Attachment 5 – WA Remediation Component Locations

FIGURE 8-1
WESTERN AREA GROUNDWATER
REMEDIATION AREAS
FACILITY DECOMMISSIONING PLAN
REVISION 3

BURNS McDONNELL

environmental properties management, LLC

OUTFALL 001
GE-WAA-04
GE-WAA-05
GE-WAA-01
GE-WAA-02
100 µg/L
GE-WAA-03
GETR-WU-01
GETR-WU-01A
GWI-WU-01A
GWI-WU-01
A
B
C
D
E
E1
F
G
H
I
J
K
L
M
N
O

LEGEND

- MONITOR WELL IN ALLUVIUM
- MONITOR WELL IN SANDSTONE A
- MONITOR WELL IN SANDSTONE B
- MONITOR WELL IN SANDSTONE C
- MONITOR WELL IN TRANSITION ZONE
- PROPOSED MONITOR WELL
- EXTRACTION TEST WELL
- EXTRACTION WELL/SUMP
- INJECTION WELL
- OUTFALL
- GROUNDWATER EXTRACTION PIPING
- TREATED WATER INJECTION PIPING
- GROUNDWATER EXTRACTION TRENCH
- TREATED WATER INJECTION TRENCH
- WESTERN AREA TREATMENT FACILITY EXTRACTION, INJECTION, AND UTILITY CORRIDOR
- WA DISCHARGE PIPING
- 100 µg/L URANIUM CONCENTRATION
- WU-BA3 REMEDIATION AREA
- WAA U>DCGL REMEDIATION AREA
- 1206-NORTH REMEDIATION AREA
- SUBAREAS
- 1206 DRAINAGE PERFORATED PIPE
- EXCAVATION AREA

NOTES

1) 180 picoCuries per liter (pCi/L) in the WAA U > DCGL, 1206-NORTH, and BA3 areas was calculated at 119 micrograms per liter (µg/L). The 100 µg/L isopleth is shown for conservatism.

2) BASEMAP: GOOGLE EARTH 2017

0 400 800
SCALE IN FEET

N

	Rev No: 0
Preparer: TJKIMMEL	Date: 9/9/2022
Reviewer: EDULLE	Date: 9/9/2022

Coordinate System
NAD 1983 StatePlane Oklahoma North FIPS 3501 Feet

Z:\Clients\ENS\CERT_ClientInfo\Sites\Database\Geospatial\Maps & Dwgs\ArcGIS\BMCD_Files\Arcdocs\2020\2022 - Decommissioning Plan\Figure 8-1_Western Area GW Remediation Areas

Attachment 6 – Area and Linear-Weighted Averaging Results

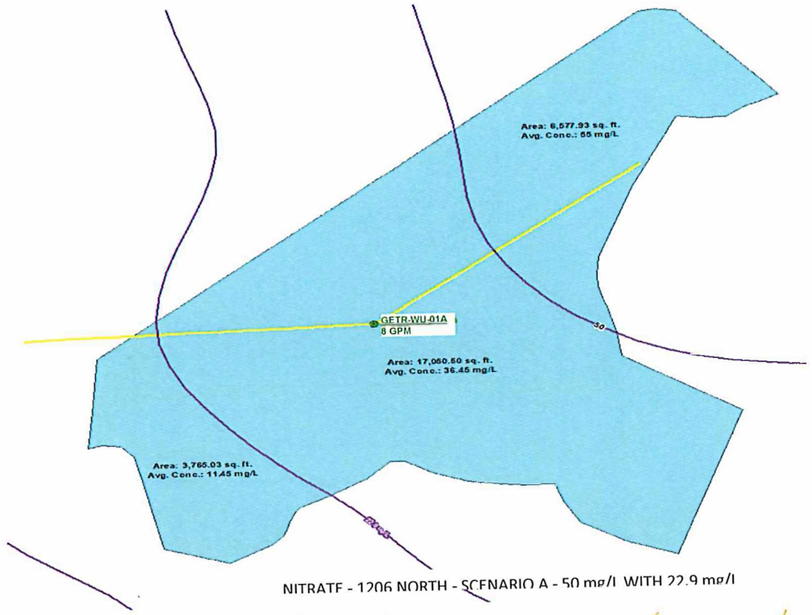
Water Treatment Design Basis
Cimarron Environmental Response Trust

10/06/2022

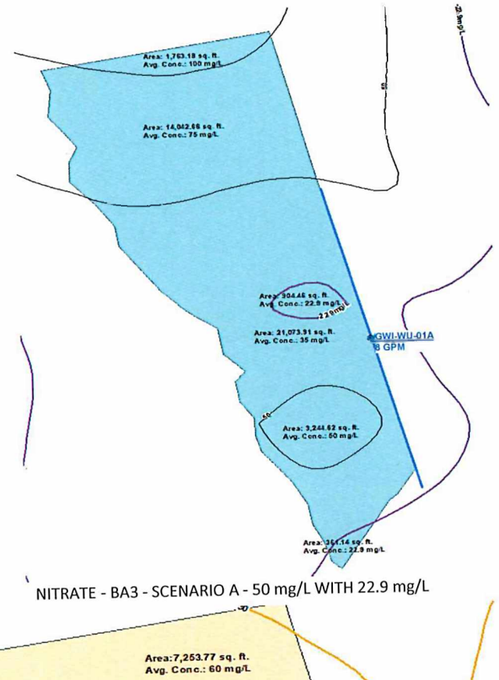
URANIUM	GWI-WU-01 (BA3)	Contour Average (ug/L)	60	150	250	350	450	550	650	750	-	-	-	-	-	-	-	-	-	-	-	Totals
		Actual Area	7,645	9,248	5,827	4,854	4,155	4,105	4,096	1,460	-	-	-	-	-	-	-	-	-	-	-	41,390 sq. ft.
		Weighted Average	458,700	1,387,200	1,456,750	1,698,900	1,869,750	2,257,750	2,662,400	1,095,000	-	-	-	-	-	-	-	-	-	-	-	311.34 ug/L
	Uranium isopleths used: Sandstone A Uranium Contours (100ug/L)																					
	WU "1206 NORTH" (GETR-WU-01)	Contour Average (ug/L)	110	130	150	170	190	210	230	250	270	290	310	330	350	370	390	410	430	450	460	Totals
		Actual Area	576	1,469	3,740	3,745	2,229	1,143	1,053	1,429	1,279	1,634	1,958	2,112	1,076	1,108	1,019	794	569	344	119	27,396 sq. ft.
		Weighted Average	63,360	190,970	561,000	636,650	423,510	240,030	242,190	357,250	345,330	473,860	606,980	696,960	376,600	409,960	397,410	325,540	244,670	154,800	54,740	248.28 ug/L
	Uranium isopleths used: Sandstone B, Transition Zone, Alluvium Uranium Contours (20ug/L)																					
NITRATE	GWI-WU-01 (BA3)	Contour Average (mg/L)	23	36	50	75	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
		Actual Area	1,266	21,074	3,245	14,043	1,763	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39,627 sq. ft.
		Weighted Average	28,991	768,147	162,231	1,053,200	176,300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.79 mg/L
	Nitrate isopleths used: Sandstone A Nitrate Contours (50mg/L)																					
	WU "1206 NORTH" (GETR-WU-01)	Contour Average (mg/L)	11	36	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
		Actual Area	3,765	17,051	6,578	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27,393 sq. ft.
		Weighted Average	43,110	621,491	361,786	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.47 mg/L
	Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50mg/L)																					

Notes:
mg/L - Milligrams per liter
sq. ft. - Square feet
ug/L - Micrograms per liter

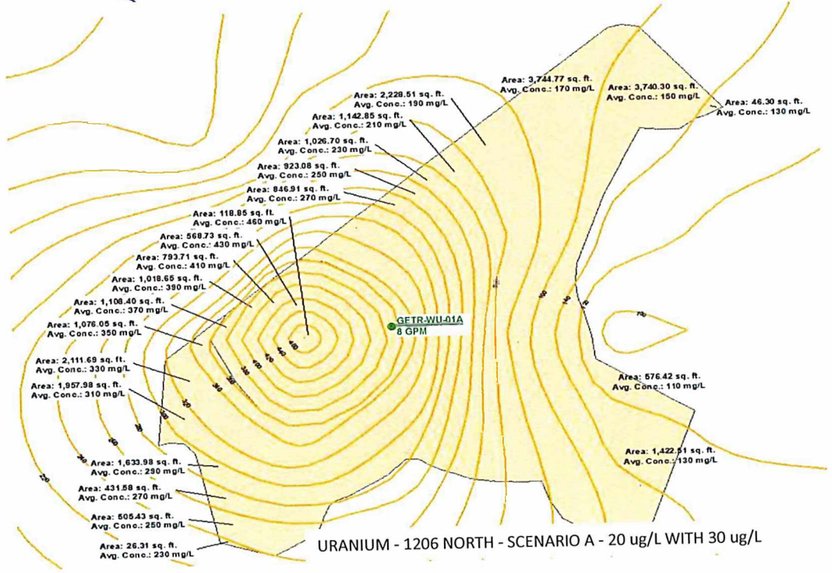
1) Shapefiles used to generate the areas are saved: Z:\Clients\ENS\CERT_ClientInfo\Sites\Database\Geospatial\Maps & Dwgs\ArcGIS\BMCD_Files\Shapes\2020 Particle Tracking Model Updates\Scenario A
2) Surfer files for COC contours are saved here: Z:\Clients\ENS\CERT\104407_CERT-DECOM2018\Design\Deliverables\60% Design\Water Treatment Design Basis\Surfer Files



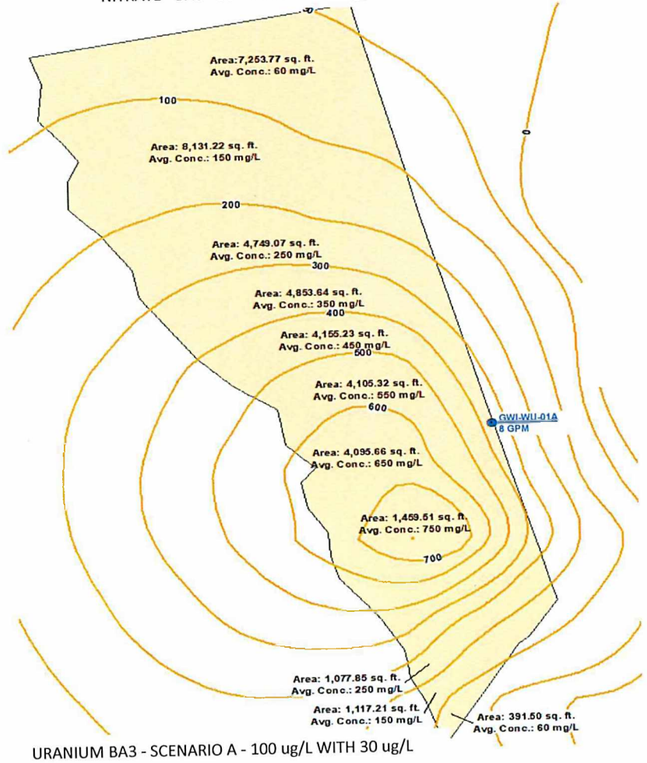
NITRATE - 1206 NORTH - SCENARIO A - 50 mg/L WITH 22.9 mg/L



NITRATE - BA3 - SCENARIO A - 50 mg/L WITH 22.9 mg/L



URANIUM - 1206 NORTH - SCENARIO A - 20 ug/L WITH 30 ug/L



URANIUM BA3 - SCENARIO A - 100 ug/L WITH 30 ug/L

Water Treatment Design Basis
Cimarron Environmental Response Trust

10/06/2022

Uranium

Segment (NW to SE)	Segment Length (ft)	Cumulative Lenth (ft)	Concentration (ug/L)	Weighted Concentration (ug/L/ft)	Trench ID
1	8.2	8.2	270	2,222.10	
2	9.1	17.3	290	2,639.00	
3	8.8	26.2	310	2,734.20	
4	9.0	35.1	330	2,966.70	
5	7.0	42.1	350	2,432.50	
6	6.3	48.4	370	2,331.00	
7	6.4	54.8	390	2,480.40	
8	6.3	61.1	410	2,595.30	
9	6.4	67.5	430	2,743.40	
10	6.3	73.8	450	2,844.00	
11	10.0	83.8	470	4,714.10	
12	6.9	90.7	450	3,100.50	
13	6.4	97.1	430	2,734.80	
14	6.3	103.4	410	2,583.00	GETR-WU-02
15	6.3	109.7	390	2,460.90	
16	6.5	116.1	370	2,390.20	
17	6.3	122.4	350	2,201.50	
18	6.9	129.4	330	2,286.90	
19	5.7	135.0	310	1,751.50	
20	6.2	141.2	290	1,809.60	
21	6.8	148.0	270	1,825.20	
22	7.1	155.1	250	1,762.50	
23	8.0	163.0	230	1,835.40	
24	7.4	170.4	210	1,554.00	
25	18.3	188.8	190	3,480.80	
26	21.3	210.0	170	3,614.20	
27	13.9	223.92	150	2,086.50	

Groundwater Data Source (Formations) - Sandstone B / Transition Zone / Alluvium

Weighted Average = 304 ug/L

Fluoride

Segment (NW to SE)	Segment Length (ft)	Cumulative Lenth (ft)	Concentration (mg/L)	Weighted Concentration (mg/L/ft)	Trench ID
1	2.7	2.7	4.75	12.73	
2	11.0	13.7	5.25	57.65	
3	11.1	24.8	5.75	63.94	
4	11.1	35.9	6.25	69.56	
5	8.9	44.8	6.75	59.81	
6	7.8	52.6	7.25	56.41	
7	7.8	60.4	7.75	60.76	
8	7.8	68.2	8.25	64.19	
9	7.7	75.9	8.75	67.73	
10	9.2	85.1	9.25	85.01	GETR-WU-02
11	18.1	103.2	8.75	158.46	
12	19.7	122.9	8.25	162.28	
13	10.9	133.8	7.75	84.55	
14	15.1	148.9	7.25	109.77	
15	22.6	171.6	6.75	152.69	
16	19.2	190.8	6.25	120.13	
17	29.1	219.8	5.75	167.04	
18	4.1	223.94	5.25	21.63	

Groundwater Data Source (Formations) - Sandstone B / Transition Zone / Alluvium

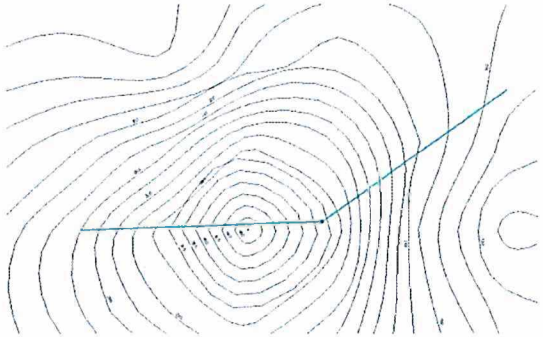
Weighted Average = 7.03 mg/L

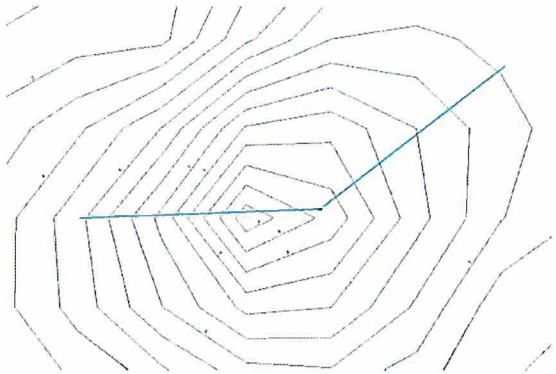
Nitrate

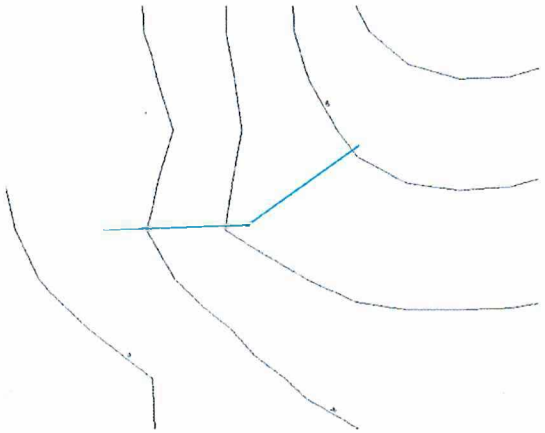
Segment (NW to SE)	Segment Length (ft)	Cumulative Lenth (ft)	Concentration (mg/L)	Weighted Concentration (mg/L/ft)	Trench ID
1	34.8	34.8	10	348.00	
2	61.8	96.6	30	1,853.70	GETR-WU-02
3	120.8	217.4	50	6,040.50	
4	6.6	223.96	62	406.72	

