

SITE-SPECIFIC QUALITY ASSURANCE & QUALITY CONTROL AUDIT

Permit Closure Type – Final



PERMIT CLOSURE REPORT – RANGELAND

Location ID 331623

Location Name DOW-LAURA-65N63W/28NENW

Report Date

31 May 2023

Soil Sage has conducted a thorough data audit as part of our Quality Assurance and Quality Control (QA/QC) protocols. The audit revealed this site has gone through a land use change.

Initial Job Assignment

Client	CIVITAS Resources
Work Assignment	CPW Centennial Valley State Wildlife Area Reclamation Report
Date	April 26, 2023

Quality Assurance & Quality Control Audit

Auditor	Soil Sage
Audit Date	05/02/2023

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	DOW-LAURA-65N63W/28NENW		
Location ID	331623		
Operator / #	HIGHPOINT OPERATING CORPORATION / 10071		
Field	WATTENBERG 90750		
County, State	WELD		
Lat/Long	40.376060 / -104.442790		
	Planned Location	X	As Drilled
Facility Status	CL	Location	NENW 28 5N63W
Facility Status Date	12/07/2013	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: 1 of 1 CAs has not been completed</p> <p>Originating Field Inspection Doc # & Date: 697504608 & 04/28/2023</p> <ul style="list-style-type: none"> See "Field Inspection Form" section of this report below for details. <p>Complete COGCC Inspection Search Results: Link</p>		
Sundry Notice (Form 4)	No Form 4s were detected during this QA & QC Audit.		
On Location Flowlines (Form 42)	Form 42s exist for Related Facilities – See individual scout card data for report details.		
Off-Location Flowlines (Form 44)	No Form 44s were detected during the QA & QC Audit.		
Field Inspection Form (Form INSP)	<p>Form INSP Doc # & Date: 697504608 & 04/28/2023</p> <ul style="list-style-type: none"> Status Summary: Follow Up Inspection Required, Corrective Action Required Inspected Facilities: Well DOW-LAURA 3-28 Inspection Status: RI – Reclamation Inspection (Final) Inspection Date & Inspector: 04/20/2023 by Chris Binschus 		

	<ul style="list-style-type: none"> ○ Complaint #: 403379491 ○ Nature of Complaint: CPW (landowner) had concerns about failed reclamation that was previously performed by BONANZA CREEK approximately three years ago. ○ Comments: This inspection only covers the well location. The access road and tank battery are being addressed under a separate inspection (FIR Doc # 697504606) – see Note in the Tank Battery section of this report below for clarification. The well location consisted mostly of weeds with little to no perennial vegetation that is not reflective of reference areas. Due to the lack of desirable vegetation establishment, COGCC is requiring soil sampling. Operator shall take samples along portions of the failed reclamation and background reference samples for comparison. Operator shall take discrete samples at six (6) inches intervals to a minimum depth of two (2) feet. See COGCC Comments Section for details on analytics. Note- Operator may need to install temporary fencing to facilitate on-going grazing operations. ○ Corrective Action: Comply with Rule 1004 to conduct additional reclamation. The corrective action date is the date the location was observed out of compliance. CA Date: 04/20/2023 ○ Overall Final Reclamation: Fail ○ Attachments: Inspection Photos Doc # 697504615
<p>COGIS Tank Facilities Information (Scout Card)</p>	<p>No Tank Battery forms were detected during this QA & QC Audit.</p> <p>However, a review of past Field Inspection Reports for this location revealed GPS coordinates of a crude oil steel tank believed to be associated with this location’s tank battery (nearby to the SE). GPS coordinates: 40.375790 /-104.442540 were detected in Inspection Doc # 674000022. Additionally, a Site Layout (Doc # 1217648) shows the Tank Battery and related production facilities approximately 80 feet to the SE of the wellhead.</p> <p>Note: This location’s Reclamation Inspection Doc # 697504608 states “This inspection only covers the well location. The access road and this tank battery are being addressed under a separate inspection (FIR Doc # 697504606) for Location 331251.” However, based on this audit’s findings, the Tank Battery is not actually the Tank Battery associated with 331251 (which is Location 447290) as stated.</p>
<p>COGIS Well Information (Scout Card)</p>	<p>Well Name: DOW-LAURA #3-28 API#: 05-123-21000</p>

	<p>FACILITY ID: 264041</p> <ul style="list-style-type: none"> ○ Status & Date: PA & 12/07/2013 ○ Lat/Long As Drilled: 40.376060 / -104.442790 ○ Form 6 Subsequent Doc # & Date: 400527149 & 02/06/2014 ○ Form 42 Doc # & Date: 400638465 & 07/02/2014 <p>Purpose: Flowlines Abandoned on 12/16/2013</p>
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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: Landsat/Copernicus 2013</p>	<p>Remotely Sensed Imagery: 05/02/2023</p>
<p>Designation: Oil and Gas Facility</p>	<p>Designation: 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

Landowner Colorado Parks and Wildlife (CPW) filed a complaint on 04/20/2023 stating concerns about failed reclamation activities at the Centennial Valley State Wildlife Area performed by operator BONANZA CREEK ENERGY OPERATING COMPANY LLC approximately three years ago. In response, COGCC Reclamation Specialist Chris Binschus performed a Reclamation Inspection of the area that failed and identified one Corrective Action (CA) requiring the operator to perform soil sampling.

The inspection only covers Well DOW-LAURA #3-28 at this Location (331623). The access road and associated Tank Battery are covered under the Final Reclamation inspection for nearby Location 331251. Note: Despite being written in the failed Final Reclamation inspection, the Tank Battery for 331623 is approximately 80 feet SE of the Well DOW-LAURA #3-28 and not the Tank Battery location (447290) referenced for Location 331251 which is approximately 1280 feet East of the wellhead. The inspection noted the area consisted mostly of weeds with little to no perennial vegetation that is not reflective of reference areas.

Site Photos

Site Investigation and Photos Date

05/02/2023

Cardinal directional photos of the site



North



East



South



West

ATTACHMENTS

Maps and Figures

Location Maps

CPW Overview Soil and Vegetation Locations
CPW Overview Observation Locations
CPW Overview Roads and Reclamation Extents
CPW Overview Reference Extents

Area Maps

Previous Infrastructure Overview
Current Site Overview
Elevation & Contours
Slope
Hydrology
NDVI Composite
NDVI

Reports

Reclamation Report
Soil Analytics
Reference Soil and Vegetation
Observations

Background Information

Natural Resources Conservation Service (NRCS) Map Unit Description

Reference Soil and Ecological Description

SITE-SPECIFIC RECLAMATION PLAN



Permit Closure Type – Final

Failed Reclamation Inspection

Site Description

Name	DOW-LAURA-65N63W/28NENW
Location ID	331623
Operator / #	BONANZA CREEK ENERGY OPERATING COMPANY LLC / 8960
Field	WATTENBERG / 90750
County, State	WELD, CO

Report Date

31 May 2023

Site Evaluation

Investigator: Soil Sage

Investigation Date: 2-4 May 2023

Reference Soil Information: This site is comprised within one soil type, Map Unit 10 - Ellicott-Ellicott sandy-skeletal complex, 0 to 3 percent slopes, sandy texture surface and at depth. These soils are formed from noncalcareous, stratified sandy alluvium. Landform is drainageways, flood plains on intermittent streams. Excessively drained with a very low available water holding capacity. Depth ranges from 0 – 10 inches, the pH is 6.5 and the organic matter is 0.35%.

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

The Northern section is intermixed leased grazing land and “native” ecosystem along the South Platte River. The reclaimed areas have residual gravel and excessive applications of manure which have impacted the recovery of the sites.

Weed pressure has occurred along the roads and patchy areas at each site.

Debris remains along the roads and sites in the form of silt fencing, waddles and oil and gas operational equipment. Reference the observation document for specifics.

Site Soils

During the field investigation, Soil Sage collected soil samples every six inches from 0 – 24 inches within the site and reference locations within the map unit. These soils were analyzed to establish current soil physicochemical properties for reclamation planning. See spreadsheet attachment Table 1 for site

specific soil characterizations and associated reference soils. Reference USDA Soils and Ecological Site Description for historical properties.

Recommendations

Data of Sampling – 2-4 May 2023

Vegetation

Spring vegetation characteristics were present, newly emerging grasses and weeds are the primary vegetation during the site visit.

Ecological Site observations serve as the baseline vegetation cover.

Table represents the present cover observations.

Sample Number	Bare Ground	Grass	Forbs	Shrubs	Litter	Weeds	Field Notes
3	10	20	0	0	70	0	

Weeds

Weed Summary Reference

Common Name	Weed List Type	Percent Cover (%)
N/A		

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 - Designed to stop the continued spread, List C - Facilitate more integrated effective weed management, Watch List - Determined to pose a potential threat to ag 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

Hydrology

Hydrology – Stream Orders 1 – 5 are present - dominant streams are orders are 1, 2 and 3. Order 3 are present in locations that have the potential for soil erosion represented by gullying and riling that follow the elevation gradient from high to low within the current reclaim extent. These could be major runoff areas for gullying and soil erosion with heavy precipitation events.

Ponding - potential ponding can occur where water follows the elevation gradients in low lying area.

Reference Hydrology and Elevation and Contour Maps

Soil/Erosion

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

Summary Acreage Table

Description	Acres
Total Disturbance Extent	0.21
○ Reclaim Extent	0.05
○ Road	N/A
○ Reference Extent	0.20

Total Disturbance Extent includes Well pad and Tank Battery, not the Road.

Reclaim Extent assumes Tank Battery is recovered.

Road is being addressed under Location 331251.

Reference areas are shared and are available in the North Reference Document and Site Overview Reference Map.

Site Recommendation and Re-Evaluation

North Side

Road: 12 inches remove and replace

Pad: 6 inches remove and replace

Replacement Soil

Texture: Sandy Loam

Organic Matter: 1%

pH: 7.0 - 8.3

Nitrate N: less than 50 ppm

Sodium: less than 150 ppm

Chloride Cl: less than 100 ppm

Sulfate S: less than 100 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. On-site access must be coordinated with Colorado Parks and Wildlife (CPW) before work commences. 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

Additional reclamation procedures are recommended at this time.

Sandy Bottomland - Salt Meadow Ecosystems CPW Mix

Common Name	Scientific Name	#PLS/Acre	% of Mix
Alkali Sacaton	<i>Puccinellia distans</i>	4	26.7
Western Wheatgrass	<i>Pascopyrum smithii</i>	4	26.7
Switchgrass	<i>Spartina pectinata</i>	3	20.0
Prairie Cordgrass	<i>Spartina pectinata</i>	2	13.3
Needle and Thread	<i>Hesperostipa comata ssp. comata</i>	2	13.3
Total Mix		15	100.0

NOTE: The seed mix is based on the soil type and landscape position. The surrounding area has similar soil properties, and this seed mix is subject to change based on land use type.

