

SITE-SPECIFIC QUALITY ASSURANCE & QUALITY CONTROL AUDIT



Permit Closure Type – Final

PERMIT CLOSURE REPORT – RANGELAND

Location ID 330368

Location Name COLORADO ENERGY FEDERAL-610N64W/14NWNW

Report Date

29 Nov 2024

Soil Sage has conducted a thorough data audit as part of our Quality Assurance and Quality Control (QA/QC) protocols.

Quality Assurance & Quality Control Audit

Auditor	Soil Sage
Audit Date	05/30/2023
Audit Review Date	11/25/2024

Audit Methodology

The following source materials were consulted during the QA and QC audit process:

- ✓ Site Permit Closures provided by CIVITAS Resources
- ✓ Colorado Oil & Gas Information System – COGIS Database
- ✓ On-site Evaluation and Proprietary Soil Sage Drone Imagery data collection
- ✓ Review of legacy imagery for site location and facility parameters

All pertinent data, imagery, and materials are included at the end of this report.

Site Description

Name	COLORADO ENERGY FEDERAL-610N64W/14NWNW		
Location ID	330368		
Operator / #	HIGHPOINT OPERATING CORPORATION / 10071		
Field	PAWNEE PIONEER 67805		
County, State	WELD, CO		
Lat/Long	40.840200 / -104.518917		
	X	Planned Location	As Drilled
Facility Status	AC	Location	NWNW 14 10N64W
Facility Status Date	11/28/2018	Access Road	Oil & Gas Access
Facility Entities	X	Tank Battery	Pits
	X	Wells	X Off-Location Flowlines (Form 44)
		Domestic Taps	X On-Location Flowlines (Form 42)
Equipment Remaining on Site	X	None	Debris or Non-Oil & Gas
		List of Equipment:	
Environment Incidents & Remediation	X	None	Spill or Release (Form 19)
		Remediation (Form 27/27A)	
Inspection Corrective Actions (CA)s	<p>Corrective Actions (CA)s were detected during the QA & QC Audit.</p> <p>CA Overall Status: Unresolved</p> <p>Form FIRR Doc # & Submittal Date: None at time of Audit.</p> <ul style="list-style-type: none"> ○ Overall Status: FAIL ○ Originating Field Inspection Report (FIR) Doc #: 697505430 Comply with Rule 1004. Reseed disturbance areas using the approved seed mix provided by the Forest Service. Establish vegetation with total perennial, non-invasive uniform plant cover of at least eighty (80) percent of reference area levels. Ensure erosion controls are implemented to stabilize the seeded soil. Operator shall continue to monitor and manage this site until the location meets Rule 1004 standards, including stormwater and weed management. Operator shall perform soil testing to investigate soil properties related to soil suitability defined in Table 915-1. Operator shall provide soil results to Staff upon request. <p>ECMC Decision: None at this time</p> <hr/> <p>Complete ECMC Inspection Search Results: Link</p>		

Sundry Notice (Form 4)	<p>Form 4 Doc # & Date: 402366281 & 08/31/2020</p> <ul style="list-style-type: none"> ○ Purpose: Final Reclamation Complete (Well COLORADO ENERGY FEDERAL #14-1 – API# 05-123-18978 only), Site Ready for Inspection. ○ Operator Comments: Well COLORADO ENERGY FEDERAL #14-1 – (API# 05-123-18978) was plugged and abandoned in 2014 and the Location 330368 and Tank Battery 459260 and associated equipment are currently owned by HIGHPOINT OPERATING CORPORATION, the former well was located in the middle of the location abandoned in 2014; the Location and tank battery along with associated equipment owned by HIGHPOINT OPERATING CORPORATION and Bonded with BLM. Operator will be the responsible party for complying with final reclamation at this location, not WARD PETROLEUM.
On Location Flowlines (Form 42)	<p>Form 42s were detected during the QA & QC Audit. See individual scout card data for details.</p>
Off-Location Flowlines (Form 44)	<p>No Form 44s were detected during the QA & QC Audit.</p> <p>However, this location is referenced in Form 44 Doc # 402532103 pertaining to the COLORADO ENERGY FEDERAL Flowline ID 464018 that was abandoned in place on 09/17/2020. This Location, 330368, is one of multiple locations connected to the COLORADO ENERGY FEDERAL Flowline. Two Verification Letters of Abandonment provide additional specifics: Doc # 402532123 and Doc # 402532124.</p>
Field Inspection Form (Form INSP)	<p>Form INSP Doc # & Date: 697505430 & 8/16/2024</p> <ul style="list-style-type: none"> ○ Status Summary: This is a Follow Up Inspection, Follow Up Inspection Required ○ Findings: 2 Comments, 1 Corrective Actions ○ Inspected Facilities: Well COLORADO ENERGY FEDERAL #14-1 ○ Inspection Status: RI ○ Inspection Date & Inspector: 08/16/2024 by Chris Binschus ○ Comments: This is a follow up Final Reclamation Inspection. Previous inspection documented Operator performed additional final reclamation activities after receiving an approved seed mix from the Forest Service on October 6, 2023. <p>After the 2024 growing season, there is virtually no desirable vegetation or even weed growth. Mulch is evident and providing temporary soil stabilization. Note- fencing remains and the western gate entrance was open at the time of this inspection and cattle presence is evident. Refer to the attached inspection photos.</p> <p>Staff did not have time to inspect the other nearby PA locations. It is Staff's expectation that the Operator perform due diligence to</p>