Groundwater Data Source (Formations) - Sandstone B / Transition Zone / Alluvium

Weighted Average = 38.6 mg/L







Water Treatment Design Basis
Cimarron Environmental Response Trust

10/06/2022

URANIUM — WAA U>DCGL (GE-WAA-02:GE-WAA-05)

GE-WAA-05	Contour Average (ug/L)	0	10	25	35	50	70	90	110	130	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	285,057	111,947	68,515	43,451	48,816	30,729	18,532	16,985	22,961	2,485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	649,478 sq. ft.
	Weighted Average	-	1,119,472	1,712,866	1,520,795	2,440,788	2,151,017	1,667,911	1,868,344	2,984,868	347,965	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.35 ug/L
Uranium isopleths used: Sandstone B, Transition Zone, Alluvium Uranium Contours (20 ug/L)																																
GE-WAA-02	Contour Average (ug/L)	0	10	20	25	35	50	70	80	90	110	130	150	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	268,494	271,613	209	55,889	40,364	60,859	41,789	769	21,985	21,818	21,267	26,088	3,014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	834,158 sq. ft.
	Weighted Average	-	2,716,133	4,181	1,397,217	1,412,724	3,042,955	2,925,218	61,507	1,978,651	2,400,005	2,764,756	3,913,260	482,166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27.69 ug/L
Uranium isopleths used: Sandstone B, Transition Zone, Alluvium Uranium Contours (20 ug/L)																																
GE-WAA-03	Contour Average (ug/L)	0	10	20	25	35	50	70	90	100	110	120	130	150	170	190	210	230	240	250	270	290	310	330	350	370	390	410	430	450	470	Totals
	Actual Area	22,063	80,711	34,880	94,900	137,583	219,874	204,059	244,741	407	315,104	7,968	288,441	200,502	102,259	57,926	35,402	21,617	7,428	4,866	3,437	2,897	2,742	2,504	1,231	1,199	1,019	794	569	344	119	2,097,586 sq. ft.
	Weighted Average	-	807,105	697,605	2,372,512	4,815,417	10,993,714	14,284,143	22,026,729	40,717	34,661,438	956,165	37,497,266	30,075,294	17,384,016	11,006,018	7,434,508	4,971,925	1,782,722	1,216,378	927,955	840,026	849,884	826,389	430,962	443,741	397,293	325,425	244,554	154,688	55,817	99.41 ug/L
Uranium isopleths used: Sandstone B, Transition Zone, Alluvium Uranium Contours (20 ug/L)																																
GE-WAA-04	Contour Average (ug/L)	0	10	20	25	35	50	70	90	110	130	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	177,689	27,184	18	54,216	127,558	82,126	30,404	18,343	10,461	5,036	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	533,174 sq. ft.
	Weighted Average	-	271,837	358	1,355,404	4,464,532	4,106,294	2,128,266	1,650,841	1,150,666	654,675	19,606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29.64 ug/L
Uranium isopleths used: Sandstone B, Transition Zone, Alluvium Uranium Contours (20 ug/L)																																

Avg. Weight Conc: 90.89 ug/L | Influent Concentration Area: 4114396 sq. ft. | Uranium Remediation Area: 2834531 sq. ft.

NITRATE — WAA U>DCGL (GE-WAA-02:GE-WAA-05)

GE-WAA-05	Contour Average (mg/L)	0	11	36	75	125	175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	310,925	50,877	25,363	167,744	83,372	11,198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	649,478 sq. ft.
	Weighted Average	-	582,537	924,470	12,580,807	10,421,440	1,959,664	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40.75 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50 mg/L)																																
GE-WAA-02	Contour Average (mg/L)	0	11	36	50	75	100	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	349,117	138,782	87,805	1,019	199,276	710	57,448	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	834,158 sq. ft.
	Weighted Average	-	1,589,052	3,200,503	50,969	14,945,688	71,044	7,180,970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.41 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50 mg/L)																																
GE-WAA-03	Contour Average (mg/L)	0	11	23	36	75	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	605,236	1,106,022	13,527	190,924	156,937	24,940	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,097,586 sq. ft.
	Weighted Average	-	12,663,953	309,774	6,959,193	11,770,265	2 493,996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.3 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50 mg/L)																																
GE-WAA-04	Contour Average (mg/L)	0	11	36	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	239,828	123,730	87,497	82,119	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	533,174 sq. ft.
	Weighted Average	-	1,416,706	3,189,271	6,158,906	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.19 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50 mg/L)																																

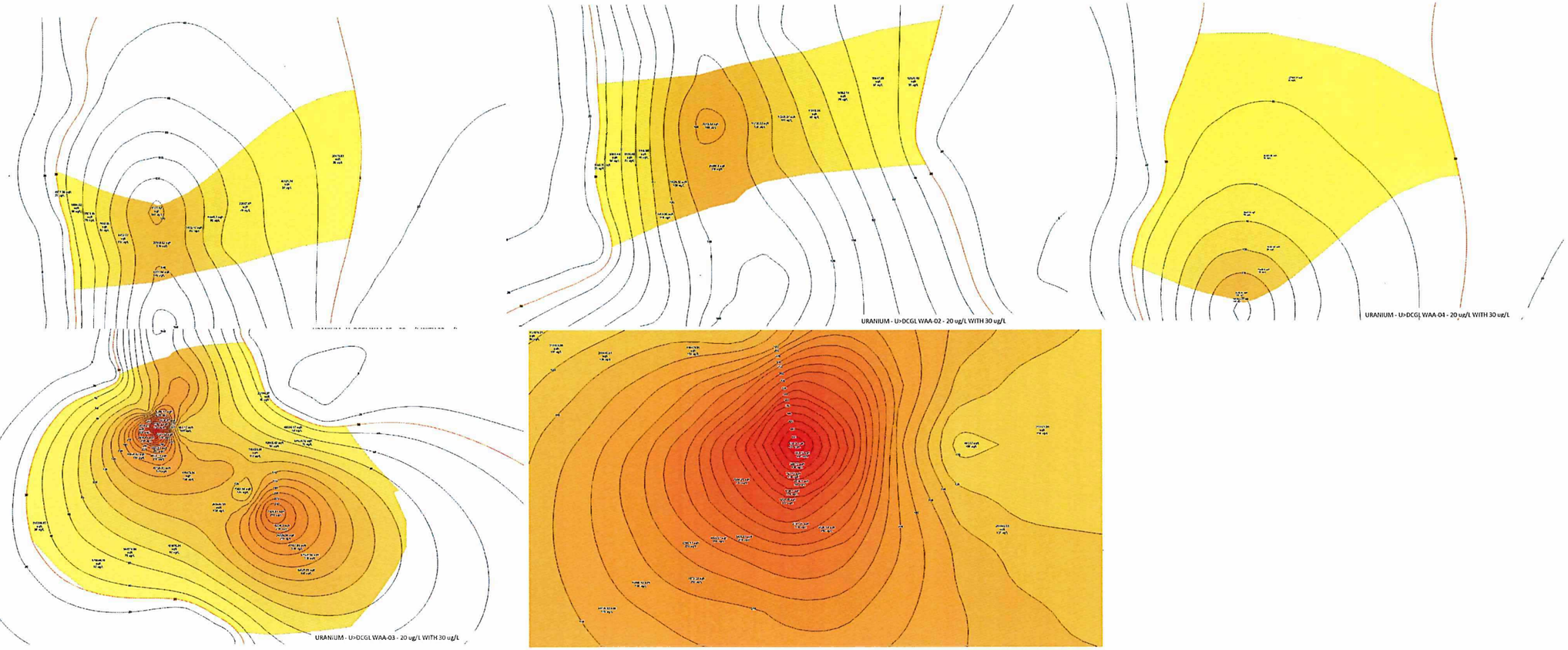
Avg. Weight Conc: 23.93 mg/L | Influent Concentration Area: 4114396 sq. ft. | Nitrate Remediation Area: N/A

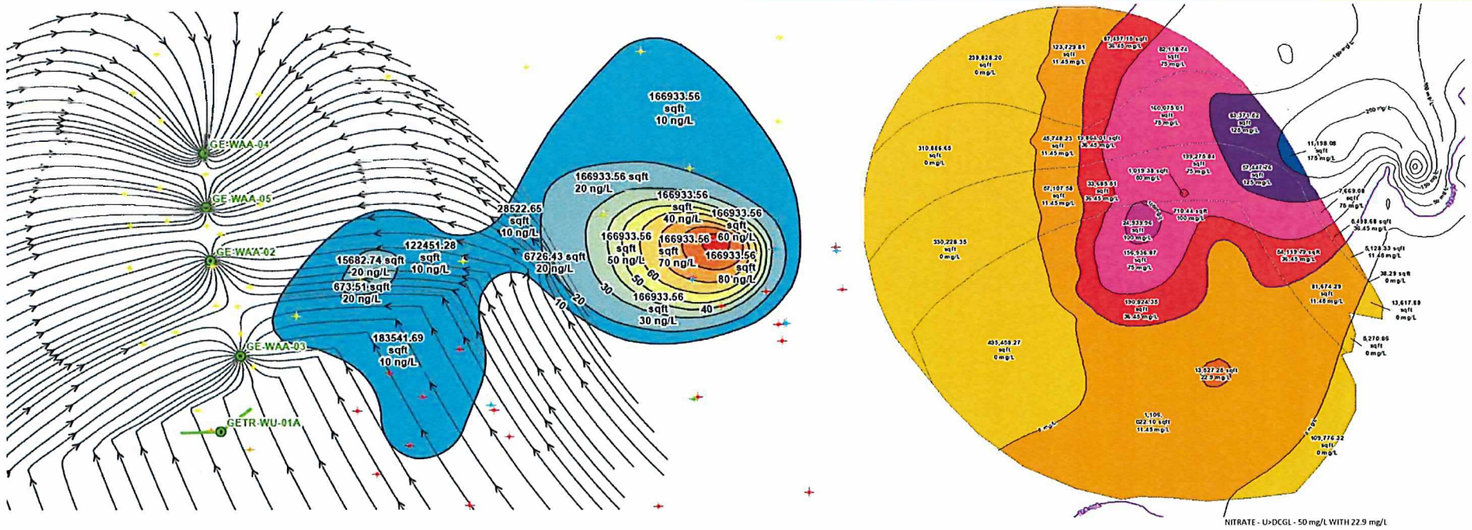
TC-99 — WAA U>DCGL (GE-WAA-02:GE-WAA-05)

GE-WAA-05	Contour Average (ng/L)	0	15	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	614,229	28,523	6,726	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	649,478 sq. ft.
	Weighted Average	-	427,840	168,161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.92 ng/L
Tc-99 isopleths used: Sandstone B, Transition Zone, Alluvium Tc-99 Contours (10 ng/L)																																
GE-WAA-02	Contour Average (ng/L)	0	15	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	696,024	122,451	15,683	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	834,158 sq. ft.
	Weighted Average	-	1,836,769	392,069	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.67 ng/L
Tc-99 isopleths used: Sandstone B, Transition Zone, Alluvium Tc-99 Contours (10 ng/L)																																
GE-WAA-03	Contour Average (ng/L)	0	15	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	1,913,371	183,542	674	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,097,586 sq. ft.
	Weighted Average	-	2,753,125	16,838	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.32 ng/L
Tc-99 isopleths used: Sandstone B, Transition Zone, Alluvium Tc-99 Contours (10 ng/L)																																
GE-WAA-04	Contour Average (ng/L)	0	15	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Totals
	Actual Area	533,174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	533,174 sq. ft.
	Weighted Average	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0 ng/L
Tc-99 isopleths used: Sandstone B, Transition Zone, Alluvium Tc-99 Contours (10 ng/L)																																

Avg. Weight Conc: 1.36 ng/L | Influent Concentration Area: 4114396 sq. ft. | Nitrate Remediation Area: N/A

Notes:
mg/L - Milligrams per liter
ng/L - Nanograms per liter
sq. ft. - Square feet
ug/L - Micrograms per liter


URANIUM - U>DCGL WAA-02 - 20 ug/L WITH 30 ug/L
URANIUM - U>DCGL WAA-04 - 20 ug/L WITH 30 ug/L
URANIUM - U>DCGL WAA-03 - 20 ug/L WITH 30 ug/L


GE-WAA-04
GE-WAA-05
GE-WAA-02
GE-WAA-03
GETR-WU-01A
166933.56 sqft 10 ng/L
166933.56 sqft 20 ng/L
166933.56 sqft 40 ng/L
166933.56 sqft 60 ng/L
166933.56 sqft 50 ng/L
166933.56 sqft 70 ng/L
166933.56 sqft 80 ng/L
166933.56 sqft 30 ng/L
28522.65 sqft 10 ng/L
6726.43 sqft 20 ng/L
122451.28 sqft 10 ng/L
15682.74 sqft 20 ng/L
673.51 sqft 20 ng/L
183541.69 sqft 10 ng/L

NITRATE - U>DCGL - 50 mg/L WITH 22.9 mg/L

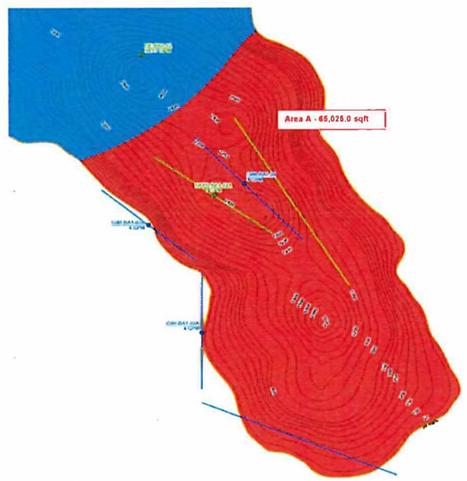
Water Treatment Design Basis
Cimarron Environmental Response Trust

10/06/2022

Total Area (Sq. Ft.)			Contour Average (ug/L)																					Weight Avg. Conc.
		A & B Areas	40	75	125	175	225	275	300	500	700	900	1100	1300	1500	1700	1900	2100	2300	2500	2700	2900	3100	3300	(ug/L)
Area A	Total Area	65,025	65,025.00	61,870.20	56,226.72	51,789.98	48,168.06	45,160.58	42,458.02	38,022.00	31,589.90	26,849.50	22,616.00	18,650.00	14,901.30	12,142.80	9,776.00	7,556.80	4,921.50	1,317.20	-	-	-	-	823.74
	Actual Area		3,154.80	5,643.48	4,436.74	3,621.92	3,007.48	2,702.56	4,436.02	6,432.10	4,740.40	4,233.50	3,966.00	3,748.70	2,758.50	2,366.80	2,219.20	2,635.30	3,604.30	1,317.20	-	-	-	-	
	Weighted Average		126,192.00	423,261.00	554,592.50	633,836.00	676,683.00	743,204.00	1,330,806.00	3,216,050.00	3,318,280.00	3,810,150.00	4,362,600.00	4,873,310.00	4,137,750.00	4,023,560.00	4,216,480.00	5,534,130.00	8,289,890.00	3,293,000.00	-	-	-	-	
Area B	Total Area	172,912	76,285.00	70,230.00	60,391.47	52,830.16	45,744.90	39,380.10	33,620.00	23,813.91	17,329.20	13,843.30	10,910.70	8,287.20	7,034.20	5,972.60	4,994.20	4,116.50	3,249.70	2,265.70	1,278.00	609.50	221.80	6.50	248.16
	Actual Area		67,864.00	32,745.50	15,934.22	10,623.38	6,384.80	5,760.10	9,806.09	6,484.71	3,485.90	2,932.60	2,623.50	1,253.00	1,061.60	978.40	877.70	866.80	984.00	987.70	668.50	387.70	215.30	6.50	
	Weighted Average		2,714,560.00	2,455,912.50	1,991,777.50	1,859,091.50	1,432,080.00	1,584,027.50	2,941,826.10	3,242,356.50	2,440,130.00	2,639,340.00	2,885,850.00	1,628,900.00	1,592,400.00	1,663,280.00	1,667,630.00	1,820,280.00	2,263,200.00	2,469,250.00	1,804,950.00	1,124,330.00	667,430.00	21,450.00	

Areas derived from 50ug/L contours
Areas derived from 200ug/L contours

Notes:
mg/L - Milligrams per liter
sq. ft. - Square feet
ug/L - Micrograms per liter



URANIUM - Area BA1-A

URANIUM - Area BA1-B

Attachment 7 – Remediation and Water Treatment Summary Schedule

Figure 9-3 - Revision 0
Remediation Schedule

Preparer: E. Dulle; Date: 09/16/22
Reviewer: J. Hesemann; Date: 09/23/22

Remediation Area	Time (Months)	2026				2027				2028				2029				2030				2031				2032				2033				2034				2035				2036				2037				2038	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
BA1-A	150	Time to Reduce Uranium to < NRC Criterion																																													
BA1-B	62	Time to Reduce Uranium to < NRC Criterion																																												
Water Treatment	126	Time Uranium Treatment System Operates[1]																																												
Water Pumping & Injection	150	Time Pumping & Injection Continues																																												
WAA U>DCGL	135	Time to Reduce Uranium to < NRC Criterion																																												
1206 North	5	← Time to Reduce Uranium to < NRC Criterion																																												
WU-BA3	48	Time to Reduce Uranium to < NRC Criterion																																												
Water Pumping & Treatment	135	Time Pumping & Uranium Treatment System Operates[1]																																												
WU-BA3 Injection	48	Treated Water Injection																																												

Notes:

[1]Either treatment system may be bypassed if the concentration of uranium in the influent is less than 30 µg/L.