Soil Amendments

New soil specifications are outlined above with NPK and OM recommendations.

Pre-Reclamation Activities and Notes:

- There are active and abandoned midstream assets in both the northern and southern parts of the reclamation area.
- Remove silt fencing, waddles and remaining oil and gas operational equipment.

Reclaim Area Protocol

Time Frame	Activity	Specifications	Site Totals
Prior to Reclamation Activities	Pre-Reclamation	Remove trash, silt fencing, waddles, and oil and gas operational equipment	Refer to the observation document for the area
Spring 2023	Remove and Replace Soil	Texture: Sandy Loam Organic Matter: 1% pH: 7.0 - 8.3 Nitrate N: less than 50 ppm Sodium: less than 150 ppm Chloride Cl: less than 100 ppm Sulfate S: less than 100 ppm	0.05 Acres
	Rip	Deep rip to 18 inches, do not rip below 18 inches. Evidence of seasonably high-water table found as shallow as 18 inches. Do not interact with this layer	
	Disc	Disc the site to a depth of 6.0-inches using a disk and harrow, field cultivator, vibrashank, or another alternative suitable to site conditions	
	Seed	CPW Mix	15 LBS/acre
	Straw	Spread certified weed free straw	2 Tons/acre
	Crimp	Crimp Straw	
Monitoring	Continuous	Site should be monitored post reclamation to ensure success	
Weed Management		Due to the seed bank of cheatgrass, thistle and kochia monthly monitoring is recommended with appropriate herbicide control	

Site Photos – Soil 4

Lat/Long: 40.376068 / -104.442792

Nearest Facility #: 331623

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.



Soil Picture 1



Soil Picture 2 Vegetation at Soil Location

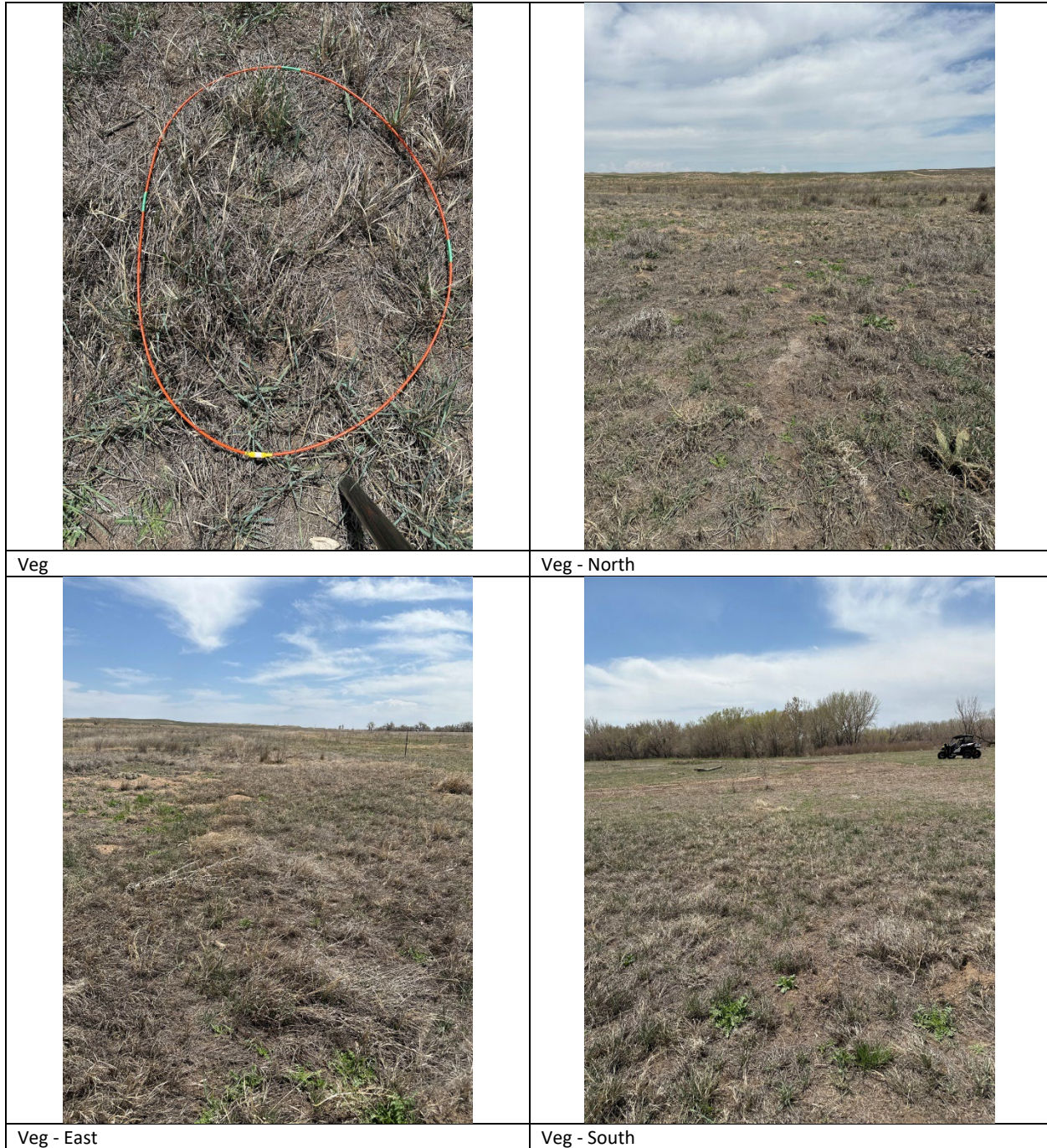
Site Photos – Vegetation 3

Lat/Long: 40.37612 / -104.44286

Nearest Facility #: 331623

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.

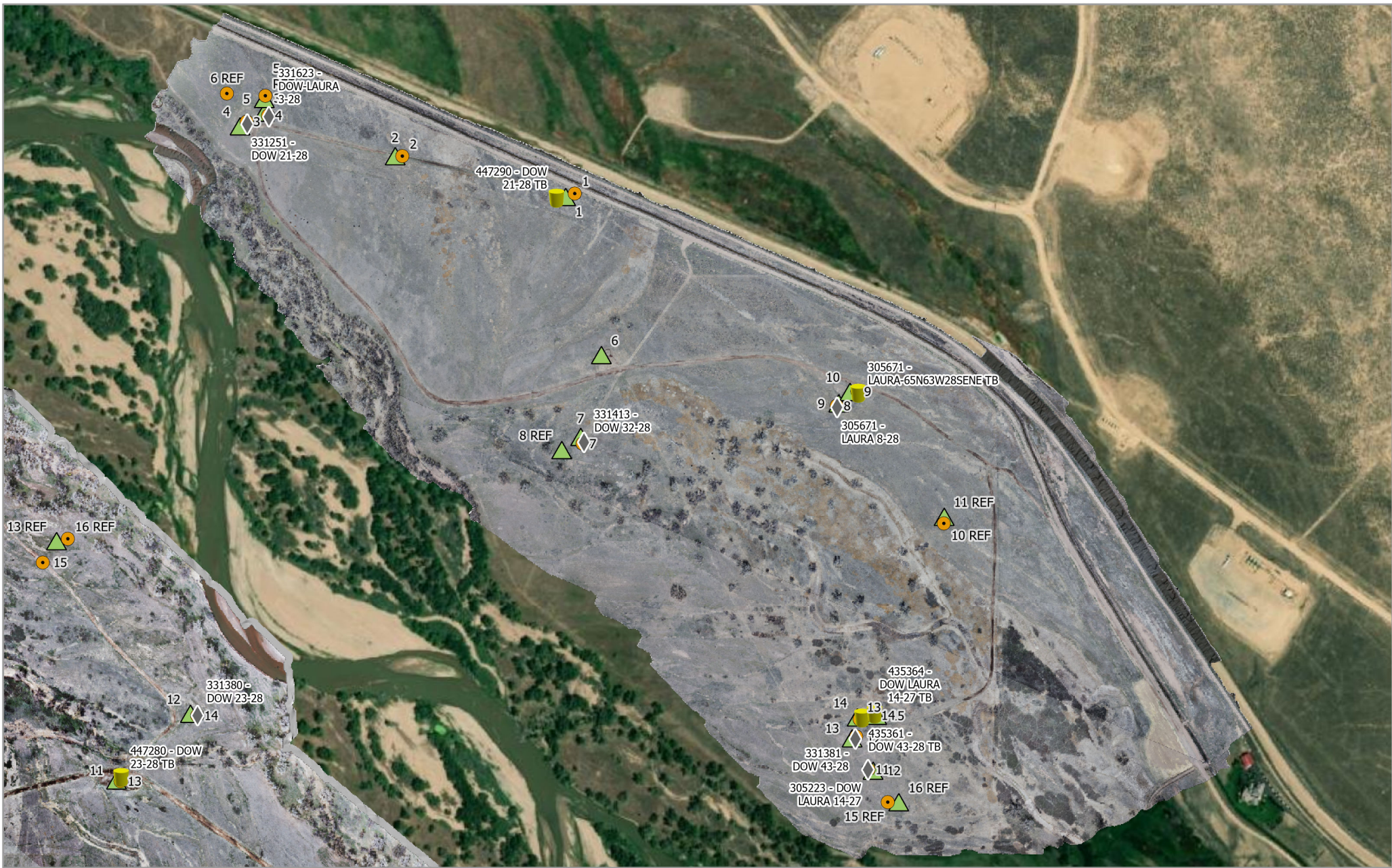




Veg – West



Grass

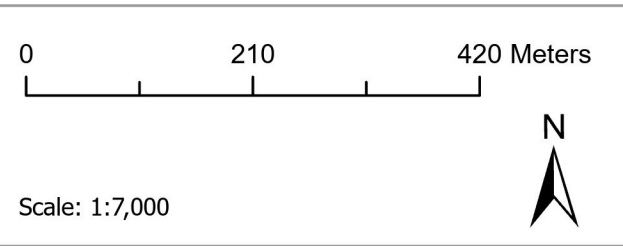


CIV - CPW North Side
Map Extent - Overview Soil & Veg Points

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 29 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