	<p>ensure the other locations comply with reclamation rules. Staff will perform final reclamation inspections at all the remaining locations in this area at a future date.</p> <ul style="list-style-type: none"> ○ Attachments: Inspection Photos Doc # 697505431 <p>Form INSP Doc # & Date: 697501947 & 08/26/2020</p> <ul style="list-style-type: none"> ○ Status Summary: No Follow Up Inspection Required ○ Findings: 2 Comments, 0 Corrective Actions ○ Inspected Facilities: Well COLORADO ENERGY FEDERAL #14-1 ○ Inspection Status: RI ○ Inspection Date & Inspector: 08/26/2020 by Chris Binschus ○ Comments: This is a Final Reclamation and Stormwater Inspection in response to a bond release request. Well was plugged and abandoned on 12/19/2014. Operator has plugged and abandoned the well on an active tank battery location operated by HIGHPOINT OPERATING CORPORATION; therefore this is a well release on an active location. No further action required. ○ Attachments: Inspection Photos Doc # 697501948
COGIS Tank Facilities Information (Scout Card)	<p>Tank Battery Name: COLORADO ENERGY FEDERAL TANK BATTERY/SEC 14 FACILITY ID: 459260</p> <ul style="list-style-type: none"> ○ Status & Date: AC & 11/28/2018 ○ Lat/Long: 40.840053 / -104.518690 ○ Note: Created Tank Battery to document production equipment for COLORADO ENERGY FEDERAL 14-4 and other wells (RRA/Rick Allison) ○ Form INSP Doc # & Date: 697501963 & 08/26/2020 <p>Status Summary: No Follow Up Inspection Required Findings: 3 Comments, 0 Corrective Actions Inspected Facilities: Tank Battery COLORADO ENERGY FEDERAL TANK BATTERY SEC 14 – ID 459260 Inspection Status: RI - Interim Reclamation and Stormwater Inspection Inspection Date & Inspector: 08/26/2020 by Chris Binschus COGCC Comments: This is an Interim Reclamation and Stormwater Inspection of the Tank Battery which is associated with API# 05-123-36881 – Well MARY KANODE #11-3. At the time of inspection, there were no reclamation issues observed. Operator is in process of decommissioning the tank battery which is associated with MARY KANODE #11-3 well. Operator submitted a Notice of Intent to</p>

	<p>Abandon (Form 6 Doc # 402415828) the well. A Bradenhead Test Report has been submitted (Form 17 Doc # 402466439). At the time of this inspection, no erosion issues were observed.</p> <p>Attachment: Inspection photos Doc # 697501964</p> <ul style="list-style-type: none"> ○ Note: The Tank Battery is physically located at Location 330368 and the Well referenced in this Inspection Document is located at Location 431982.
COGIS Well Information (Scout Card)	<p>Well Name: COLORADO ENERGY FEDERAL #14-1</p> <p>API#: 05-123-18978</p> <p>FACILITY ID: 251175</p> <ul style="list-style-type: none"> ○ Status & Date: PA & 12/19/2014 ○ Lat/Long As Drilled: 40.8400530 / -104.518960 ○ Form 6 Doc # & Date: 400782527 & 12/23/2015 ○ Form 42 Doc # & Date: 400749203 & 12/10/2014 <p>Purpose: Start of Plugging Operations</p>

COGCC Abbreviations: [Location & Facility Status Codes](#), [Inspection Types & Statuses](#) and [COGCC Help](#).

Audit Key Findings – Designation Land Use Observations

PREVIOUS LAND USE	CURRENT LAND USE
<p>Reference Imagery for Infrastructure:</p> <p>Landsat/Copernicus 2013</p>	<p>Remotely Sensed Imagery:</p> <p>05/25/2023</p>
<p>Designation:</p> <p>Oil & Gas Facility</p>	<p>Designation:</p> <p>Rangeland</p>

The following imagery sources were reviewed during this audit:

EarthExplorer, DRCOG 2002 - 2014, NAIP Imagery 2011, 2013, 2015, 2017, 2019, 2021, ESRI Maxar and Remotely Sensed Imagery Sep 2022

Closure Information

A Final Reclamation and Stormwater inspection of Well COLORADO ENERGY FEDERAL #14-1 at this Location (330368) was conducted on 08/26/2020 in response to a bond release requested. The well was plugged and abandoned on 12/19/2014. Since the operator plugged and abandoned the well on an active Tank Battery location, this Inspection is a Well Release on an Active Location.

