El Dorado Chemical Company
CAO LIS 18-085 Response to Order and Agreement Paragraph 2

February 2019

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Strategic Environmental Services

EDCC CAO LIS 18-085 Response to Order and Agreement Paragraph 2

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February 2019

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TREND ANALYSIS OF THE HISTORICAL DATA SET (PARA. 2 (a))

1.0 Introduction

El Dorado Chemical Company (EDCC) has monitored groundwater on a routine basis since 2001. In 2006 EDCC entered into a CAO with ADEQ requiring semiannual monitoring of 22 groundwater wells located throughout the property. Information collected during the groundwater monitoring has been submitted annually to ADEQ on or before April 1. CAO LIS 18-085, effective November 25, 2018, requires continuation of the Remedial Action Plan and associated monitoring in addition to preparation of an Evaluation Report of data and effectiveness of the groundwater remedy.

To aid in determination of the effectiveness of the November 16, 2007 Remedial Action Plan (RAP) for site groundwater remediation, an evaluation and a statistical analysis of ammonia (NH_4^+), nitrate (NO_3^-), and sulfate (SO_4^{2-}) has been completed for groundwater data collected subsequent to the 2008 implementation of the RAP. The evaluation included a comparison of the mean constituent monitoring well concentration to the 95th percentile of the upgradient well constituents, a statistical analysis completed to determine if there were differences between monitoring wells and upgradient wells, and of constituent concentration trends over time within each of the monitoring wells. Sample populations were tested for normality (Shapiro-Wilk Test) to determine the statistical approach for comparing constituent concentrations in wells. The data sets failed the normality tests. Non-normal data sets are generally analyzed using non-parametric test such as Kruskal-Wallis which is an analysis of variance (ANOVA) test method based on ranks. An appropriate pairwise multiple comparison procedure (Dunn's Method) was used to isolate wells with median concentrations differing from the upgradient wells. Intra-well constituent concentration trends were analyzed and tested for significance. All statistical analysis were completed utilizing the SigmaPlot 12.0 statistical software package.

2.0 Statistical Analysis Results

Mean NH_4^+ concentrations for individual monitoring wells exceeded the 95% concentration for the control wells (ECMW1, ECMW2, and ECMW3) in all the wells except ECMW13, ECMW15, and ECMW22. Statistically significant differences ($\alpha < 0.05$) were detected for NH_4^+ between the control wells and groundwater monitoring wells ECMW6, ECMW7, ECMW8, and ECMW11. Mean NO_3^- concentrations for individual monitoring wells exceeded the 95% concentration for the control wells in ECMW5 – ECMW11 and ECMW14 – ECMW17. Statistically significant differences ($\alpha = 0.05$) were detected for NO_3^- and groundwater monitoring wells ECMW5 – ECMW11 and ECMW17. Mean SO_4^{2-} concentrations for individual monitoring wells exceeded the 95% concentration for the control wells in ECMW4 – ECMW11, ECMW13, ECMW14, and ECMW17. Statistical results are summarized in Tables 2a.1 – 2a.3.

Statistically significant increasing trends in NH_4^+ concentration over time were displayed for ECMW6, ECMW7, ECMW8, and ECMW19. Statistically significant increasing trends in NO_3^- concentration over time were displayed for ECMW5 – ECMW8 while significantly significant decreasing trends were displayed in ECMW14 and ECMW17. Statistically significant increasing trends in SO_4^{2-} concentrations over time were displayed for ECMW4 and ECMW12 while statistically significant decreasing trends were observed in ECMW5, ECMW8, ECMW14, and ECMW17.

Table 2a.1. Statistical Analysis Results for Ammonia.