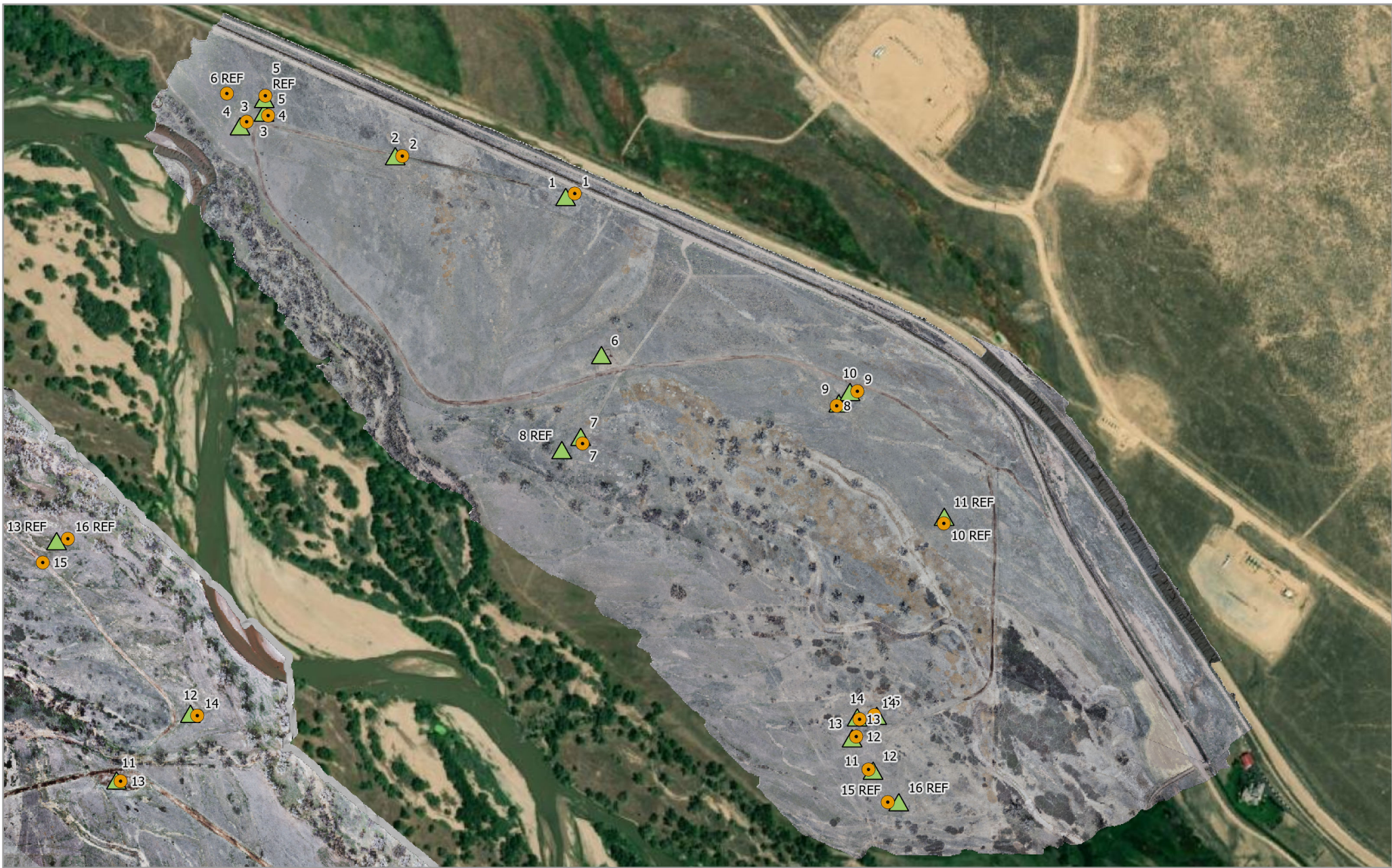
Legend

- ◆ Well
- Tank Battery
- Soils
- ▲ Veg



Service Credits - Maxar



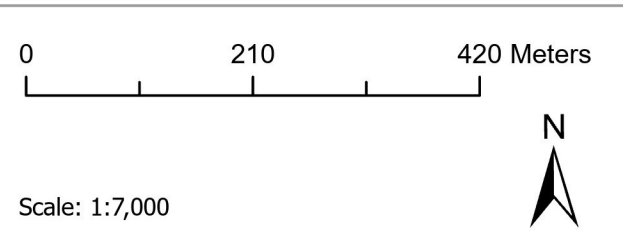


CIV - CPW North Side
Map Extent - Overview Soil & Veg Points

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 29 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

Legend

- Soils
- ▲ Veg



Service Credits - Masar



**CIV - CPW North Side
Map Extent - Overview Observation
Points**

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 29 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

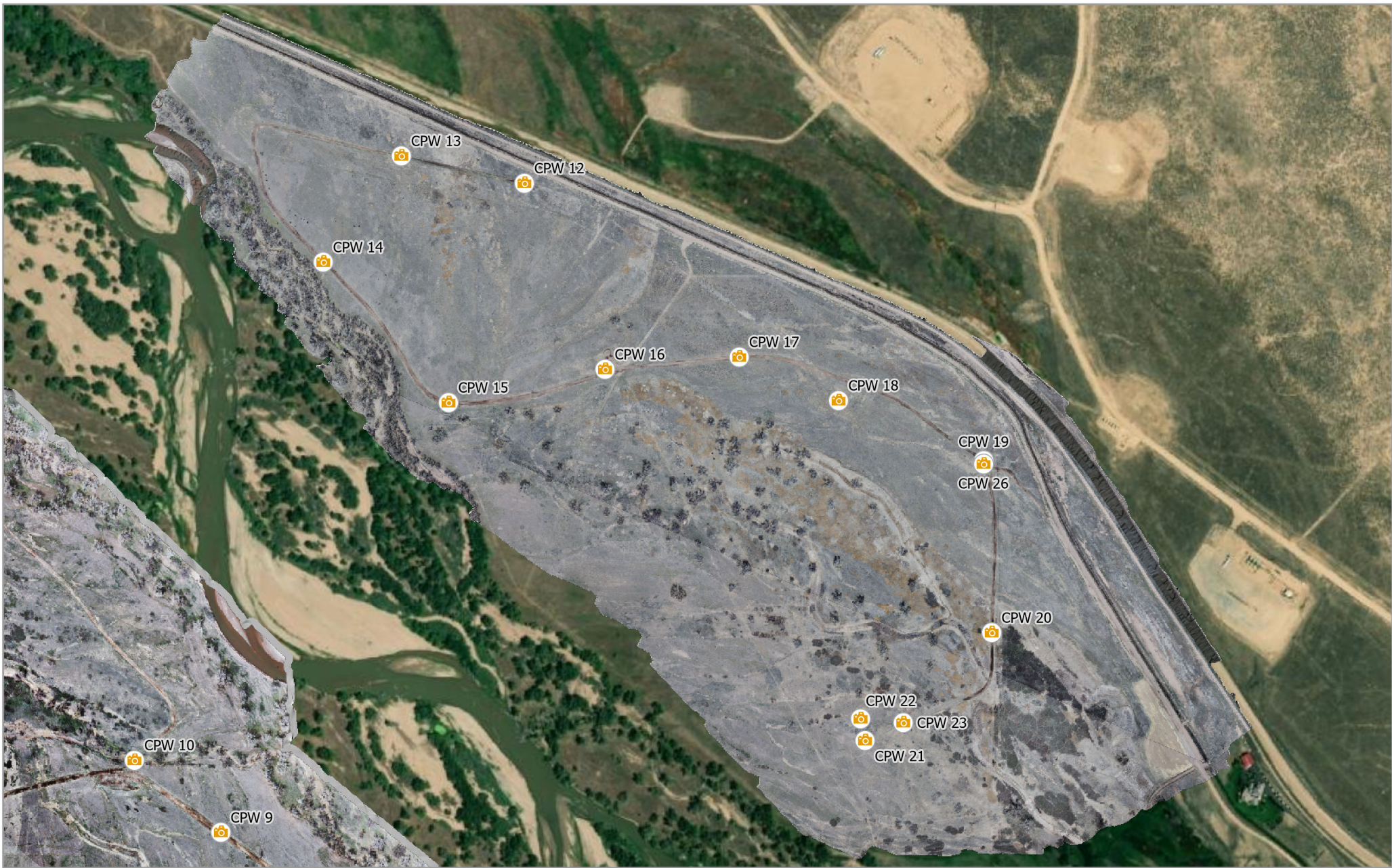
Legend

- ◆ Well
- 🗑 Tank Battery
- 📷 Observations

0 210 420 Meters

Scale: 1:7,000





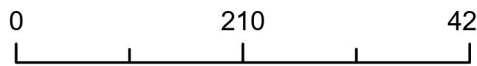
**CIV - CPW North Side
Map Extent - Overview Observation
Points**

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 29 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage


Legend

 Observations

0 210 420 Meters



Scale: 1:7,000



Service Credits - Maxar





Service Credits - Mazar

**CIV - CPW North Side
Map Extent - Overview Reclaim & Road
Reclaim Extent**

Imagery: RS Orthomosaic & DSM
Imagery Date: 2 May 2023
Map Date: 31 May 2023
Datum: WGS 1984 UTM Zone 13N
POC: Soil Sage

