



# ERM

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31 December 2024

Guttersen State CC #20-32D

Remediation #31544

Operator #100322

This Supplemental Site Investigation Report has been prepared by Environmental Resources Management, Inc. (ERM), on behalf of Chevron, for the Guttersen State CC #20-32D Site (Remediation #31544). As detailed in the third quarter 2024 Supplemental Site Investigation and Remediation Workplan Document # 403909564 (Form 27) received by the Colorado Energy and Carbon Management Commission (ECMC) on 23 September 2024, EAGLE Environmental Consulting, LLC (EAGLE) completed initial site investigation activities on 3 October 2023 including the collection of five wellhead samples and one background sample.

Tasman Geosciences, Inc. (TASMAN) completed initial site investigation activities on 19 December 2023 that included the collection of five grab soil samples along the flowline. Samples were analyzed by a certified laboratory for the full extent of ECMC Table 915-1 analytes. One soil wellhead sample, WH-FS-01@6', collected by EAGLE exceeded the ECMC Table 915-1 Residential Soil Screening Level (SSL) for arsenic and was above Groundwater Protection SSLs for barium and selenium. One soil flowline sample, FL01-A@2' exceeded the ECMC Table 915-1 regulatory standards for arsenic and pH; therefore, further delineation of these residual constituents was deemed necessary.

ERM performed shallow delineation and background soil sampling via hand auger around the former flowline as depicted on **Figure 1**. The analytical results from the recent Site investigation activities are summarized in the following sections.

## SITE INVESTIGATION ACTIVITIES

### SOIL SAMPLING

On 24 September 2024, ERM advanced four wellhead delineation soil borings (31544-WH-01-N, 31544-WH-01-S, 31544-WH-01-E, and 31544-WH-01-W) within the Guttersen State CC #20-32D former operations boundary to delineate samples WH-FS-01@6' and FL01-A@2'. Samples were collected at 4-, 6-, and 8- feet below ground surface (bgs) at each boring location and analyzed for pH, arsenic, barium and selenium. Sample locations and relevant features are depicted on **Figure 1**.

Six background soil borings (BG-01 through BG-06) were advanced to evaluate arsenic, barium, lead, selenium and pH background concentrations from the non-impacted area of the Site.

Samples were collected from the 2-foot bgs interval from all the background sampling locations to compare with the previous exceedance.

A total of 12 delineation soil samples and 6 background samples were submitted to Summit Laboratory, an accredited laboratory located in Golden, Colorado, for analysis of pH by United States Environmental Protection Agency (EPA) Method 9045D; and arsenic, barium, and selenium by EPA Method 6020B. The 6 background samples were submitted on a separate COC than the delineation samples.

## RESULTS

The analytical results for pH are summarized in **Table 1** and the analytical results for total metals are summarized in **Table 2** the laboratory analytical report is included in **Attachment A**. Sampling locations and corresponding analytical results for the 16 September 2024 sampling event are illustrated on **Figure 1**.

Upon receipt of laboratory analytical results, data were reviewed for general quality control and quality assurance measures. The following notable observations and data qualifiers were associated with this data set:

- Soil samples at the time of laboratory receipt were 14.6 degrees Celsius (°C), outside the acceptable range of 0 to 6°C. However, samples were delivered the same day of sampling on bagged ice and were observed to be actively cooling.
- All sample bottles were received intact, and samples analyzed within their respective hold times.
- No data qualifier codes were flagged in the analytical results.

Laboratory analytical results exceed the ECMC Table 915-1 Residential SSL for arsenic in 14 out of 18 soil samples collected and exceed the ECMC Table 915-1 Protection of Groundwater SSL for the remaining 4 arsenic samples.