A separate, Interim Reclamation Inspection of the Tank Battery ID 459260 reported at this Location (330368) was also conducted on 08/26/2020. The operator is in the process of decommissioning the Tank Battery for API# 05-123-36881 – Well MARY KANODE #11-3 which is reported at Location [431982](#).

Location 330268 is the site of multiple tank batteries for other, non-related Locations within the Pawnee Grasslands area, including a shared, abandoned centralized Tank Battery (GPS coordinates: 40.839987 / -104.518626) serving 3 Locations: [330782](#), [330783](#), and [330784](#).

Site Photo

Site Investigation and Photos Date

06/26/2024

Cardinal directional photos of the site.



North



East



South



West

ATTACHMENTS

Reclamation Plan

Site Specific Reclamation Plan
Soil Analytical Spreadsheet
Ward Laboratory Analysis
Forest Service Seed Mix

Maps and Figures

Area Maps

Current Site Overview
Reclaim Area
Fence Removal

SITE-SPECIFIC RECLAMATION PLAN



Permit Closure Type – Final

Failed Reclamation Inspection

Site Description

Name	COLORADO ENERGY FEDERAL-610N64W/14NWNW
Location ID	330368
Operator / #	HIGHPOINT OPERATING CORPORATION / 10071
Field	PAWNEE PIONEER 67805
County, State	WELD, CO

Report Date

30 Jan 2025 - Revision

27 Nov 2024

Site Evaluation

Investigator: Soil Sage

Investigation Date: 26 Aug 2024

Previous Investigation Date: 30 May and 6 Jun 2023

Reference Soil Information: The Pawnee area contains six primary soil types and three secondary soil types.

Primary Map Units

- MU 32 – Kim-Mitchell Complex
 - This soil is formed from calcareous loamy alluvium and/or colluvium. Landform is plains, alluvial fans, and fans, with the Loamy Plains Ecological Site. Soils are well drained with a high-water holding capacity, and slope 6 to 9 percent.

Secondary Map Units

- MU 62 – Stoneham Fine Sandy Loam
 - This soil is formed from calcareous loamy alluvium. Landform is plains, with the Loamy Plains Ecological Site. Soils are well drained with a moderate water holding capacity, and slope 6 to 9 percent.

Soil chemical properties within the rooting zone to 50 inches is described in the Soil Properties – USDA Soil Properties section of this report.

Current Land Use in Reference Area: Range land

Observations

Overall, for the Pawnee cluster the site is on federal land with cattle grazing rights. Intermixed with wildlife grazing. The road system is currently being used.

Weed pressure within the extent and along the roads and at each site.

Fences remain at this location 330368.

Site Soils

During the field investigation, Soil Sage collected soil samples from 0-8 inches within the reclamation area. These soils were analyzed to establish current soil physicochemical properties for reclamation planning. See spreadsheet attachment Table 1 for site specific soil characterizations, that include the previous soil analysis and the associated reference soils. Reference USDA Soils and Ecological Site Description for historical properties.

Site Specific Soil Characterization Data

Sample Dates: 26 Aug 2024

Previous Sampling Dates - 30 May and 6 Jun 2023

Soil Analytical Summary

The soil sampling design was based upon the reclamation extent within the disturbance boundary.

Summary of the analytical soil results for the recent sampling and the previous analytical soil results for the Site.

Physical and Chemical Properties for the topsoil and subsoil

Depth inches	Texture	pH	EC	OM %	SAR
Topsoil 8	Clay	7.6	1.6	2.9	10.1
Previous Site Topsoil 12 (avg)	Clay	7.9	1.2	3.9	58
Reference 6 Topsoil 12 (avg)	Clay	7.9	0.32	3.2	0.65

Plant Available Chemical Properties for topsoil and subsoil

Depth inches	Nitrogen (N) ppm	Phosphorus (P) ppm	Potassium (K) ppm	N Lbs/A
Topsoil 8	24	28	798	58
Previous Site Topsoil 12 (avg)	32	29	817	6
Reference 6 Topsoil 12 (avg)	2	8	645	4

Plant Nutrients Salts topsoil and subsoil

Depth inches	Sodium (Na) ppm	Chloride (Cl) ppm	Sulfates (S) ppm
Topsoil 8	1174	76	14
Previous Site Topsoil 12 (avg)	604	3.3	19
Reference 6 Topsoil 12 (avg)	64	1.8	6

This site has elevated values for Electric Conductivity (EC) and Sodium Absorption Ratio (SAR*), which is indicated by the elevated concentration of Sodium. SAR values that approach and exceed 1, indicate the presence of naturally occurring salts or the accumulation of salts based on other factors.

In addition, the analysis performed at the laboratory identified the presence of two additional salts – Chloride and Sulfate. These salts at elevated concentrations, typically above 100 ppm, can impede plant growth depending on environmental conditions, previous land use activities and other soil properties.

*Sodium Adsorption Ratio - SAR is a measure of the ratio of sodium (Na⁺) relative to calcium (Ca²⁺) and magnesium (Mg²⁺) in the water extract (solution phase) from a saturated soil paste.

Vegetation

Site vegetation observations took place in Aug within the reclamation extent. Weeds are the primary vegetation during the site visit.