Legend

- ◆ Well
- 🛢 Tank Battery
- ▭ Reclaim Extent
- ▭ Road Reclaim

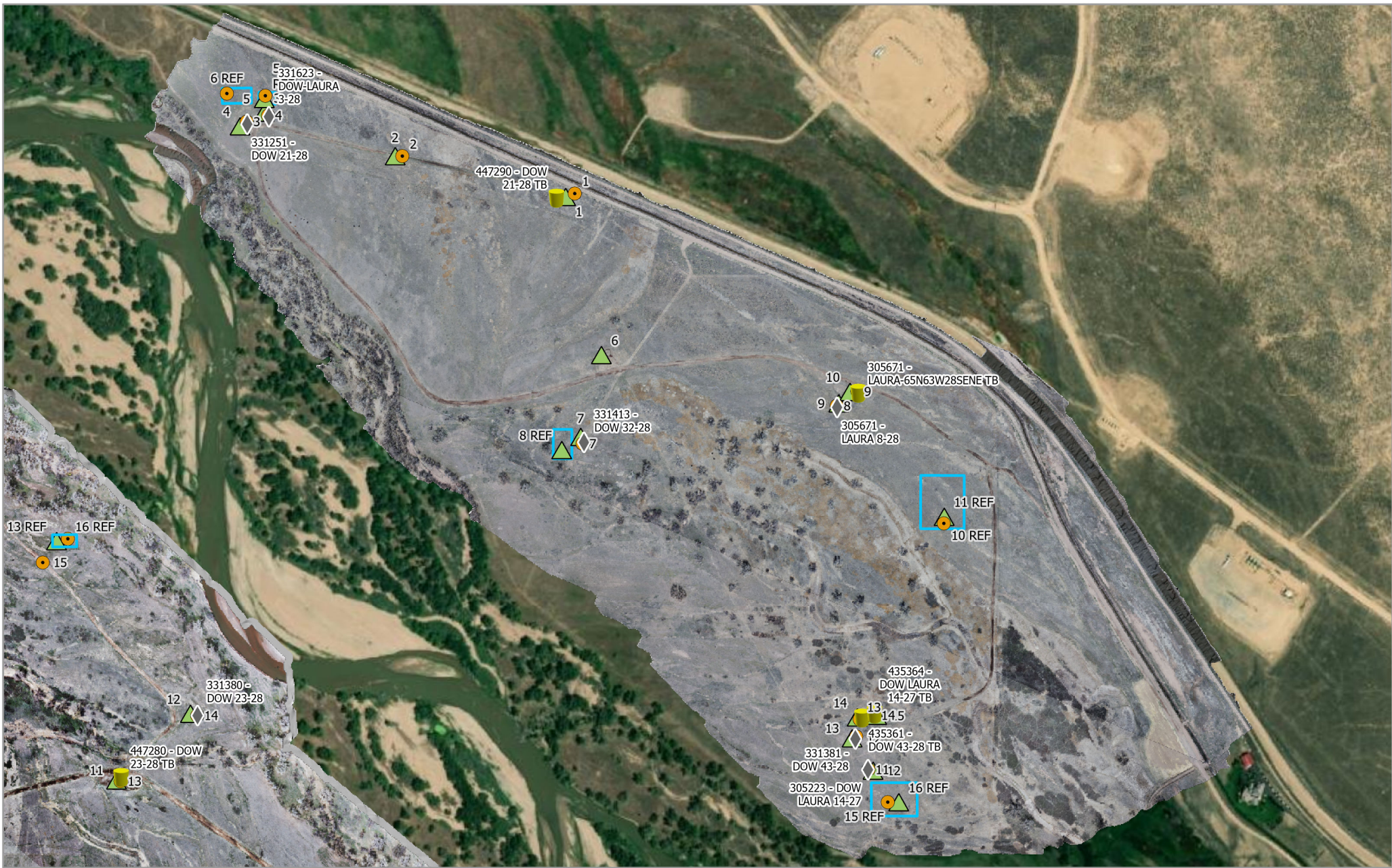
0 210 420 Meters

Reclaim Extent: 3.1 surface Acres
Road: 7 surface Acres including buffer

Scale: 1:7,000

N





CIV - CPW North Side
Map Extent - Overview Reference Extent

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 29 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

Legend

- ◆ Well
- Tank Battery
- Soils
- ▲ Veg
- Reference Extent

0 210 420 Meters

Scale: 1:7,000



Service Credits - Maxar



Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA

CIV - 331623 - DOW LAURA 3-28
Map Extent - Landsat/Copernicus 2013

Imagery: Landsat Copernicus
 Imagery Date: 6 Sep 2013
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

Legend

◆ Well	▭ Reclaim Extent
● Soils	▭ Separator
▲ Veg	▭ Tank Battery
▭ Disturbance Extent	▭ Reference Extent

0 10 20 Meters

Scale: 1:500

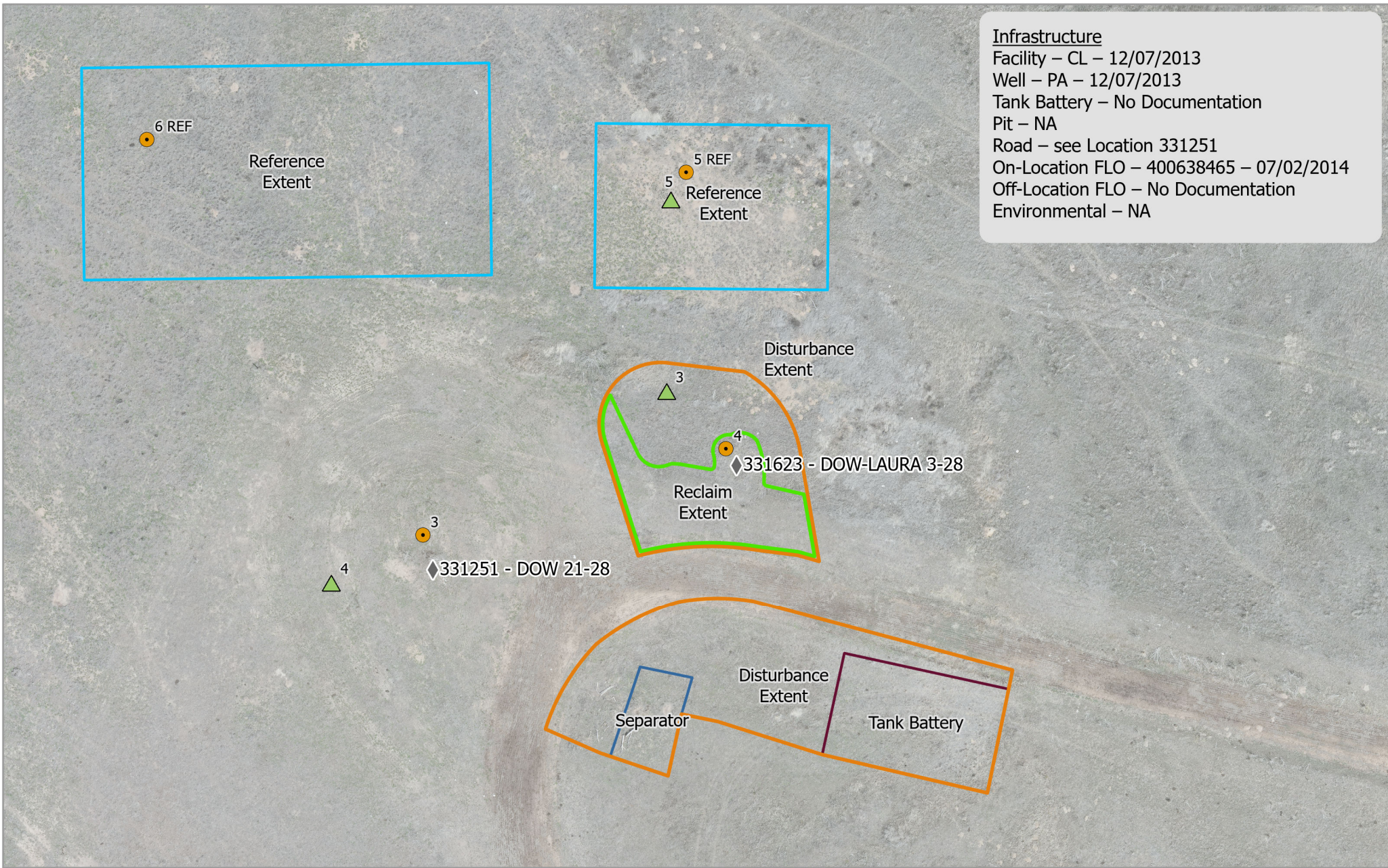
Pad Location:
 40.376060
 -104.442790

N



Service Credits -

Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA



CIV - 331623 - DOW LAURA 3-28
Map Extent - Overview

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

Legend

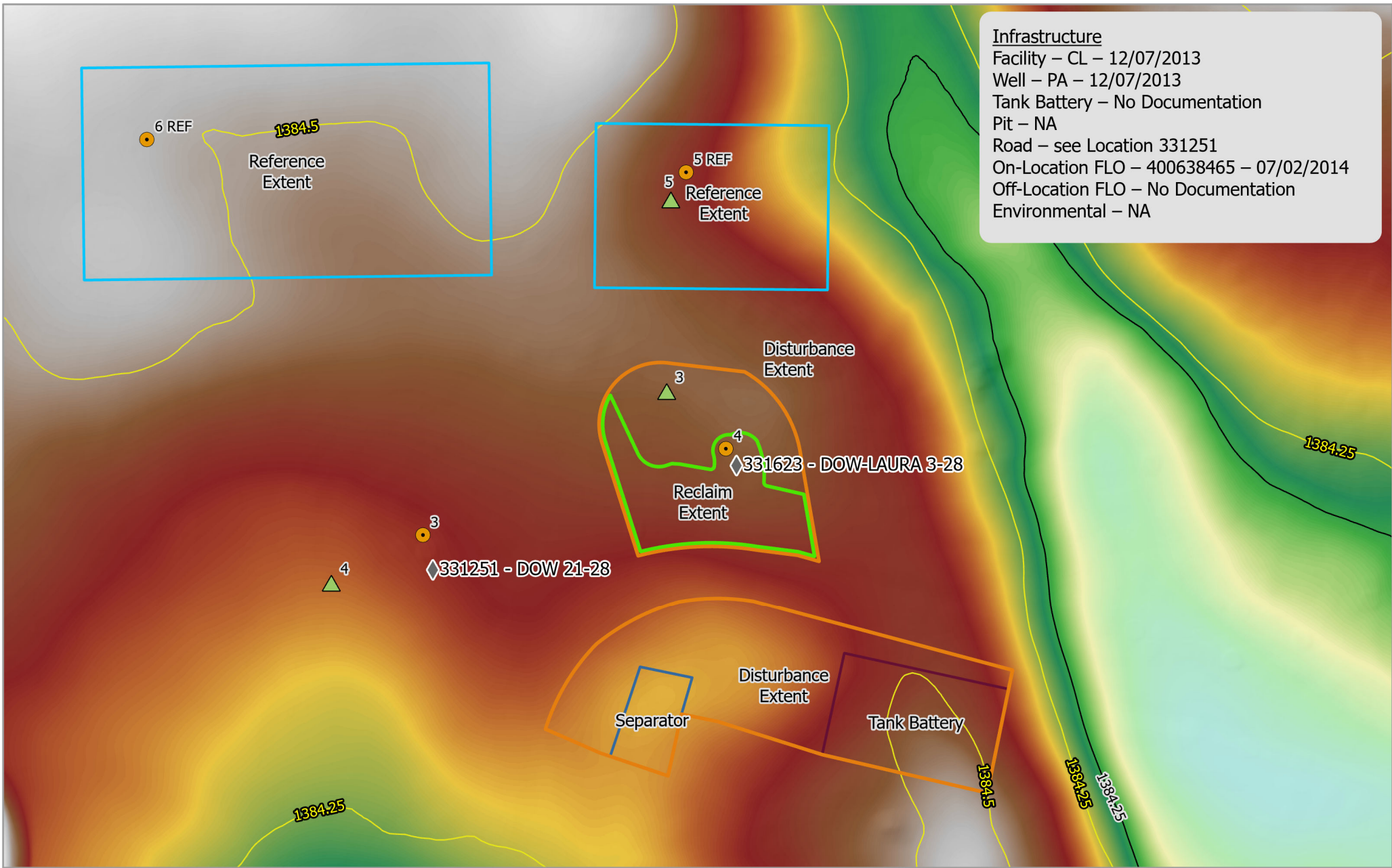
◆ Well	▭ Reclaim Extent
● Soils	▭ Separator
▲ Veg	▭ Tank Battery
▭ Disturbance Extent	▭ Reference Extent