Attachment 8 – Remediation Duration Estimate Calculations: BA1

Remediation and Water Treatment Duration Estimate Calculations
BA1-A ("U>DCGL" Transition Zone / Sandstone B)

$$R = 1 + \frac{\rho_b}{n} K_d$$

Table 1: Retardation Calculation

Bulk Density (g/ml)	Porosity [n][1]	Uranium K_d (ml/g)[2]		Retardation [R]
1.81	0.11	3		50.36

Table 2: Remediation Pore Volume Calculation

Bulk Saturated Plume Volume [V][3] (ft^3)	Porosity [n][1]	Pore Volume (ft^3) [PV = V*n]	Pore Volume [PV] (gallons)
818,370	0.11	90,021	673,355

Table 3: Estimated Initial Aqueous-Phase Contaminant Concentration

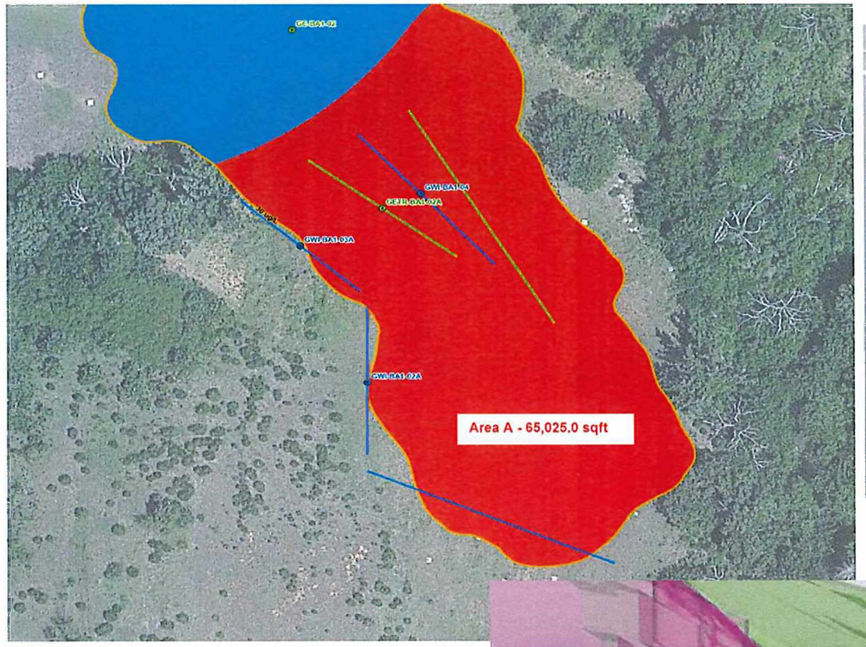
Concentration Basis	Initial Aqueous-Phase Contaminant Concentration (µg/L)	Remarks
Incremental Averaging of Concentrations within Remediation Area	823.62	Average uranium concentration in Area A
Maximum Representative Concentration within Remediation Area	2,975	Representative uranium concentration for TMW-09

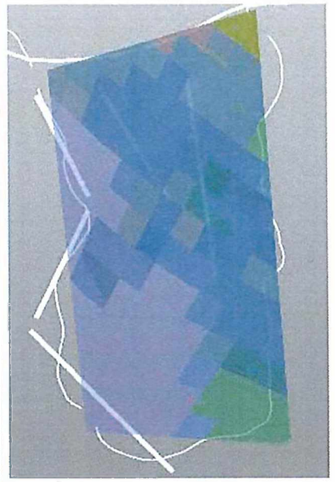
Table 4: Estimated Number of Pore Volumes to Achieve Remediation Goal (180 pCi/L)

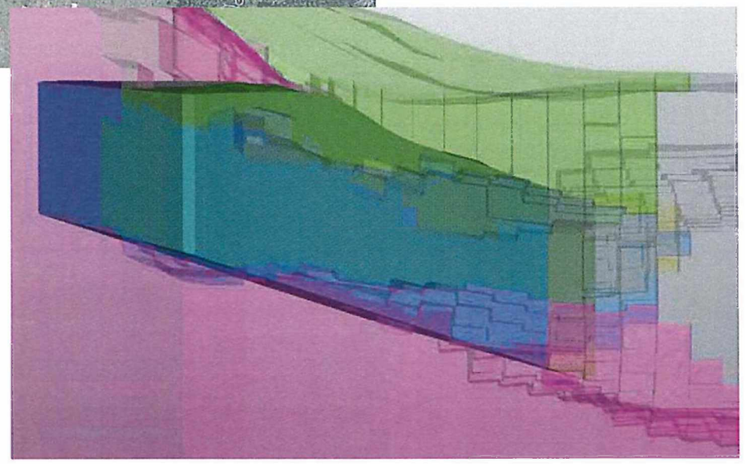
R	Uranium Cleanup Concentration (µg/L)[4]	Initial Aqueous-Phase Contaminant Concentration (µg/L)[5]	No. of Pore Volumes[6] [#PV = -R ln(Cleanup/Initial)]	Remarks
50.36	201	2,975	135.7	Pore volumes required to achieve cleanup goal (DCGL) and discontinue remediation

Table 5: Estimated Time to Achieve Remediation Goal (180 pCi/L)

No. of Pore Volumes	Pore Volume (gallons)	Flow Rate (gpm)[7]	Flow Rate (gpd)	Duration Estimate (days)	Duration Estimate (months)	Remarks
135.7	673,355	14	20,160	4,533	149.1	Time to achieve cleanup goal (DCGL) and discontinue remediation.







Definitions:

ml - milliliters
g - gram
pCi/L - picocuries per liter
ft^3 - cubic feet
K_d - distribution coefficient
ug - microgram
L - liter
gpm - gallons per minute
gpd - gallons per day
DCGL - Derived Concentration Goal Level

Notes:

[1]Assumes 11% transmissive porosity for BA1 transition zone, as presented in *Environmental Sequence Stratigraphy (ESS) and Porosity Analysis, Burial Area 1,* dated April 6, 2018.

[2]K_d derived from previous studies as mentioned in the Technical Memorandum (TM007), September 2022, page 10.

[3]Plume volume calculated using Earth Volumtric Studio. Includes saturated volume of transition zone and Sandstone B formations within combined capture zone of extraction trenches GETR-BA1-01 and GETR-BA1-02, located within area of uranium groundwater contamination exceeding 30 µg/L.

[4]Remediation will be discontinued when the uranium groundwater concentration reaches 201 µg/L, the equivalent of 180 pCi/L as calculated in *Uranium Activity vs. Mass Concentration (09-13-22)* (ML22271A633).

[5]The larger of the following is assumed as initial uranium concentration for estimating the groundwater remediation duration: (1) the maximum representative concentration reported for any well within the remediation area (determined using sampling results for monitoring events conducted from 2011 through Q2 2017), (2) the concentration estimated by conducting incremental averaging of concentrations within the specified treatment area. The incremental averaging is performed using isopleth contours developed using representative groundwater concentrations for monitor wells located within the remediation area (see *Incr. AWCA Calcs (09-09-22).xlsx*). Initial aqueous-phase contaminant concentrations will be variable.

[6]Number of pore volumes assumes linear, reversible and instantaneous sorption, and may result in an underestimation of cleanup timeframe estimates.

[7]Flow rate is based on the nominal combined groundwater recovery rate for extraction trenches GETR-BA1-01 and GETR-BA1-02.

- Remediation durations presented herein are estimates and do not account for all factors contributing to the actual time required to remediate plumes via groundwater injection and extraction. Estimates will be updated using system performance and groundwater monitoring data collected during the early stages of remedial operations.

Remediation and Water Treatment Duration Estimate Calculations
BA1-B ("U>DCGL" Alluvium)

$$R = 1 + \frac{\rho_b}{n} K_d$$

Table 1: Retardation Calculation

Bulk Density (g/ml)	Porosity [n][1]	Uranium K_d (ml/g)[2]		Retardation [R]
1.81	0.3	2		13.07

Table 2: Remediation Pore Volume Calculation

Area of Plume [A] (ft^2)	Porosity [n][1]	Average Plume Thickness [b][3] (ft)	Pore Volume (ft^3) [PV = b*n*A]	Pore Volume [PV] (gallons)
172,912	0.3	16	829,978	6,208,232

Table 3: Estimated Initial Aqueous-Phase Contaminant Concentration

Concentration Basis	Initial Aqueous-Phase Contaminant Concentration (µg/L)	Remarks
Incremental Averaging of Concentrations within Remediation Area	248	Average uranium concentration in Area B
Maximum Representative Concentration within Remediation Area	3,516.00	Representative uranium concentration for TMW-13

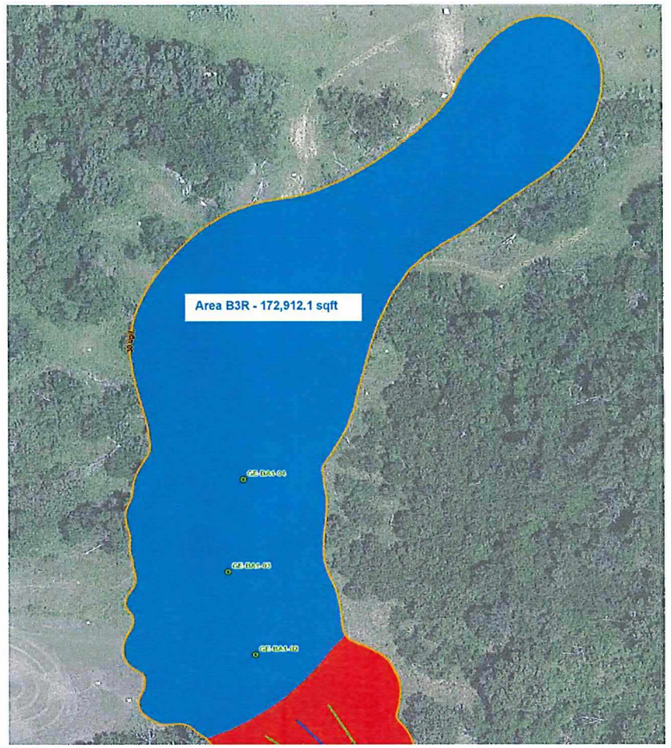
DCGL Duration Estimate

Table 4a: Estimated Number of Pore Volumes to Achieve Remediation Goal (180 pCi/L)

R	Uranium Cleanup Concentration (µg/L)[4]	Initial Aqueous-Phase Contaminant Concentration (µg/L)[5]	No. of Pore Volumes[6] [#PV = -R ln(Cleanup/Initial)]	Remarks
13.07	201	3,516.00	37.4	Pore volumes required to achieve cleanup goal (DGCL) and discontinue remediation

Table 5a: Estimated Time to Achieve Remediation Goal (180 pCi/L)

No. of Pore Volumes	Pore Volume (gallons)	Flow Rate (gpm)[7]	Flow Rate (gpd)	Duration Estimate (days)	Duration Estimate (months)	Remarks
37.4	6,208,232	86	123,840	1,875	**61.7**	Time to achieve cleanup goal (DGCL) and discontinue remediation.



Definitions:
ml - milliliters
g - gram
ft^3 - cubic feet
K_d - distribution coefficient
ug - microgram
pCi/L - picocuries per liter
L - liter
gpm - gallons per minute
gpd - gallons per day
DCGL - Derived Concentration Goal Level

Notes:
[1]Assumes 30% transmissive porosity for alluvial sand, as presented in the Technical Memorandum (TM007), September 2022, page 8.
[2]K_d derived from previous studies as mentioned in the Technical Memorandum (TM007), September 2022, page 10.
[3]Saturated zone thickness assumed to be 16 feet, as presented in the Technical Memorandum (TM007), September 2022, page 9.
[4]Remediation will be discontinued when the uranium groundwater concentration reaches 201 µg/L, the equivalent of 180 pCi/L as calcuated in *Uranium Activity vs. Mass Concentration (09-13-22)* (ML22271A633).
[5]The larger of the following is assumed as initial uranium concentration for estimating the groundwater remediation duration: (1) the maximum representative concentration reported for any well within the remediation area (determined using sampling results for monitoring events conducted from 2011 through Q2 2017), (2) the concentration estimated by conducting incremental averaging of concentrations within the specified treatment area. The incremental averaging is performed using isopleth contours developed using representative groundwater concentrations for monitor wells located within the remediation area (see *Incr. AWCA Calcs (09-09-22).xlsx*). Initial aqueous-phase contaminant concentrations will be variable.
[6]Number of pore volumes assumes linear, reversible and instantaneous sorption, and may result in an underestimation of cleanup timeframe estimates.
[7]Flow rate is based on the nominal combined groundwater recovery rate for extraction wells GE-BA1-02 through GE-BA1-04.
- Remediation durations presented herein are estimates and do not account for all factors contributing to the actual time required to remediate plumes via groundwater injection and extraction. Estimates will be updated using system performance and groundwater monitoring data collected during the early stages of remedial operations.

Attachment 9 – Remediation Duration Estimate Calculations: WA

Remediation and Water Treatment Duration Estimate Calculations
WAA U>DCGL (Alluvium/Transition Zone/SSB)
Uranium

$$R = 1 + \frac{\rho_b}{n} K_d$$

Table 1: Retardation Calculation

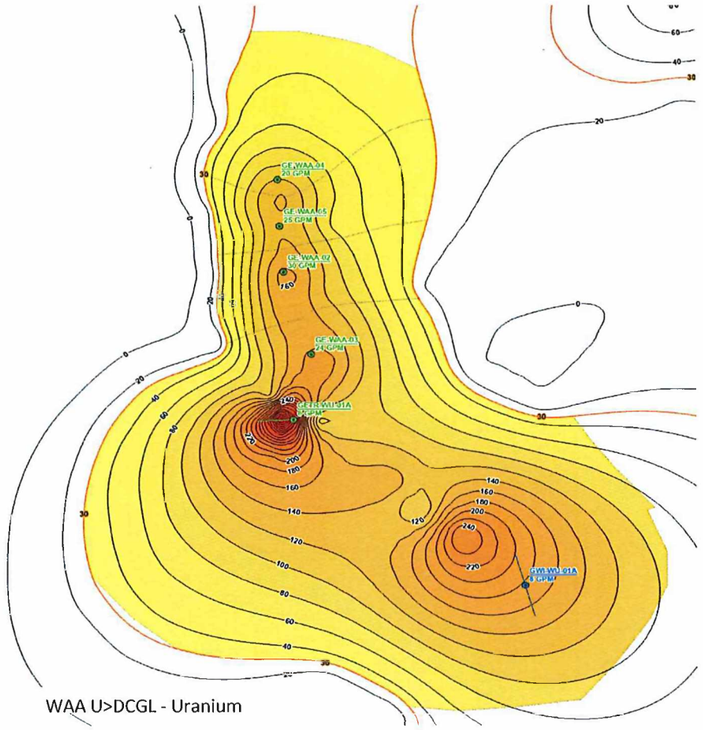
Bulk Density (g/ml)	Porosity [n][1]	Uranium K_d (ml/g)[2]		Retardation [R]
1.81	0.3	2		13.07

Table 2: Remediation Pore Volume Calculation

Remediation Area [A] (ft^2)	Porosity [n][1]	Average Remediation Area Thickness [b][3] (ft)	Pore Volume (ft^3) [PV = b*n*A]	Pore Volume [PV] (gallons)
2,834,531	0.3	19	16,156,827	120,853,064

Table 3: Estimated Initial Aqueous-Phase Contaminant Concentration

Concentration Basis	Initial Aqueous-Phase Contaminant Concentration (µg/L)	Remarks
Incremental Averaging of Concentrations within Remediation Area	91.04	Average uranium concentration [see Incr. AWCA Calcs_Scenario A-2 (10-26-20)]
Maximum Representative Concentration within Remediation Area	177.80	Representative uranium concentration for **WELL T-62**



WAA U>DCGL - Uranium

DCGL Duration Estimate

Table 4a: Estimated Number of Pore Volumes to Achieve Remediation Goal (123 ug/L)

R	Uranium Cleanup Concentration (µg/L)[4]	Initial Aqueous-Phase Contaminant Concentration (µg/L)[5]	No. of Pore Volumes[6] [#PV = -R ln(Cleanup/Initial)]	Remarks
13.07	123	178	4.8	Pore volumes required to achieve cleanup goal (DCGL) and discontinue remediation

Table 5a: Estimated Time to Achieve Remediation Goal (123 ug/L)

No. of Pore Volumes	Pore Volume (gallons)	Flow Rate (gpm)[7]	Flow Rate (gpd)	Duration Estimate (days)	Duration Estimate (months)	Remarks
4.8	120,853,064	99	142,560	4,082	134.2	Time to achieve cleanup goal (DCGL) and discontinue remediation.