Weeds

Weed Summary

Common Name	Weed List Type
Field Bindweed	List C
Buffalo Bur	Common
Cheatgrass (Previous)	List C
Puncturevine (Previous)	List C
Kochia (Previous)	Common
Lambs quarter/unknown (Previous)	Common

Weed Inventory Criteria

- Each site is accessed for noxious weeds and common weeds
- Data are aggregated using point locations coupled with percent cover assessments and area measurements as needed
- Governance - Colorado Department of Agriculture - Colorado Noxious Weeds List, effective October 2020
- List A - Designated for eradication, List B - Designated to stop the continued spread, List C - Facilitate more integrated effective weed management, Watch List - Determined to pose a potential threat to agriculture and natural productivity.
- Common - designates weeds that do not fall within the Colorado Department of Agriculture lists
- Other - designates other identified weeds at the site

Site Characteristics

Soil/Erosion

Exposed soils have moderate susceptibility to water erosion and are in the moderately susceptible group for wind erosion due to ecosystem dynamics and vegetative cover.

Summary Acreage Table

Description	Acres
Total Disturbance Extent	3
○ Reclaim Extent	3
○ Road*	1.22

Total Disturbance Extent includes the outer road to the north of the facility.

*Road – road remains active consult USFS.

Site Recommendation and Re-Evaluation

Replacement Soil Requirements

Texture: Clay Loam

Organic Matter: 3%

pH: 7.7 - 7.9

Nitrate N: less than 11 ppm

Sodium: less than 90 ppm

Chloride Cl: less than 10 ppm

Sulfate S: less than 18 ppm

Soil tests must be submitted to Luke Kelly (lkelly@civiresources.com) and Sam Streeter (sam@soilsage.com) for approval prior to use on the project. Certified Weed Free Straw must be used, and evidence must be supplied to Luke Kelly and Sam Streeter. Soil Sage will be performing inspections during reclamation activities and after work is complete to ensure success. Schedule of reclamation activities (approximate) must be submitted before reclamation starts and any changes to the schedule must be communicated via email to Luke Kelly and Sam Streeter.

Seed Mix

Vegetation Seed Mix

Forest Service has provided a seed mix to Civitas.

Seed mix included in the attachment section.

Soil Amendments

New soil specifications are outlined above.

Application of soil amendments for this prairie ecosystem will be limited to UREA (46-0-0) 50 lbs./acre for plant establishment.

Reclamation Activities and Notes:

Site

- Continuous bare ground on pad
- Removal of soil up to 14 inches due to salt concentration exceed reference soils.
- Removal of soils up to 24 inches within the previous tank battery extent
- Replace soils, decompact, disc, seed, and crimp straw. Use USFS seed mix that is adjusted to work with the entire site
- Spray for pre-emergent herbicide
- Remove fence

Road

- Remains active contact USFS

Reclaim Area Protocol

Step	Description	Complete Date
1 – Soil Samples	Collection of soil samples from the site	26 Aug 2024
2 – Remove Exclusion Fence	Removal of fences as per reclamation plan	Week of April 1, 2025
3 – Soil Removal to Mapped Extent	Removal of non-compliant soil to defined boundaries. 24 inches within the subset boundary box and 14 inches for the remaining extent.	Week of April 1, 2025
4 – Soil Removal Inspection	In-person inspection and confirmation with soil sampling	Week of April 1, 2025
5 – Imported Soil Sample Test Results Review*	Verification of imported soil with current lab test results	Week of April 7, 2025
6 – Soil Import	Import soil as specified in the plan	Week of April 14, 2025
7 – Seeding	Planting appropriate seed mix for reclamation 20 PLS/sq ft	Week of April 28, 2025
8 – Straw Spread and Crimp	Spreading and crimping straw to stabilize soil apply 2 tons/acres	Week of May 5, 2025
9 – Monitor	Continuous monitoring post reclamation	2025 -2027
10 – Weed Management	Monthly monitoring is recommended with appropriate herbicide control	Jun 9 – Oct 6, 2025

*Soil Import Properties – reference Soil Replacement Requirements

Site Photos – Soil 1 – 330368

Lat/Long: 40.84031 / -104.51901

Nearest Facility #: 3303368

Date: 6 Jun 2023

Photo locations correspond with the overview map.






Site Photos – Vegetation Observation – 330368

Lat/Long: 40.840316, -104.519033

Nearest Facility #: 330368

Date Range: 26 Aug 2023

	
<p>Vervain (<i>Genus Verbena</i>)</p>	<p>Buffalo-bur (<i>Solanum rostratum</i>) and Thymeleaf Sandmat (<i>Euphorbia serpillifolia</i>)</p>
	
<p>Field Bindweed (<i>Convolvulus arvensis</i>) List C</p>	<p>Buffalo-bur (<i>Solanum rostratum</i>)</p>

Site Photos – Soil 1 – 330368

Lat/Long: 40.84031 / -104.51901

Nearest Facility #: 3303368

Date: 6 Jun 2023

Photo locations correspond with the overview map.