0 10 20 Meters

Scale: 1:500

Pad Location:
 40.376060
 -104.442790





Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA

CIV - 331623 - DOW LAURA 3-28
Map Extent - Elevation & Contours

Imagery: RS DSM, USGS
 Imagery Date: 2 May 2023, 2013
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

◆ Well	▭ Disturbance Extent	Elevation Meters 1404 1369
● Soils	▭ Reclaim Extent	
▲ Veg	▭ Separator	
~ 0.25 m Contours (2013)	▭ Tank Battery	
~ 0.25 m Contours (2023)	▭ Reference Extent	

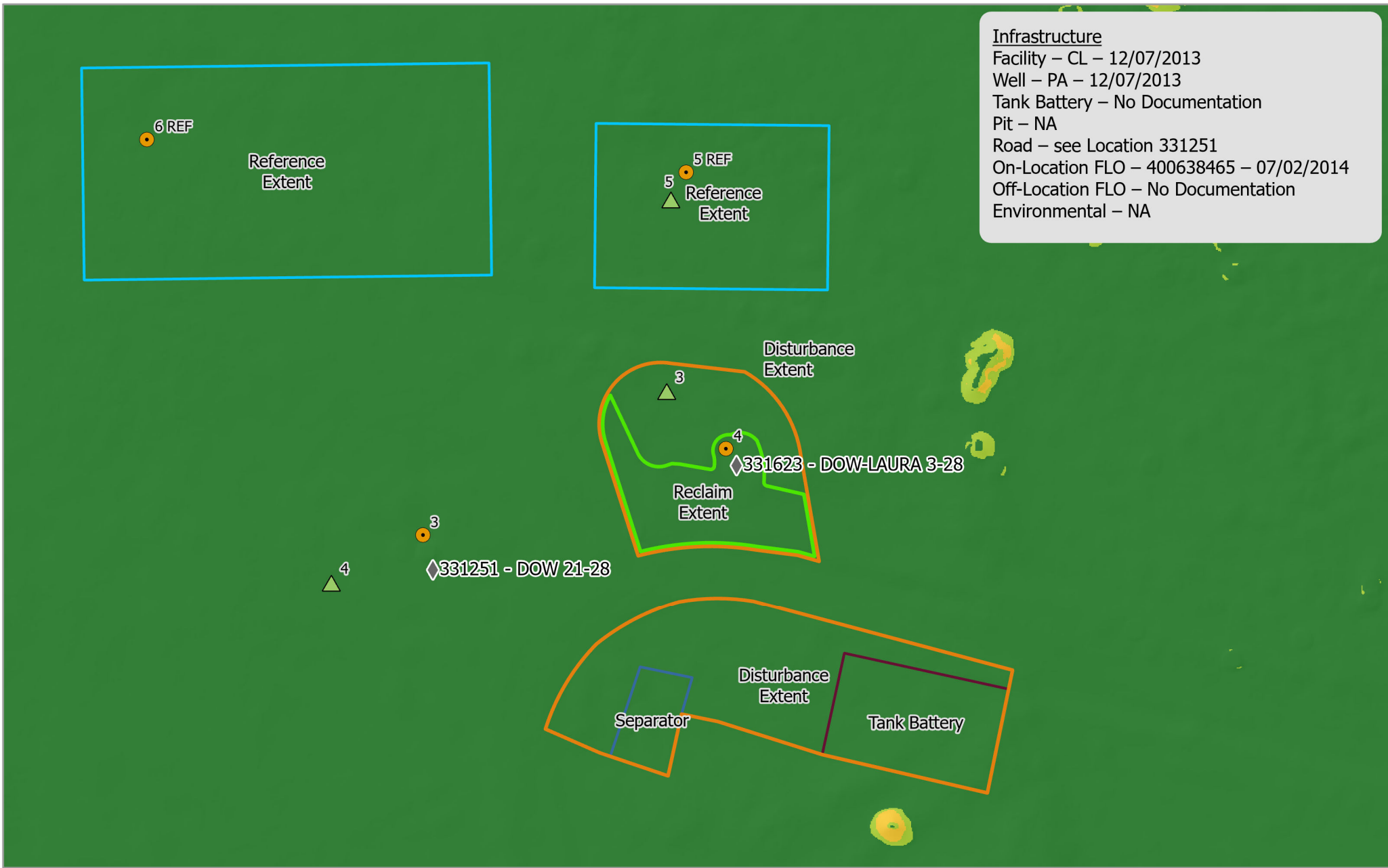
0 10 20 Meters

Scale: 1:500

Pad Location:
40.376060
-104.442790



Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA



CIV - 331623 - DOW LAURA 3-28
Map Extent - Slope

Imagery: RS DSM
 Imagery Date: 2 May 2023
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

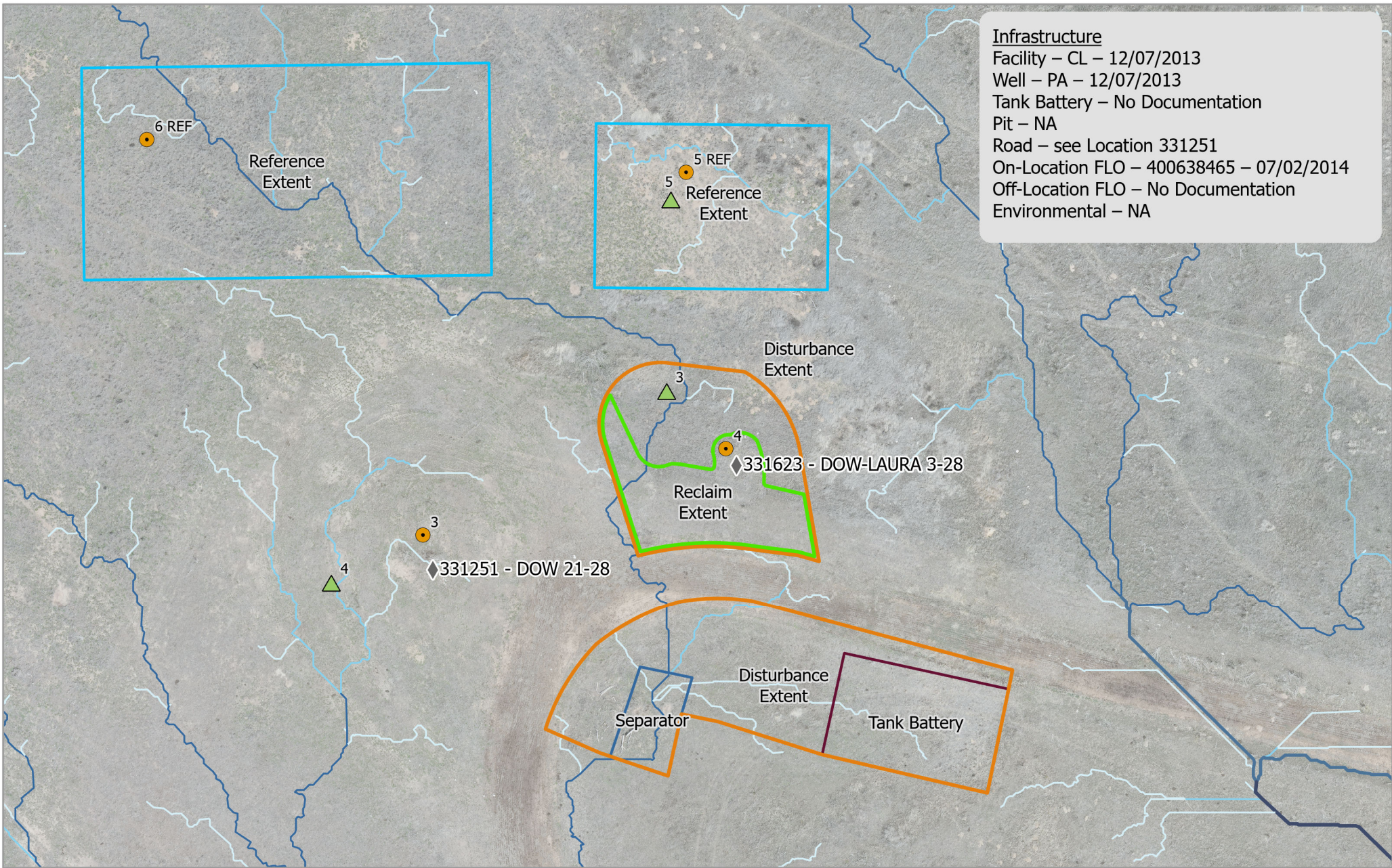
◆ Well	▭ Disturbance Extent	Slope Percent
● Soils	▭ Reclaim Extent	
▲ Veg	▭ Separator	■ <15
	▭ Tank Battery	■ 15 - 30
	▭ Reference Extent	■ 30 - 100
		■ >100

0 10 20 Meters

Scale: 1:500

Pad Location:
 40.376060
 -104.442790





Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA

CIV - 331623 - DOW LAURA 3-28
Map Extent - Hydrology

Imagery: RS Orthomosaic & DSM
 Imagery Date: 2 May 2023
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