Definitions:
ml - milliliters
g - gram
ft^3 - cubic feet

K_d - distribution coefficient

ug - microgram
pCi/L - picocuries per liter
L - liter
gpm - gallons per minute
gpd - gallons per day
DCGL - Derived Concentration Goal Level

Notes:
[1]Assumes 30% transmissive porosity for alluvial sand, as presented in the Technical Memorandum (TM007), September 2022, page 8.
[2]K_d derived from previous studies as mentioned in the Technical Memorandum (TM007), September 2022, page 10.
[3]Saturated zone thickness assumed to be 16 feet, as presented in the Technical Memorandum (TM007), September 2022, page 9.
[4]Remediation will be discontinued when the uranium groundwater concentration reaches 123 µg/L, the equivalent of 180 pCi/L as calcuated in *Uranium Activity vs. Mass Concentration (09-13-22)* (ML22271A633).

[5]The larger of the following is assumed as initial uranium concentration for estimating the groundwater remediation duration: (1) the maximum representative concentration reported for any well within the remediation area (determined using sampling results for monitoring events conducted from 2011 through Q2 2017), (2) the concentration estimated by conducting incremental averaging of concentrations within the specified treatment area. The incremental averaging is performed using isopleth contours developed using representative groundwater concentrations for monitor wells located within the remediation area (see *Incr. AWCA Calcs (09-09-22).xlsx*). Initial aqueous-phase contaminant concentrations will be variable.
[6]Number of pore volumes assumes linear, reversible and instantaneous sorption, and may result in an underestimation of cleanup timeframe estimates.
[7]Flow rate is based on the nominal combined groundwater recovery rate for extraction wells GE-WAA-02 through GE-WAA-05.
- Remediation durations presented herein are estimates and do not account for all factors contributing to the actual time required to remediate plumes via groundwater injection and extraction. Estimates will be updated using system performance and groundwater monitoring data collected during the early stages of remedial operations.

Remediation and Water Treatment Duration Estimate Calculations
1206-NORTH (Alluvium/Transition Zone/SSB)
Uranium

$$R = 1 + \frac{\rho_b}{n} K_d$$

Table 1: Retardation Calculation

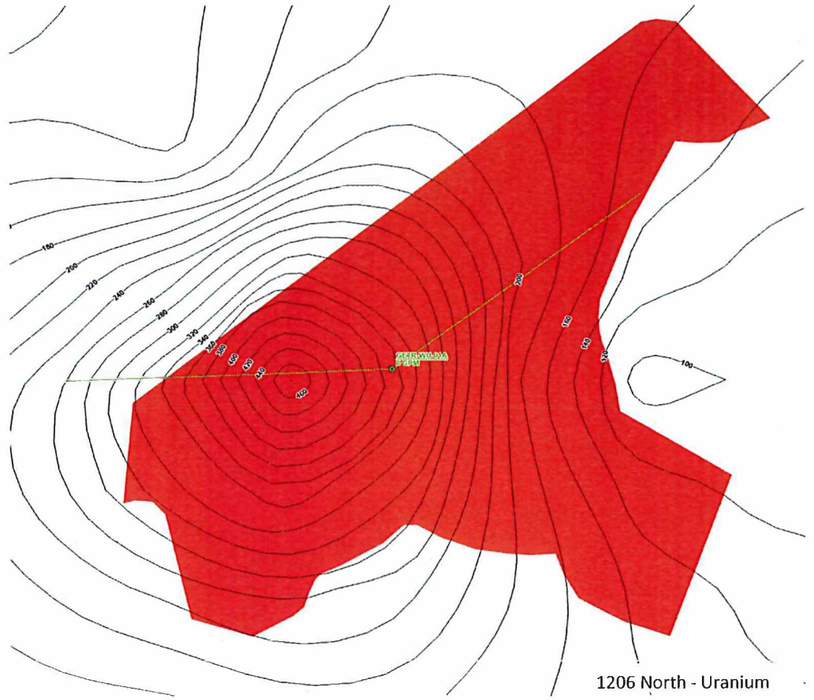
Bulk Density (g/ml)	Porosity [n][1]	Uranium K_d (ml/g)[2]		Retardation [R]
1.81	0.11	3		50.36

Table 2: Remediation Pore Volume Calculation

Bulk Saturated Plume Volume [V][3] (ft^3)	Porosity [n][1]	Pore Volume (ft^3) [PV = V*n]	Pore Volume [PV] (gallons)
27,396	0.11	3,014	22,541

Table 3: Estimated Initial Aqueous-Phase Contaminant Concentration

Concentration Basis	Initial Aqueous-Phase Contaminant Concentration (µg/L)	Remarks
Incremental Averaging of Concentrations within Remediation Area	248.49	Average uranium concentration [see Incr. AWCA Calcs_Scenario A-2 (10-26-20)]
Maximum Representative Concentration within Remediation Area	526.60	Representative uranium concentration for **WELL MWWA-03**



1206 North - Uranium

DCGL Duration Estimate

Table 4a: Estimated Number of Pore Volumes to Achieve Remediation Goal (123 ug/L)

R	Uranium Cleanup Concentration (µg/L)[4]	Initial Aqueous-Phase Contaminant Concentration (µg/L)[5]	No. of Pore Volumes[6] [#PV = -R ln(Cleanup/Initial)]	Remarks
50.36	123	527	73.2	Pore volumes required to achieve cleanup goal (DCGL) and discontinue remediation

Table 5b: Estimated Time to Achieve Remediation Goal (123 ug/L)

No. of Pore Volumes	Pore Volume (gallons)	Flow Rate (gpm)[7]	Flow Rate (gpd)	Duration Estimate (days)	Duration Estimate (months)	Remarks
73.2	22,541	8	11,520	143	4.8	Time to achieve cleanup goal (DCGL) and discontinue remediation.

Definitions:

ml - milliliters
g - gram
ft^3 - cubic feet
K_d - distribution coefficient
ug - microgram
pCi/L - picocuries per liter
L - liter
gpm - gallons per minute
gpd - gallons per day
DCGL - Derived Concentration Goal Level

Notes:

[1]Assumes 11% transmissive porosity for BA1 transition zone, as presented in *Environmental Sequence Stratigraphy (ESS) and Porosity Analysis, Burial Area 1* , dated April 6, 2018.

[2]K_d derived from previous studies as mentioned in the Technical Memorandum (TM007), September 2022, page 10.

[3]Plume volume calculated using Earth Volumtric Studio. Includes saturated volume of transition zone and Sandstone B formations within capture zone of extraction trench GETR-WU-01, located within area of uranium groundwater contamination exceeding 30 µg/L.

[4]Remediation will be discontinued when the uranium groundwater concentration reaches 123 µg/L, the equivalent of 180 pCi/L as calcuated in *Uranium Activity vs. Mass Concentration (09-13-22)* (ML22271A633).

[5]The larger of the following is assumed as initial uranium concentration for estimating the groundwater remediation duration: (1) the maximum representative concentration reported for any well within the remediation area (determined using sampling results for monitoring events conducted from 2011 through Q2 2017), (2) the concentration estimated by conducting incremental averaging of concentrations within the specified treatment area. The incremental averaging is performed using isopleth contours developed using representative groundwater concentrations for monitor wells located within the remediation area (see *Incr. AWCA Calcs (09-09-22).xlsx*). Initial aqueous-phase contaminant concentrations will be variable.

[6]Number of pore volumes assumes linear, reversible and instantaneous sorption, and may result in an underestimation of cleanup timeframe estimates.

[7]Flow rate is based on the nominal groundwater recovery rate for extraction trench GETR-WU-01.

- Remediation durations presented herein are estimates and do not account for all factors contributing to the actual time required to remediate plumes via groundwater injection and extraction. Estimates will be updated using system performance and groundwater monitoring data collected during the early stages of remedial operations.

Remediation and Water Treatment Duration Estimate Calculations
WU-BA3 (SSA)
Uranium

$$R = 1 + \frac{\rho_b}{n} K_d$$

Table 1: Retardation Calculation

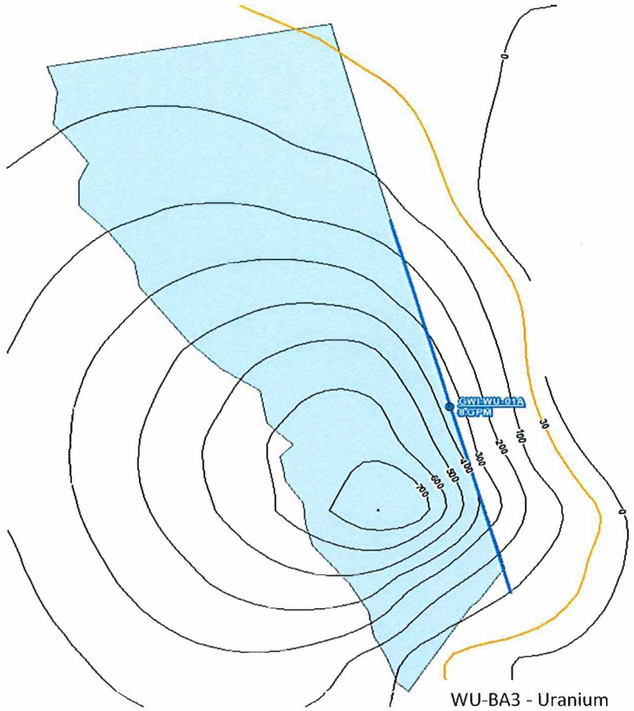
Bulk Density (g/ml)	Porosity [n][1]	Uranium K_d (ml/g)[2]		Retardation [R]
1.81	0.1	3		55.30

Table 2: Remediation Pore Volume Calculation

Area of Plume [A] (ft^2)	Porosity [n][1]	Average Plume Thickness [b][3] (ft)	Pore Volume (ft^3) [PV = b*n*A]	Pore Volume [PV] (gallons)
41,390	0.1	5	20,695	154,799

Table 3: Estimated Initial Aqueous-Phase Contaminant Concentration

Concentration Basis	Initial Aqueous-Phase Contaminant Concentration (µg/L)	Remarks
Incremental Averaging of Concentrations within Remediation Area	311.34	Average uranium concentration
Maximum Representative Concentration within Remediation Area	875	Representative uranium concentration for **WELL 1351**



WU-BA3 - Uranium

DCGL Duration Estimate

Table 4a: Estimated Number of Pore Volumes to Achieve Remediation Goal (123 ug/L)

R	Uranium Cleanup Concentration (µg/L)[4]	Initial Aqueous-Phase Contaminant Concentration (µg/L)[5]	No. of Pore Volumes[6] [#PV = -R ln(Cleanup/Initial)]	Remarks
55.30	123	875	108.5	Pore volumes required to achieve cleanup goal (DCGL) and

Table 5a: Estimated Time to Achieve Remediation Goal (123 ug/L)

No. of Pore Volumes	Pore Volume (gallons)	Flow Rate (gpm)[7]	Flow Rate (gpd)	Duration Estimate (days)	Duration Estimate (months)	Remarks
108.5	154,799	8	11,520	1,458	48.0	Time to achieve cleanup goal (DCGL) and discontinue remediation.

Definitions:

ml - milliliters
g - gram
ft^3 - cubic feet
K_d - distribution coefficient
ug - microgram
pCi/L - picocuries per liter
L - liter
gpm - gallons per minute
gpd - gallons per day
DCGL - Derived Concentration Goal Level
MCL - maximum contaminant level

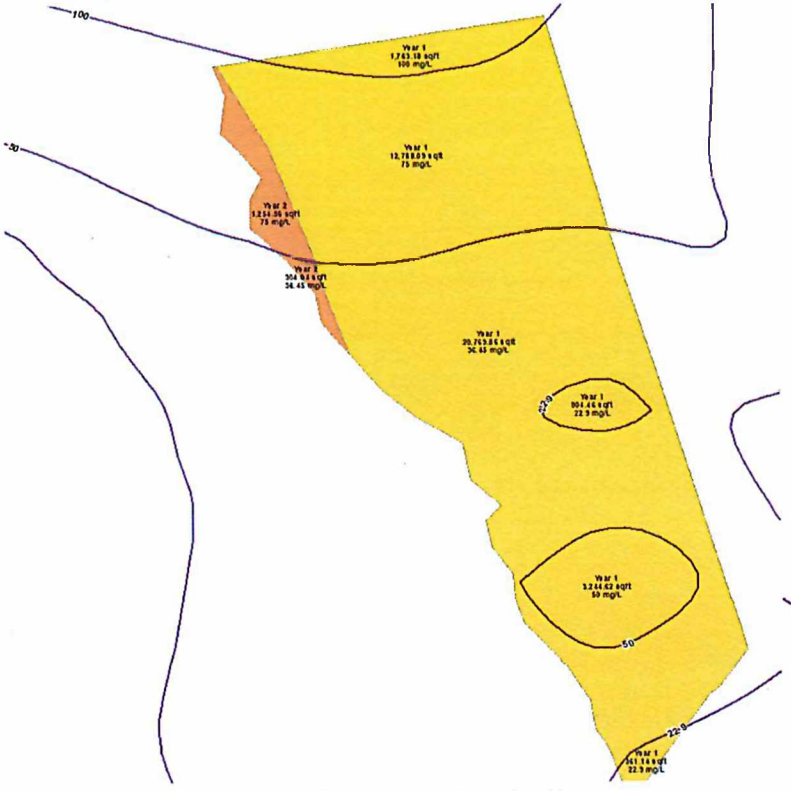
Notes:

[1]Assumes 10% transmissive porosity for alluvial sand, as presented in the Technical Memorandum (TM007), September 2022, page 8.
[2]K_d derived from previous studies as mentioned in the Technical Memorandum (TM007), September 2022, page 10.
[3]Saturated zone thickness assumed to be 5 feet, as presented in the Technical Memorandum (TM007), September 2022, page 9.
[4]Remediation will be discontinued when the uranium groundwater concentration reaches 123 µg/L, the equivalent of 180 pCi/L as calcuated in *Uranium Activity vs. Mass Concentration (09-13-22)* (ML22271A633).
[5]The larger of the following is assumed as initial uranium concentration for estimating the groundwater remediation duration: (1) the maximum representative concentration reported for any well within the remediation area (determined using sampling results for monitoring events conducted from 2011 through Q2 2017), (2) the concentration estimated by conducting incremental averaging of concentrations within the specified treatment area. The incremental averaging is performed using isopleth contours developed using representative groundwater concentrations for monitor wells located within the remediation area (see *Incr. AWCA Calcs (09-09-22).xlsx*). Initial aqueous-phase contaminant concentrations will be variable.
[6]Number of pore volumes assumes linear, reversible and instantaneous sorption, and may result in an underestimation of cleanup timeframe estimates.
[7]Flow rate is based on the nominal water injection rate for injection trench GWI-WU-01.
- Remediation durations presented herein are estimates and do not account for all factors contributing to the actual time required to remediate plumes via groundwater injection and extraction. Estimates will be updated using system performance and groundwater monitoring data collected during the early stages of remedial operations.

