Community & Economic Development Department
4430 S. Adams County Pkwy.
1st Floor, Suite W2000B
Brighton, CO 80601
PHONE 720.523.6800
EMAIL epermitcenter@adcogov.org
adcogov.org

Request for Comments

Case Name: Bennett D Pad at Manilla
Case Number: OGF2025-00001

February 21, 2025

The Adams County Community & Economic Development Department is requesting comments on the following application: **Oil and Gas Facility (OGF) Permit to allow 26 wells on 22.96 acres in the Agricultural-3 zone district including in the Airport Influence Zone (AIZ)**. This request is located at 1631 Manilla Road. The Assessor's Parcel Number is 0181700000105. The applicant is Crestone Peak Resources Operating, LLC.

Please forward any written comments on this application to the Community and Economic Development Department at 4430 South Adams County Parkway, Suite W2000A Brighton, CO 80601-8216 or call (720) 523-6891 **by 03/24/2025** in order that your comments may be taken into consideration in the review of this case. If you would like your comments included verbatim, please send your response by way of e-mail to GDean@adcogov.org.

Once comments have been received and the staff report written, the staff report and notice of public hearing dates may be forwarded to you upon request. The full text of the proposed request and additional colored maps can be obtained by contacting this office or by accessing the Adams County web site at www.adcogov.org/current-land-use-cases.

Thank you for your review of this case.

Gregory Dean
Oil & Gas Administrator

BOARD OF COUNTY COMMISSIONERS

Julie Duran Mullica — DISTRICT 1
Kathy Henson — DISTRICT 2
Emma Pinter — DISTRICT 3
Steve O'Dorisio — DISTRICT 4
Lynn Baca — DISTRICT 5

OPERATIONS PLAN - OIL AND GAS FACILITY

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M.
COUNTY OF ADAMS, STATE OF COLORADO

CONTACTS:

PROPERTY OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC
0181700000105
555 17TH STREET, SUITE 3700
DENVER, CO 80202

APPLICANT/OPERATOR: CRESTONE PEAK RESOURCES OPERATING LLC
A WHOLLY-OWNED SUBSIDIARY OF CIVITAS RESOURCES, INC.
555 17TH STREET, SUITE 3700
DENVER, CO 80202

ENGINEER/CONSULTANT: 609 CONSULTING, LLC
1095 SABERTON AVENUE
SHERIDAN, WY 82801
JAKE EDMUNDS
(307) 674-0609

ADAMS COUNTY: PLANNING & DEVELOPMENT
4430 SOUTH ADAMS COUNTY PARKWAY
BRIGHTON, CO 80601
(702) 523-6800

ADAMS COUNTY SHERIFF'S DEPARTMENT
GENE CLAPS, ADAMS COUNTY SHERIFF
(303) 654-1850

BENNETT-WATKINS FIRE DEPARTMENT
(303) 644-3572

LEGAL DESCRIPTION:

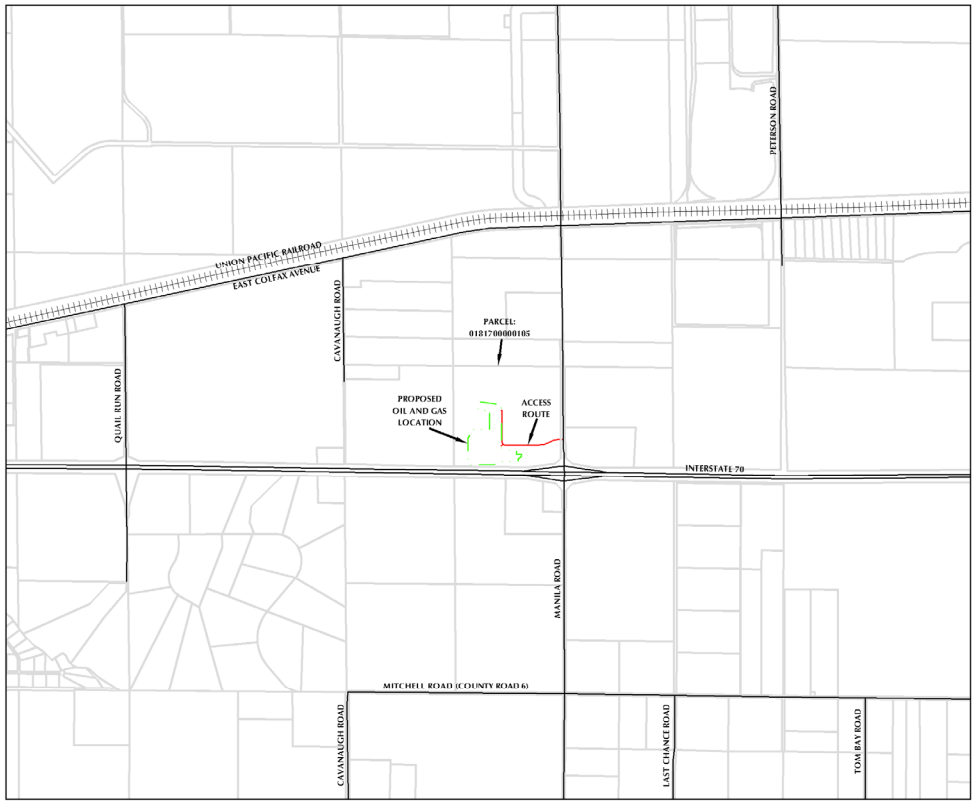
PART OF THE SE1/4 OF SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M., COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED ON LAND SURVEY PLAT AND SPECIAL WARRANTY DEED UNDER RECEPTION NO. 2022000032417.

EXISTING ZONING: A-3

CERTIFICATE OF APPROVAL BY THE DEPARTMENT OF PLANNING & DEVELOPMENT

DEPARTMENT OF PLANNING & DEVELOPMENT DIRECTOR

ECMC PERMIT NO: _____



VICINITY MAP

0 1500' 3000'

1" = 3000'

SHEET INDEX

OPERATIONS PLAN	
SHEET NO.	SHEET NAME
SHEET-1	COVER SHEET
SHEET-2	IMPACT AREA MAP
SHEET-3	IMPACT AREA MAP
SHEET-4	CONSTRUCTION LAYOUT SITE PLAN
SHEET-5	DRILLING LAYOUT SITE PLAN
SHEET-6	COMPLETIONS LAYOUT SITE PLAN
SHEET-7	PRODUCTION LAYOUT SITE PLAN
SHEET-8	SIGNAGE PLAN

WELLS

1	TRANSPORT 3-64 34-35-36 1AH
2	TRANSPORT 3-64 34-35-36 1BH
3	TRANSPORT 3-64 34-35-36 2AH
4	TRANSPORT 3-64 34-35-36 2BH
5	TRANSPORT 3-64 34-35-36 3AH
6	TRANSPORT 3-64 34-35-36 3BH
7	TRANSPORT 3-64 34-35-36 4AH
8	TRANSPORT 3-64 34-35-36 4BH
9	BOMHOFF EAST 4-64 10-11-12 1AH
10	BOMHOFF EAST 4-64 10-11-12 1BH
11	BOMHOFF EAST 4-64 10-11-12 2AH
12	BOMHOFF EAST 4-64 10-11-12 2BH
13	BOMHOFF EAST 4-64 10-11-12 3AH
14	FRASER FED 3-64 33-32 1BH
15	FRASER FED 3-64 33-32 2BH
16	FRASER FED 3-64 33-32 3BH
17	FRASER FED 3-64 33-32 4BH
18	BD LAND 4-64 5-4 1AH
19	BD LAND 4-64 5-4 1BH
20	BD LAND 4-64 5-4 2AH
21	BD LAND 4-64 5-4 2BH
22	BD LAND 4-64 5-4 3AH
23	BD LAND 4-64 5-4 3BH
24	BD LAND 4-64 5-4 4AH
25	BOMHOFF WEST 4-64 9-8-7 1AH
26	BOMHOFF WEST 4-64 9-8-7 1BH

609 CONSULTING, LLC
LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331
SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

Prepared For:
CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD
COVER SHEET

DATE:	12/18/24	SHEET:	1 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

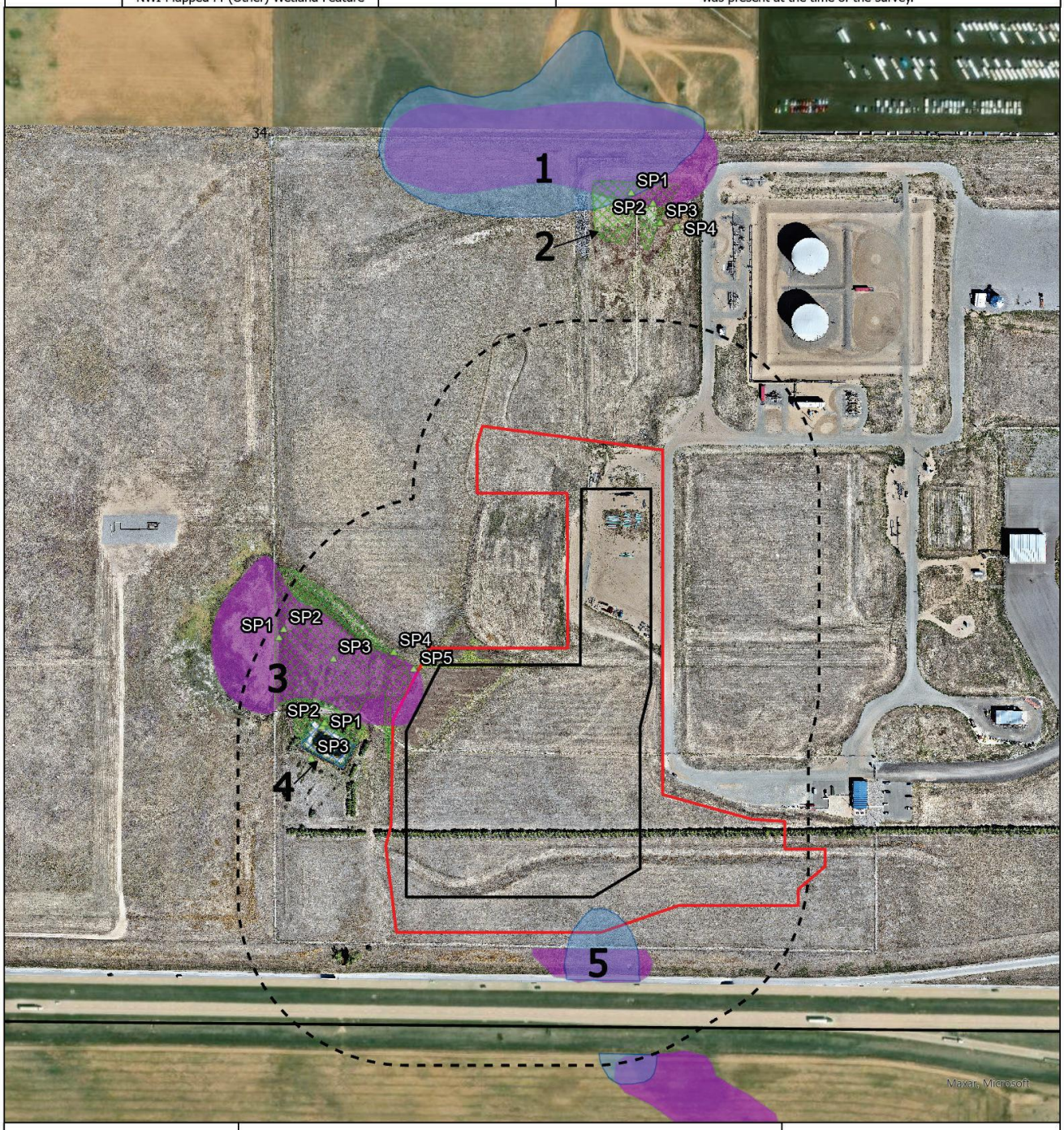
K:\CIVITAS RESOURCES\2023\231023_1BZ_SOCS_T3S R64W\DWG\SOCS_BENNETT.dwg, 12/18/2024 3:47:55 PM, jakeedmunds