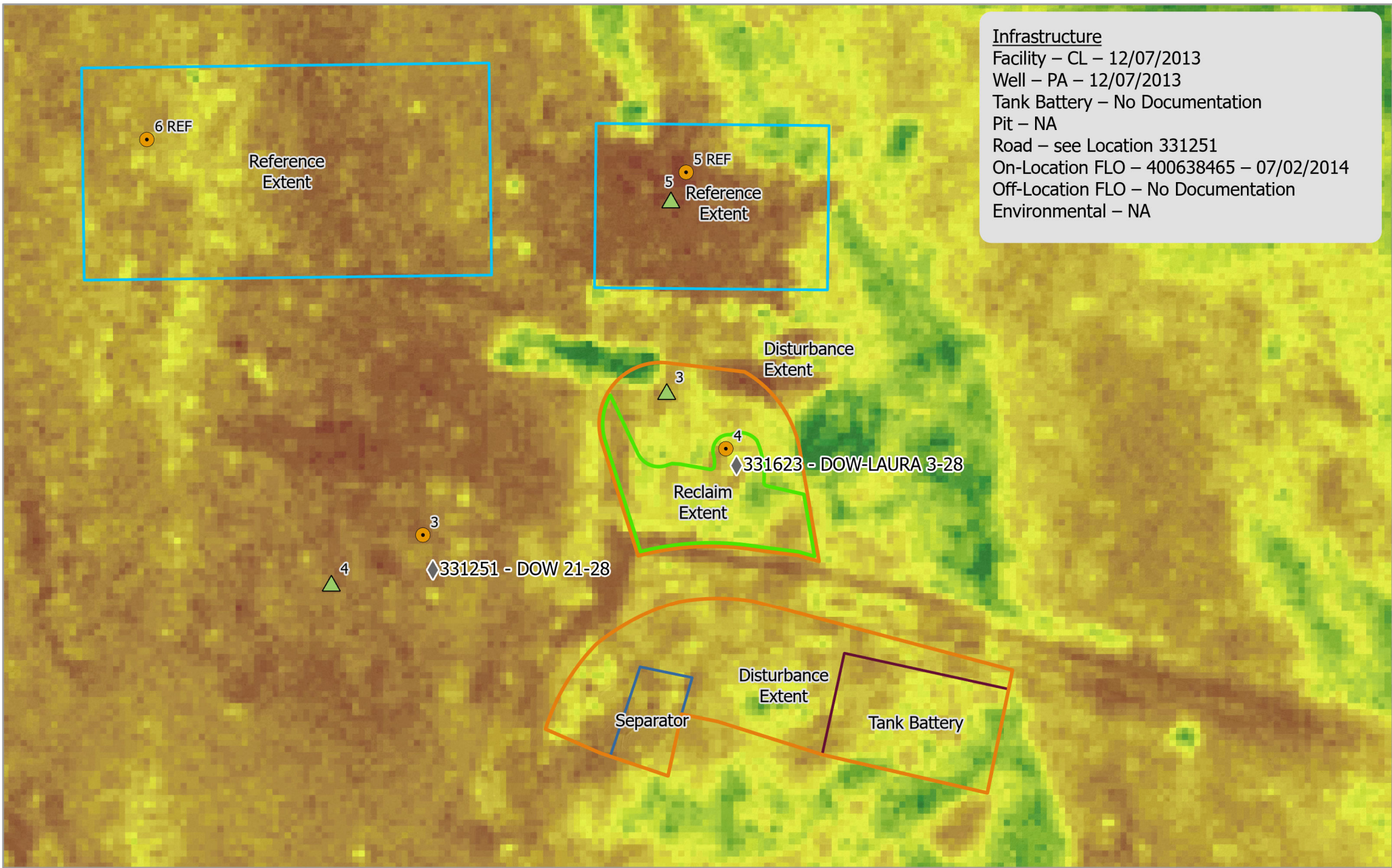
◆ Well	▭ Separator	Stream Order
● Soils	▭ Tank Battery	— 1
▲ Veg	▭ Reference Extent	— 2
▭ Disturbance Extent		— 3
▭ Reclaim Extent		— 4
		— 5

0 10 20 Meters

Scale: 1:500

Pad Location:
 40.376060
 -104.442790





Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA

CIV - 331623 - DOW LAURA 3-28
Map Extent - NAIP NDVI Composite

Imagery: USDA NAIP
 Imagery Date: 2011-2021
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

- ◆ Well
- Soils
- ▲ Veg
- ▭ Disturbance Extent
- ▭ Reclaim Extent
- ▭ Separator
- ▭ Tank Battery
- ▭ Reference Extent

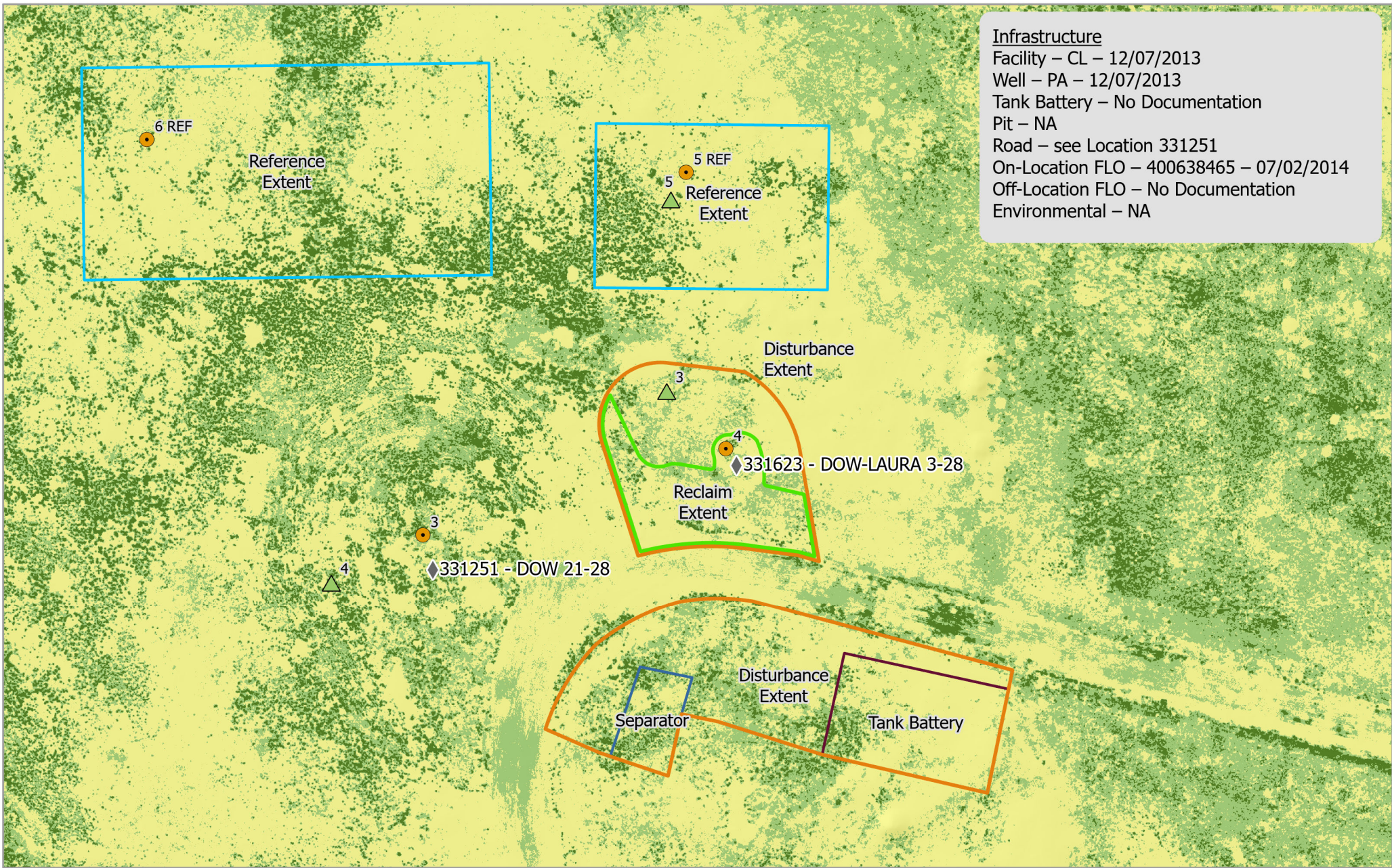
0 10 20 Meters

Scale: 1:500

Pad Location:
 40.376060
 -104.442790

Service Credits - Esri, USDA Farm Service Agency





Infrastructure
 Facility – CL – 12/07/2013
 Well – PA – 12/07/2013
 Tank Battery – No Documentation
 Pit – NA
 Road – see Location 331251
 On-Location FLO – 400638465 – 07/02/2014
 Off-Location FLO – No Documentation
 Environmental – NA

CIV - 331623 - DOW LAURA 3-28
Map Extent - NDVI

Imagery: RS Multispectral
 Imagery Date: 2 May 2023
 Map Date: 31 May 2023
 Datum: WGS 1984 UTM Zone 13N
 POC: Soil Sage

◆ Well	▭ Separator	NDVI
● Soils	▭ Tank Battery	Classes
▲ Veg	▭ Reference Extent	■ 1-Veg
▭ Disturbance Extent		■ 2-Veg
▭ Reclaim Extent		■ 3-Non Veg
		■ 4-Non Veg
		■ 5-Non Veg

0 10 20 Meters

Scale: 1:500

Pad Location:
 40.376060
 -104.442790



Service Credits -

CPW Soil and Vegetation



North Side Reference

Site Soils

These soils were analyzed to establish current soil physicochemical properties.

Soil Analytical Spreadsheet

Map Unit(s) – 10

The CPW_North_SoilData_17MAY2023 - contains 4 soil references.

Overview of the 0-12 inches

- Soil texture is a Sandy Loam/Loamy Sand with intermixed Sandy Clay Loam
- pH 7.5
- ECe 1.1
- Organic Matter % - 1.5
- SAR 1.4
- N-P-K – 6-38-199
- Nitrate-N Lbs/A = 11
- Sodium – 105 ppm
- Chloride – 18 ppm
- Sulfate – 64 ppm

NOTE: The native soils have elevated sodium levels in 2 of the 4 samples in the top 12 inches which has a direct correlation to the higher ECe and SAR values.

Vegetation Analysis

Ecological Site observations serve as the baseline vegetation cover.

Table represents the present cover observations.

During the time of sampling the site contained bare ground no vegetation analysis performed.

Sample Number	Bare Ground	Grass	Forbs	Shrubs	Litter	Weeds	Field Notes
8	5	20	0	0	65	10	
11	20	15	5	0	50	10	
16	10	20	0	0	60	10	

Site Average for Vegetative Cover and Total Percent Cover based on field sampling.

