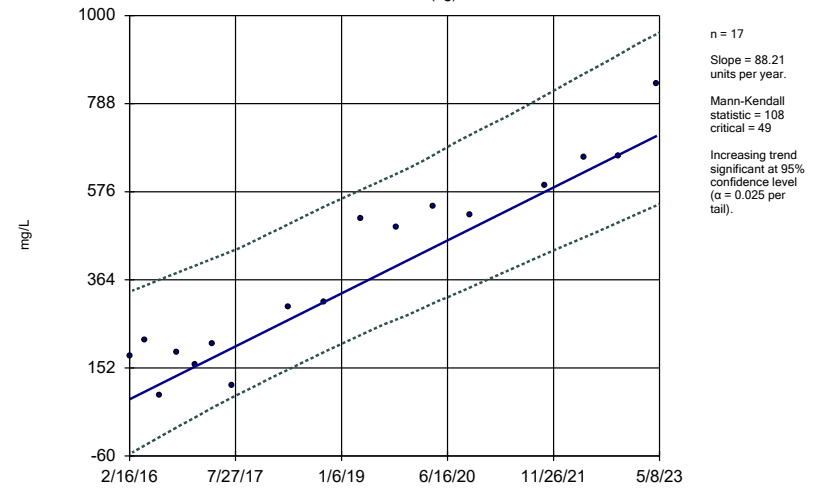
H-3 (bg)



Constituent: Sulfate Analysis Run 6/19/2023 1:32 PM  
Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

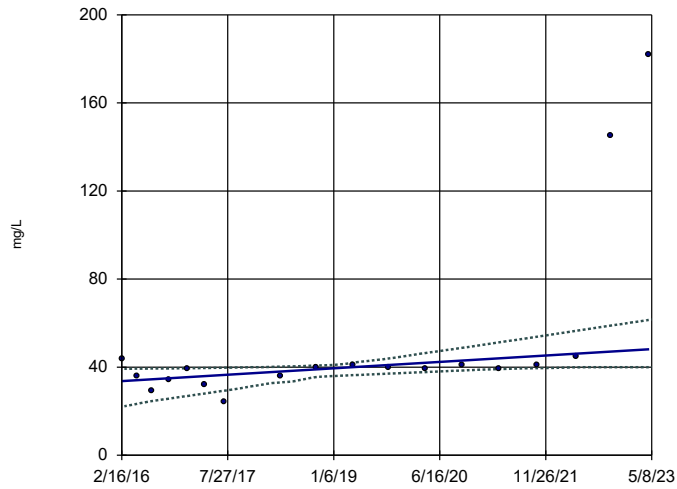
H-4 (bg)



Constituent: Sulfate Analysis Run 6/19/2023 1:32 PM  
Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-5



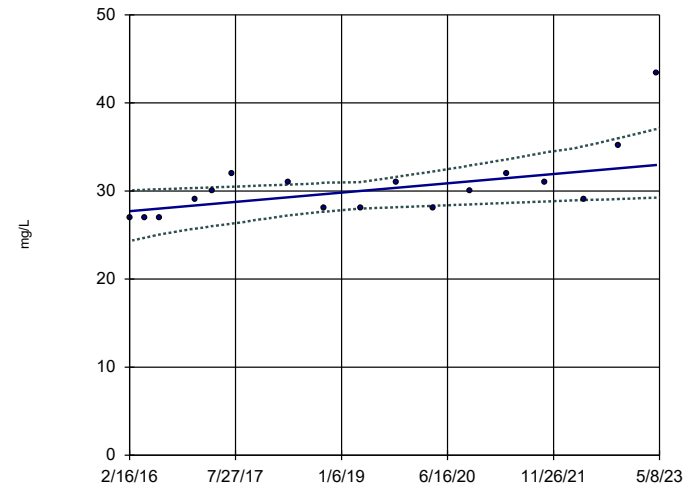
n = 18  
 Slope = 2.005  
 units per year.  
 Mann-Kendall  
 statistic = 79  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Sulfate Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-6



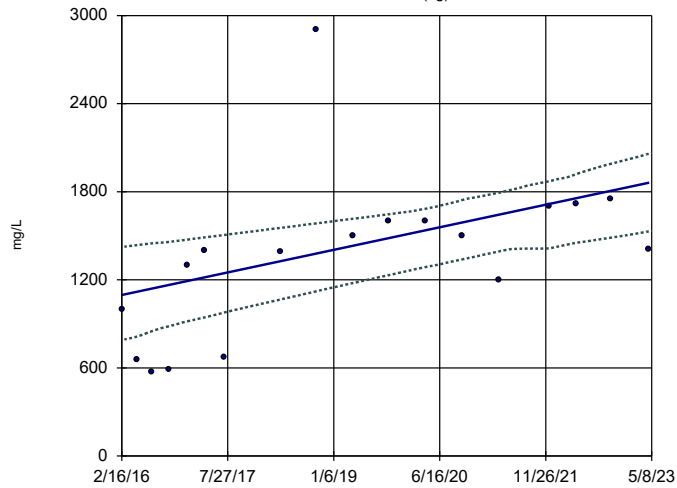
n = 17  
 Slope = 0.7315  
 units per year.  
 Mann-Kendall  
 statistic = 70  
 critical = 49  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Sulfate Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-2 (bg)



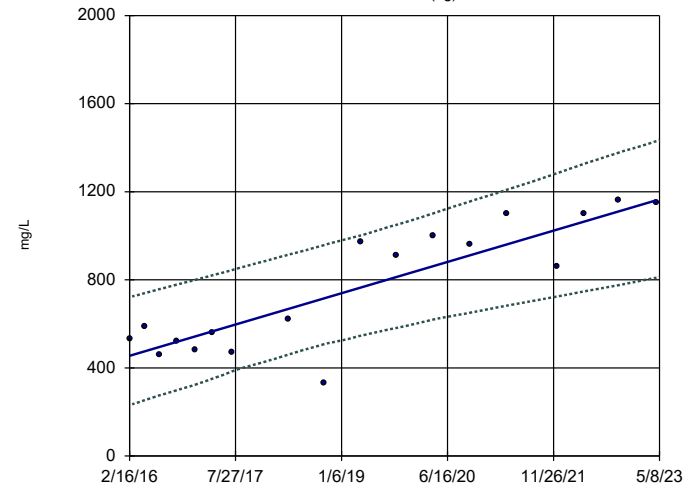
n = 18  
 Slope = 106.5  
 units per year.  
 Mann-Kendall  
 statistic = 83  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Total Dissolved Solids Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

### Sen's Slope and 95% Confidence Band

H-4 (bg)



n = 18  
 Slope = 98.38  
 units per year.  
 Mann-Kendall  
 statistic = 92  
 critical = 53  
 Increasing trend  
 significant at 95%  
 confidence level  
 ( $\alpha = 0.025$  per  
 tail).

Constituent: Total Dissolved Solids Analysis Run 6/19/2023 1:32 PM

Holcomb Station CCR LF Client: Sunflower Electric Power Corp. Data: sunflower 20230619

**APPENDIX C**

**REVISION LOG**