Parameter	Well ID	Mean (mg/L)	Mean Concentration greater than the 95% Control Wells	Significantly Different than Control	Significant Trend, Increasing or Decreasing
Ammonia	CNTL	0.52	0.50	--	--
	ECMW4	0.87	Yes	No	No
	ECMW5	1.14	Yes	No	No
	ECMW6	883.78	Yes	Yes	Yes, increasing
	ECMW7	617.74	Yes	Yes	Yes, increasing
	ECMW8	349.67	Yes	Yes	Yes, increasing
	ECMW9	2.25	Yes	No	No
	ECMW10	0.81	Yes	No	No
	ECMW11	15.30	Yes	Yes	No
	ECMW12	2.31	Yes	No	No
	ECMW13	0.50	No	No	No
	ECMW14	0.85	Yes	No	No
	ECMW15	0.50	No	No	No
	ECMW16	1.70	Yes	No	No
	ECMW17	3.15	Yes	No	No
	ECMW18	1.19	Yes	No	No
	ECMW19	0.58	Yes	No	Yes, Increasing
	ECMW20	0.59	Yes	No	No
	ECMW21	0.50	No	No	No
	ECMW22	0.58	Yes	No	No

Table 2a.2. Statistical Analysis Results for Nitrate.

Parameter	Well ID	Mean	Mean Concentration Greater than the 95% of Control Wells	Significantly Different than Control Well	Significant Trend, Increasing or Decreasing
Nitrate	CNTL	0.74	1.86	--	--
	ECMW4	0.53	No	No	No
	ECMW5	30.49	Yes	Yes	Yes, increasing
	ECMW6	3,131.82	Yes	Yes	Yes, increasing
	ECMW7	1,280.91	Yes	Yes	Yes, increasing
	ECMW8	1,073.78	Yes	Yes	Yes, increasing
	ECMW9	29.71	Yes	Yes	No
	ECMW10	47.88	Yes	Yes	No
	ECMW11	20.95	Yes	Yes	No
	ECMW12	0.47	No	No	No
	ECMW13	0.38	No	No	No
	ECMW14	10.23	Yes	No	Yes, decreasing
	ECMW15	2.35	Yes	No	No
	ECMW16	10.17	Yes	No	No
	ECMW17	14.67	Yes	Yes	Yes, decreasing
	ECMW18	0.39	No	No	No
	ECMW19	0.79	No	No	No
	ECMW20	1.01	No	No	No
	ECMW21	1.70	No	No	No
	ECMW22	1.84	No	No	No

Table 2a.3. Statistical Analysis Results for Sulfate.

Parameter	Well ID	Mean	Mean Concentration Greater than the 95% of Control Wells	Significantly Different than Control Wells	Significant Trend, Increasing or Decreasing
Sulfate	CNTL	12.80	23.05	--	--
	ECMW4	799.29	Yes	Yes	Yes, increasing
	ECMW5	86.67	Yes	No	Yes, decreasing
	ECMW6	69.67	Yes	No	No
	ECMW7	627.09	Yes	Yes	No
	ECMW8	522.56	Yes	Yes	Yes, decreasing
	ECMW9	542.45	Yes	Yes	No
	ECMW10	147.44	Yes	Yes	No
	ECMW11	175.62	Yes	Yes	No
	ECMW12	17.06	No	No	Yes, increasing
	ECMW13	460.75	Yes	Yes	No
	ECMW14	130.53	Yes	Yes	Yes, decreasing
	ECMW15	12.11	No	No	No
	ECMW16	13.83	No	No	No
	ECMW17	31.57	Yes	No	Yes, decreasing
	ECMW18	3.46	No	No	No
	ECMW19	2.71	No	No	No
	ECMW20	9.64	No	No	No
	ECMW21	5.98	No	No	No
	ECMW22	6.57	No	No	No

WRITTEN EVALUATION OF CONSTITUENTS BEING MONITORED (PARA. 2 (b))

1.0 Introduction

EDCC currently monitors 22 groundwater wells for the constituents presented in Table 2b.1 at the indicated frequencies. ADEQ provided approval of the current sampling constituents and frequency in the original CAO and subsequent letters dated June 9, 2007; September 1, 2009; and August 9, 2011. Several of the monitoring constituents were removed from the monitoring program through ADEQ approval in the referenced letters due to low concentrations or proving not necessary for tracking the effectiveness of the RAP.

Table 2b.1. Groundwater Monitoring Constituents and Sampling Frequency.