Grasses	Forbs	Total Percent Cover	Site Target Recovery (80%)
18	5	23	18

Weeds

Weed Summary Reference based on 2-4 May 2023 Monitoring

Common Name	Weed List Type	Percent Cover (%)
Field Bindweed	List C Noxious	10
Tansy Mustard	Common Weed	10

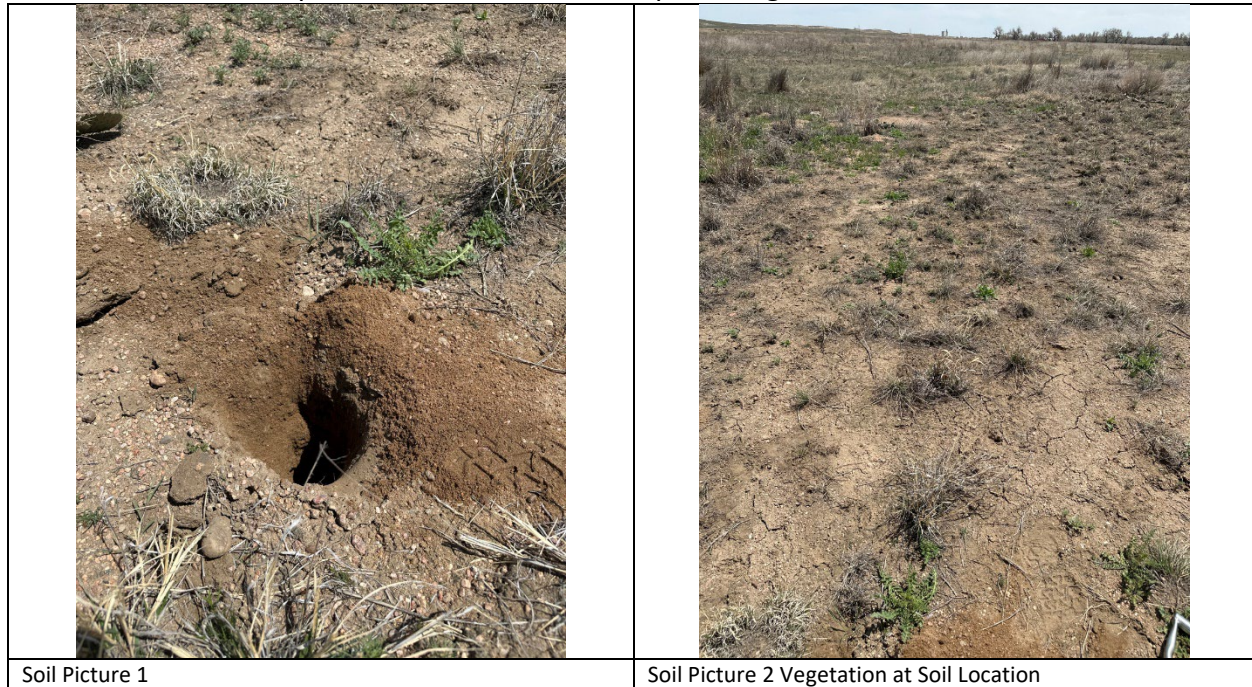
Site Photos – Soil 5

Lat/Long: 40.376311 / -104.442836

Nearest Facility #: 331623 and 331251

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.






Site Photos – Soil 6

Lat/Long: 40.376343 / -104.443456

Nearest Facility #: 331623 and 331251

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.

	
<p>Soil Picture 1</p>	<p>Soil Picture 2 Vegetation at Soil Location</p>
	

Site Photos – Soil 10

Lat/Long: 40.370999 / -104.431953

Nearest Facility #: 305671, 331381 and 305223

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.



Site Photos – Soil 15

Lat/Long: 40.367564 / -104.432884

Nearest Facility #: 305223

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.



Soil Picture 1



Soil Picture 2 Vegetation at Soil Location

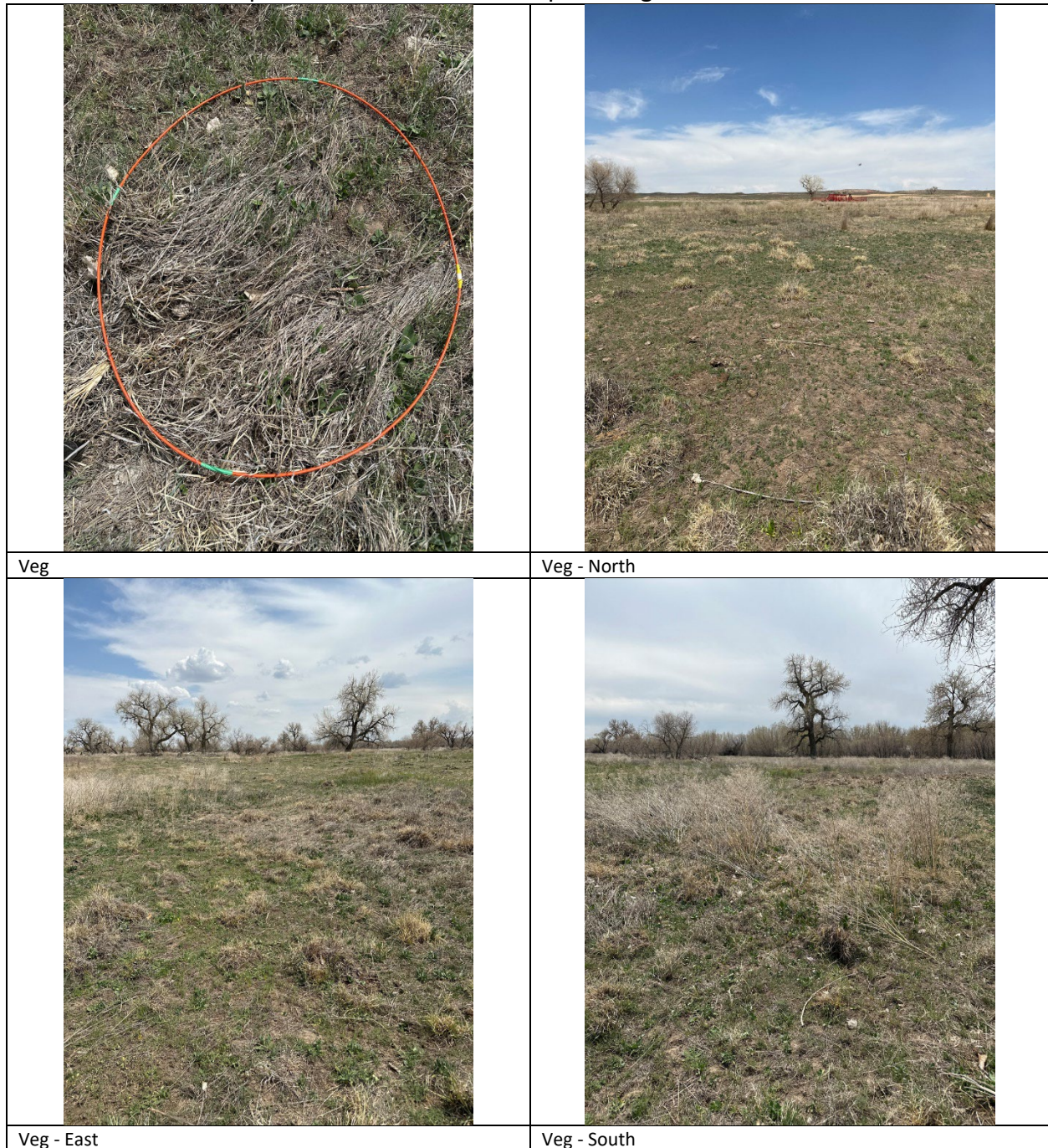
Site Photos – Vegetation 8

Lat/Long: 40.371947 / -104.438097

Nearest Facility #: 331413

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.





Veg – West



Grass ssp.



Field Bindweed – *Convolvulus arvensis* – Colorado List C
Noxious Weed





Site Photos – Vegetation 11

Lat/Long: 40.371095 / -104.431946

Nearest Facility #:

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.

	
Veg	Veg - North
	
Veg - East	Veg - South



Veg – West



Tansy Mustard – *Descurainia pinata* – Common Weed



Grass ssp.



Tansy Mustard – *Descurainia pinata* – Common Weed

CPW Site Observations



North

Reference the Observation overview map

Observation 12 – ROAD - North

40.375215 / -104.43867

	
<p>Distinctive start of the manure application, 4-6 inches manure and compaction.</p>	