Site Photos – Vegetation Observation – 330368

Lat/Long: 40.840316, -104.519033

Nearest Facility #: 330368

Date Range: 26 Aug 2023




	
<p>Vervain (<i>Genus Verbena</i>)</p>	<p>Buffalo-bur (<i>Solanum rostratum</i>) and Thymeleaf Sandmat (<i>Euphorbia serpillifolia</i>)</p>
	
<p>Field Bindweed (<i>Convolvulus arvensis</i>) List C</p>	<p>Buffalo-bur (<i>Solanum rostratum</i>)</p>

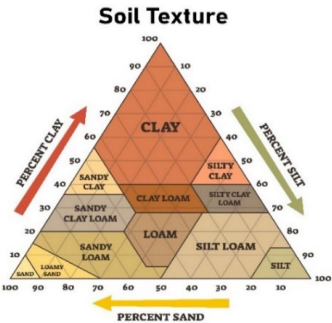
TABLE 1: Soil Report

Client	Civitas	Date	26-Aug-24
Operator	Bonanza Creek	Ward	20240903
Location ID - Name	Pawnee		
Type	Location Topsoil replacement		



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Soil Profile				Physical Properties			
				Partical Size			
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	Sand %	Silt %	Clay %	Texture Hydro
CIV-330368-SOIL 1	0	8	8	34	22	44	Clay
CIV-330502-SOIL 2	0	8	8	46	24	30	Sandy Clay Loam
CIV-330688-SOIL 3	0	8	8	54	18	28	Sandy Clay Loam
CIV-330782-SOIL 4	0	8	8	44	20	36	Clay Loam
CIV-330783-SOIL 5	0	8	8	44	18	38	Clay Loam
CIV-330784-SOIL 6	0	8	8	54	16	30	Sandy Clay Loam
CIV-431982-SOIL 7	0	8	8	44	18	38	Clay Loam



Soil Profile				Chemical Properties					Calcium Carbonate	
				pH	ECe	CEC	Excess Lime	Organic Matter	SAR	%
				Sat Paste	mmhos/cm	meq/100g		(LOI) %		
CIV-330368-SOIL 1	0	8	8	7.6	1.58	52.6	HIGH	2.9	10.1	2.1
CIV-330502-SOIL 2	0	8	8	7.2	2.08	39.9	HIGH	2	1.4	1.5
CIV-330688-SOIL 3	0	8	8	7.3	1.96	44.2	HIGH	2	1.4	2.9
CIV-330782-SOIL 4	0	8	8	6.9	1.43	23.2	LOW	1.8	0.8	0.1
CIV-330783-SOIL 5	0	8	8	7.4	1.22	50.8	HIGH	2.6	1.1	6.6
CIV-330784-SOIL 6	0	8	8	7.5	1.16	47.4	HIGH	1.8	1.3	3.6
CIV-431982-SOIL 7	0	8	8	7.4	1.23	39.2	HIGH	3.1	0.6	0.8
ECMC Table 915-1				6-8.3	<4				<6	

Soil Profile				Extraction Method			
				KCL	M3	NH4OAc	
				Phosphorus	Potassium		
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	Nitrate-N	P	K	Nitrate - N
				ppm	ppm	ppm	Lbs/A
CIV-330368-SOIL 1	0	8	8	24.2	28	798	58
CIV-330502-SOIL 2	0	8	8	67.4	32	541	162
CIV-330688-SOIL 3	0	8	8	35.4	87	329	85
CIV-330782-SOIL 4	0	8	8	46.6	26	363	112
CIV-330783-SOIL 5	0	8	8	46.8	30	541	112
CIV-330784-SOIL 6	0	8	8	38.2	13	580	92
CIV-431982-SOIL 7	0	8	8	44.2	20	712	106

Plant Available													
Soil Profile				NH4OAc	NH4OAc	NH4OAc	Hot Water	Ca-NO3	M3	AB-DTPA	Iron	Manganese	Zinc
Location	Top Depth (in)	Bottom Depth (in)	Soil Thickness (in)	Calcium Ca	Magnesium Mg	Sodium Na	Boron B	Chloride Cl	Sulfate S	Copper Cu	Fe	Mn	Zn
				ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
CIV-330368-SOIL 1	0	8	8	8408	411	1174	5.83	76	14.3	0.43	1.1	1.7	0.35
CIV-330502-SOIL 2	0	8	8	7035	351	96	0.57	45.8	25.8	0.33	2	2	0.26
CIV-330688-SOIL 3	0	8	8	7453	668	125	1.01	36.6	108	0.62	5.9	2.5	2.17
CIV-330782-SOIL 4	0	8	8	3757	394	54	0.35	16.6	15.2	0.45	2.7	2.8	0.33
CIV-330783-SOIL 5	0	8	8	9125	404	91	0.89	18.7	16.6	0.31	1.2	1.8	0.95
CIV-330784-SOIL 6	0	8	8	8517	348	91	0.4	15.4	11.3	0.21	1.1	1	2.15
CIV-431982-SOIL 7	0	8	8	6744	413	54	0.48	24.2	14.1	0.32	1.3	1.3	0.31
ECMC Table 915-1							2						