CIVITAS RESOURCES COMPANY, LLC
BENNETT D
SEC34 T3S R64W, R58W, 6th P.M.
ADAMS COUNTY, COLORADO

Produced for: CIVITAS Crestone Peak Resources, LLC

Produced by: RPG RESOURCES a System One company

Feature Number	Feature Classification	Distance and Direction	Observations
1	NHD-Mapped Intermittent Lake/Pond NWI-Mapped Pf (Other) Wetland Feature	Approximately 812-feet north	This feature was field verified NOT present. No hydric vegetation, soils, or hydrology was present at the time of the survey. There was no standing water or topography change within the mapped lake/pond area.
2	Emergent Wetland within Stormwater Basin	Approximately 710-feet north	A field verified wetland within a large depression used for drainage purposes. A concrete flowline passes through the wetland area and a 3-foot tall rock outfall creates a boundary to the west.
3	NWI-Mapped Pf (Other) Wetland Feature	Approximately 54-feet west	A field verified wetland fed by a marsh/pond beyond the Civitas property boundary. Surface water was present within 1 inch.
4	Stormwater Pond with Fringe Wetland	Approximately 150-feet west	A field observed stormwater pond with an OHWM. Fringe wetlands along the bed and bank of the pond were confirmed via wetland delineations.
5	NHD-Mapped Intermittent Lake/Pond NWI-Mapped Pf (Other) Wetland Feature	Approximately 40-feet south	This feature was field verified NOT present. No hydric vegetation, soils, or hydrology was present at the time of the survey.



SURVEY MAP

- Oil & Gas Location (OGL)
- Working Pad Surface (WPS)
- 500-Foot Buffer Around WPS
- NHD-Mapped Lake/Pond
- NWI-Mapped Other Wetland
- Delineated Wetland
- Delineated Lake/Pond
- Wetland Sample Point

Projection: WGS 1984
Date: 9/26/2024
Drafted by: HJL

0 250 500 Feet

N

1 inch equals 300 feet

HAUL ROUTE MAP

BENNETT D PAD

SE1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

NOTE:
PIPELINE ROUTE IS PRELIMINARY AND SUBJECT TO CHANGE

LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- TRAFFIC ROUTE
- PIPELINE ROUTE

TRAVEL PATH:
TAKE EXIT 299 OFF OF INTERSTATE 70 TO MANILA ROAD AND PROCEED IN A NORTHERLY DIRECTION FOR 0.1 MILES TO THE PROPOSED ACCESS ROAD TO THE WEST. EXIT LEFT ONTO THE PROPOSED ACCESS ROAD AND CONTINUE 0.4 MILES TO THE PROPOSED LOCATION.

609 CONSULTING, LLC
LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331
SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

DATE SURVEYED:	9/24/24
DATE:	10/4/24
DRAFTER:	JFE
REVISED:	10/18/24

PREPARED FOR: CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

K:\CIVITAS RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\GIS\ALA\BENNETT D_ALA_SITE_PLANS.dwg, 10/18/2024 9:05:11 AM, kgoles

Adams County

Oil and Gas Facility Application

Bennett D Pad

SE ¼ Section 34, Township 3 South, Range 64 West

Prepared by:

CIVITAS

Crestone Peak Resources Operating LLC

Oil and Gas Facility Permit Submittal Items

Conceptual Review Summary

Refer to Operations Plan and Written Narrative for Alternative Site Analysis

Community & Economic Development Department

Case Number PRE2024-00071 as of 11/2/2024

4430 South Adams County Parkway, Suite W2000A
Brighton CO 80601-8216 (720) 523-6800

Case Information

Case Name:	Bennett D Pad Concept
Received:	10/14/2024
Location:	1631 MANILLA RD
Parcel(s):	0181700000105
Description:	Conceptual Review Request for an Oil and Gas Facility Permit (OGF) for the proposed Bennett D Pad oil and gas location. The application seeks to permit the drilling and completing of up twenty-six (26) horizontal wells and the installation of related surface production equipment on one (1) well pad, that will be serviced by (1) one existing access road.

CASE ASSIGNMENT

Case Manager	Gregory Dean
Primary Engineer	AGAJDYS
Long Range Planner	EGLEASON

EXTERNAL AGENCY REVIEWS

CDOT Review	No
Division of Water Resources Review	No
Geological Survey Review	No
Soil Conservation Review	No
Xcel Energy Review	No
Adams County Fire Review	No
Brighton Fire Review	No
Strasburg Fire Review	No
North Metro Fire Review	No
o Division of Parks and Wildlife Review	No
CDPHE Review	No

GENERAL

New PRE WF	Yes
Type of Project	Oil and Gas Facility
Proposed Land Use	Other
Received	10/14/2024
Internal Review Deadline	10/28/2024
Referral Agency Deadline Date	10/28/2024
Comments Due Date	10/30/2024
Target	11/06/2024
Conceptual Review Time	8:30 - 9:15
Conceptual Review Meeting Duration	90 min
Application Fee	1100

WIZARD

Wizard Session Key	bb92b451e552494483a9a7a5bb6aa031

Workflow Information

Task Name	Task Status	Date
Send Case Manager Introduction	Complete	10/16/2024
Building Safety Review	No Comment	10/29/2024
Plan Distribution	Complete	10/15/2024
Planner Review	Complete	10/29/2024

Alternative Site Analysis:
Applicant Desired Location:
(+) co-located with existing gas processing/midstream facility, likely more compatible with surrounding land uses
(+) shortest haul route and pipeline corridor routes that avoid homes
(+) no high priority wildlife habitats or buffer conservation areas within 2,000-feet
(+) least new surface disturbance with co-location and not requiring additional facilities to access and development minerals in the area.
(-) Wetlands in the immediate vicinity
(-) 5 homes within 2,000-feet, could require informed consent

Alternative Location 1:
(-) Dense residential development NW of alt location 1, could require informed consent
(-) Long haul routes and pipeline corridors (2.5 miles)
(-) proposed haul routes run by residences
(-) closer to surface waters (Box Elder Creek)
(-) near HPH for mule deer and aquatic native species conservation waters
(-) more surface disturbance relative to desire location with co-location of midstream facility

Alternative Location 2:
(+) Less residential uses within 2,000-feet near alt loc 2 than desired location (3 vs. 5)
(+) No HPH corridors within the buffer area
(+) Less wetlands immediately adjacent to alt location compared to desired location, though 3 wetlands occur within the 2,000-foot setback
(-) Longer haul routes and pipeline corridors needed for alt loc 2
(-) more surface disturbance required relative to desire location with co-location of midstream facility
(-) Mineral development not technologically feasible relative to desired location. This could require an additional facility to be built to access minerals fully

Alternative Location 3:
(+) Less residential uses within 2,000-feet near alt loc 3 than desired location (1 vs. 5)
(+) No HPH corridors within the buffer
(-) Longest haul route and pipeline corridor of all alternative sites. 4.2 miles of haul route and 2 miles of pipeline corridor required.
(-) haul routes would run by homes
(-) five potential wetlands within 2,000-feet of alt loc 3
(-) nearest to surface waters (West Sand Creek) of all proposed alternative sites

The applicant's desired location and all 3 of their alternatives each present the potential for adverse impact to public health, safety, welfare, the environment, and wildlife resources. Many of these potential adverse impacts could likely be avoided, minimized, or mitigated with the implementation of BMPs, COAs, and facility design considerations by the applicant. Staff believes the applicant's desired location has the least likelihood of adverse impacts to residents and resources and has the greatest ability to comply with Adams County Development Standards and Regulations of those presented. Of the 3 presented alternatives to the applicant's desired location, Staff feels that alternative location 2 appears least impactful followed by alternative location 3 and then last alternative location 1. While the applicant's desired location appears to be the least impactful overall, there is no guarantee that this location will be successful if a formal OGF application is filed and must demonstrate compliance with AdCo DS&R through the evaluation processes as defined and outlined.

Given the presence of wetlands near this proposed site and within the 2,000-foot setback (designated as environmentally sensitive areas by Adams County) this location will likely require Board of County Commissioner approval rather than being eligible for the administrative approval process, should it comply with the remaining DS&R for OGF applications.

Neighborhood Services Review	Complete	10/30/2024
There are no open violations at this location at this time. No comment.		
Long Range Planner Review	No Comment	10/30/2024
Plan Coordination	Complete	11/01/2024
Development Engineering Review	No Comment	11/01/2024
Closed via script due to Plan Coordination result		
Development Engineering Review	Complete	11/01/2024

--- Items required at the time of application ---

ENG1: Applicant will be required to submit the following items when they apply for the OGF permit:

1. Site plan
2. Drainage letter signed and stamped by a Professional Engineer licensed in the State of Colorado
3. Operations and Maintenance (O&M) plan for the existing pond
4. Proposed haul routes for BOTH the drill and the routine export traffic
5. Sediment and erosion control (SEC) plans
6. A CDPHE storm water discharge permit for construction activities (COR400000).

ENG2: Any new concrete will require expansion of the existing pond and must be accounted for in the site plan, drainage letter, O&M plans, and SEC plans.

ENG3: Applicant may be required to apply for a building permit for the drill itself at the time of construction.

ENG4: All engineering documents must be submitted through and EGR permit. This will run parallel with the OGF permit.

--- Information only, no response required ---

ENG1: According to the Federal Emergency Management Agency's January 20, 2016 Flood Insurance Rate Map (FIRM Panel #08001C0960H), the project site is NOT located within a regulated 100-yr floodplain. A Floodplain Use Permit is NOT required.

ENG2: Property is NOT in Adams County MS4 Stormwater Permit area. An Adams County Stormwater Quality (SWQ) Permit will NOT be required. Since the proposed improvements disturb more than one (1) acre of land AND are part of a larger development that disturbs over one (1) acre, the applicant will be required to obtain a State Permit COR400000. Builder/developer is responsible for adhering to all the regulations of Adams County Ordinance 11 regarding illicit discharge. Applicant is responsible for installation and maintenance of Erosion and Sediment Control BMPs.

ENG3: No new access is requested. Must use existing access to property. Any modifications to the existing driveway or adding additional driveways will require additional permitting. No additional access to be approved for this lot at this time.