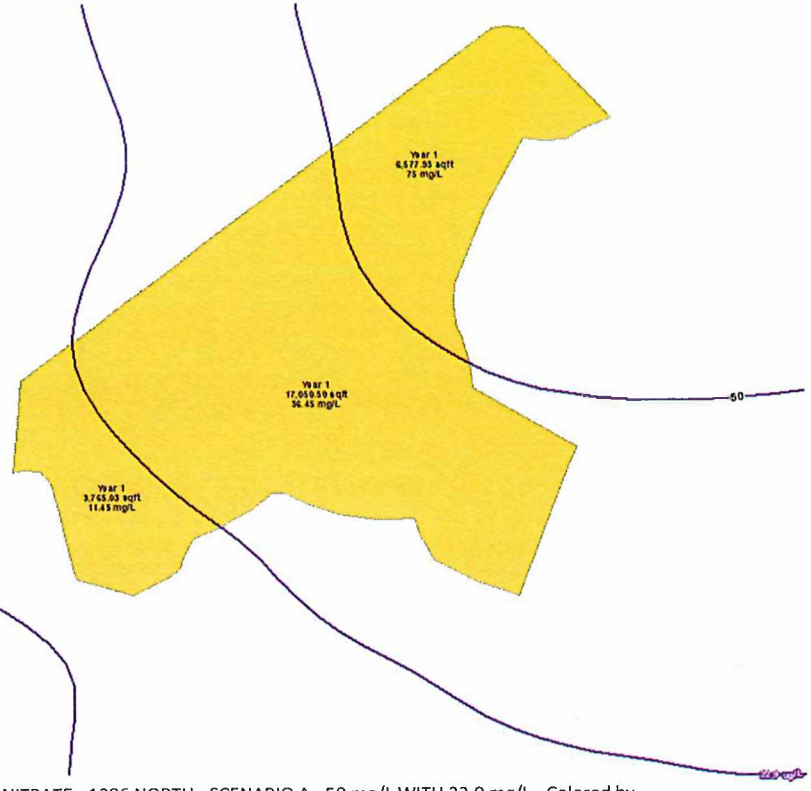
Attachment 10 – Nitrate Time-Weighted Concentration Averaging Results

NITRATE	GWI-WU-01 (BA3)	Year	Total Area (sq. ft.)	Contour Average (mg/L)	23	36	50	75	100	-	-	Totals
		1	39,831.36	Actual Area	1,266	20,770	3,245	12,788	1,763	-	-	39,831 sq. ft.
				Weighted Average	28,982	757,061	162,231	959,107	176,318	-	-	52.31 mg/L
		2	1,558.60	Actual Area	-	304	--	1,255	-	-	-	1,559 sq. ft.
				Weighted Average	-	11,082	-	94,092	-	-	-	67.48 mg/L
		3	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
		4	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
		5	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
	Nitrate isopleths used: Sandstone A Nitrate Contours (50mg/L)											
	WU "1206 NORTH" (GETR-WU-01)	Year	Total Area (sq. ft.)	Contour Average (mg/L)	11	36	75	-	-	-	-	Totals
		1	27,393.46	Actual Area	3,765	17,051	6,578	-	-	-	-	27,393 sq. ft.
				Weighted Average	43,110	621,491	493,345	-	-	-	-	42.27 mg/L
		2	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
		3	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
		4	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
		5	-	Actual Area	-	-	-	-	-	-	-	sq. ft.
				Weighted Average	-	-	-	-	-	-	-	-
	Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50mg/L)											

Notes:
mg/L - Milligrams per liter
sq. ft. - Square feet



NITRATE - BA3 - SCENARIO A - 50 mg/L WITH 22.9 mg/L - Colored by Year



NITRATE - 1206 NORTH - SCENARIO A - 50 mg/L WITH 22.9 mg/L - Colored by

NITRATE

WAA U>DCGL (GE-WAA-02:GE-WAA-05)

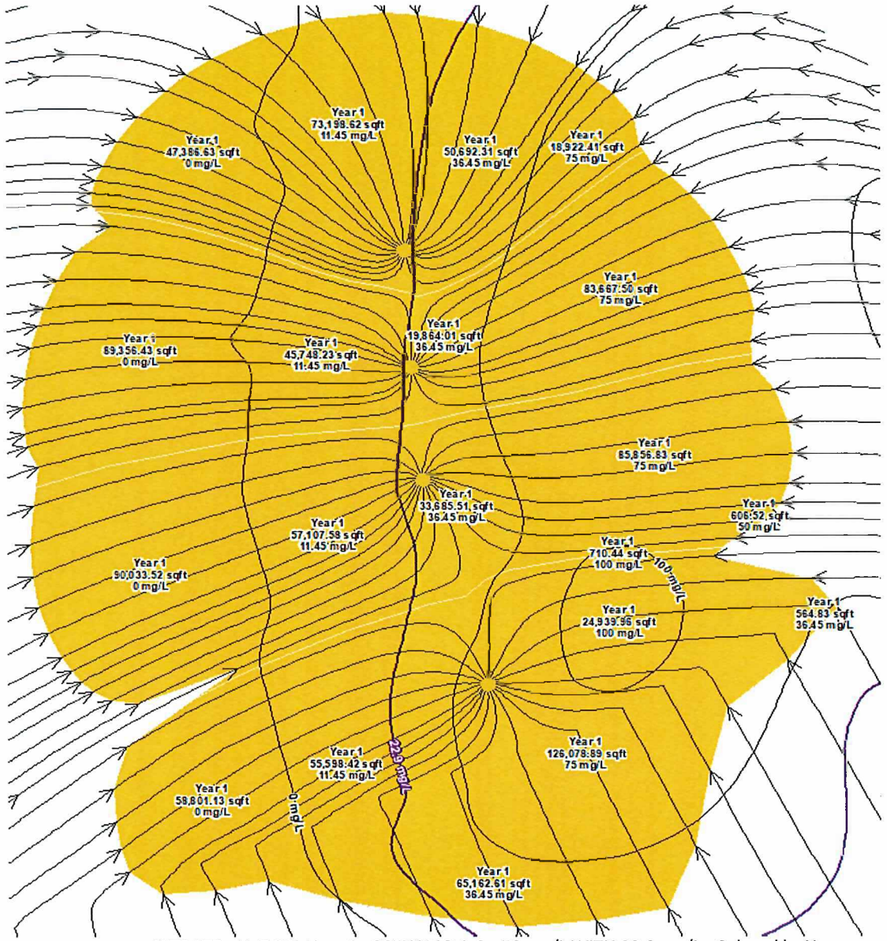
GE-WAA-05	Year	Total Area (sq. ft.)	Contour Average (mg/L)	0	11	36	75	125	175	-	Totals
	1	238,636.18	Actual Area	89,356	45,748	19,864	83,668	-	-	-	238,636 sq. ft.
			Weighted Average	-	523,817	724,043	6,275,063	-	-	-	31.52 mg/L
	2	148,269.81	Actual Area	84,863	-	-	54,477	8,931	-	-	148,270 sq. ft.
			Weighted Average	-	-	-	4,085,738	1,116,333	-	-	35.09 mg/L
	3	102,705.76	Actual Area	59,024	-	-	12,683	30,999	-	-	102,706 sq. ft.
			Weighted Average	-	-	-	951,191	3,874,899	-	-	46.99 mg/L
	4	74,480.97	Actual Area	41,497	-	-	6,176	25,019	1,789	-	74,481 sq. ft.
			Weighted Average	-	-	-	463,207	3,127,380	313,100	-	52.41 mg/L
	5	85,385.17	Actual Area	36,185	5,128	5,498.68	10,741	18,423	9,408.94	-	85,385 sq. ft.
			Weighted Average	-	58,719	200,427	805,608	2,302,829	1,646,565	-	58.72 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50mg/L)											

GE-WAA-02	Year	Total Area (sq. ft.)	Contour Average (mg/L)	0	11	36	50	75	100	125	Totals
	1	268,000.40	Actual Area	90,034	57,108	33,686	607	85,857	710	-	268,000 sq. ft.
			Weighted Average	-	653,882	1,227,837	30,326	6,439,262	71,044	-	31.43 mg/L
	2	163,702.53	Actual Area	95,033	-	-	413	56,541	-	11,716	163,703 sq. ft.
			Weighted Average	-	-	-	20,644	4,240,592	-	1,464,491	34.98 mg/L
	3	108,024.73	Actual Area	62,424	-	-	-	12,891	-	32,709	108,025 sq. ft.
			Weighted Average	-	-	-	-	966,852	-	4,088,640	46.8 mg/L
	4	138,714.89	Actual Area	41,682	3,642	37,552	-	42,817	-	13,023	138,715 sq. ft.
			Weighted Average	-	41,703	1,368,764	-	3,211,253	-	1,627,839	45.05 mg/L
	5	155,715.14	Actual Area	59,945	78,032	16,568	-	1,170	-	-	155,715 sq. ft.
			Weighted Average	-	893,468	603,902	-	87,728	-	-	10.18 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50mg/L)											

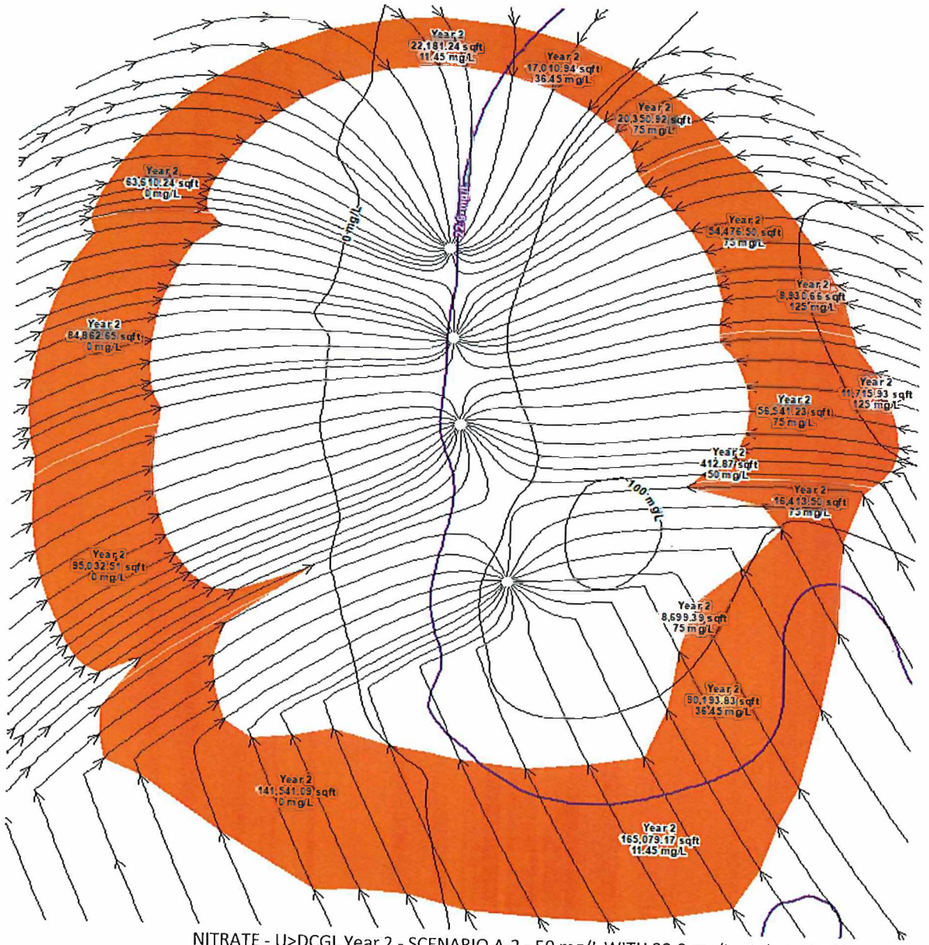
GE-WAA-03	Year	Total Area (sq. ft.)	Contour Average (mg/L)	0	11	23	36	75	100	-	Totals
	1	331,145.85	Actual Area	58,801	55,598	-	65,727	126,079	24,940	-	331,146 sq. ft.
			Weighted Average	-	636,602	-	2,395,765	9,455,917	2,493,996	-	45.24 mg/L
	2	421,926.98	Actual Area	141,541	165,079	-	90,194	25,113	-	-	421,927 sq. ft.
			Weighted Average	-	1,890,156	-	3,287,565	1,883,467	-	-	16.74 mg/L
	3	448,628.73	Actual Area	139,900	270,858	13,527	18,623	5,720	-	-	448,629 sq. ft.
			Weighted Average	-	3,101,329	493,068	1,396,740	571,987	-	-	12.4 mg/L
	4	443,052.43	Actual Area	92,197	334,451	-	16,380	25	-	-	443,052 sq. ft.
			Weighted Average	-	3,829,462	-	1,228,490	2,522	-	-	11.42 mg/L
	5	452,832.14	Actual Area	172,797	280,035	-	-	-	-	-	452,832 sq. ft.
			Weighted Average	-	3,206,404	-	-	-	-	-	7.08 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50mg/L)											

GE-WAA-04	Year	Total Area (sq. ft.)	Contour Average (mg/L)	0	11	36	75	-	-	-	Totals
	1	190,199.96	Actual Area	47,387	73,199	50,692	18,922	-	-	-	190,200 sq. ft.
			Weighted Average	-	838,124	1,847,735	1,419,181	-	-	-	21.58 mg/L
	2	123,153.34	Actual Area	63,610	22,181	17,011	20,351	-	-	-	123,153 sq. ft.
			Weighted Average	-	253,975	620,049	1,526,319	-	-	-	19.49 mg/L
	3	86,090.84	Actual Area	48,953	12,840	9,043	15,255	-	-	-	86,091 sq. ft.
			Weighted Average	-	147,015	329,613	1,144,130	-	-	-	18.83 mg/L
	4	61,903.91	Actual Area	37,260.70	7,518.70	5,170	11,954.83	-	-	-	61,904 sq. ft.
			Weighted Average	-	86,089	188,435	896,612	-	-	-	18.92 mg/L
	5	71,825.85	Actual Area	42,617	7,992	5,581	15,636	-	-	-	71,826 sq. ft.
			Weighted Average	-	91,503	203,439	1,172,664	-	-	-	20.43 mg/L
Nitrate isopleths used: Sandstone B, Transition Zone, Alluvium Nitrate Contours (50mg/L)											

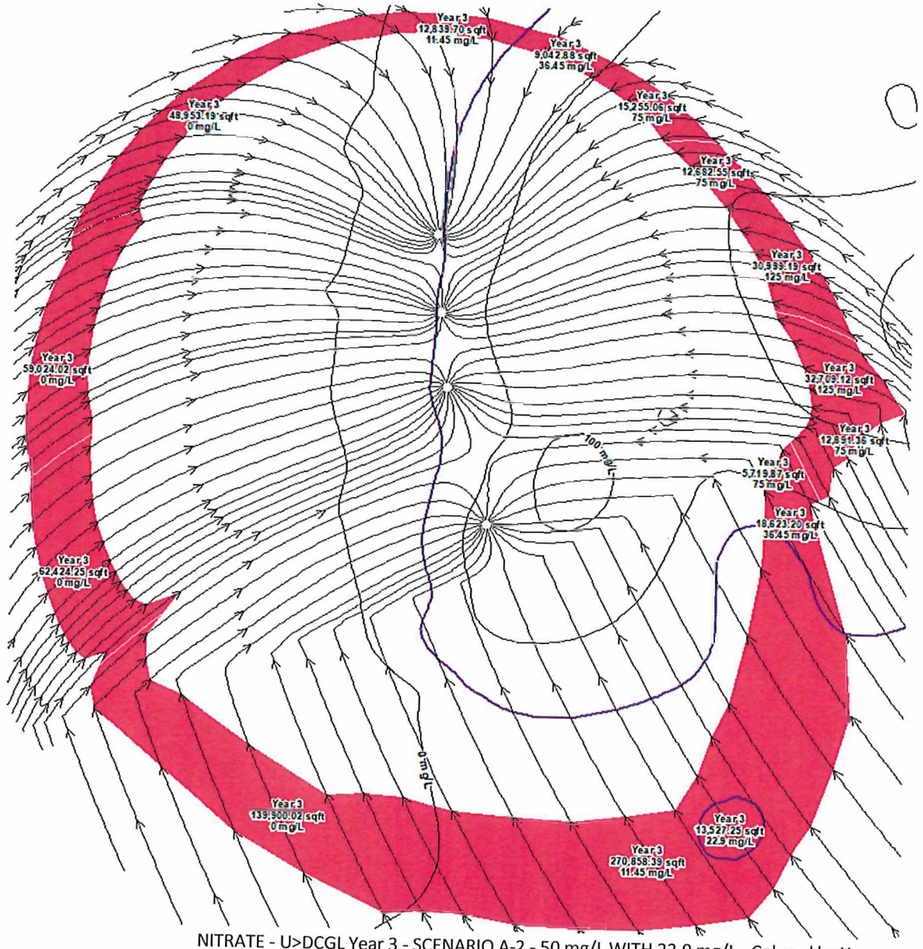
Notes:
mg/L - Milligrams per liter
sq. ft. - Square feet



NITRATE - U>DCGL Year 1 - SCENARIO A-2 - 50 mg/L WITH 22.9 mg/L - Colored by Year