Monitoring Well	NH_4	NO_3	SO_4	PB		CR		pH
				Dissolved	Total	Dissolved	Total	
MW-1	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-2	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-3	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-4	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-5	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-6	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-7	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-8	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-9	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-10	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-11	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-12	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-13	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-14	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-15	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-16	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-17	SA	SA	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-18	SA-Even	SA	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-19	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-20	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-21	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA
MW-22	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA-Even	SA

SA: Semi-Annual

SA-Even: Semi-Annual Even Years

2.0 Evaluation of Monitoring Constituents

The current constituent list provides sufficient tracking of the performance of the Remedial Action Plan, specifically the groundwater recovery system and monitored natural attenuation. As presented in Section 2(a) NH_4^+ concentrations for the downgradient, mid gradient, and six of the production areas (ECMW4, ECMW5, ECMW9, ECMW10, ECMW12, and ECMW13) wells are statistically similar to the upgradient wells. With the exception of ECMW19, the above wells do not show a significant trend while the wells nearest the recovery wells (ECMW6, ECMW7, and ECMW8) all show a statistically significant increasing trend. With the exception of the last two samples (0.75 and 1.21 mg/L) the NH_4^+ concentrations for ECMW19 have all been reported as <0.5. While the ECMW19 NH_4^+ shows a statistically significant increasing trend (attributed to the two recent sample concentrations above the detection limit), the NH_4^+ concentration is still statistically similar to the upgradient wells. The NH_4^+ concentration at ECMW19 should be closely monitored in future sampling events to determine if this trend continues, requiring further evaluation.

Similarly, NO_3^- concentrations in the downgradient wells are all statistically similar to the background wells with the exception of the well ECMW17. Nitrate concentrations in the mid gradient wells and three of the production area wells (ECMW4, ECMW12, and ECMW13) are also statistically similar to the control wells. Both ECMW14 and ECMW17 concentrations display a statistically significant decreasing trend with the ECMW17 NO_3^- concentration decreasing from near 100 mg/L in 2008 to less than 10 mg/L in 2018. The NO_3^- concentration in ECMW14 has been less than 10 mg/L for the last six sampling events. The monitoring wells nearest the recovery wells (ECMW5 – ECMW8) display a statistically significant increasing trend over time.

Sulfate concentrations in the downgradient wells are all statistically similar to the control wells. Sulfate concentrations in three of the production area wells (ECMW5, ECMW6, and ECMW12) and two of the mid gradient wells (ECMW15 and ECMW16) are statistically similar to the control wells. The mean SO_4^{2-} concentrations of ECMW15 and ECMW18 – ECMW22 are lower than the mean background well concentration. Statistically significant decreasing trends are displayed in ECMW5, ECMW8, ECMW14, and ECMW17 while statistically significant increasing trends are displayed in ECMW4 and ECMW12.

Lead (Pb) and Chromium (Cr) concentrations are primarily below the detection limits for all of the wells except ECMW6 and ECMW8 where Pb concentrations range from 0.02 mg/L to 0.08 mg/L. The elevated Pb concentrations are confined to the production area and are near the groundwater recovery wells.

The statistical analysis of the groundwater monitoring wells imply that the NH_4^+ plume is contained within the production area and continues to be migrating to the groundwater recovery wells. While ECMW17 routinely exceeds the target NH_4^+ concentration (0.55 mg/L), there is not a statistically significant trend in concentration. The NO_3^- concentration has significantly decreased since 2008 with NO_3^- concentration dipping below 10 mg/L from a starting point of near 100 mg/L. Nitrate and NH_4^+ are linked through chemical processes.

Should the NO_3^- concentration continue to decrease as predicted by the trend, reductions in NH_4^+ concentrations would be expected.

The current monitoring constituents are appropriate for monitoring the effectiveness of the RAP. The target endpoint for the downgradient wells is an NH_4^+ concentration of 0.55 mg/L. Tracking NH_4^+ and NO_3^- provide sufficient evidence that the plume is not migrating beyond the production area. Additionally, monitoring SO_4^{2-} concentrations provide evidence that this constituent is not migrating beyond the production area. As previously mentioned, other constituents have been eliminated from the monitoring program at the approval of ADEQ as they have been deemed not necessary for tracking the migration of the plume.