## WELLHEAD DELINEATION

- Wellhead delineation borings exceed the ECMC Table 915-1 pH range of 6.0 to 8.3 standard units (SU) in nine of the 12 samples and the pH values range from 8.0 to 9.1 SUs.
- Wellhead delineation borings exceed the ECMC Table 915-1 Residential SSL arsenic value of 0.68 mg/kg in all 12 samples collected with arsenic values range from 0.571 to 1.17 mg/kg.
- Wellhead delineation borings do not exceed the ECMC Table 915-1 Residential SSL barium value of 815,000 mg/kg and barium values range from 33 to 386 mg/kg.
- Wellhead delineation samples do not exceed the ECMC Table 915-1 Residential SSL selenium value of 390 mg/kg as all the wellhead delineation analytical results for selenium were non-detect.

## BACKGROUND SAMPLES

- All background samples collected do not exceed the ECMC Table 915-1 pH range of 6.0 to 8.3 standard units (SU) with pH values ranging from 6.9 to 8.3.
- All background samples exceed the ECMC Table 915-1 arsenic Residential SSL of 0.68 milligrams per kilogram (mg/kg) with arsenic results ranging from 1.06 to 1.50 mg/kg.
- All background samples collected were below the ECMC Table 915-1 barium Residential SSL of 15000 mg/kg and barium results range from 30.9 to 45.5 mg/kg.
- Background analytical results for selenium were non-detect.

## SOIL SUITABILITY FOR RECLAMATION STATUS

The analytical results for arsenic in 8 of 12 samples collected from delineation borings associated with the Guttersen State CC #20-32D wellhead exceed the ECMC Table 915-1 Residential SSL. However, when compared to the maximum arsenic result (1.50 mg/kg) of samples taken from the nearby background soil borings, multiplied by 1.25 (1.88 mg/kg), all delineation sample results are below the calculated background arsenic value.

Four samples exceed the ECMC Table 915-1 Protection of Groundwater SSL for barium. When compared to the maximum barium result (45.5 mg/kg) of samples taken from the nearby background soil borings, multiplied by 1.25 (56.9 mg/kg), all 4 samples statistically exceed background concentrations. However, ERM reviewed historical documentation which indicates groundwater is not within 20-feet of the ground surface and comparison of analytical results to Groundwater Protection SSLs do not seem to be appropriate. The laboratory-reported values in soil samples taken from delineation borings around the Guttersen State CC #20-32D wellhead location for selenium were non-detect and therefore below any ECMC Table 915-1 values.

ERM recommends no further assessment of arsenic and selenium at this Site. Further assessment is recommended of barium for on-Site and background samples from non-impacted portions of the Site related to Soil Reclamation in 1<sup>st</sup> Quarter 2025.



## TABLES

Table 1  
SUMMARY OF SOIL SUITABILITY FOR RECLAMATION CHEMISTRY DATA  
OPERATOR: 100322  
Guttersen State CC #20-32D, Weld County, Colorado  
REM# 31544

			Analyte	pH (Standard Units)
			Colorado ECMC Table 915-1 Limits	6.0-8.3
Sample ID	Sample Date	Depth (ft bgs)	Sample Results	
<b>Background Samples</b>				
BG-01	09/24/2024	2		<b>8.3</b>
BG-02	09/24/2024	2		<b>7.8</b>
BG-03	09/24/2024	2		<b>7.3</b>
BG-04	09/24/2024	2		<b>7.2</b>
BG-05	09/24/2024	2		<b>7.0</b>
BG-06	09/24/2024	2		<b>6.9</b>
<b>Delineation Boring Samples</b>				
WH-01-E	09/24/2024	4		<b>8.1</b>
WH-01-E	09/24/2024	6		<b>8.4</b>
WH-01-E	09/24/2024	8		<b>8.7</b>
WH-01-N	09/24/2024	4		<b>8.7</b>
WH-01-N	09/24/2024	6		<b>8.9</b>
WH-01-N	09/24/2024	8		<b>9.1</b>
WH-01-S	09/24/2024	4		<b>8.4</b>
WH-01-S	09/24/2024	6		<b>8.6</b>
WH-01-S	09/24/2024	8		<b>8.6</b>
WH-01-W	09/24/2024	4		<b>8.0</b>
WH-01-W	09/24/2024	6		<b>8.2</b>
WH-01-W	09/24/2024	8		<b>8.8</b>