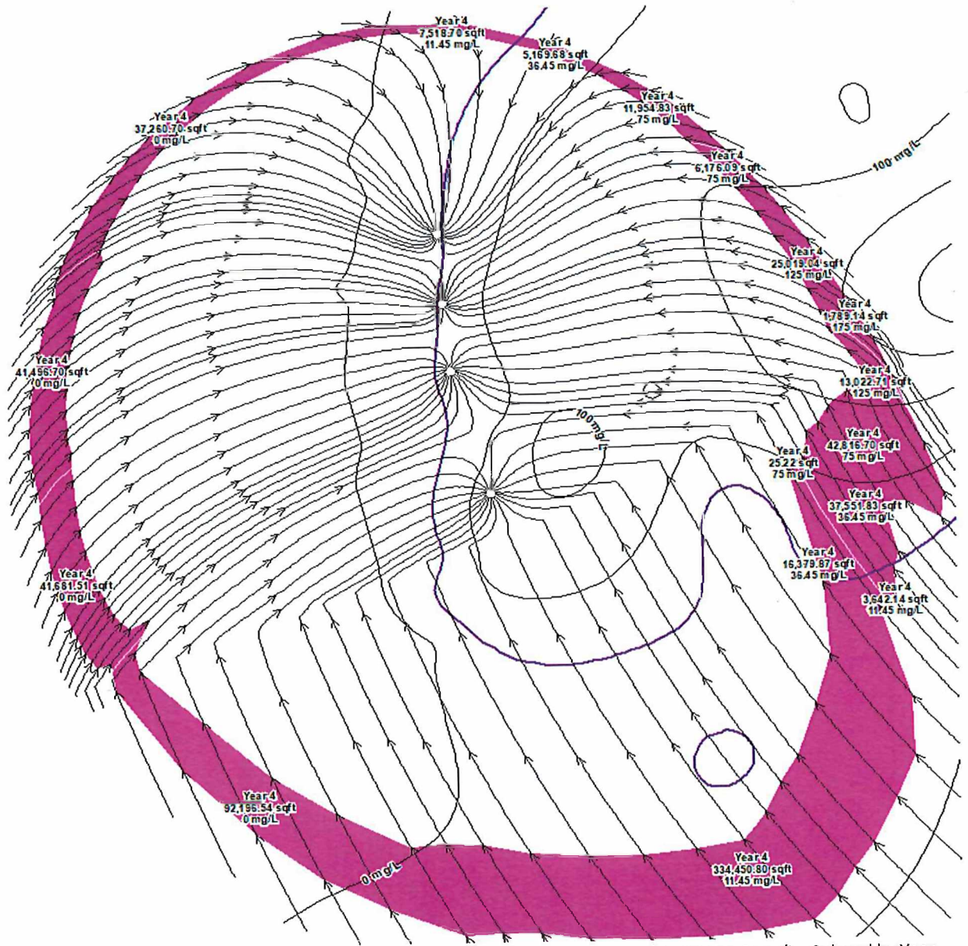


NITRATE - U>DCGL Year 2 - SCENARIO A-2 - 50 mg/L WITH 22.9 mg/L - Colored by Year



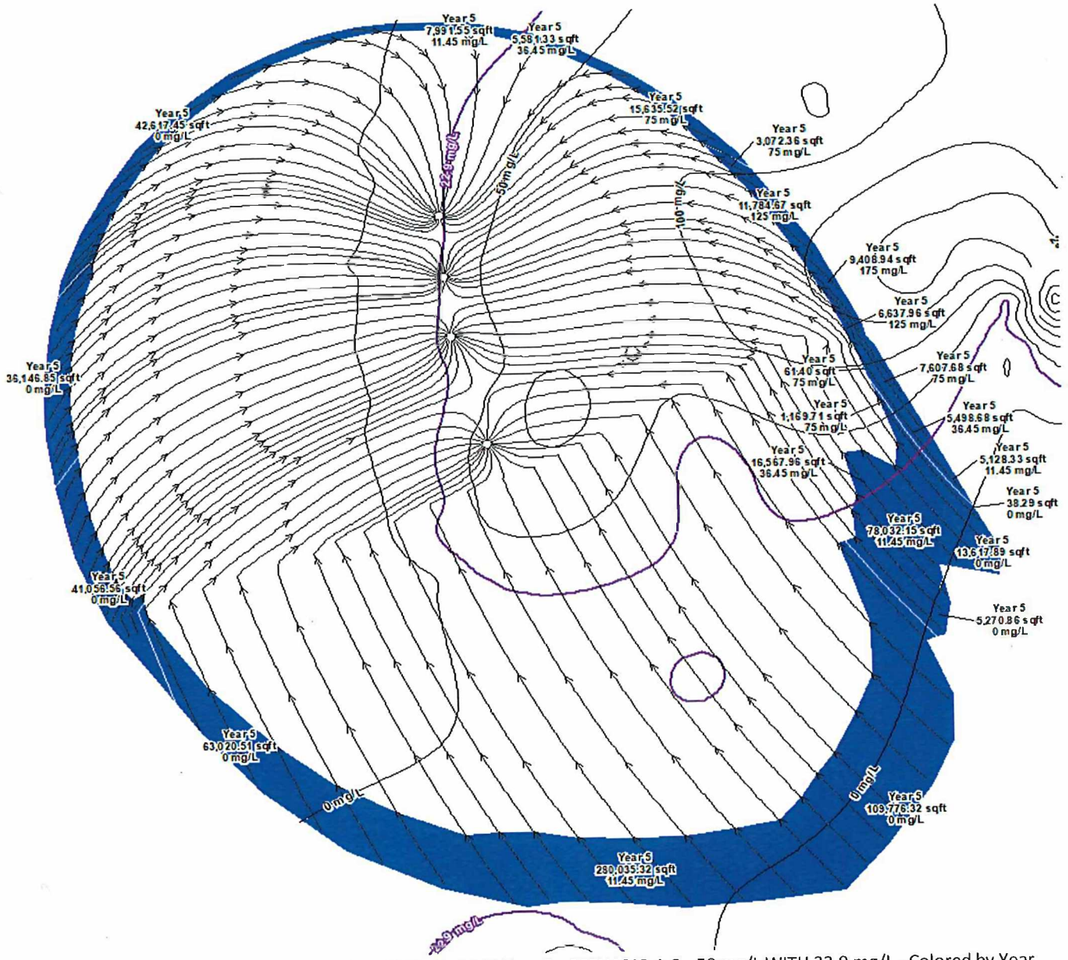
NITRATE - U>DCGL Year 3 - SCENARIO A-2 - 50 mg/L WITH 22.9 mg/L - Colored by Year

Water Treatment Design Basis
Cimmaron Environmental Response Trust



NITRATE - U>DCGL Year 4 - SCENARIO A-2 - 50 mg/L WITH 22.9 mg/L - Colored by Year

Water Treatment Design Basis
Cimmaron Environmental Response Trust



NITRATE - U>DCGL Year 5 - SCENARIO A-2 - 50 mg/L WITH 22.9 mg/L - Colored by Year

Attachment 11 – Nitrate Flow Rate-Weighted Concentration Averaging Results

Nitrate Flow Rate-Weighted Concentration Averaging Results
Water Treatment Design Basis

9/28/2022

Remediation Area	Extraction Well/Trench	Influent Flow Rate (gpm)	Adjusted Flow Rate (gpm)	Year	Nitrate (mg/L)	Weighted Nitrate (mg/L)	
		q	q*%		C_t	$q*C_t$	**Comments:**
1206-North	GETR-WU-01	8	--	1	38.60	308.80	-Initial Influent Concentration: Linear, incremental concentration averaging along trench alignment using isoconcentration contours [se Incr. AWCA Calcs (09-09-22).
			--	2	--	--	- Maximum Influent Concentration: Nitrate concentration from year with highest TWCA concentration [see Incr. TWCA Calcs (09-09-22).
			--	3	--	--	
			--	4	--	--	
			--	5	--	--	
WAA U > DCGL	GE-WAA-05	25	--	1	31.52	788.00	- Initial Influent Concentration: Nitrate concentrations from year 1 [see Incr. TWCA Calcs (09-09-22).
			--	2	35.09	877.25	- Maximum Influent Concentration: Nitrate concentration from year with highest TWCA concentration [see Incr. TWCA Calcs (09-09-22).
			--	3	46.99	1,174.75	
			--	4	52.41	1,310.25	
			--	5	58.72	1,468.00	
	GE-WAA-02	30	--	1	31.43	942.90	- Initial Influent Concentration: Nitrate concentrations from year 1 [see Incr. TWCA Calcs (09-09-22).
			--	2	34.98	1,049.40	- Maximum Influent Concentration: Nitrate concentration from year with highest TWCA concentration [see Incr. TWCA Calcs (09-09-22).
			--	3	46.80	1,404.00	
			--	4	45.05	1,351.50	
			--	5	10.18	305.40	
	GE-WAA-03	24	--	1	67.13	1,611.12	- Initial Influent Concentration: Nitrate concentration interpolated from Surfer.
			--	2	16.74	401.76	- Maximum Influent Concentration: Nitrate concentration from year with highest nitrate concentration [see Incr. TWCA Calcs (09-09-22).
			--	3	12.40	297.60	
			--	4	11.42	274.08	
			--	5	7.08	169.92	
	GE-WAA-04	20	--	1	21.58	431.60	- Initial Influent Concentration: Nitrate concentrations from year 1 [see Incr. TWCA Calcs (09-09-22).
			--	2	19.49	389.80	- Maximum Influent Concentration: Nitrate concentration from year with highest TWCA concentration [see Incr. TWCA Calcs (09-09-22).
			--	3	18.83	376.60	
			--	4	18.92	378.40	
			--	5	20.43	408.60	
Initial $\sum q*c_t$		107	0			4,082.42	
Initial $\sum q$						107.00	
Initial Influent Concentration						38.15	

Notes:

gpm - gallons per minute
mg/L - milligrams per liter
ug/L - micrograms per liter

Attachment 12 – WA Influent Concentration Analysis Results

WATF - Uranium

Remediation Area	C_i (µg/L)	C_i Source	C_{max} (µg/L)	C_{max} Source	Is C_i representative of C_{max}? (Y/N)	Flow Rate (gpm)	R^1	PV^1 (ft^3)	PV (liters)	Q (liters/day)	Time Required for Initial Conc. to Reach Max. Level (days)[2]	C_f (µg/L)	Combined Influent C_f (µg/L)	Time Required for Combined Influent Conc. to Reach MCL (months)
WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	147	FWCA	147	FWCA	Y	99	13.1	16,156,827	457,509,639	539,648	0	101.4	101.4	N/A
1206-NORTH (GETR-WU-01)	304	LWCA	304	LWCA	Y	8	50.4	3,014	85,334	43,608	0	0.00		
Combined Treatment System Influent Flow Rate[5]						107								

WATF - Nitrate

Remediation Area	C_i (mg/L)	C_i Source	C_2 (mg/L)	C_3 (mg/L)	C_4 (mg/L)	C_5 (mg/L)	C_{max} (mg/L)	C_{max} Source	Is C_i representative of C_{max}? (Y/N)	Flow Rate (gpm)	R^2	PV^2 (ft^3)	PV (liters)	Q (liters/day)	Time Required for Initial Conc. to Reach Max. Level (days)	C_f (mg/L)	Combined Influent C_f (mg/L)
WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	38.1	FWCA	27	33	33	24	38.1	FWCA	Y	99	4.62	23,452,057	664,087,208	539,648	0	19.82	19.82
1206-NORTH (GETR-WU-01)	38.6	FWCA	--	--	--	--	38.6	FWCA	Y	8	10.9	3,014	85,334	43,608	0	0.00	
Combined Treatment System Influent Flow Rate										107							

WATF - Fluoride

Remediation Area	C_i (mg/L)	C_i Source	C_{max} (mg/L)	C_{max} Source	Is C_i representative of C_{max}? (Y/N)
WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	2.3	FWCA	2.3	FWCA	Y
1206-NORTH (GETR-WU-01)	7.03	LWCA	7.03	LWCA	Y

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

cubic foot = 28.3168 liters
gpm = 5451 liters per day

Notes:

C_i - initial concentration
C_f - final concentration
C_{max} - maximum concentration
gpm - gallons per minute
MCL - maximum contaminant level
mg/L - milligrams per liter
R - retardation

$$R = 1 + \frac{\rho_b}{n} K_d$$

PV - pore volume
Q - flow rate
AWCA - Area-weighted concentration averaging
FWCA - Flow rate-weighted concentration averaging
LWCA - Linear-weighted concentration averaging
SIC - Surfer-interpolated concentration

[1]Retardation (R) and pore volume (PV) taken from [Remediation Duration Estimates (08-29-22)]. To more accurately represent influent concentration calculations, the remediation area was as the area for PV calculations.

[2]Retardation (R) and pore volume (PV) for nitrate taken from [Decay Analysis Pore Volumes (08-29-22)] . Total area of capture zone used to calculate PV. This pore volume is not representative of the capture zone for associated with Years 1 through 4; however, pore volume is not used to determine influent concentration for Years 1 through 3 and the difference in pore volume between Years 4 and 5 PV is negligible.

Western Area Uranium Influent Concentration Analysis
Water Treatment Design Basis

9/28/2022

Western Area Combined Influent - Uranium		
Area	WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	1206-NORTH (GETR-WU-01)
C_i (µg/L)	146.94	304.00
C_{max} (µg/L)	146.94	304.00
Flow Rate (gpm)	99	8
R	13.1	50.4
PV (liters)	457,509,639	85,334
Q (liters/day)	539,648	43,608
Time Required for Initial Conc. to Reach Max. Level (months)	0	0