GROUNDWATER RECOVERY SYSTEM EVALUATION (PARA. 2 (c))

1.0 Background

Construction of two recovery wells (ECRW-1 and ECRW-2) screened in the Cockfield Formation was completed and the wells became operational in November 2006. A Recovery Well Installation Report dated January 29, 2007 was submitted to ADEQ and contained detailed information on the well components and start-up operations. Recovered groundwater was utilized in the chemical condensate system of the then-present Direct Strong Nitric acid (DSN) unit.

2.0 Operational Summary

EDCC has attempted operation of the two recovery wells continuously since their initial startup but has experienced difficulty maintaining consistent recovery from both wells simultaneously. As shown in Table 2c.1 the peak annual recovered volume for ECRW-1 was 480,000 gallons in 2008, and for ECRW-2 was 533,952 gallons in 2010. Extended shutdown of one or both recovery wells has been caused by mechanical failures and after an explosion destroyed the DSN acid plant on May 15, 2012.

Table 2c.1. Annual and Total Groundwater Recovered, EDCC 2006-2017.

Year	ECRW-1 (gal)	ECRW-2 (gal)
2006	80,800	82,389
2007	200,000	200,000
2008	480,000	480,000
2009	0	0
2010	0	533,952
2011*	0	156,197
2012	0	65,232
2013	262,800	131,400
2014	78,840	512,460
2015	210,240	512,460
2016	259,200	207,360
2017	262,800	210,240
Total 2006-2017	1,834,680	3,091,690

*Recovery well volumes for 2011 were recorded as the combined total for both wells. The value shown was attributed to ECRW-2 based on communication with EDCC.

Effluent from the recovery wells is not monitored or analyzed. However, near adjacent monitoring wells ECMW-7 and ECMW-6 are assumed due to their proximity to be representative of the groundwater quality of the recovery well effluents. Using the annual average concentrations of the principal contaminants (Nitrate-N, Ammonia-N, and Sulfate) as analyzed for ECMW-7 (nearest ECRW-1) and ECMW-6 (nearest ECRW-2), the recovery system has been effective at removing contaminants from the Cockfield Formation near the

EDCC production area. The combined estimated mass removed by the recovery wells for the period 2006-2017 is: Nitrate-N 95,829 lb., Ammonia-N 33,790 lb., Sulfate 12,836 lb.

Figure 2c is the 1st-half 2018 potentiometric map of the uppermost saturated zone at EDCC and also includes contours for the 2004 groundwater elevations showing pre-recovery system conditions. The recession of 2018 contour lines downgradient from ECRW-1 and ECRW-2 compared to the 2004 contours is an indication of general lowering of the static water levels in the subsurface near the production area, potentially attributed to operation of groundwater recovery system.