SOIL REPORT

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Terms Defined

pH	A measure of the acidity or basicity (alkalinity) of a soil. pH is defined as the negative logarithm (base 10) of the activity of hydronium ion in a solution
ECe	The Electrical Conductivity of a saturated soil Extract that measures salinity
Alkalinity	Alkalinity indicates a solution's power to react with acid and buffer its pH - the power to keep its pH from changing. The higher the Alkanility, the higher the buffering capacity against pH change.
CEC - Cation Exchange Capacity	The measure of how many cations can be retained on soil particle surfaces.
CEC Ranges	
Range 11-50	High Clay, more lime to correct a given pH, greater capacity to hold nutrients, physical effects of high clay content, high water-holding capacity
Range 1-10	High Sand, Nitrogen and potassium leaching, less lime to correct a given pH, physical effects of high sand content, low water-holding capacity

Optimal pH range for plant growth

6.0 -7.0

Reference Key

Low
Medium
High
Optimal
Neutral
No Reference
Analytical Error

Typical Soil Concentrations sufficient for plant growth

Element	Symbol	mg/kg	percent	Relative number
		ppm		of atoms
Nitrogen	N	15,000	1.5	1,000,000
Potassium	K	10,000	1	250,000
Calcium	Ca	5,000	0.5	125,000
Magnesium	Mg	2,000	0.2	80,000
Phosphorus	P	2,000	0.2	60,000
Sulfur	S	1,000	0.1	30,000
Chlorine	Cl	100	--	3,000
Iron	Fe	100	--	2,000
Boron	B	20	--	2,000
Manganese	Mn	50	--	1,000
Zinc	Zn	20	--	300
Copper	Cu	6	--	100
Molybdenum	Mo	0.1	--	1
Nickel	Ni	0.1	--	1

Notes

Root Formation
Chlorophyll Formation
Proteins & NPK Uptake
Chlorophyll catalyst
Absorption Calcium
Photosynthesis & Respiration - correlated with %OM
Fixation of Organic Nitrogen

Source: E.Epstein, 1965

Ag Testing - Consulting

Account No. : 19356

Soil Analysis Report

DANIELS, JUDY
SOIL SAGE LLC
8323 DEPEW WAY
ARVADA

CO 80003

Invoice No. : 1430856
Date Received : 08/29/2024
Date Reported : 09/03/2024

Results For : CIV
Location : PAWNEE

Lab No. : 90062 Depth : 0 - 8
ID : CIV-330368-SOIL 1

1:1 Soil pH	8.8
Soluble Salts 1:1, mmho/cm	0.43
Excess Lime Rating	HIGH
Organic Matter LOI, %	2.9
Nitrate-N KCl, ppm N	24.2
Nitrate-N, lbs N / Acre	58
Phosphorus M3, ppm P	28
Potassium NH ₄ OAc, ppm K	798
Sulfate M-3, ppm S	14.3
Zinc DTPA, ppm Zn	0.35
Iron DTPA, ppm Fe	1.1
Manganese DTPA, ppm Mn	1.7
Copper DTPA, ppm Cu	0.43
Calcium NH ₄ OAc, ppm Ca	8408
Magnesium NH ₄ OAc, ppm Mg	411
Sodium NH ₄ OAc, ppm Na	1174
Chloride Ca-NO ₃ , ppm Cl	76.0
Boron Hot Water, ppm B	5.83
Calcium Carbonate, %	2.1

Sum of Cations, me/100g	% Saturation				
	H	K	Ca	Mg	Na
52.6	0	4	79	7	10

Saturated Soil Paste Analysis (SAR)

Saturation, %	50
Sat Paste pH	7.6
Sat Paste ECe, mmho/cm	1.58
HCO ₃ , ppm	235
Cl, ppm	159
Ca, ppm	42
Mg, ppm	9
Na, ppm	274
S, ppm	24.5