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	WAA U>DCGL	1206-NORTH	WEIGHTED AVERAGE	Combined Influent Flow Rate	Months	Days	Notes
0	146.936364	304.000000	158.68	107	0	0.0	
1	146.533426	223.266349	152.27	107	1	30.4	
2	146.131593	163.973233	147.47	107	2	60.8	
3	145.730862	120.426662	143.84	107	3	91.3	
4	145.331231	88.444806	141.08	107	4	121.7	
5	144.932695	64.956411	138.95	107	5	152.1	According to remediation duration calculations for 1206 North, uranium DCGL is met at 4.8 months; however 1206 North groundwater extraction will continue until water injection in WU-BA3 is discontinued in Month 48.
6	144.535251	47.705858	137.30	107	6	182.5	
7	144.138898	35.036555	135.98	107	7	212.9	
8	143.743632	25.731854	134.92	107	8	243.4	
9	143.349449	18.898215	134.04	107	9	273.8	
10	142.956348	13.879393	133.31	107	10	304.2	
11	142.564325	10.193425	132.67	107	11	334.6	
12	142.173376	7.486345	132.10	107	12	365.0	
13	141.783500	5.498187	131.59	107	13	395.5	
14	141.394693	4.038027	131.13	107	14	425.9	
15	141.006952	2.965643	130.69	107	15	456.3	
16	140.620274	2.178054	130.27	107	16	486.7	
17	140.234657	1.599625	129.87	107	17	517.1	
18	139.850097	1.174811	129.48	107	18	547.6	
19	139.466591	0.862815	129.10	107	19	578.0	
20	139.084138	0.633676	128.73	107	20	608.4	
21	138.702733	0.465390	128.37	107	21	638.8	
22	138.322374	0.341796	128.01	107	22	669.2	
23	137.943058	0.251025	127.65	107	23	699.7	
24	137.564782	0.184360	127.29	107	24	730.1	
25	137.187544	0.135399	126.94	107	25	760.5	
26	136.811340	0.099441	126.59	107	26	790.9	
27	136.436168	0.073032	126.24	107	27	821.3	
28	136.062024	0.053637	125.89	107	28	851.8	
29	135.688907	0.039393	125.55	107	29	882.2	
30	135.316813	0.028931	125.20	107	30	912.6	
31	134.945739	0.021248	124.86	107	31	943.0	
32	134.575683	0.015605	124.52	107	32	973.4	
33	134.206641	0.011461	124.17	107	33	1003.9	
34	133.838612	0.008417	123.83	107	34	1034.3	
35	133.471591	0.006182	123.49	107	35	1064.7	
36	133.105578	0.004540	123.15	107	36	1095.1	
37	132.740568	0.003334	122.82	107	37	1125.5	
38	132.376558	0.002449	122.48	107	38	1156.0	
39	132.013548	0.001799	122.14	107	39	1186.4	
40	131.651532	0.001321	121.81	107	40	1216.8	
41	131.290509	0.000970	121.47	107	41	1247.2	
42	130.930477	0.000712	121.14	107	42	1277.6	
43	130.571431	0.000523	120.81	107	43	1308.1	
44	130.213370	0.000384	120.48	107	44	1338.5	
45	129.856292	0.000282	120.15	107	45	1368.9	
46	129.500192	0.000207	119.82	107	46	1399.3	
47	129.145069	0.000152	119.49	107	47	1429.7	
48	128.790919	0.000112	128.79	99	48	1460.2	According to remediation duration calculations for WU-BA3, uranium DCGL is met at 48.0 months. Groundwater extraction in 1206 North is discontinued.
49	128.437741	0.000000	128.44	99	49	1490.6	
50	128.085532	0.000000	128.09	99	50	1521.0	
51	127.734288	0.000000	127.73	99	51	1551.4	
52	127.384007	0.000000	127.38	99	52	1581.8	
53	127.034687	0.000000	127.03	99	53	1612.3	
54	126.686325	0.000000	126.69	99	54	1642.7	
55	126.338918	0.000000	126.34	99	55	1673.1	
56	125.992464	0.000000	125.99	99	56	1703.5	
57	125.646960	0.000000	125.65	99	57	1733.9	
58	125.302403	0.000000	125.30	99	58	1764.4	
59	124.958792	0.000000	124.96	99	59	1794.8	
60	124.616122	0.000000	124.62	99	60	1825.2	
61	124.274392	0.000000	124.27	99	61	1855.6	
62	123.933600	0.000000	123.93	99	62	1886.0	
63	123.593741	0.000000	123.59	99	63	1916.5	
64	123.254815	0.000000	123.25	99	64	1946.9	
65	122.916819	0.000000	122.92	99	65	1977.3	
66	122.579749	0.000000	122.58	99	66	2007.7	
67	122.243603	0.000000	122.24	99	67	2038.1	
68	121.908379	0.000000	121.91	99	68	2068.6	
69	121.574075	0.000000	121.57	99	69	2099.0	
70	121.240687	0.000000	121.24	99	70	2129.4	
71	120.908214	0.000000	120.91	99	71	2159.8	
72	120.576652	0.000000	120.58	99	72	2190.2	
73	120.246000	0.000000	120.25	99	73	2220.7	
74	119.916254	0.000000	119.92	99	74	2251.1	
75	119.587412	0.000000	119.59	99	75	2281.5	
76	119.259473	0.000000	119.26	99	76	2311.9	
77	118.932432	0.000000	118.93	99	77	2342.3	
78	118.606288	0.000000	118.61	99	78	2372.8	
79	118.281039	0.000000	118.28	99	79	2403.2	
80	117.956682	0.000000	117.96	99	80	2433.6	
81	117.633214	0.000000	117.63	99	81	2464.0	
82	117.310633	0.000000	117.31	99	82	2494.4	
83	116.988937	0.000000	116.99	99	83	2524.9	
84	116.668123	0.000000	116.67	99	84	2555.3	
85	116.348189	0.000000	116.35	99	85	2585.7	
86	116.029132	0.000000	116.03	99	86	2616.1	
87	115.710950	0.000000	115.71	99	87	2646.5	
88	115.393640	0.000000	115.39	99	88	2677.0	
89	115.077201	0.000000	115.08	99	89	2707.4	
90	114.761629	0.000000	114.76	99	90	2737.8	
91	114.446923	0.000000	114.45	99	91	2768.2	
92	114.133080	0.000000	114.13	99	92	2798.6	
93	113.820097	0.000000	113.82	99	93	2829.1	
94	113.507973	0.000000	113.51	99	94	2859.5	
95	113.196704	0.000000	113.20	99	95	2889.9	
96	112.886290	0.000000	112.89	99	96	2920.3	
97	112.576726	0.000000	112.58	99	97	2950.7	
98	112.268012	0.000000	112.27	99	98	2981.2	
99	111.960143	0.000000	111.96	99	99	3011.6	
100	111.653120	0.000000	111.65	99	100	3042.0	
101	111.346938	0.000000	111.35	99	101	3072.4	
102	111.041596	0.000000	111.04	99	102	3102.8	
103	110.737091	0.000000	110.74	99	103	3133.3	
104	110.433421	0.000000	110.43	99	104	3163.7	
105	110.130584	0.000000	110.13	99	105	3194.1	
106	109.828577	0.000000	109.83	99	106	3224.5	
107	109.527398	0.000000	109.53	99	107	3254.9	
108	109.227046	0.000000	109.23	99	108	3285.4	
109	108.927517	0.000000	108.93	99	109	3315.8	
110	108.628809	0.000000	108.63	99	110	3346.2	
111	108.330921	0.000000	108.33	99	111	3376.6	
112	108.033849	0.000000	108.03	99	112	3407.0	
113	107.737593	0.000000	107.74	99	113	3437.5	
114	107.442148	0.000000	107.44	99	114	3467.9	
115	107.147514	0.000000	107.15	99	115	3498.3	
116	106.853687	0.000000	106.85	99	116	3528.7	
117	106.560667	0.000000	106.56	99	117	3559.1	

Western Area Uranium Influent Concentration Analysis
Water Treatment Design Basis

9/28/2022

Western Area Combined Influent - Uranium		
Area	WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	1206-NORTH (GETR-WU-01)
C_i (µg/L)	146.94	304.00
C_{max} (µg/L)	146.94	304.00
Flow Rate (gpm)	99	8
R	13.1	50.4
PV (liters)	457,509,639	85,334
Q (liters/day)	539,648	43,608
Time Required for Initial Conc. to Reach Max. Level (months)	0	0

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	WAA U>DCGL	1206-NORTH	WEIGHTED AVERAGE	Combined Influent Flow Rate		Months	Days	Notes
118	106.268450	0.000000	106.27	99		118	3589.6	
119	105.977034	0.000000	105.98	99		119	3620.0	
120	105.686418	0.000000	105.69	99		120	3650.4	
121	105.396598	0.000000	105.40	99		121	3680.8	
122	105.107573	0.000000	105.11	99		122	3711.2	
123	104.819341	0.000000	104.82	99		123	3741.7	
124	104.531899	0.000000	104.53	99		124	3772.1	
125	104.245245	0.000000	104.25	99		125	3802.5	
126	103.959378	0.000000	103.96	99		126	3832.9	
127	103.674294	0.000000	103.67	99		127	3863.3	
128	103.389992	0.000000	103.39	99		128	3893.8	
129	103.106470	0.000000	103.11	99		129	3924.2	
130	102.823725	0.000000	102.82	99		130	3954.6	
131	102.541756	0.000000	102.54	99		131	3985.0	
132	102.260560	0.000000	102.26	99		132	4015.4	
133	101.980135	0.000000	101.98	99		133	4045.9	
134	101.700479	0.000000	101.70	99		134	4076.3	
135	101.421590	0.000000	101.42	99		135	4106.7	According to remediation duration calculations for WAA U>DCGL, uranium DCGL is met at 134.2 months.

Attachment 13 – BA1 Influent Concentration Analysis Results

BA1 Influent Concentration Analysis
Water Treatment Design Basis

09/28/2022

BA1 - Uranium														
Remediation Area	**C_i (µg/L)**	**C_i Source**	**C_{max} (µg/L)**	**C_{max} Source**	**Is C_i representative of C_{max}? (Y/N)**	**Flow Rate (gpm)**	**R[1]**	**PV[1] (ft^3)**	**PV (liters)**	**Q (liters/day)**	**Time Required for Initial Conc. to Reach Max. Level (days)**	**C_f at 150 months (µg/L)**	**Combined Influent C_f at 150 Months (µg/L)**	**Time Required for Combined Influent Conc. to Reach MCL (months)**
BA1-A1 (GETR-BA1-01 & GETR-BA1-02)	**1,720.0**	FWCA	**1,720.0**	FWCA	Y	14	50	90,021	2,549,098	76,314	**0**	**114**	**17.8**	**126**
BA1-B3 (GE-BA1-02 through GE-BA1-04)	**1,132.5**	FWCA	**1,132.5**	FWCA	Y	86	13	916,942	25,964,863	468,785	**0**	**2.07**		
Combined Treatment System Influent Flow Rate						100								

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

cubic foot = 28.3168 liters
gpm 5451 liters per day

Notes:
C_i - initial concentration
C_f - final concentration
C_{max} - maximum concentration
gpm - gallons per minute
MCL - maximum contaminant level
ug/L - micrograms per liter
R - retardation
PV - pore volume
Q - flow rate
FWCA - Flow rate-weighted concentration averaging

$$R = 1 + \frac{\rho_b}{n} K_d$$

[1]Retardation (R) and pore volume (PV) taken from remediation duration estimate calculations [Remediation Duration Estimates (08-29-22)].

BA1 Uranium Influent Concentration Analysis
Water Treatment Design Basis

08/30/2022

BA1 Combined Influent - Uranium		
Area	BA1-A1 (GETR-BA1-01 & GETR-BA1-02)	BA1-B3 (GE-BA1-02 through GE-BA1-04)
C_I (µg/L)	1,720.0	1,132.5
C_{max} (µg/L)	1,720.0	1,132.5
Flow Rate (gpm)	14	86
R	50.4	13.1
PV (liters)	2,549,098	25,964,863
Q (liters/day)	76,314	468,785
Area (ft^2)	--	76,285
Time Required for Initial Conc. to Reach Max. Level (months)	0	0

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	A	B3	ug/L WEIGHTED AVERAGE	Combined Influent Flow Rate	Months	Days	Notes
0	1,720.0	1,132.5	1,214.79	100	-	-	
1	1,689.2	1,085.9	1,170.39	100	1	30.42	
2	1,659.0	1,041.2	1,127.71	100	2	60.84	
3	1,629.2	998.4	1,086.70	100	3	91.26	
4	1,600.1	957.3	1,047.27	100	4	121.68	
5	1,571.4	917.9	1,009.37	100	5	152.10	
6	1,543.3	880.1	972.94	100	6	182.52	
7	1,515.6	843.9	937.92	100	7	212.94	
8	1,488.5	809.1	904.25	100	8	243.36	
9	1,461.8	775.8	871.87	100	9	273.78	
10	1,435.7	743.9	840.74	100	10	304.20	
11	1,410.0	713.3	810.81	100	11	334.62	
12	1,384.7	683.9	782.03	100	12	365.04	
13	1,359.9	655.8	754.35	100	13	395.46	
14	1,335.6	628.8	727.72	100	14	425.88	
15	1,311.6	602.9	702.12	100	15	456.30	
16	1,288.2	578.1	677.49	100	16	486.72	
17	1,265.1	554.3	653.80	100	17	517.14	
18	1,242.4	531.5	631.00	100	18	547.56	
19	1,220.2	509.6	609.08	100	19	577.98	
20	1,198.3	488.6	587.98	100	20	608.40	
21	1,176.9	468.5	567.68	100	21	638.82	
22	1,155.8	449.2	548.14	100	22	669.24	
23	1,135.1	430.7	529.34	100	23	699.66	
24	1,114.8	413.0	511.25	100	24	730.08	
25	1,094.8	396.0	493.84	100	25	760.50	
26	1,075.2	379.7	477.07	100	26	790.92	
27	1,056.0	364.1	460.94	100	27	821.34	
28	1,037.0	349.1	445.40	100	28	851.76	
29	1,018.5	334.7	430.44	100	29	882.18	
30	1,000.2	320.9	416.04	100	30	912.60	
31	982.3	307.7	402.17	100	31	943.02	
32	964.7	295.1	388.82	100	32	973.44	
33	947.5	282.9	375.96	100	33	1,003.86	
34	930.5	271.3	363.56	100	34	1,034.28	
35	913.8	260.1	351.63	100	35	1,064.70	
36	897.5	249.4	340.13	100	36	1,095.12	
37	881.4	239.1	329.05	100	37	1,125.54	
38	865.6	229.3	318.38	100	38	1,155.96	
39	850.1	219.9	308.09	100	39	1,186.38	
40	834.9	210.8	298.18	100	40	1,216.80	
41	819.9	202.1	288.62	100	41	1,247.22	
42	805.3	193.8	279.41	100	42	1,277.64	
43	790.8	185.8	270.53	100	43	1,308.06	
44	776.7	178.2	261.97	100	44	1,338.48	
45	762.8	170.8	253.72	100	45	1,368.90	
46	749.1	163.8	245.76	100	46	1,399.32	
47	735.7	157.1	238.08	100	47	1,429.74	
48	722.5	150.6	230.68	100	48	1,460.16	
49	709.6	144.4	223.53	100	49	1,490.58	
50	696.9	138.5	216.64	100	50	1,521.00	
51	684.4	132.8	209.99	100	51	1,551.42	
52	672.1	127.3	203.58	100	52	1,581.84	
53	660.1	122.1	197.39	100	53	1,612.26	
54	648.3	117.0	191.41	100	54	1,642.68	
55	636.7	112.2	185.64	100	55	1,673.10	
56	625.3	107.6	180.07	100	56	1,703.52	
57	614.1	103.2	174.70	100	57	1,733.94	
58	603.1	98.9	169.51	100	58	1,764.36	
59	592.3	94.9	164.49	100	59	1,794.78	
60	581.7	90.9	159.65	100	60	1,825.20	
61	571.3	87.2	154.97	100	61	1,855.62	
62	561.0	83.6	150.45	100	62	1,886.04	According to remediation duration calculations, the uranium DCGL is achieved in Area B in 61.7 months.
63	551.0	80.2	146.09	100	63	1,916.46	
64	541.1	76.9	141.87	100	64	1,946.88	
65	531.4	73.7	137.79	100	65	1,977.30	
66	521.9	70.7	133.85	100	66	2,007.72	
67	512.6	67.8	130.04	100	67	2,038.14	
68	503.4	65.0	126.35	100	68	2,068.56	
69	494.4	62.3	122.79	100	69	2,098.98	
70	485.5	59.7	119.35	100	70	2,129.40	
71	476.8	57.3	116.02	100	71	2,159.82	
72	468.3	54.9	112.79	100	72	2,190.24	
73	459.9	52.7	109.67	100	73	2,220.66	
74	451.7	50.5	106.66	100	74	2,251.08	
75	443.6	48.4	103.74	100	75	2,281.50	
76	435.6	46.4	100.91	100	76	2,311.92	
77	427.8	44.5	98.18	100	77	2,342.34	
78	420.2	42.7	95.53	100	78	2,372.76	
79	412.6	40.9	92.96	100	79	2,403.18	
80	405.3	39.2	90.48	100	80	2,433.60	
81	398.0	37.6	88.08	100	81	2,464.02	
82	390.9	36.1	85.75	100	82	2,494.44	
83	383.9	34.6	83.49	100	83	2,524.86	
84	377.0	33.2	81.30	100	84	2,555.28	
85	370.2	31.8	79.18	100	85	2,585.70	
86	363.6	30.5	77.13	100	86	2,616.12	
87	357.1	29.2	75.14	100	87	2,646.54	
88	350.7	28.0	73.21	100	88	2,676.96	
89	344.4	26.9	71.34	100	89	2,707.38	
90	338.3	25.8	69.52	100	90	2,737.80	
91	332.2	24.7	67.76	100	91	2,768.22	
92	326.3	23.7	66.05	100	92	2,798.64	
93	320.4	22.7	64.40	100	93	2,829.06	
94	314.7	21.8	62.79	100	94	2,859.48	
95	309.0	20.9	61.23	100	95	2,889.90	
96	303.5	20.0	59.72	100	96	2,920.32	
97	298.1	19.2	58.25	100	97	2,950.74	
98	292.7	18.4	56.82	100	98	2,981.16	
99	287.5	17.7	55.43	100	99	3,011.58	
100	282.3	16.9	54.09	100	100	3,042.00	
101	277.3	16.2	52.78	100	101	3,072.42	
102	272.3	15.6	51.51	100	102	3,102.84	
103	267.4	14.9	50.28	100	103	3,133.26	
104	262.7	14.3	49.08	100	104	3,163.68	
105	258.0	13.7	47.91	100	105	3,194.10	
106	253.3	13.2	46.78	100	106	3,224.52	

BA1 Uranium Influent Concentration Analysis
Water Treatment Design Basis

08/30/2022

BA1 Combined Influent - Uranium		
Area	BA1-A1 (GETR-BA1-01 & GETR-BA1-02)	BA1-B3 (GE-BA1-02 through GE-BA1-04)
C_I (µg/L)	1,720.0	1,132.5
C_{max} (µg/L)	1,720.0	1,132.5
Flow Rate (gpm)	14	86
R	50.4	13.1
PV (liters)	2,549,098	25,964,863
Q (liters/day)	76,314	468,785
Area (ft^2)	–	76,285
Time Required for Initial Conc. to Reach Max. Level (months)	0	0