ENG4: If the applicant proposes to import greater than 10 CY of soil to this site, additional permitting is required. Per Section 4-04-02-02, of the Adams County Development Standards and Regulations, a Temporary or Special Use Permit is required to ensure that only clean, inert soil is imported into any site within un-incorporated Adams County. A Conditional Use Permit will be required if the importation exceeds 500,000 CY.

ROW Review	Complete	10/31/2024

ROW1: The location as proposed, not an alternative site, is possibly the best scenario due to existing detention, access, etc.
ROW2: Any changes to the detention/storm water quality facilities, or new construction will require the dedication of the detention pond and access to same. Exhibits are required for the access and detention for dedication to the county. PW ROW Agent, David Dittmer, will handle these cases.
ROW3: Alternative locations will require traffic studies to determine if additional ROW is required for access and vehicular load on the ROWs. There will be considerable trucking during and after drilling that will affect county roads.
ROW4: CDOT is studying the feasibility to add an off ramp at Quail Run Road due to growth and traffic impacts. Any location abutting this ROW will need to take this into account and must have a 120' offset to any permanent structures due to section line setback regulations. CDOT will require a 60' half width road at a minimum and the off ramp will match that of Bennett's off ramp.
ROW5: Additional comments will be provided once the site is set and we have a clean site map for review.
ROW6: The lay-flat water line, utilized, may not be located in county ROW. All crossings must be permitted by engineering review. this may require the operator to obtain temporary construction easements along the route.

Environmental Analyst Review Comment 10/31/2024

The following comments apply to Alternative Locations 2 and 3:

BEIR14. A cross-section of the subject parcels is located within the Natural Resource Conservation Overlay (NRCO), corresponding to the 100-year floodplain also transecting the parcels. The NRCO aims to protect important wildlife areas, designated floodplains, riparian corridors, and cultural resources. Refer to Sections 3-43 and 4-14-02 of the Adams County Development Standards and Regulations (ACDSR) for more details.

BEIR15. If disturbance of land not previously developed within the NRCO is greater than one combined (1) acre, then a Resources Review must be completed by a qualified professional consultant prior to application submittal so that it may be taken into consideration. See Adams County Development Standards and Regulations (ACDSR) Section 4-14-02-03 for Resources Review methodology.

BEIR16. All development must comply with the NRCO buffers/setbacks requirements for individual protected resources provided in ACDSR Section 4-14-02-04-02.

BEIR17. Specifically, along rivers and streams, development shall be located out of the riparian plant community, but in no case shall the required setback be less than fifty (50) feet nor more than one hundred-fifty (150) feet.

BEIR18. Specifically, in relation to wetlands, development shall be located out of the hydric zone, but in no case shall the required setback be less than fifty (50) feet (500 feet from the edge of hydric soil perimeter).

Environmental Analyst Review Comment 10/31/2024

The following comments apply to construction and operation:

BEIR5. Natural drainage and water areas are visible across the subject parcels. These drainage areas and wildlife habitat should be developed in an environmentally sensitive manner in order to protect natural features and processes, protect and enhance important wildlife corridors, and generally sustain a high-quality natural environment.

BEIR6. Exposure to air pollution is associated with numerous health problems including asthma, lung cancer, and heart disease. Construction and traffic in unpaved areas may contribute to increased fugitive dust emissions. Adams County recommends the applicant utilize all available methods to minimize fugitive dust during all phases of construction and operation.

BEIR7. An inert fill permit must be obtained prior to importing any volume of fill material onto the parcel as part of site development. Permit type will depend on the duration and total volume of fill to be imported to the site. The fill must meet the definition of clean, inert material.

BEIR8. Per ACDSR 4-11-02-03-03-03 General Provisions, Oil and Gas Facilities shall be at least 2,000 feet from the property line of any existing residences or platted residential lots, schools or future school facilities, state licensed daycares, high occupancy building units, environmentally sensitive areas, and designated parks and open spaces.

BEIR9. Per ACDSR 4-11-02-03-03-03 General Provisions, Oil and Gas Facilities shall be at least 1,000 feet from groundwater under the direct influence of surface water (GUDI) wells and Type III Aquifer wells as defined by Colorado Water Quality Control Commission and ECMC (formerly COGCC) rules.

BEIR10. Setbacks will be measured from the edge of the Oil and Gas Location, as defined by the ECMC, the measurement of setbacks will not include the access road.

BEIR11. Administrative Waiver from setback requirements: an administrative waiver may be obtained from the setback requirements if the Operator receives a written waiver from each primary resident and property owner located within the setback. Staff will evaluate the granting of an Administrative Waiver from setback requirements based on the following criteria: (1) the number of affected residents within the setback (2) location of the facility, (2) size of the facility, (4) compatibility of the facility with surrounding land uses; and (5) conformance with the Adams County Comprehensive Plan.

BEIR12. No Administrative Waivers will be issued from setback requirements for school facilities, future school facilities, state licensed daycares, groundwater wells, environmentally sensitive areas or designated parks and open spaces.

BEIR13. For Oil and Gas Facilities that do not meet the above setback requirements: A waiver may be granted by the Board of County Commissioners that complies with the requirements of ACDSR Section 2-02-14-07-07.

Environmental Analyst Review	Complete	10/31/2024

The following comments apply to permits and plans:

BEIR1. The applicant/operator shall follow all applicable hazardous materials management regulations, including CDPHE and ECMC, to ensure proper management of hazardous materials and wastes such that they do not present a significant actual or potential hazard to public health, safety, or environment.

BEIR2. For projects that require an air permit, the applicant shall contact the CDPHE Air Pollution Control Division (APCD) for information and provide copies of permits for Adams County review. Additional information is available at: https://www.colorado.gov/pacific/cdphe/categories/services-and-information/environment/air-quality/air-emissions-business-and-industry.

BEIR3. The determination of the risks of a release of hazardous materials from the proposed project may include but is not limited to the following considerations:

a. Plans for compliance with federal and State handling, storage, disposal, and transportation requirements.
b. Use of waste minimization techniques.
c. Adequacy of spill prevention and countermeasures, and emergency response plans.

BEIR4. All plans shall be reviewed and approved by the applicable fire district prior to approval in order to determine existing services provide adequate protection. This information will be provided to Adams County for review.

Economic Development Review	No Comment	10/31/2024
Parks Review	No Comment	10/22/2024
Application Intake	Complete	10/14/2024

EMAIL SENT TO: jpiekara@civiresources.com

Thank you for your application.

PRE2024-00071 – Bennett D Pad — The Conceptual Review meeting is scheduled for Wednesday, November 06, 2024, from 8:30am – 10:00am. You will receive more details from the Planner assigned to your case.

Have a good day.

Planner Review	Complete	10/31/2024

OGA 1: Alternative Site Analysis:
Applicant Desired Location:
(+) co-located with gas processing/midstream facility, likely more compatible with surrounding land uses
(+) shortest haul route and pipeline corridor routes
(+) no high priority wildlife habitats or buffer conservation areas within 2,000-feet
(+) least new surface disturbance with co-location and not requiring additional facilities to access and development minerals in the area.
(-) Wetlands in the immediate vicinity
(-) 5 homes within 2,000-feet

Alternative Location 1:
(-) Dense residential development NW of alt location 1
(-) Residential development is classified as a Disproportionately Impacted Community
(-) Long haul routes and pipeline corridors (2.5 miles)
(-) proposed haul routes run by residences
(-) closer to surface waters (Box Elder Creek)
(-) near HPH for mule deer and aquatic native species conservation waters
(-) more surface disturbance relative to desire location with co-location of midstream facility

Alternative Location 2:
(+) Less residential uses within 2,000-feet near alt loc 2 than desired location (3 vs. 5)
(+) No HPH corridors within the buffer
(+) Less wetlands immediately adjacent to alt location compared to desired location, though 3 wetlands occur within the 2,000-foot setback
(-) Longer haul routes and pipeline corridors needed
(-) more surface disturbance relative to desire location with co-location of midstream facility
(-) Mineral development not technologically feasible relative to desired location. This would require an additional facility to be built to access minerals fully

Alternative Location 3:
(+) Less residential uses within 2,000-feet near alt loc 3 than desired location (1 vs. 5)
(+) No HPH corridors within the buffer
(-) Longest haul route and pipeline corridor of all alternative sites. 4.2 miles of haul route and 2 miles of pipeline corridor required.
(-) haul routes would run by homes
(-) five potential wetlands within 2,000-feet of alt loc 3
(-) nearest to surface waters (West Sand Creek) of all proposed alternative sites

OGA2: The applicant's desired location and all 3 of their alternatives each present the potential for adverse impact to public health, safety, welfare, the environment, and wildlife resources. Many of these potential adverse impacts could likely be mitigated with the implementation of BMPs, COAs, and facility design considerations by the applicant. Staff believes the applicant's desired location has the least likelihood of adverse impacts to residents and resources and has the greatest ability to comply with Adams County Development Standards and Regulations. Of the 3 presented alternatives to the applicant's desired location, Staff feels that alternative location 2 appears least impactful followed by alternative location 3 and then last alternative location 1. While the applicant's desired location appears to be the least impactful overall, there is no guarantee that this location will be successful if a formal OGF application is filed and must demonstrate compliance with DS&R through the evaluation processes as defined and outlined.

OGA3: Given the presence of wetlands near this proposed site and within the 2,000-foot setback (designated as environmentally sensitive areas by Adams County) this location will likely require Board of County Commissioner approval rather than being eligible for the administrative approval process, should it comply with the remaining DS&R for OGF applications.

OGA4: Off-location "well connects" or pipelines will require separate land use approvals.

OGA5: Proposed lay-flat temporary pipeline for bring water to location could require additional land use, access, or ROW approvals. A map of the lay-flat placement including ROWs, landowners, road crossings, ditch placement, etc. will be required.

OGA6: Discussion of source of fresh water and the exact path from source will be required.

Community & Economic Development Department
Environmental Programs
4430 S. Adams County Pkwy.
1st Floor, Suite W2000B
Brighton, CO 80601-8218
PHONE 720.523.6800 | FAX 720.523.6967
adcogov.org

John Piekara
Civitas Resources
555 17th Street, Suite 3700
Denver, CO 80202

December 31, 2024

Subject: PRE2024-00071 Bennett D Pad – Conceptual Review Letter

This letter serves as confirmation that the applicant, Crestone Peak Resources / Civitas Resources has successfully completed the Conceptual Review meeting for the Subject project on November 6, 2024. This preapplication meeting satisfies the requirements in Adams County Development Standard and Regulations (ACDS&R) Section 2-02-14-04.1, including the Alterative Site Analysis. The applicant therefore may proceed with a Development Application Submittal for the associated Oil and Gas Facility (OGF) permit that complies with all other requirements of the applicable ACDS&R.

If you have any questions about the permitting process, please do not hesitate to contact me at gdean@adcogov.org or (720)523-6891.