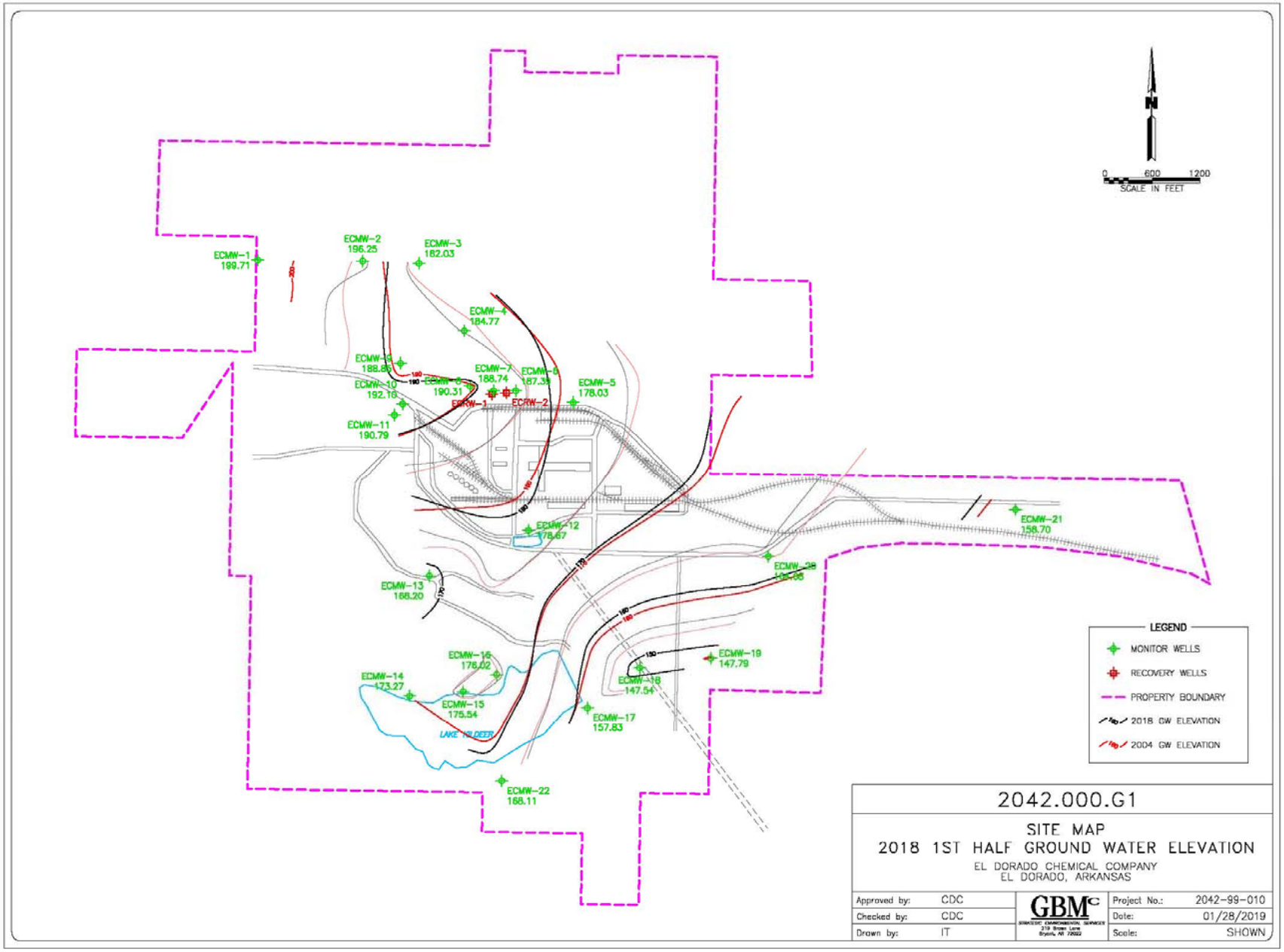
3.0 Current Status

Recovery wells ECRW-1 and ECRW-2 are currently operational and discharge to the EDCC wastewater collection system, as the DSN acid plant no longer exists. The most recent data available shows the recovery rate for both wells is 0.5 gal/min or less. Previous geologic investigations (Woodward-Clyde, 1997) determined average hydraulic conductivity (K=1.87 ft/d) and saturated thickness (h=13.83 ft) of the uppermost subsurface zone at EDCC. Using those physical parameters and not accounting for site-specific variations in subsurface lithology, the estimated productivity of ECRW-1 and ECRW-2 should be greater than 1 gal/min.

4.0 Conclusions/Recommendations

The recovery well system at EDCC has been successful in removing contaminants from the uppermost saturated layer of the Cockfield Formation and has proven to be a component in reducing potential exposure risk at the site. Based on the declining productivity of both recovery wells, the investigation of possible remedial/rehabilitative measures to restore or improve groundwater flow into the wells is recommended.

Figure 2c


0 600 1200
SCALE IN FEET
ECMW-1 199.71
ECMW-2 196.25
ECMW-3 182.03
ECMW-4 184.77
ECMW-9 188.80
ECMW-10 192.16
ECMW-11 190.79
ECMW-8 190.31
ECMW-7 188.74
ECMW-6 187.39
ECMW-5 178.03
ECRW-1
ECRW-2
ECMW-12 178.67
ECMW-13 168.20
ECMW-14 173.27
ECMW-16 176.02
ECMW-15 175.54
LAKE IN DEER
ECMW-17 157.83
ECMW-18 147.54
ECMW-19 147.79
ECMW-20 156.88
ECMW-21 156.70
ECMW-22 168.11
LEGEND
MONITOR WELLS
RECOVERY WELLS
PROPERTY BOUNDARY
2018 GW ELEVATION
2004 GW ELEVATION
2042.000.G1
SITE MAP
2018 1ST HALF GROUND WATER ELEVATION
EL DORADO CHEMICAL COMPANY
EL DORADO, ARKANSAS
Approved by: CDC
Checked by: CDC
Drawn by: IT
GBMC
Project No.: 2042-99-010
Date: 01/28/2019
Scale: SHOWN