Reviewed By : Nick Ward

9/6/2024

Copy : 1

Page 1 of 14

Account No. : 19356

Soil Analysis Report

DANIELS, JUDY
SOIL SAGE LLC
8323 DEPEW WAY
ARVADA

CO 80003

Invoice No. : 1430856
Date Received : 08/29/2024
Date Reported : 09/03/2024

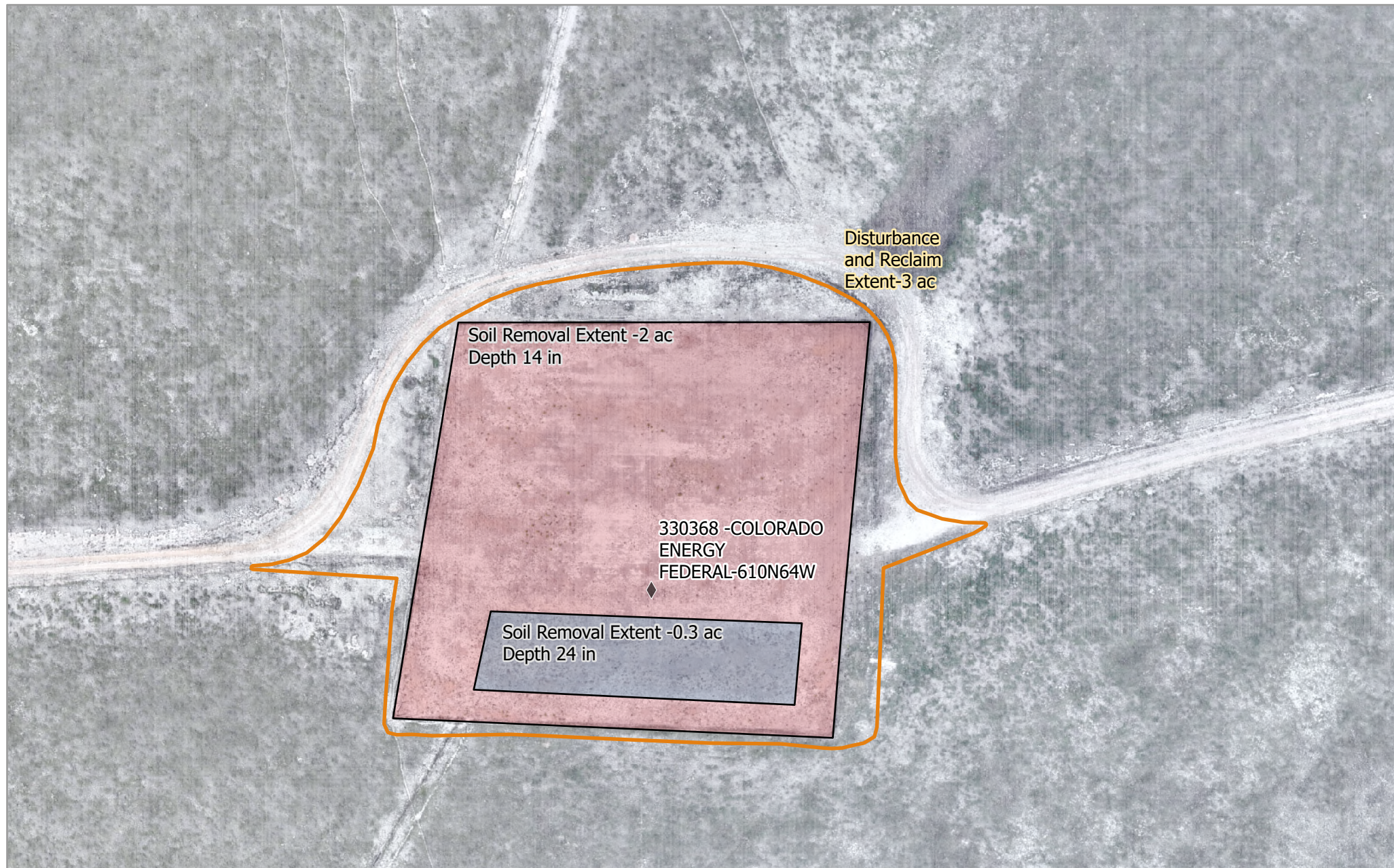
Results For : CIV
Location : PAWNEE

Sodium Adsorption Ratio 10.1

Soil Texture	Sand, %	Silt, %	Clay, %
Clay	34	22	44

Scientific Binomial	Common Name	Season	Seeds/lb	Percent of mix	Total Pounds PLS Per Acre	Variety
<i>Pascopyrum smithii</i>	western wheatgrass	Cool	110,000	0.3	11.88	
<i>Bouteloua curtipendula</i>	side-oats grama	Warm	191,000	0.15	3.42	Butte or Trailway
<i>Buchloë dactyloides</i>	buffalograss	Warm	56,000	0.15	11.67	Cody or Tatanka
<i>Chondrosum gracile</i>	blue grama	Warm	825,000	0.15	0.79	Alma or Hachita
<i>Nassella viridula</i>	green needlegrass	Warm	181,000	0.05	1.20	
<i>Sporobolus cryptandrus</i>	sand dropseed	Warm	5,398,000	0.05	0.04	
<i>Hesperostipa comata</i>	needle-and-thread	Cool	115,000	0.1	3.79	Canbar or High Plains
<i>Cleome serrulata</i>	Rocky Mtn beeplant	NA	65,900	0.03	2.0	
<i>Sphaeralcea coccinea</i>	scarlet globemallow	NA	500,000	0.02	0.17	
			TOTAL	1	34.95	