Observation 13 - ROAD- North

40.375561 / -104.440652



Manure in the top 4 inches then compaction

Observation 14 - ROAD- North

40.374259 / -104.44192



Sand and manure with compaction

Observation 15 – ROAD - North

40.372523 / -104.439919



Top 6 inches is manure, sand with compaction

Observation 16 – ROAD, CORRAL, VEHICLE TRAFFIC - North

North of the 331413

40.372919 / -104.437395



Cheatgrass and gravel



Road



OK Corral on the footprint of the disturbance



Gravel and weds

Observation 17 - ROAD - North

40.39306 / -104.43523



6 inches of Sandy manure with compaction



Unincorporated manure

Observation 18 - DEBRIS - North

40.372523 / -104.433646



Trash – buried cable



Trash – buried cable

Observation 19 - ROAD - North

40.371765 / -104.431303



4inches of manure with compactions



Unincorporated manure

Observation 20 – ROAD and WADDLES- North

40.369642 / -104.431193



Manure, sand, and compaction



Unincorporated manure



Waddles



Waddles



Waddles

Observation 21 – ROAD- North

40.368321 / -104.433245



Gravel on access road



Gravel on access road

Observation 22 – TANK BATTERY - North

40.36859 / -104.433314

	
<p>Cow feeding station</p>	<p>Hay</p>
	
<p>Hay on the tank battery location</p>	

Observation 23 - ROAD - North

40.36854 / -104.43263



Weeds and 6 inches of gravel and rock and compaction on the access road

Weeds



Gravel and rocks

Observation 26 – ROAD - North

40.3717320 / -104.4313185



Trash – Straw Waddle



Trash – Straw Waddle

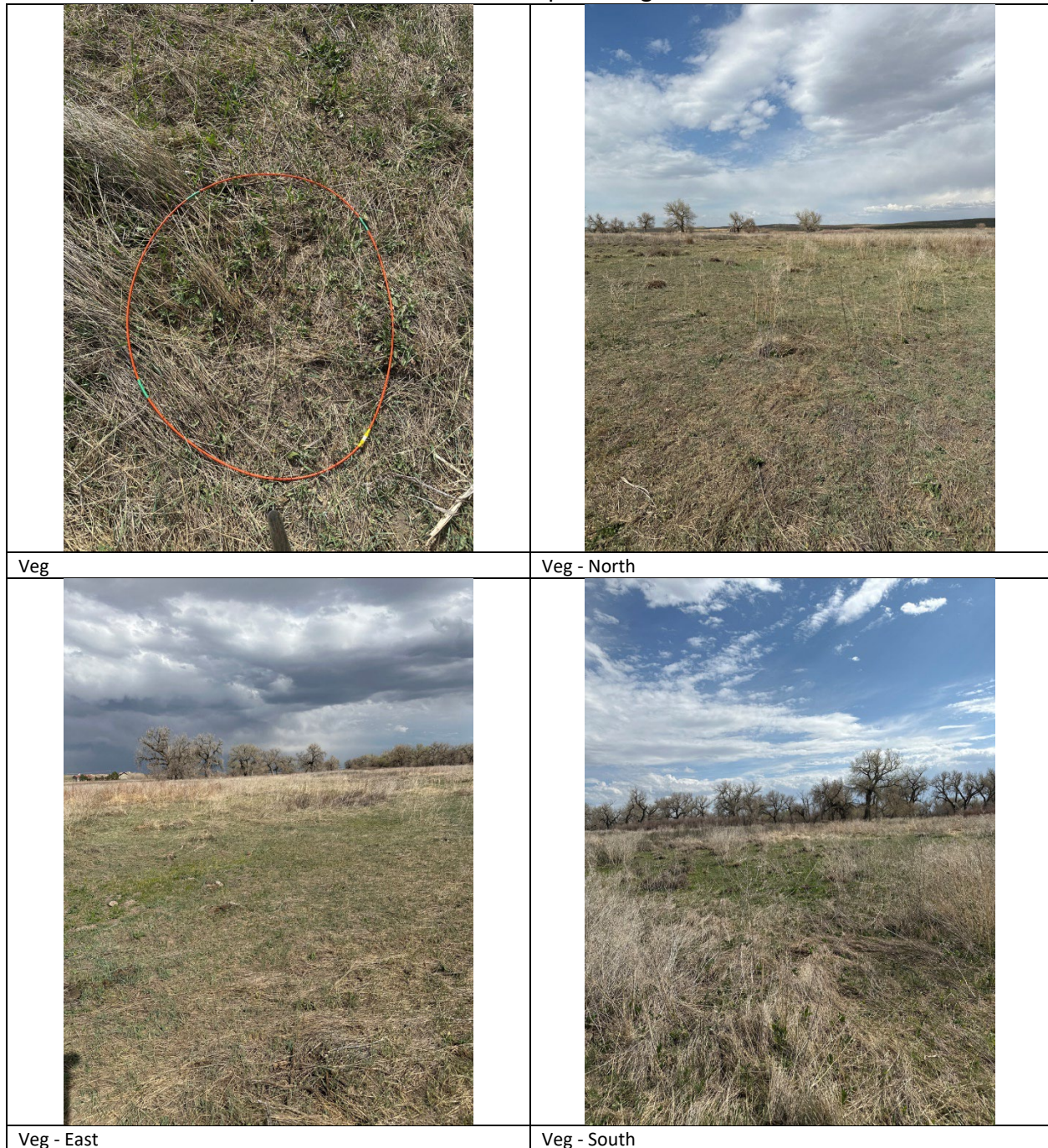
Site Photos – Vegetation 16

Lat/Long: 40.367575 / -104.432707

Nearest Facility #: 305223

Date Range: 2-4 May 2023

Photo locations correspond with the overview map and vegetation table.





Veg – West



Grass ssp. and Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed



Grass ssp. and Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed



Grass ssp. and Field Bindweed – *Convolvulus arvensis* – Colorado List C Noxious Weed

Soil Properties

USDA Soil Description

Reference Soil Information

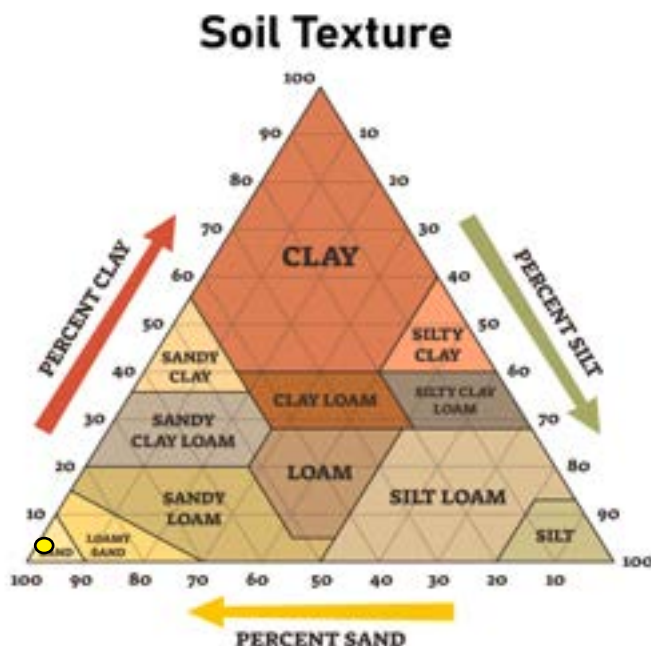
The location of the site is contained within one soil type, Ellicott-Ellicott sandy-skeletal complex.

Map Unit 10 Reference Soil information - Ellicott-Ellicott sandy-skeletal complex

This soil is formed from noncalcareous, stratified sandy alluvium. Landform is drainageways, flood plains on intermittent streams, with the Sandy Bottomland Ecological Site. Soils are excessively drained with a very low water holding capacity, and slope 0-3 percent.

Depth (in)	Physical			Chemical			
	Texture	Bulk Density	Partical Size Percent sand, silt, clay	pH	EC	SAR	OM%
0-10	Sand	1.65	95-3-2	6.5	0.1	0.0	0.35
10-20	Sand	1.64	95-4-1	7.0	0.1	0.0	0.25
20-30	Sand	1.63	95-4-1	7.2	0.1	0.0	0.25
30-40	Sand	1.63	95-4-1	7.6	0.1	0.0	0.25
40-50	Coarse Sand	1.66	95-4-1	7.6	0.1	0.0	0.25
50 +	Coard Sand	1.68	95-4-2	7.6	0.1	0.0	0.25

Soil Texture Triangle reflect the 0-10 in depth



Erosion Potential (10 inches)

- K Factor, Whole soil - .02. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.
- Wind Erodibility Group – 1. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.

Soil Reference Information

There is a general relationship of soil bulk density to root growth based on soil texture. Bulk densities ideal for root growth are less than 1.60 g/cc for sandy textures, less than 1.40 g/cc for loamy textures, and less than 1.10 g/cc for clayey textures. Bulk densities that restrict root growth are greater than 1.80 g/cc for sandy textures, 1.65 g/cc for loamy textures, and 1.47 g/cc for clayey textures.

Vegetation

Reference vegetation – Sandy Bottomland Ecology

Climate

Average Annual Precipitation 14 to 17 inches annually - average 15 inches

Average Annual Air Temperature ranges from 48 to 52 degrees F

Drought conditions in effect

Long-term effects of these latest drought events have yet to be determined. Growth of native cool-season plants begin about April 1 and continue to mid-June. Native warm-season plants begin growth about May 1 and continue to about August 15. Regrowth of cool-season plants occur in September in most years, depending on moisture.

Reference dynamics

The Reference State is characterized by a dominance of warm-season tallgrasses (sand bluestem, prairie sandreed, and switchgrass). The Shrub State is dominated by sand sagebrush and a minor component of understory species (sand dropseed, Fendler threeawn). The Eroded State is characterized by annual forbs and grasses (sunflower, kochia, Russian thistle, cheatgrass) and early successional plants (sandhill muhly, sand dropseed, Fendler threeawn, and lemon scurfpea).

Drought has increased mortality of blue grama and other bunchgrasses significantly in some locales.

Principle dominants are sand bluestem, prairie sandreed, and switchgrass. Subdominant grasses include needle and thread, blue grama, little bluestem, and western wheatgrass. Significant forbs and shrubs are pacific peavine, evening primrose, prairie clovers, leadplant and western sandcherry. Cottonwoods may be present. The potential vegetation is about 70-85% grasses or grass-like plants, 8-15% forbs and 7-15% shrubs.

Carbon sequestration is greatly reduced.

Reference Vegetation – Sandy Bottomland Ecology

At Risk Plant Community

Key species from the Reference Plant Community, Sand bluestem, prairie sandreed, switchgrass, western sandcherry and leadplant have decreased in frequency and production. Blue grama and sand sagebrush have increased. Sand dropseed, Fendler threeawn, slimflower scurfpea, and Cuman ragweed (western ragweed) have also increased.

The risk of losing some of the tallgrass species, palatable forbs and shrubs. The reduction of tallgrass species, nitrogen-fixing forbs, key shrub component and increased warm-season shortgrass has altered the biotic integrity of this plant community. Nutrient cycle, water cycle and energy flow are at risk of becoming impaired.

Vegetation

Sandy Bottomland Ecosystem Vegetative Community Composition

Common Name	Scientific Name
Sand Bluestem	<i>Andropogon hallii</i>
Prairie Sandreed	<i>Calamovilfa longifolia</i>
Switchgrass	<i>Panicum virgatum</i>
Indiangrass	<i>Sorghastrum nutans</i>
Needle and Thread	<i>Hesperostipa comata ssp. comata</i>
Blue Grama	<i>Bouteloua gracilis</i>
Western Wheatgrass	<i>Pascopyrum smithii</i>
Little Bluestem	<i>Schizachyrium scoparium</i>
Sideoats Grama	<i>Bouteloua curtipendula</i>
Sand Dropseed	<i>Sporobolus cryptandrus</i>
Indian Ricegrass	<i>Achnatherum hymenoides</i>
Hairy Grama	<i>Bouteloua hirsuta</i>
Prairie Junegrass	<i>Koeleria macrantha</i>
Saltgrass	<i>Distichlis spicata</i>
Sixweeks Fescue	<i>Vulpia octoflora</i>
Sand Bluestem	<i>Andropogon hallii</i>
Switchgrass	<i>Panicum virgatum</i>
Indiangrass	<i>Sorghastrum nutans</i>
Manystem Pea	<i>Lathyrus polymorphus</i>
Dotted Blazing Star	<i>Liatris punctata</i>
Purple Prairie Clover	<i>Dalea purpurea var. purpurea</i>
Broadbeard Beardtongue	<i>Penstemon angustifolius</i>
Upright Prairie Coneflower	<i>Ratibida columnifera</i>
Scarlet Globemallow	<i>Sphaeralcea coccinea</i>
White Heath Aster	<i>Symphotrichum ericoides var. ericoides</i>
Annual Buckwheat	<i>Eriogonum annuum</i>
White Sagebrush	<i>Artemisia ludoviciana</i>
Painted Milkvetch	<i>Atragalus ceramicus var. filifolius</i>

Change Detection

Normalized Difference Vegetation (NDVI)

Section will primarily focus on the NDVI imagery for vegetation reference and current analytics.

The composite NAIP NDVI imagery from 2010-2020, this data set does not contain the NDVI values to perform statistical analysis. The imagery foot print encompasses the site extent and a vegetation reference extent for vegetative analysis.

Remotely sensed data was gathered on 2 - 4 May 2023, which reflects the current vegetative cover statistics.

NDVI calculations used the Near Infrared from the multispectral sensors. The NDVI reflects the measurements from the plant's topmost layer of leaves, typically used during spring emergence into mid-season growth.