EVALUATION OF RAP TARGET GOALS AT PROPERTY BOUNDARY AND DOWNGRADIENT WELLS ECMW-17 AND ECMW-22 (PARA. 2 (d))

The Remedial Action Plan (RAP) set target goals for ammonia concentration at 0.55 mg/L at the property boundary of the EDCC site. ECWM17 - ECWM22 are downgradient wells located along the southeast property boundary of the EDCC facility. ECWM17 and ECWM22 are positioned adjacent and downgradient to Lake Kildeer.

Table 2d.1 presented below provides summary statistics of ammonia concentrations for ECWM17-22 from 2008-2018. The monitoring wells with the highest average concentration of ammonia are ECWM17 and ECWM18. The target ammonia concentration of 0.55 mg/L was exceeded 19 of the 22 times that ECWM17 was sampled. ECWM18 and ECWM22 each had three exceedances of the target goal. The only well to not exceed the target goal was ECWM21. ECWM17-20 and ECWM22 have exceeded, or on average, exceed the RAP target ammonia concentration of 0.55 mg/L.

As seen in Table 2d.1, the number of times each well was sampled for ammonia is varied. This is due to a change in the monitoring program during 2007-2008. During this period the monitoring program called for sampling of ammonia at ECWM17 semiannually, each year and at ECWM18-22 semiannually, every two years.

Table 2d.1 Ammonia concentrations of downgradient monitoring wells (period of record of 2008-2018).

Monitoring Well Number	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	Number of times sampled	Number of exceedances (>0.55 mg/L)
17	3.15	0.50	11.20	22	19
18	1.19	0.50	9.64	15	3
19	0.58	0.50	1.21	12	2
20	0.59	0.50	1.62	12	1
21	0.50	0.50	0.50	12	0
22	0.58	0.50	1.25	12	3

While ECWM17-20 and ECWM22 have exceeded the target of 0.55 mg/L, concentrations in these locations have not shown a statistically significant increase (Para 2(a)). Additionally, statistical analysis of ammonia data (Para. 2(b)) shows that concentrations for the down gradient, mid gradient, and production area wells (excluding ECMW19) are statistically similar to the upgradient wells. This suggests that migration of the contaminant plume into the downgradient zone has not occurred. Increasing ammonia concentrations in monitoring wells near recovery wells (6,7) also indicate recovery operations may be preventing plume migration

from the production area. ADEQ appears to confirm this assessment via letter dated August 30, 2017 regarding the 2016 Annual Groundwater Report. Continued groundwater monitoring will provide further information towards the attainment of the 0.55 mg/L ammonia goal.

REVIEW AND UPDATE OF FINDINGS OF 2007 HUMAN HEALTH RISK ASSESSMENT (PARA. 2 (e))

1.0 Introduction

Findings from the 2007 Human Health Risk Assessment (HHRA) developed as part of the Remedial Action Plan were reviewed. The 2007 HHRA determined that there are no documented completed receptor pathways regarding groundwater at the EDCC site for on-site or off-site receptors, either human or ecological. Based upon this determination, groundwater monitoring data from 2001 to 2006, and potential exposure pathways, the HHRA was limited to assessing only hypothetical exposure to ammonia.

2.0 Exposure Pathways and Receptors

A review of exposure pathways and potential receptors of groundwater at the EDCC site was conducted. The 2007 HHRA found no potential on-site exposure scenarios due to the absence of connectivity between groundwater and surface waters and the ability for EDCC management to restrict access to groundwater at the site. Potential off-site residential exposure scenarios evaluated included: ingestion of groundwater, inhalation of volatile compounds released from indoor use of groundwater, and inhalation of volatile compounds from soil gas. After evaluation, the pathways of principal concern were found to be ingestion of groundwater and inhalation due to groundwater use by off-site residents. This exposure would likely only occur due to the installation of an off-site groundwater well.