Gregory Dean
Adams County, Oil & Gas Administrator

BOARD OF COUNTY COMMISSIONERS

Eva J. Henry — DISTRICT 1
Charles "Chaz" Tedesco — DISTRICT 2
Emma Pinter — DISTRICT 3
Steve J. O'Dorisio — DISTRICT 4
Lynn E. Baca — DISTRICT 5

Neighborhood Meeting Summary

Bennett D Pad / Oil and Gas Facility

Neighborhood Meeting Summary

November 25, 2024

Meeting Summary

On November 25, 2024, Crestone, a wholly owned subsidiary of Civitas Resources, held a neighborhood meeting for the Bennett D Pad / Oil and Gas Facility at the Bennett Community Center, 1100 E Colfax Ave, Bennett, CO 80102. The meeting was held from 6:00 p.m. to approximately 7:00 p.m. The invitation was sent to forty-nine addresses on November 8, 2024. Four members of the public, a representative from Adams County and six representatives from Crestone were in attendance. Members of the public were given a contact card for Crestone staff. Poster boards were on display detailing drilling, casing / cementing program, and completions. Handouts were available illustrating proposed drilling and completion layouts and the location once wells are in production. The meeting started with a brief presentation followed by questions from the public. Details of the questions, concerns and responses are below.

Questions and Concerns with Crestone's Responses

- Will the oil be trucked or piped?
- Oil will be piped to the oil terminal on the property.

- What is going on with the trucking from other sites [to the Bennett Terminal]? They were told it would be 100% piped at some point.
- Some older sites do not have pipeline takeaway, so these wells are still being trucked. Majority of newer pads have pipeline takeaway. We should see trucking of oil to the terminal decrease in the future.

- Is this project separate from other existing projects?
- Yes, this will be a new well pad and facility with oil piped to the terminal.

- Concerned that trucks are destroying road (Manilla Road). Concerned they will get worse and not fixed if damaged.
- Described how this project will use about 1/10th of a mile of Manilla Road (Adams County Road) from I-70 to the existing access to the oil terminal. Mentioned how we will need to conduct a traffic impact study to ensure our operations address road maintenance, as needed.

- Will the trees on the south end of the property be removed?
- Trees will need to be removed to accommodate the temporary space required for our operations.

- Asked if the project to the east off Manilla Road (2150 Manilla Road; parcel 0181735200001) is one of our projects and related to this project.
- We mentioned this is a midstream operator, and not related to the Bennett D Pad.

- Will the site have cameras?
- The new location will have a camera skid at the entrance. This camera skid is built with AI technology and tracks every vehicle (LPR) that enters the facility. These cameras are live view but not monitored 24/7, they are set to notify security under certain circumstances. There are also cameras around the oil terminal.

- Will the site be fenced?
- Yes, the whole property is fenced, therefore this site will be too.

- There were general comments made about landscaping and maintenance of the property not being up to par and hoping we can address this.
- We acknowledged the concerns, and we would look into it.

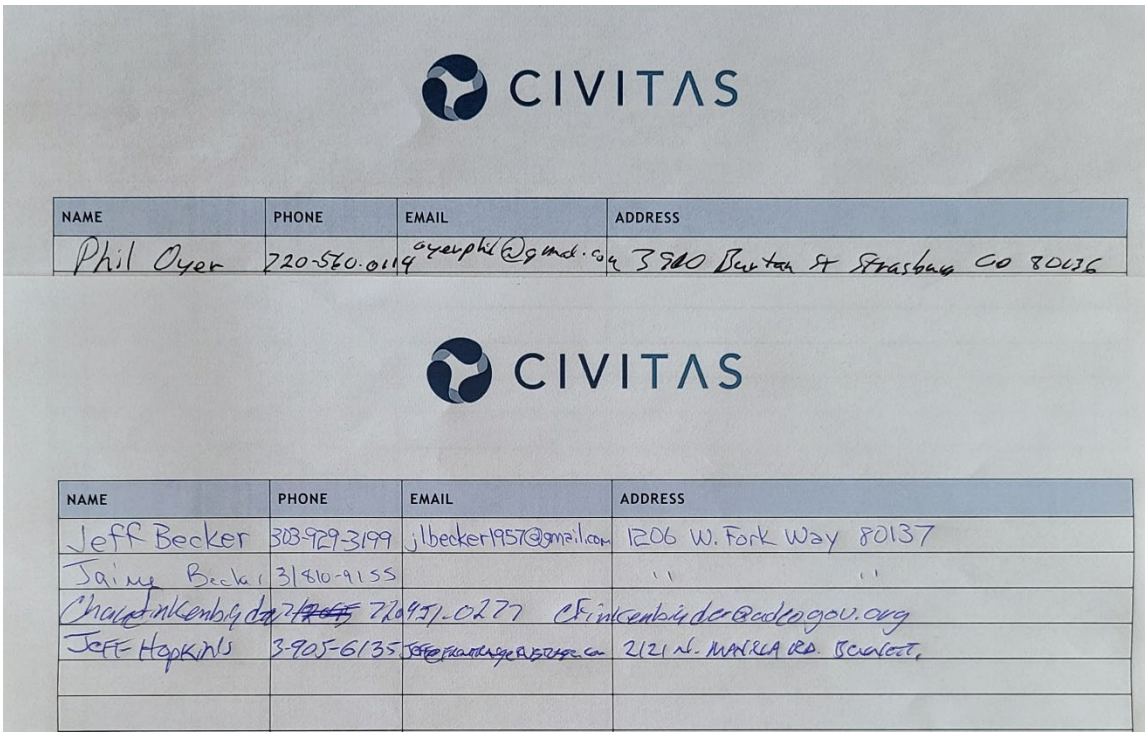
- Did we have to work with the FAA because of proximity to the Space Port?
- Yes, filed with FAA and have conditions to satisfy such as lights and flags on the derrick.

- Will there be a lot of dirt work done here? Is there a comparable size site to see?
- Mentioned it will be approximately 23 acres in size during the construction phase with no fill material brought as the site is balanced. Provided the locations of other pads to see which as relatively comparable in size.

- Will you need all of the topsoil that is segregated and could it be given to "me" [a surface owner for their own use]?
- We can look into it.

- Mr. Becker (property owner approximately 3,200' from proposed site) was curious about the general project and operations timeline as he is a mineral owner in one of the DSUs Bennet D intends to develop. Proponent of the overall project and confirmed other nearby Civitas projects (Fraser and Arkansas oil and gas locations) caused no adverse impacts.

Attendee List



CIVITAS

NAME	PHONE	EMAIL	ADDRESS
Phil Oyer	720-560-0119	oyerphil@gmail.com	3980 Burton St Strasburg CO 80136

CIVITAS

NAME	PHONE	EMAIL	ADDRESS
Jeff Becker	303-929-3199	jlbecker1957@gmail.com	1206 W. Fork Way 80137
Jaime Becker	3|810-9155		" "
Chad Winkenbilder	~~720-45~~ 720-971-0277	CFwinkenbilder@adcogov.org	
Jeff Hopkins	303-905-6135	[illegible]	2121 N. MANREA RD. Bennett,

Crestone Representatives: Jeff Annable, Dan Harrinton, Shayne Heap, Ryan Nance (76 Group), John Piekara and Jeremy Sonnier


CIVITAS
Crestone Peak Resources LLC*
Bennett D Pad
Neighborhood Meeting
Adams County
November 25, 2024


CIVITAS

BENNETT D - ADAMS COUNTY COMMUNITY OPEN HOUSE

Civitas Resources would like to invite you to come and meet Civitas representatives to learn more about the company's development plan for the Bennett D project in Adams County

The Bennett D - Adams County is a new Oil & Gas Facility with 26 wells and a production facility. This will be an opportunity to ask questions from subject matter experts and understand the project scope and timelines.

IN-PERSON PRESENTATION & OPEN HOUSE

November 25th, 2024 at 6:00PM

Bennett Community Center
1100 E Colfax Avenue
Bennett, CO 80102

Contacts:

Civitas Resources

Community Outreach - 720-279 9842
communityrelations@civiresources.com

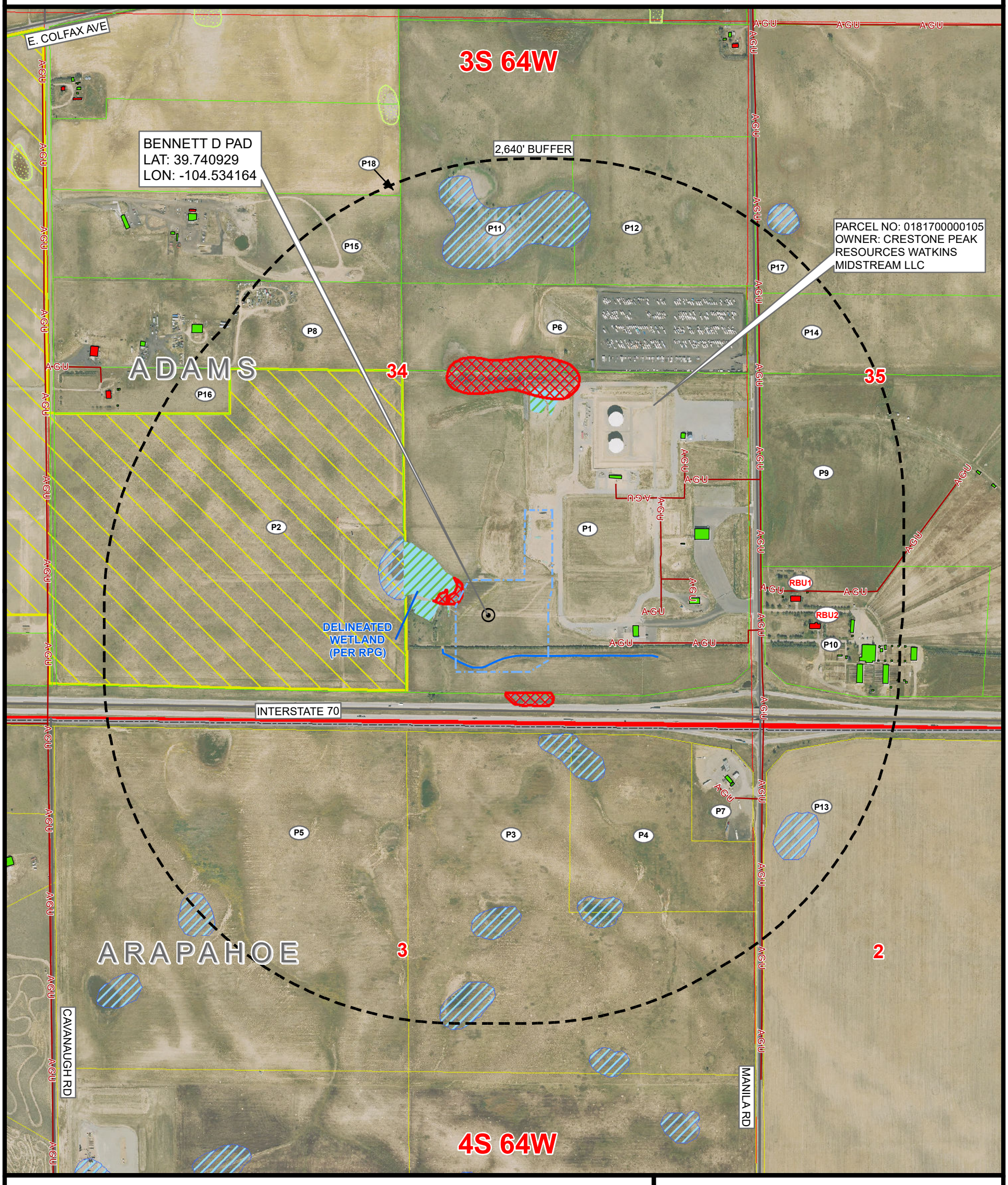
Adams County

Greg Dean
Oil & Gas Administrator
720-523-6891
gdean@adcogov.org

ALTERNATIVE LOCATION ANALYSIS - PROPOSED LOCATION

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- PROPOSED REFERENCE POINT
- PROPOSED WORKING PAD SURFACE
- BUFFER
- BUILDING
- NON-RESIDENTIAL BUILDING UNIT
- RESIDENTIAL BUILDING UNIT
- HEALTH FACILITY
- SCHOOL FACILITY
- CHILD CARE FACILITY
- ABOVE GROUND UTILITY
- PUBLIC ROAD
- RAILROAD
- DITCH/CANAL/DRAINAGE
- DISPROPORTIONATELY IMPACTED COMMUNITY
- ARAPAHOE COUNTY PARCEL BOUNDARY
- ADAMS COUNTY PARCEL BOUNDARY
- AURORA JURISDICTIONAL BOUNDARY
- RULE 411.b 2640' BUFFER
- 100-YEAR FLOODWAY (EFFECTIVE)
- 100-YEAR FLOODPLAIN (EFFECTIVE)
- COUNTY BOUNDARY
- RIPARIAN CORRIDOR
- DELINEATED WETLANDS
- RIVERINE CORRIDOR
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED/SHRUB WETLAND
- OTHER
- LAKE
- FRESHWATER POND
- NWI RIVERINE/POND/WETLAND (FIELD VERIFIED TO NOT BE PRESENT)

NOTE:
THIS MAP IS A COMPILATION OF PUBLICLY AVAILABLE DATA. THE ACCURACY AND COMPLETENESS OF SAID DATA HAS NOT BEEN VERIFIED BY 609 CONSULTING, LLC. EXISTING CONDITIONS MAY DIFFER FROM WHAT IS SHOWN.

Prepared For:

CIVITAS
CRESTONE PEAK RESOURCES, LLC
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DENVER, CO 80202

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Loveland, Colorado 80538
Phone 970-776-4331
SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

N

NAD83 CO-Nft
Scale: 1" = 750ft

Drawn by: CPS Date: 4 Oct 2024
Revised: CPS Date: 25 Oct 2024

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Development Application

Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

DEVELOPMENT APPLICATION FORM

Application Type:

☐ Conceptual Review	☐ Preliminary PUD	☐ Temporary Use
☐ Subdivision, Preliminary	☐ Final PUD	☐ Variance
☐ Subdivision, Final	☐ Rezone	☐ Conditional Use
☐ Plat Correction/ Vacation	☐ Special Use	☒ Other: OGF

PROJECT NAME: Bennett D Pad

APPLICANT

Name(s): Crestone Peak Resources Operating, LLC Phone #: 3032947824

Address: 555 17th St, Suite 3700

City, State, Zip: Denver, CO 80202

2nd Phone #: Email: jpiekara@civiresources.com

OWNER

Name(s): same as above Phone #:

Address:

City, State, Zip:

2nd Phone #: Email:

TECHNICAL REPRESENTATIVE (Consultant, Engineer, Surveyor, Architect, etc.)

Name: Jake Edmunds - 609 Consulting Phone #: 3076740609

Address: 1095 Saberton Avenue

City, State, Zip: Sheridan, WY 82801

2nd Phone #: Email: jedmunds@609consulting.com

DESCRIPTION OF SITE

Address:	1631 Manilla Rd
City, State, Zip:	Bennett, CO 80102
Area (acres or square feet):	22.96 acres
Tax Assessor Parcel Number	181700000105
Existing Zoning:	A-3
Existing Land Use:	commercial / industrial
Proposed Land Use:	commercial / industrial

Have you attended a Conceptual Review? YES [X] NO [ ]

If Yes, please list PRE#: 2024-00071

I hereby certify that I am making this application as owner of the above described property or acting under the authority of the owner (attached authorization, if not owner). I am familiar with all pertinent requirements, procedures, and fees of the County. I understand that the Application Review Fee is non-refundable. All statements made on this form and additional application materials are true to the best of my knowledge and belief.

Name: John Piekara Date: 1/27/2025

Owner's Printed Name

Name:

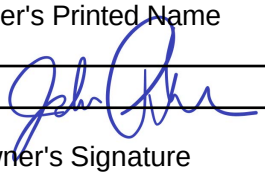
Owner's Signature

The applicant hereby affirms that the Operator and its associated subcontractors and affiliates have complied with applicable worker safety training and certification requirements as outlined in Adams County Development Standards and Regulations Sec. 4-11-02-03-03-03. Records and documentation of compliance are available and will be provided to the County upon request.

Name: John Piekara Date: 1/27/2025

Owner's Printed Name

Name:



Owner's Signature

Operations Plan including:

Cover Sheet

Impact Area Maps

Site Plans

Signage Plan

Written Narrative (Including Alternative Site Analysis)

OPERATIONS PLAN - OIL AND GAS FACILITY

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M.
COUNTY OF ADAMS, STATE OF COLORADO

CONTACTS:

PROPERTY OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC
0181700000105
555 17TH STREET, SUITE 3700
DENVER, CO 80202

APPLICANT/OPERATOR: CRESTONE PEAK RESOURCES OPERATING LLC
A WHOLLY-OWNED SUBSIDIARY OF CIVITAS RESOURCES, INC.
555 17TH STREET, SUITE 3700
DENVER, CO 80202

ENGINEER/CONSULTANT: 609 CONSULTING, LLC
1095 SABERTON AVENUE
SHERIDAN, WY 82801
JAKE EDMUNDS
(307) 674-0609

ADAMS COUNTY: PLANNING & DEVELOPMENT
4430 SOUTH ADAMS COUNTY PARKWAY
BRIGHTON, CO 80601
(702) 523-6800

ADAMS COUNTY SHERIFF'S DEPARTMENT
GENE CLAPS, ADAMS COUNTY SHERIFF
(303) 654-1850

BENNETT-WATKINS FIRE DEPARTMENT
(303) 644-3572

LEGAL DESCRIPTION:

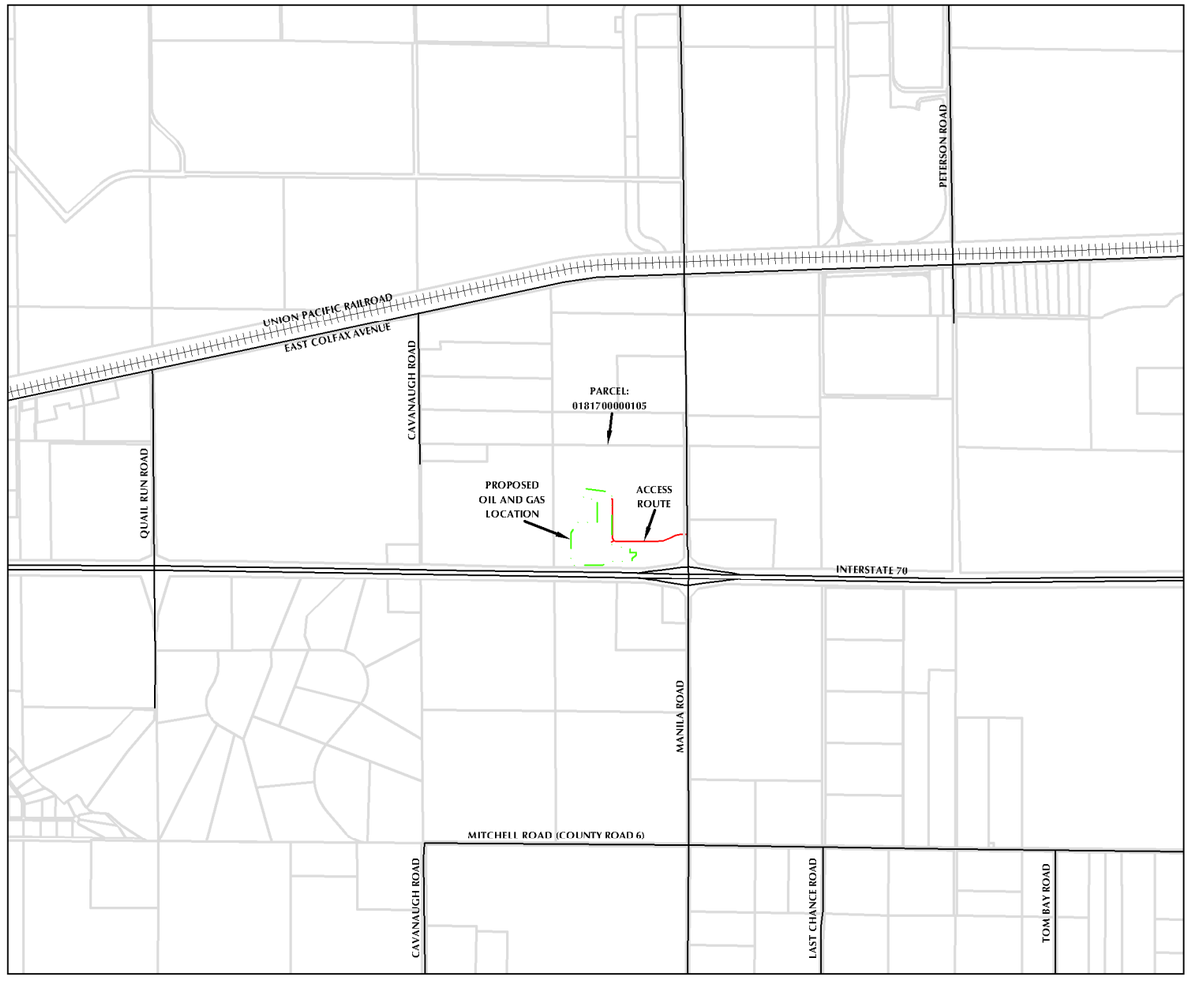
PART OF THE SE1/4 OF SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M., COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED ON LAND SURVEY PLAT AND SPECIAL WARRANTY DEED UNDER RECEPTION NO. 2022000032417.