Notes:  
Bold and blue analytical result values exceed the ECMC Table 915-1 limit(s)  
ECMC = Colorado Energy and Carbon Management Commission  
ft bgs = feet below ground surface  
pH = pH Standard Units

Table 2  
SUMMARY OF METALS IN SOIL CHEMISTRY DATA  
OPERATOR: 100322  
Guttersen State CC #20-32D, Weld County, Colorado  
REM# 31544

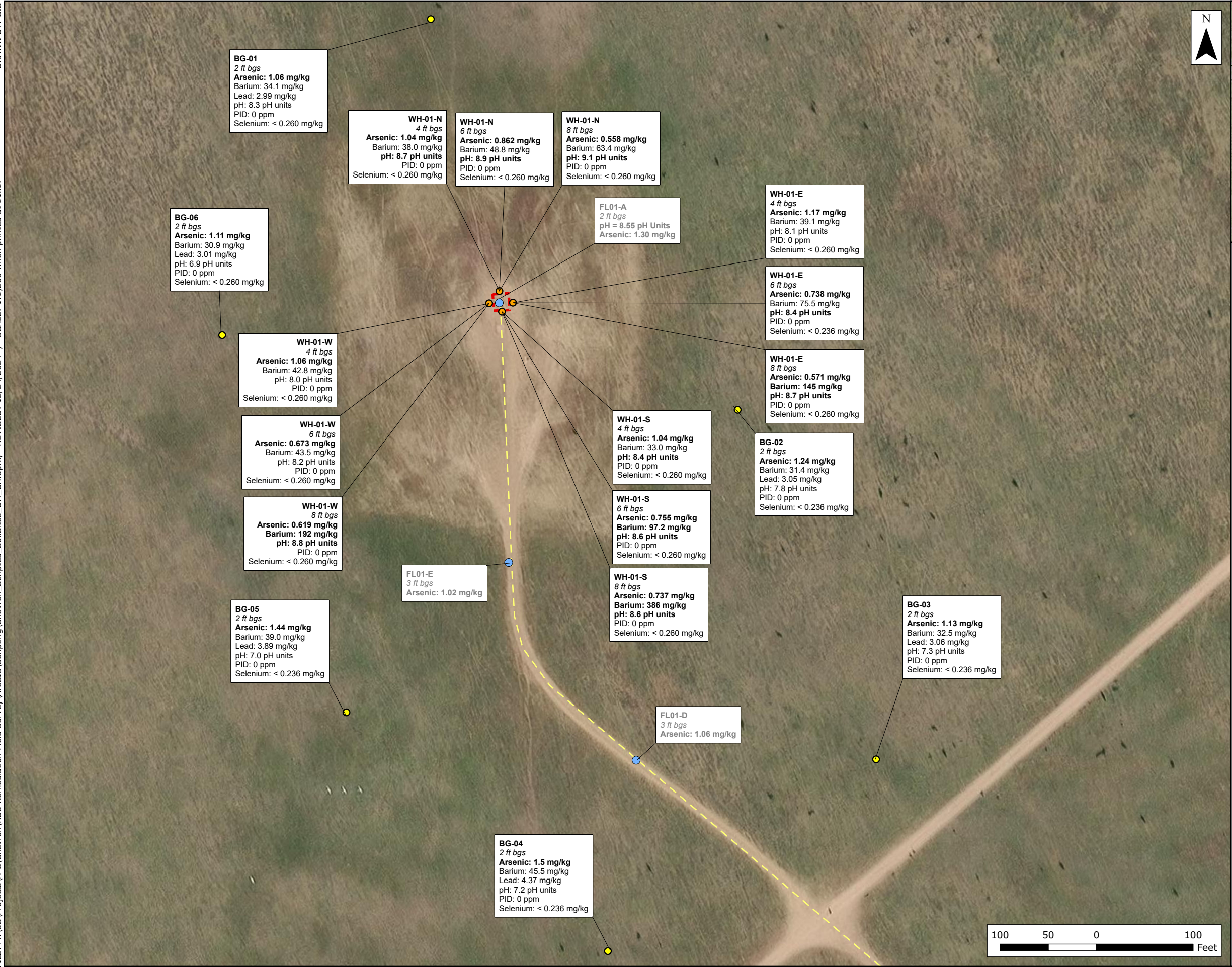
Analyte			Arsenic (mg/kg)	Barium (mg/kg)	Selenium (mg/kg)
Colorado ECMC Table 915-1 Limits (Protection of Groundwater SSL)			0.29	82	0.26
Colorado ECMC Table 915-1 Limits (Residential SSL)			0.68	15000	390
Maximum Background Concentration			1.50	45.5	0.26
Maximum Background Concentration X 1.25			1.88	56.9	0.33
Sample ID	Sample Date	Depth (ft bgs)	Sample Results		
Background Samples					
BG-01	09/24/2024	2	1.06	34.1	< 0.260
BG-02	09/24/2024	2	1.24	31.4	< 0.236
BG-03	09/24/2024	2	1.13	32.5	< 0.236
BG-04	09/24/2024	2	1.50	45.5	< 0.260
BG-05	09/24/2024	2	1.44	39.0	< 0.260
BG-06	09/24/2024	2	1.11	30.9	< 0.260
Delineation Boring Samples					
WH-01-E	09/24/2024	4	1.17	39.1	< 0.26
WH-01-E	09/24/2024	6	0.738	75.5	< 0.26
WH-01-E	09/24/2024	8	0.571	145	< 0.26
WH-01-N	09/24/2024	4	1.04	38	< 0.26
WH-01-N	09/24/2024	6	0.862	48.8	< 0.26
WH-01-N	09/24/2024	8	0.558	63.4	< 0.26
WH-01-S	09/24/2024	4	1.04	33	< 0.26
WH-01-S	09/24/2024	6	0.755	97.2	< 0.26
WH-01-S	09/24/2024	8	0.737	386	< 0.26
WH-01-W	09/24/2024	4	1.06	42.8	< 0.26
WH-01-W	09/24/2024	6	0.673	43.5	< 0.26
WH-01-W	09/24/2024	8	0.619	192	< 0.26