A search of public well records was conducted to confirm that no new public wells have been installed since the 2007 Human Health and Ecological Groundwater Risk Assessment. Available public data confirms that no new wells within a 1.5-mile radius of the plant centroid have been put in service. On-site and off-site groundwater wells are not installed in the shallow aquifer and are unlikely to be implemented in the future due to the availability of municipal water provided by the City of El Dorado and groundwater from the deeper Sparta Aquifer.

3.0 Exposure Points and Concentrations for Potential Receptors

Pathways of potential concern for off-site ammonia exposure by contaminated groundwater are inhalation due to groundwater use. The point concentration for ammonia was calculated for both acute and chronic exposure based on volatilization during water use in a residential shower. Calculations and methodologies for determining point concentrations were reviewed and determination was made that no updates to the HHRA are necessary. Furthermore, the exposure is still considered hypothetical due to a lack of groundwater connectivity or usage.

4.0 Risk Characterization

Acute and chronic ammonia point concentrations were considered for human exposure and risk characterization. Ammonia point concentrations were evaluated against Agency for

Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs) for health effects associated with inhalation. These MRLs were confirmed to be current and are therefore considered appropriate for continued use in the EDCC HHRA. Risk characterization for nitrate, chromium, and lead was also considered in the HHRA but no appreciable risks were calculated. Concentrations of these chemicals observed in monitoring data since the risk assessment have decreased or not statistically changed. Therefore, no re-evaluation for these chemicals was conducted.

5.0 Groundwater Target Levels

A groundwater target level for ammonia concentration was set at the property boundary for the 2007 HHRA. This target level (0.55 mg/L) represents the 95th percentile of the upper confidence limit of upgradient unit (background) concentrations of ammonia at the time of assessment. This target was believed to represent a potentially attainable level. While it is above the established screening level for tap water (0.21 mg/L), the evaluation of inhalation based on groundwater in the upgradient unit results in point concentrations that meet acute and chronic MRLs.

6.0 Environmental Data Gaps

Data gaps were identified in the HHRA which could potentially improve the reliability of the risk assessment. These included: documentation of any actual surface connection between the groundwater and surface waters, sediment concentrations of Chemical of Potential Concern (COPC), soil concentrations of COPC, and sediment toxicity of the receiving streams into which any groundwater might discharge. To date, no assessment or sampling to compile this information has been conducted. However, this data may still be useful in determining the pathway to final site closure.

7.0 Project End Points for Site Closure

Section 2.3.1 of the Remedial Action Plan defines criteria to be met in order to consider the selected remedy for the site complete. Criteria include: 1) has the 0.55 mg/l goal been attained; 2) is the ammonia data from the Downgradient Groundwater Unit (DGU) statistically significantly less than or equal to (at an alpha of 0.05) that of the background wells (Upgradient Groundwater Unit (UGU)); 3) have the ammonia levels in the DGU stabilized (not increased) or decreased over time. The remedy will be considered complete upon achieving either criteria 1 or criteria 2. At such time as criteria 3, outlined above, has been attained (i.e. the ammonia trend indicates stabilized concentration levels and no statistically significant increase over time) the continuation of the recovery well operation may no longer be required. After cessation of the recovery well operation, and prior to completion of the remedy, the monitoring frequency will be reduced to once per year to assess the progress of natural attenuation processes. Should the ammonia levels in the DGU be found to be increasing at a statistically significant level (alpha=0.05) then the RAP will be revised to further characterize and delineate the plume (determining if the ammonia levels have indeed increased or if the plume has expanded) and/or to evaluate the need for additional remedial measures to address containment.

Statistical evaluation has shown that criteria 2 above has been met. However, due to residual contamination in the production area, EDCC will continue to implement the selected remedy until such time that more data becomes available through recovery operations and groundwater monitoring which will be used to re-evaluate criteria for site closure.