EXISTING ZONING: A-3

CERTIFICATE OF APPROVAL BY THE DEPARTMENT OF PLANNING & DEVELOPMENT

_____
DEPARTMENT OF PLANNING & DEVELOPMENT DIRECTOR

ECMC PERMIT NO: _____



VICINITY MAP

0 1500' 3000'

1" = 3000'

SHEET INDEX

OPERATIONS PLAN	
SHEET NO.	SHEET NAME
SHEET-1	COVER SHEET
SHEET-2	IMPACT AREA MAP
SHEET-3	IMPACT AREA MAP
SHEET-4	CONSTRUCTION LAYOUT SITE PLAN
SHEET-5	DRILLING LAYOUT SITE PLAN
SHEET-6	COMPLETIONS LAYOUT SITE PLAN
SHEET-7	PRODUCTION LAYOUT SITE PLAN
SHEET-8	SIGNAGE PLAN

WELLS

1	TRANSPORT 3-64 34-35-36 1AH
2	TRANSPORT 3-64 34-35-36 1BH
3	TRANSPORT 3-64 34-35-36 2AH
4	TRANSPORT 3-64 34-35-36 2BH
5	TRANSPORT 3-64 34-35-36 3AH
6	TRANSPORT 3-64 34-35-36 3BH
7	TRANSPORT 3-64 34-35-36 4AH
8	TRANSPORT 3-64 34-35-36 4BH
9	BOMHOFF EAST 4-64 10-11-12 1AH
10	BOMHOFF EAST 4-64 10-11-12 1BH
11	BOMHOFF EAST 4-64 10-11-12 2AH
12	BOMHOFF EAST 4-64 10-11-12 2BH
13	BOMHOFF EAST 4-64 10-11-12 3AH
14	FRASER FED 3-64 33-32 1BH
15	FRASER FED 3-64 33-32 2BH
16	FRASER FED 3-64 33-32 3BH
17	FRASER FED 3-64 33-32 4BH
18	BD LAND 4-64 5-4 1AH
19	BD LAND 4-64 5-4 1BH
20	BD LAND 4-64 5-4 2AH
21	BD LAND 4-64 5-4 2BH
22	BD LAND 4-64 5-4 3AH
23	BD LAND 4-64 5-4 3BH
24	BD LAND 4-64 5-4 4AH
25	BOMHOFF WEST 4-64 9-8-7 1AH
26	BOMHOFF WEST 4-64 9-8-7 1BH

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DENVER, CO 80202

BENNETT D PAD
COVER SHEET

DATE:	12/18/24	SHEET:	1 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

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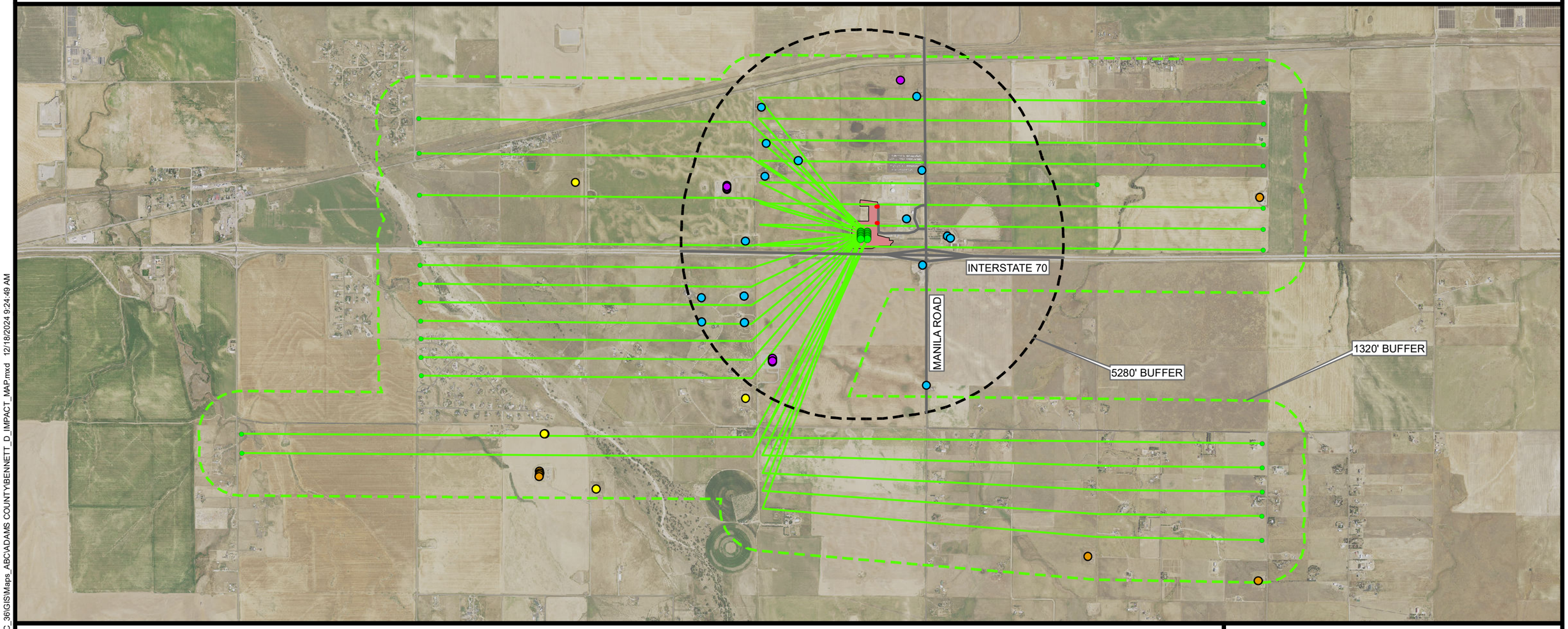
IMPACT MAP

BENNETT D PAD

SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- WELL - PROPOSED
- BOTTOM HOLE - PROPOSED
- WELL PATH - PROPOSED
- PROPOSED OIL AND GAS LOCATION
- PROPOSED OIL AND GAS LOCATION BUFFER
- WELL BORE BUFFER
- EXISTING WATER WELL
- ECMC OIL AND GAS WELL
- ABANDONED OIL AND GAS WELL
- SHUT-IN OIL AND GAS WELL
- PROPOSED ACCESS ROAD
- EXISTING ROAD

NOTE:
WELL LOCATIONS DERIVED FROM ENERGY AND CARBON MANAGEMENT COMMISSION (ECMC)(cogcc.state.co.us).
THE ESTIMATED DISTANCES FROM PROPOSED BORE LOCATIONS TO THE NEAREST EXISTING WELL SURFACE LOCATIONS ARE BASED ON ECMC DATA.

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N

NAD83 CO-Nft
Scale: 1" = 3,000ft

SHEET 2 OF 8

Drawn by: KMG Date: 18 Dec 2024
Revised: Date:

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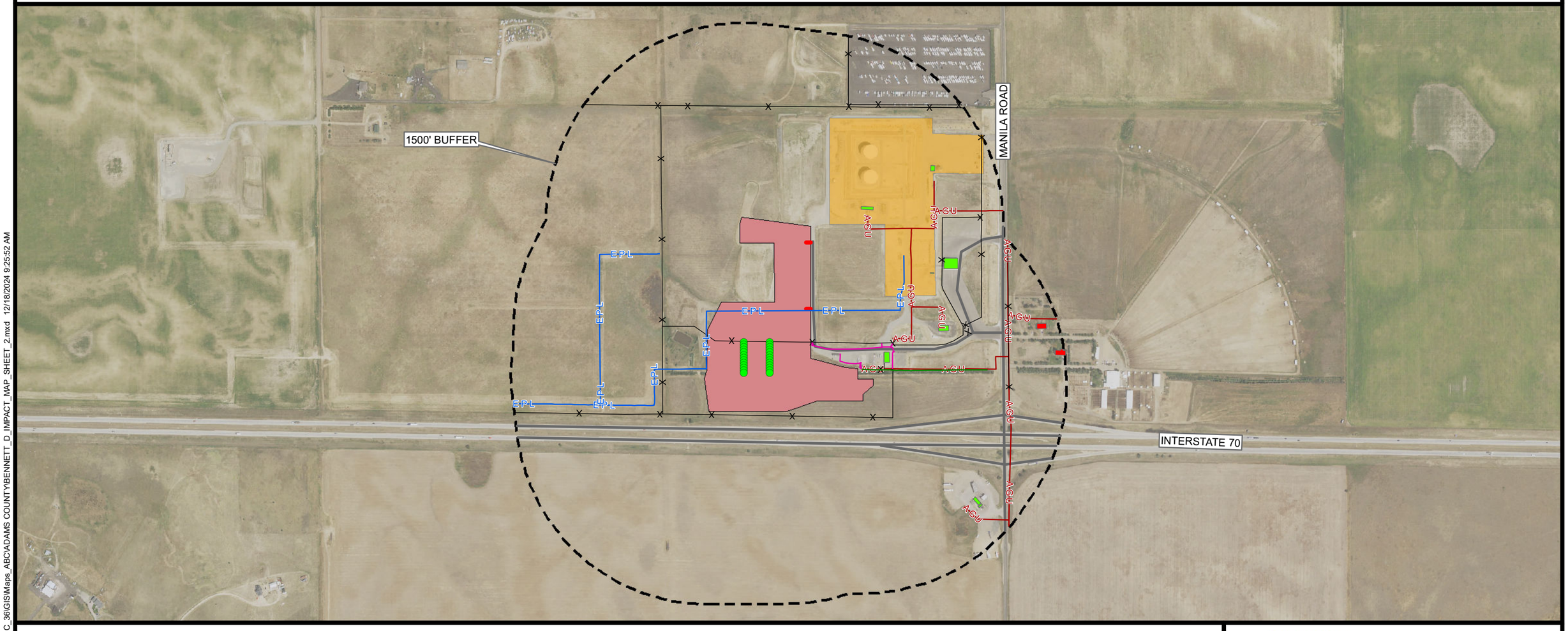
IMPACT MAP

BENNETT D PAD

SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- WELL - PROPOSED
- PROPOSED OIL AND GAS LOCATION
- PROPOSED OIL AND GAS LOCATION BUFFER
- BUILDING
- RESIDENTIAL BUILDING UNIT
- FACILITY
- PROPOSED ACCESS ROAD
- EXISTING ROAD
- EXISTING FENCE
- EXISTING ABOVE GROUND UTILITY
- EXISTING BURIED POWERLINE
- EXISTING PIPELINE
- EXISTING BURIED FIBER OPTIC LINE

NOTE:
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Prepared For:

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N

NAD83 CO-Nft
Scale: 1" = 750ft

SHEET 3 OF 8

Drawn by: KMG Date: 18 Dec 2024
Revised: Date:

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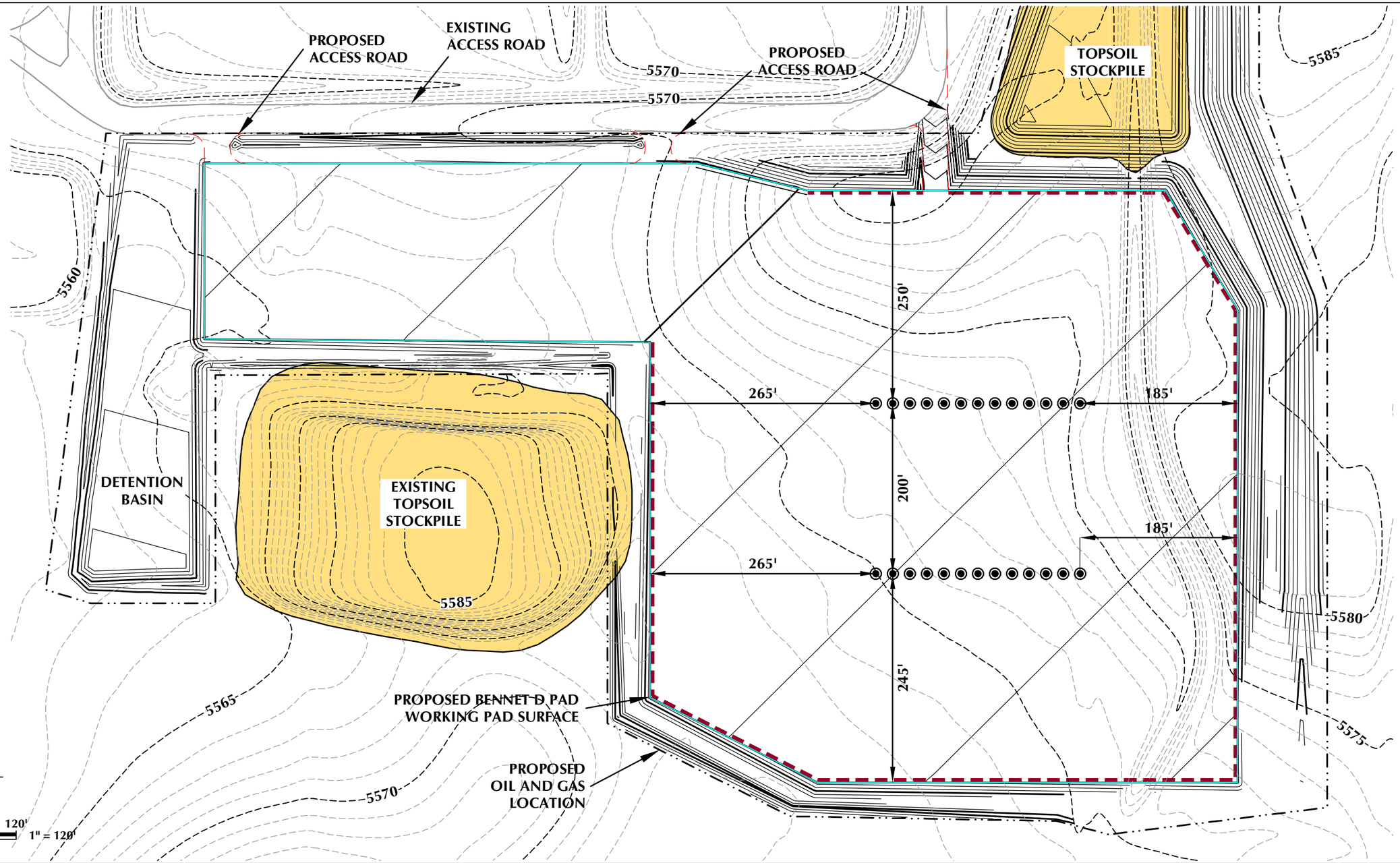
CONSTRUCTION LAYOUT SITE PLAN

BENNETT D PAD

SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



LEGEND

- PROPOSED WELL
- EXISTING WELL
- PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
- PROPOSED WORKING PAD SURFACE (13.24 ACRES)
- SOUND WALLS
- EXISTING 1' CONTOUR
- PROPOSED 1' CONTOUR

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BENNETT D PAD
CONSTRUCTION LAYOUT SITE PLAN

DATE:	12/18/24	SHEET:	4 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

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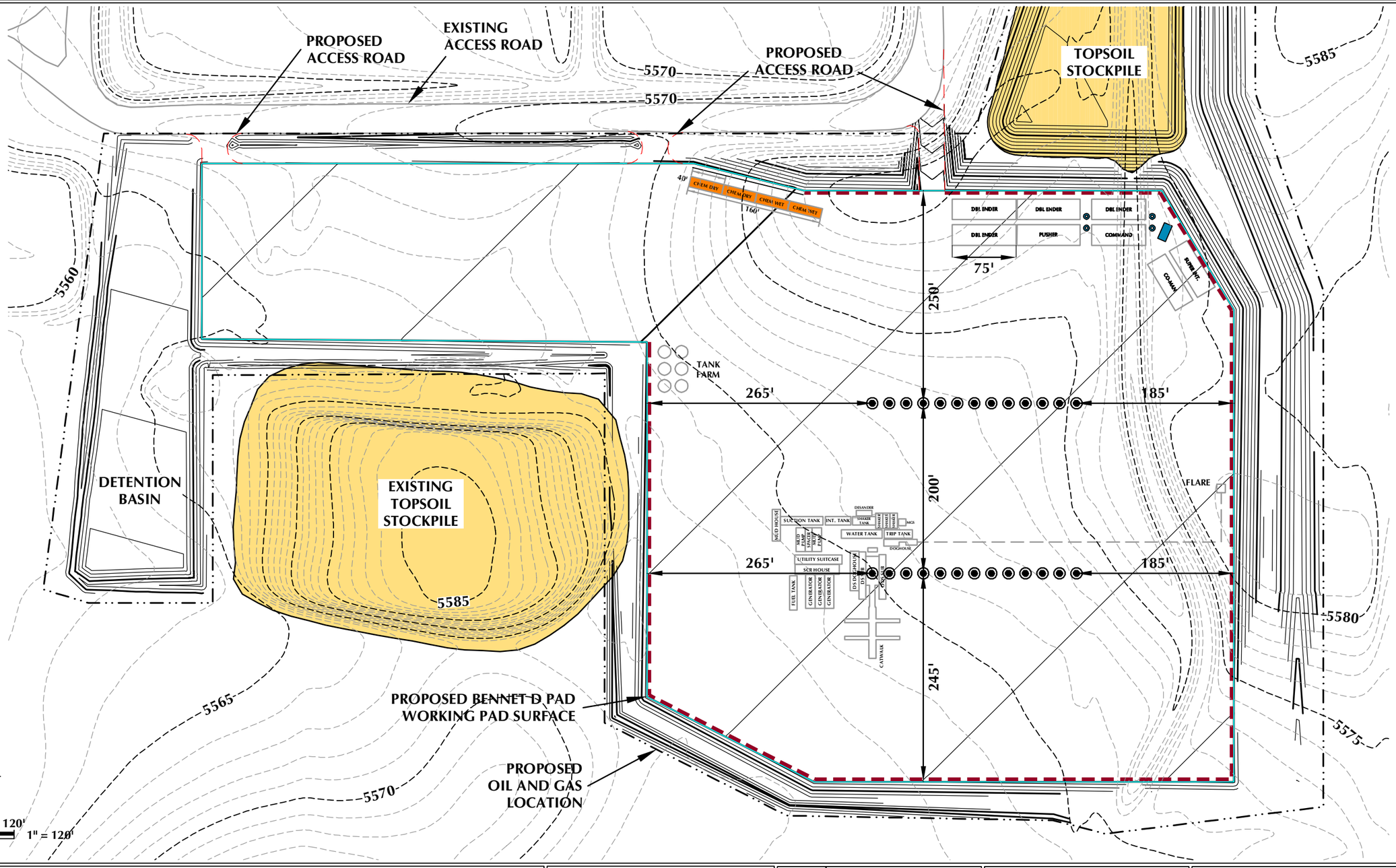
DRILLING LAYOUT SITE PLAN

BENNETT D PAD

SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



LEGEND

- PROPOSED WELL
- EXISTING WELL
- PROPOSED OIL AND GAS LOCATION
- PROPOSED WORKING PAD SURFACE
- SOUND WALLS
- EXISTING 1' CONTOUR
- PROPOSED 1' CONTOUR

NOTE:

- RIG PROFILE IS APPROXIMATE AND SUBJECT TO MODIFICATION DUE TO SPECIFIC CIRCUMSTANCES.

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Prepared For:

CIVITAS

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DENVER, CO 80202

BENNETT D PAD
DRILLING LAYOUT SITE PLAN

DATE:	12/18/24	SHEET:	5 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

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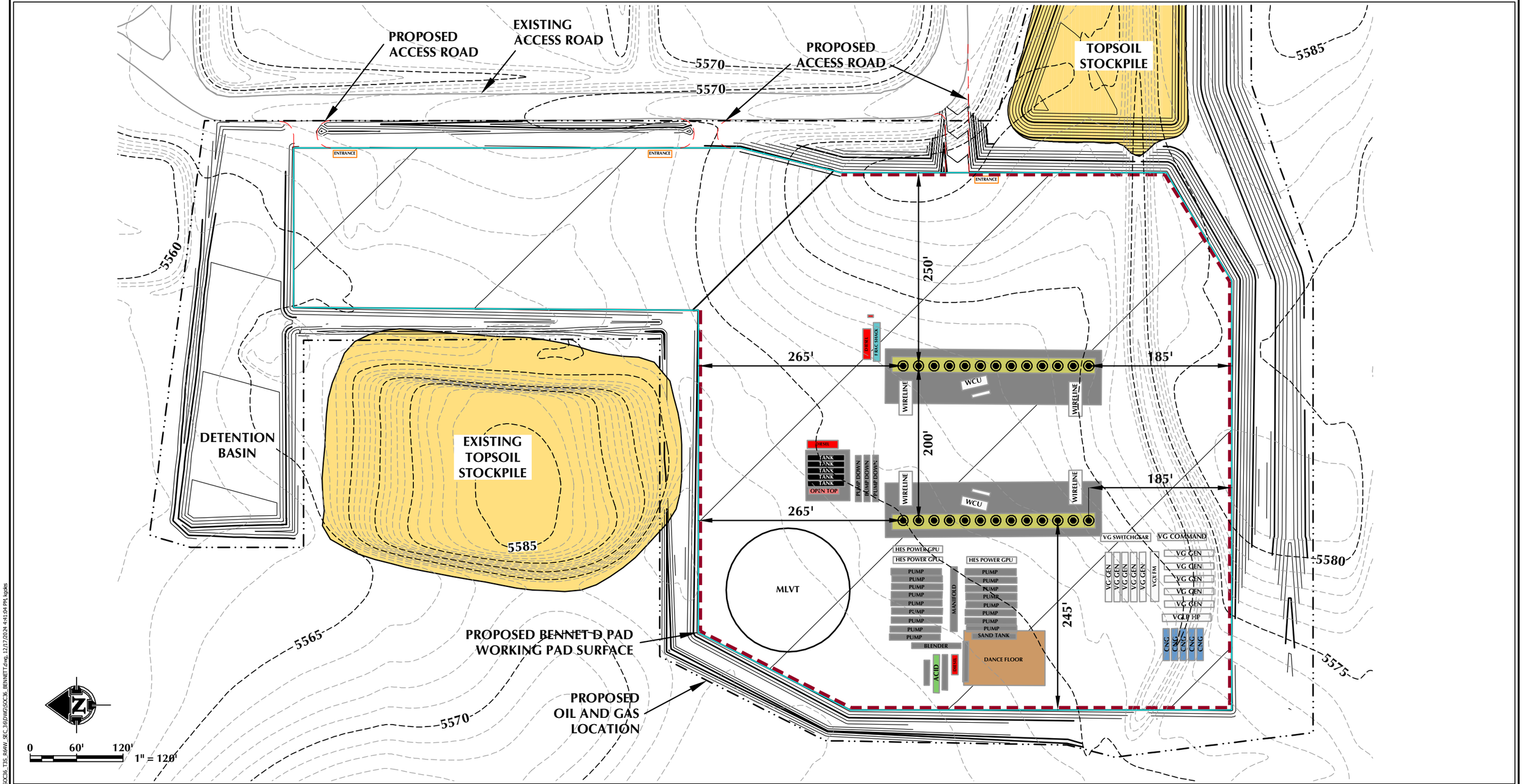
COMPLETIONS LAYOUT SITE PLAN

BENNETT D PAD

SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



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LEGEND

- PROPOSED WELL
- EXISTING WELL
- PROPOSED OIL AND GAS LOCATION
- PROPOSED WORKING PAD SURFACE
- EXISTING 1' CONTOUR
- PROPOSED 1' CONTOUR
- CNG
- DIESEL
- DANCE FLOOR
- OPEN TOP
- PRS
- FRAC SHACK
- EQUIPMENT - OTHER
- EQUIPMENT - UN
- DESIGNATED AREA
- AMP UP
- ACID
- VG GEN
- ENTRANCE
- SOUND WALLS

NOTE:

- COMPLETIONS LAYOUT IS APPROXIMATE AND SUBJECT TO MODIFICATION DUE TO SPECIFIC CIRCUMSTANCES.