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	A	B3	ug/L WEIGHTED AVERAGE	Combined Influent Flow Rate		Months	Days	Notes
107	248.8	12.6	45.68	100		107	3,254.94	
108	244.3	12.1	44.61	100		108	3,285.36	
109	240.0	11.6	43.57	100		109	3,315.78	
110	235.7	11.1	42.56	100		110	3,346.20	
111	231.5	10.7	41.57	100		111	3,376.62	
112	227.3	10.2	40.61	100		112	3,407.04	
113	223.2	9.8	39.68	100		113	3,437.46	
114	219.2	9.4	38.78	100		114	3,467.88	
115	215.3	9.0	37.89	100		115	3,498.30	
116	211.5	8.6	37.03	100		116	3,528.72	
117	207.7	8.3	36.20	100		117	3,559.14	
118	204.0	7.9	35.39	100		118	3,589.56	
119	200.3	7.6	34.59	100		119	3,619.98	
120	196.7	7.3	33.82	100		120	3,650.40	
121	193.2	7.0	33.07	100		121	3,680.82	
122	189.7	6.7	32.34	100		122	3,711.24	
123	186.3	6.4	31.62	100		123	3,741.66	
124	183.0	6.2	30.93	100		124	3,772.08	
125	179.7	5.9	30.25	100		125	3,802.50	
126	176.5	5.7	29.59	100		126	3,832.92	Combined influent concentration reaches MCL in 126 months
127	173.3	5.4	28.95	100		127	3,863.34	
128	170.2	5.2	28.32	100		128	3,893.76	
129	167.2	5.0	27.71	100		129	3,924.18	
130	164.2	4.8	27.11	100		130	3,954.60	
131	161.3	4.6	26.53	100		131	3,985.02	
132	158.4	4.4	25.96	100		132	4,015.44	
133	155.5	4.2	25.41	100		133	4,045.86	
134	152.7	4.1	24.87	100		134	4,076.28	
135	150.0	3.9	24.34	100		135	4,106.70	
136	147.3	3.7	23.83	100		136	4,137.12	
137	144.7	3.6	23.33	100		137	4,167.54	
138	142.1	3.4	22.84	100		138	4,197.96	
139	139.5	3.3	22.36	100		139	4,228.38	
140	137.1	3.2	21.90	100		140	4,258.80	
141	134.6	3.0	21.44	100		141	4,289.22	
142	132.2	2.9	21.00	100		142	4,319.64	
143	129.8	2.8	20.56	100		143	4,350.06	
144	127.5	2.7	20.14	100		144	4,380.48	
145	125.2	2.6	19.73	100		145	4,410.90	
146	123.0	2.4	19.32	100		146	4,441.32	
147	120.8	2.3	18.93	100		147	4,471.74	
148	118.6	2.3	18.54	100		148	4,502.16	
149	116.5	2.2	18.16	100		149	4,532.58	
150	114.4	2.1	17.80	100		150	4,563.00	According to remediation duration calculations, the uranium DCGL is achieved in Area A in 149.1 months.

Attachment 14 – WA-BA1 Nitrate Combined Effluent Analysis Results

BA1, Western Area - Nitrate Combined										
Remediation Area	C_i (mg/L)	C_i Source	C_{max} (mg/L)	C_{max} Source	Is C_i representative of C_{max}? (Y/N)	R^1	PV^1 (ft^3)	PV (liters)	Combined Effluent C_i (mg/L)	Combined Effluent C_{max} (mg/L)
BA1-A1 (GETR-BA1-01 & GETR-BA1-02)	0	--	0	--	--	50	90,021	2,549,098	22.09	22.09
BA1-B3 (GE-BA1-02 through GE-BA1-04)	0	--	0	--	--	13	916,942	25,964,863		
BA1-B3R (GE-BA1-02 through GE-BA1-04)	0	--	0	--	--	13	366,168	10,368,706		
WAA U>DCGL (GE-WAA-01 through GE-WAA-04)	38.12	FWCA	38.12	FWCA	Y	4.62	23,452,057	664,087,208		
1206-NORTH (GETR-WU-01)	38.60	FWCA	38.60	FWCA	Y	10.87	3,014	85,334		

Notes:
C_i - initial concentration
C_{max} - maximum concentration
gpm - gallons per minute
mg/L - milligrams per liter
R - retardation
PV - pore volume
FWCA - Flow rate-weighted concentration averaging
[1]Retardation (R) and pore volume (PV) taken from [Decay Analysis Pore Volumes (09-09-22)].

Western Area, BA1 Effluent Concentration Analysis
Water Treatment Design Basis

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Western Area, BA1 Combined Effluent - Nitrate					
Area	WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	1206-NORTH (GETR-WU-01)	BA1	BA1 Q Re-Injection (gpm)	WA Q-Reinjection (gpm)
C_1 (mg/L)	38.12	38.60	0.00	28	8
C_2 (mg/L)	27.46	--	0.00		
C_3 (mg/L)	32.86	--	0.00		
C_4 (mg/L)	33.48	--	0.00		
C_5 (mg/L)	23.76	--	0.00		
Flow Rate (gpm)	99	8	100		
R	4.6	10.9			
PV (liters)	664,087,208	85,334			
Q (liters/day)	539,648	43,608			
Time Required for Initial Conc. to Reach Max. Level (months)	0	0			

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	WAA U>DCGL	1206-NORTH	INFLUENT WEIGHTED AVERAGE	BA1-WA Combined Effluent	Months	Days	Notes
0	38.117374	38.600000	38.15	22.09	0	0.0	Year 1 Conc.
1	38.117374	9.239573	35.96	20.82	1	30.4	
2	38.117374	2.211651	35.43	20.51	2	60.8	
3	38.117374	0.529397	35.31	20.44	3	91.3	
4	38.117374	0.126720	35.28	20.42	4	121.7	
5	38.117374	0.030333	35.27	20.42	5	152.1	
6	38.117374	0.007261	35.27	20.42	6	182.5	
7	38.117374	0.001738	35.27	20.42	7	212.9	
8	38.117374	0.000416	35.27	20.42	8	243.4	
9	38.117374	0.000100	35.27	20.42	9	273.8	
10	38.117374	0.000024	35.27	20.42	10	304.2	
11	38.117374	0.000006	35.27	20.42	11	334.6	
12	38.117374	0.000001	35.27	20.42	12	365.0	
13	27.456667	0.000000	25.40	14.71	13	395.5	Year 2 Conc.
14	27.456667	0.000000	25.40	14.71	14	425.9	
15	27.456667	0.000000	25.40	14.71	15	456.3	
16	27.456667	0.000000	25.40	14.71	16	486.7	
17	27.456667	0.000000	25.40	14.71	17	517.1	
18	27.456667	0.000000	25.40	14.71	18	547.6	
19	27.456667	0.000000	25.40	14.71	19	578.0	
20	27.456667	0.000000	25.40	14.71	20	608.4	
21	27.456667	0.000000	25.40	14.71	21	638.8	
22	27.456667	0.000000	25.40	14.71	22	669.2	
23	27.456667	0.000000	25.40	14.71	23	699.7	
24	27.456667	0.000000	25.40	14.71	24	730.1	
25	32.858081	0.000000	30.40	17.60	25	760.5	Year 3 Conc.
26	32.858081	0.000000	30.40	17.60	26	790.9	
27	32.858081	0.000000	30.40	17.60	27	821.3	
28	32.858081	0.000000	30.40	17.60	28	851.8	
29	32.858081	0.000000	30.40	17.60	29	882.2	
30	32.858081	0.000000	30.40	17.60	30	912.6	
31	32.858081	0.000000	30.40	17.60	31	943.0	
32	32.858081	0.000000	30.40	17.60	32	973.4	
33	32.858081	0.000000	30.40	17.60	33	1003.9	
34	32.858081	0.000000	30.40	17.60	34	1034.3	
35	32.858081	0.000000	30.40	17.60	35	1064.7	
36	32.858081	0.000000	30.40	17.60	36	1095.1	
37	33.477071	0.000000	30.97	17.93	37	1125.5	Year 4 Conc., Reset to t = 0
38	33.298427	0.000000	30.81	17.84	38	1156.0	
39	33.120736	0.000000	30.64	17.74	39	1186.4	
40	32.943993	0.000000	30.48	17.65	40	1216.8	
41	32.768194	0.000000	30.32	17.55	41	1247.2	
42	32.593332	0.000000	30.16	17.46	42	1277.6	
43	32.419404	0.000000	30.00	17.37	43	1308.1	
44	32.246404	0.000000	29.84	17.27	44	1338.5	
45	32.074327	0.000000	29.68	17.18	45	1368.9	
46	31.903168	0.000000	29.52	17.09	46	1399.3	
47	31.732923	0.000000	29.36	17.00	47	1429.7	
48	31.563586	0.000000	31.56	18.27	48	1460.2	1206 North Discontinued
49	31.395153	0.000000	31.40	18.18	49	1490.6	
50	31.227618	0.000000	31.23	18.08	50	1521.0	
51	31.060978	0.000000	31.06	17.98	51	1551.4	
52	30.895227	0.000000	30.90	17.89	52	1581.8	

Western Area, BA1 Effluent Concentration Analysis
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Western Area, BA1 Combined Effluent - Nitrate					
Area	WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	1206-NORTH (GETR-WU-01)	BA1	BA1 Q Re-Injection (gpm)	WA Q-Reinjection (gpm)
C_1 (mg/L)	38.12	38.60	0.00	28	8
C_2 (mg/L)	27.46	--	0.00		
C_3 (mg/L)	32.86	--	0.00		
C_4 (mg/L)	33.48	--	0.00		
C_5 (mg/L)	23.76	--	0.00		
Flow Rate (gpm)	99	8	100		
R	4.6	10.9			
PV (liters)	664,087,208	85,334			
Q (liters/day)	539,648	43,608			
Time Required for Initial Conc. to Reach Max. Level (months)	0	0			

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	WAA U>DCGL	1206-NORTH	INFLUENT WEIGHTED AVERAGE	BA1-WA Combined Effluent	Months	Days	Notes
53	30.730360	0.000000	30.73	17.79	53	1612.3	
54	30.566373	0.000000	30.57	17.70	54	1642.7	
55	30.403262	0.000000	30.40	17.60	55	1673.1	
56	30.241020	0.000000	30.24	17.51	56	1703.5	
57	30.079645	0.000000	30.08	17.41	57	1733.9	
58	29.919130	0.000000	29.92	17.32	58	1764.4	
59	29.759472	0.000000	29.76	17.23	59	1794.8	
60	29.600667	0.000000	29.60	17.14	60	1825.2	
61	29.442708	0.000000	29.44	17.05	61	1855.6	
62	29.285593	0.000000	29.29	16.95	62	1886.0	
63	29.129315	0.000000	29.13	16.86	63	1916.5	
64	28.973872	0.000000	28.97	16.77	64	1946.9	
65	28.819259	0.000000	28.82	16.68	65	1977.3	
66	28.665470	0.000000	28.67	16.60	66	2007.7	
67	28.512502	0.000000	28.51	16.51	67	2038.1	
68	28.360350	0.000000	28.36	16.42	68	2068.6	
69	28.209011	0.000000	28.21	16.33	69	2099.0	
70	28.058478	0.000000	28.06	16.24	70	2129.4	
71	27.908750	0.000000	27.91	16.16	71	2159.8	
72	27.759820	0.000000	27.76	16.07	72	2190.2	
73	27.611685	0.000000	27.61	15.99	73	2220.7	
74	27.464340	0.000000	27.46	15.90	74	2251.1	
75	27.317782	0.000000	27.32	15.82	75	2281.5	
76	27.172005	0.000000	27.17	15.73	76	2311.9	
77	27.027007	0.000000	27.03	15.65	77	2342.3	
78	26.882782	0.000000	26.88	15.56	78	2372.8	
79	26.739327	0.000000	26.74	15.48	79	2403.2	
80	26.596638	0.000000	26.60	15.40	80	2433.6	
81	26.454710	0.000000	26.45	15.32	81	2464.0	
82	26.313539	0.000000	26.31	15.23	82	2494.4	
83	26.173122	0.000000	26.17	15.15	83	2524.9	
84	26.033454	0.000000	26.03	15.07	84	2555.3	
85	25.894531	0.000000	25.89	14.99	85	2585.7	
86	25.756350	0.000000	25.76	14.91	86	2616.1	
87	25.618906	0.000000	25.62	14.83	87	2646.5	
88	25.482196	0.000000	25.48	14.75	88	2677.0	
89	25.346215	0.000000	25.35	14.67	89	2707.4	
90	25.210959	0.000000	25.21	14.60	90	2737.8	
91	25.076426	0.000000	25.08	14.52	91	2768.2	
92	24.942610	0.000000	24.94	14.44	92	2798.6	
93	24.809508	0.000000	24.81	14.36	93	2829.1	
94	24.677117	0.000000	24.68	14.29	94	2859.5	
95	24.545432	0.000000	24.55	14.21	95	2889.9	
96	24.414450	0.000000	24.41	14.13	96	2920.3	
97	24.284167	0.000000	24.28	14.06	97	2950.7	
98	24.154579	0.000000	24.15	13.98	98	2981.2	
99	24.025682	0.000000	24.03	13.91	99	3011.6	
100	23.897474	0.000000	23.90	13.84	100	3042.0	
101	23.769949	0.000000	23.77	13.76	101	3072.4	
102	23.643106	0.000000	23.64	13.69	102	3102.8	
103	23.516938	0.000000	23.52	13.62	103	3133.3	
104	23.391445	0.000000	23.39	13.54	104	3163.7	
105	23.266621	0.000000	23.27	13.47	105	3194.1	
106	23.142463	0.000000	23.14	13.40	106	3224.5	

Western Area, BA1 Effluent Concentration Analysis
Water Treatment Design Basis

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Western Area, BA1 Combined Effluent - Nitrate					
Area	WAA U>DCGL (GE-WAA-02 through GE-WAA-05)	1206-NORTH (GETR-WU-01)	BA1	BA1 Q Re-Injection (gpm)	WA Q-Reinjection (gpm)
C_1 (mg/L)	38.12	38.60	0.00	28	8
C_2 (mg/L)	27.46	--	0.00		
C_3 (mg/L)	32.86	--	0.00		
C_4 (mg/L)	33.48	--	0.00		
C_5 (mg/L)	23.76	--	0.00		
Flow Rate (gpm)	99	8	100		
R	4.6	10.9			
PV (liters)	664,087,208	85,334			
Q (liters/day)	539,648	43,608			
Time Required for Initial Conc. to Reach Max. Level (months)	0	0			

$$C_t = C_0 e^{(-Q/(PV*R))t}$$

Cumulative Time (Months)	WAA U>DCGL	1206-NORTH	INFLUENT WEIGHTED AVERAGE	BA1-WA Combined Effluent	Months	Days	Notes
107	23.018967	0.000000	23.02	13.33	107	3254.9	
108	22.896131	0.000000	22.90	13.26	108	3285.4	
109	22.773950	0.000000	22.77	13.18	109	3315.8	
110	22.652421	0.000000	22.65	13.11	110	3346.2	
111	22.531540	0.000000	22.53	13.04	111	3376.6	
112	22.411305	0.000000	22.41	12.97	112	3407.0	
113	22.291711	0.000000	22.29	12.91	113	3437.5	
114	22.172756	0.000000	22.17	12.84	114	3467.9	
115	22.054435	0.000000	22.05	12.77	115	3498.3	
116	21.936746	0.000000	21.94	12.70	116	3528.7	
117	21.819684	0.000000	21.82	12.63	117	3559.1	
118	21.703247	0.000000	21.70	12.57	118	3589.6	
119	21.587432	0.000000	21.59	12.50	119	3620.0	
120	21.472235	0.000000	21.47	12.43	120	3650.4	
121	21.357652	0.000000	21.36	12.36	121	3680.8	
122	21.243681	0.000000	21.24	12.30	122	3711.2	
123	21.130318	0.000000	21.13	12.23	123	3741.7	
124	21.017560	0.000000	21.02	12.17	124	3772.1	
125	20.905404	0.000000	20.91	12.10	125	3802.5	
126	20.793846	0.000000	20.79	12.04	126	3832.9	
127	20.682884	0.000000	20.68	11.97	127	3863.3	
128	20.572513	0.000000	20.57	11.91	128	3893.8	
129	20.462732	0.000000	20.46	11.85	129	3924.2	
130	20.353536	0.000000	20.35	11.78	130	3954.6	
131	20.244923	0.000000	20.24	11.72	131	3985.0	
132	20.136890	0.000000	20.14	11.66	132	4015.4	
133	20.029433	0.000000	20.03	11.60	133	4045.9	
134	19.922550	0.000000	19.92	11.53	134	4076.3	
135	19.816237	0.000000	19.82	11.47	135	4106.7	