Notes:

Bold and pink analytical results values exceed the ECMC Table 915-1 limit(s) (Residential SSL)  
Bold and blue analytical results values exceed the Colorado ECMC Table 915-1 limit(s) (Protection of Groundwater SSL)  
ECMC = Colorado Energy and Carbon Management Commission  
SSL = soil screening level  
ft bgs = feet below ground surface  
mg/kg = milligrams per kilogram



FIGURES



**Legend**

- Former Sample Location
- Background
- Flowline Delineation
- Wellhead Delineation
- Former Flowline
- Former Wellhead

**Notes:**

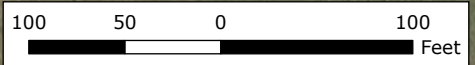
**Bold** values exceed the ECMC criteria for soil suitability.

PID = Photo Ionization Detector  
ppm = parts per million  
mg/kg = milligrams per kilogram

ECMC = Energy and Carbon Management Commission

ECMC Table 915-1 limit(s)  
Arsenic: 0.68 mg/kg  
Barium: 15,000 mg/kg  
Selenium: 390 mg/kg  
pH: 6.0 - 8.3 pH Units

**Figure 1**  
**Soils Analytical Data**  
**24 September 2024**  
**Guttersen State CC #20-32D**  
**REM #31544**  
**Operator: 100322**  
RBU Remediation Field Survey  
Chevron  
Weld County, Colorado





ATTACHMENT A LABORATORY ANALYTICAL REPORT