PLS = Pure, Live Seed



Service Credits -

**CIV - 330368 - Colorado Energy Federal
610N64W/14NWNW**

Map Extent - Reclaim Extent

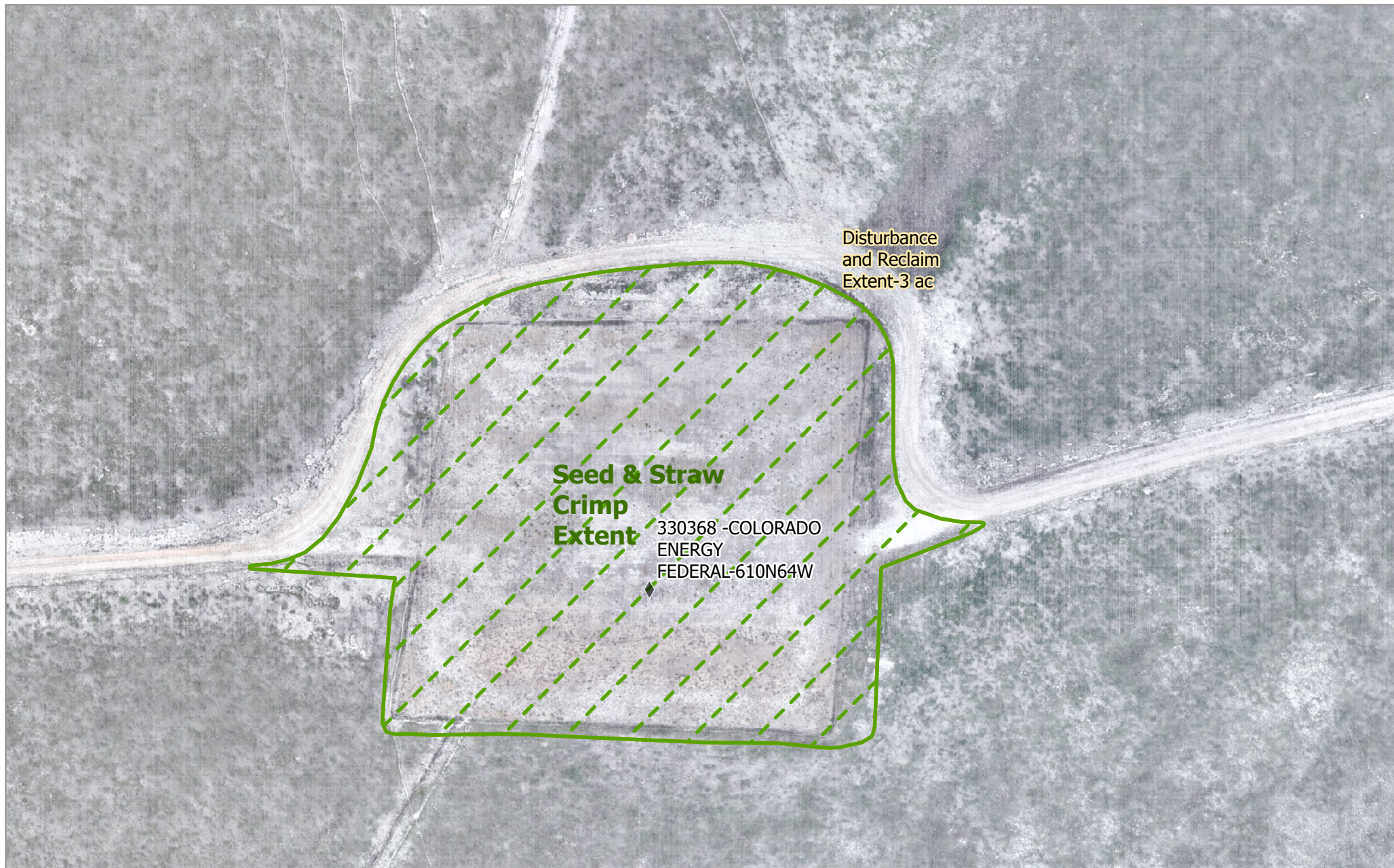
Imagery: RS Orthomosaic & DSM
Imagery Date: 26 Aug 2024
Map Date: 02 Dec 2024
Datum: NAD_1983_UTM_Zone_13N
POC: Soil Sage

- ◆ Oil and Gas Locations
- ▭ Disturbance Boundary
- ▭ Soil Removal & Replace
- ▭ Soil Removal & Replace

0 0.01 0.02 0.04 Miles

Scale: 1:1,096





Service Credits -

**CIV - 330368 - Colorado Energy Federal
610N64W/14NWNW
Map Extent - Reclaim Extent**

Imagery: RS Orthomosaic & DSM
Imagery Date: 26 Aug 2024
Map Date: 02 Dec 2024
Datum: NAD_1983_UTM_Zone_13N
POC: Soil Sage

- ◆ Oil and Gas Locations
- ▭ Disturbance Boundary
- ▭ Seed Boundary

0 0.01 0.02 0.04 Miles

Scale: 1:1,096





**CIV - 330368 - Colorado Energy
Federal 14-1
Map Extent - Remove Fence**

Imagery: RS Orthomosaic
Imagery Date: 26 Aug 2024
Map Date: 09 Sep 2024
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Legend

- ◆ Wells
- Remove Fence



Scale: 1:1,000

Pad Location:
40.840200
-104.518917



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Bureau, USDA, USFWS