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Prepared For:

CIVITAS

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555 17TH STREET, SUITE 3700
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BENNETT D PAD

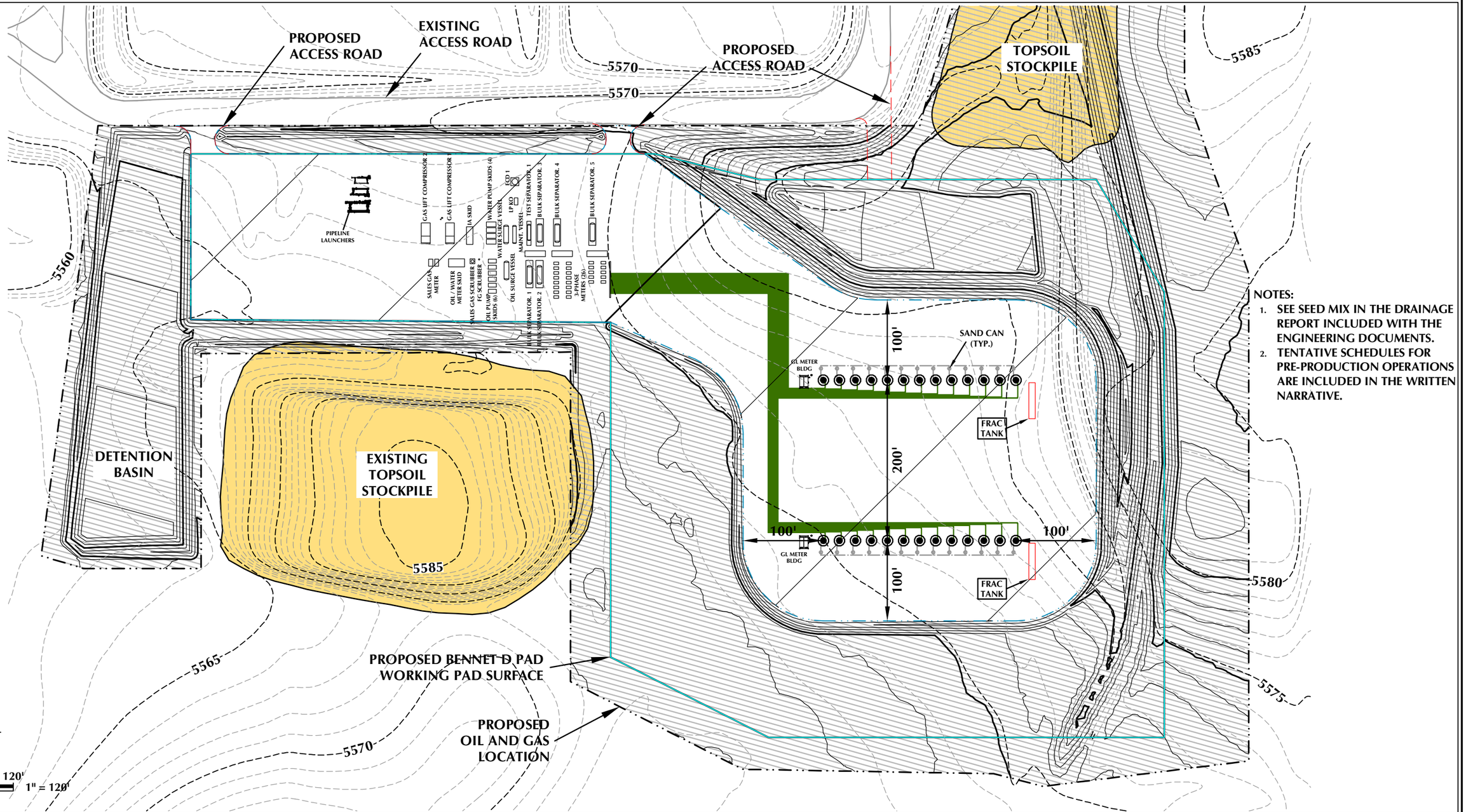
COMPLETIONS LAYOUT SITE PLAN

DATE:	12/18/24	SHEET:	6 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

PRODUCTION LAYOUT SITE PLAN

BENNETT D PAD

SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



NOTES:

1. SEE SEED MIX IN THE DRAINAGE REPORT INCLUDED WITH THE ENGINEERING DOCUMENTS.
2. TENTATIVE SCHEDULES FOR PRE-PRODUCTION OPERATIONS ARE INCLUDED IN THE WRITTEN NARRATIVE.

LEGEND

- PROPOSED WELL
- EXISTING WELL
- PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
- PROPOSED WORKING PAD SURFACE (13.24 ACRES)
- RECLAMATION AREA (15.54 ACRES)
- UNRECLAIMED AREA (7.42 ACRES)
- PROPOSED FLOWLINE
- PROPOSED PIPELINE
- EXISTING 1' CONTOUR
- PROPOSED 1' CONTOUR

NOTE:

- WELLHEADS AND FACILITY EQUIPMENT WILL REMAIN PERMANENT AFTER FLOWBACK IS COMPLETE. SAND CANS AND FRAC TANKS ARE TEMPORARY AND WILL BE REMOVED FOLLOWING FLOWBACK OPERATIONS

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Prepared For:

CIVITAS

CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD

PRODUCTION LAYOUT SITE PLAN

DATE:	12/18/24	SHEET:	7 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

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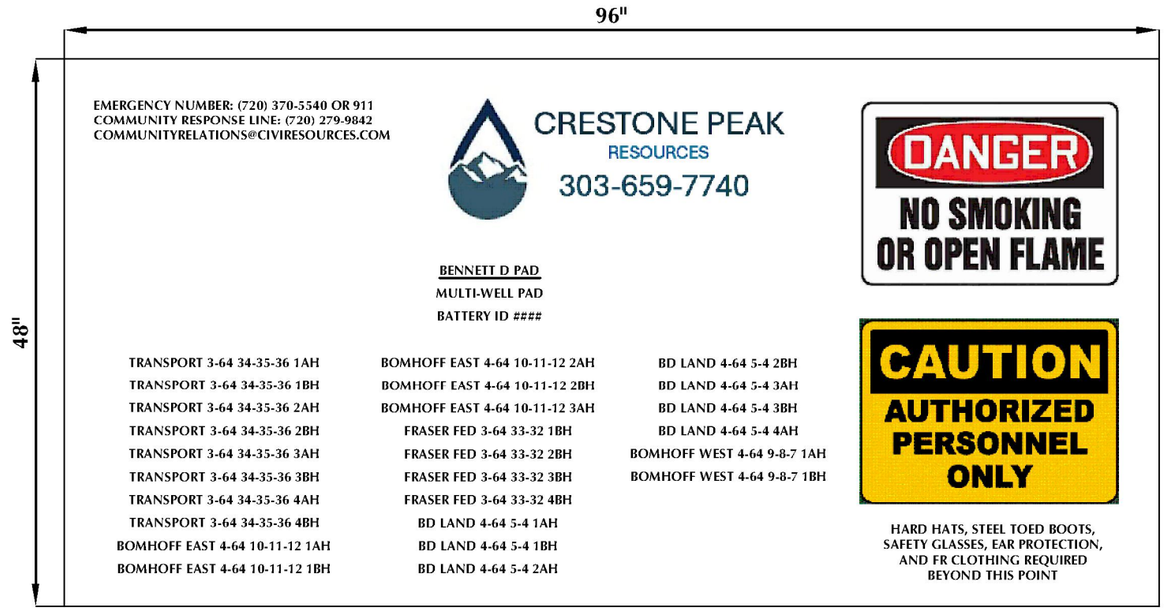
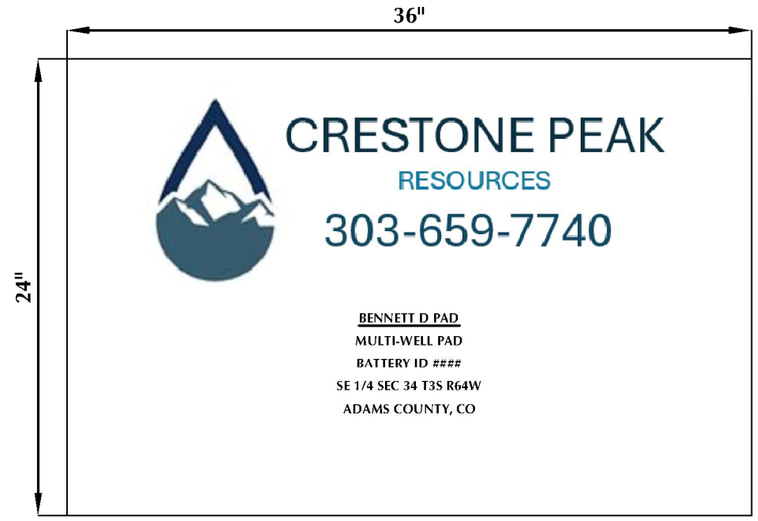
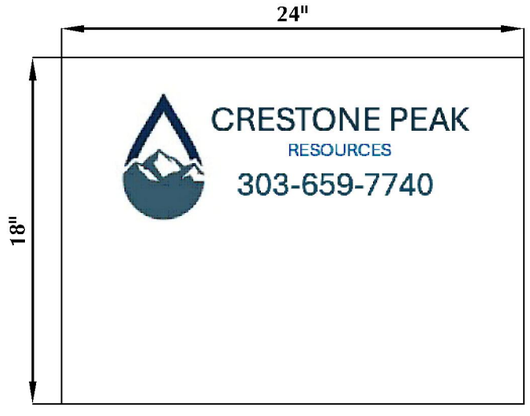
SIGNAGE PLAN
BENNETT D PAD
SE 1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



SCALE: NTS
SIZE : 96" X 48"
MATERIAL: WHITE MAX METAL W/ UV LAMINATE AND CONSTRUCTED ANGLE IRON FRAMES
LOCATION: PLACED AT FACILITY ENTRANCE



SCALE: NTS
SIZE : 36" X 24"
MATERIAL: WHITE MAX METAL W/ UV LAMINATE AND CONSTRUCTED ANGLE IRON FRAMES
LOCATION: PLACED AT EACH BATTERY



SCALE: NTS
SIZE : 24" X 18"
MATERIAL: WHITE MAX METAL W/ UV LAMINATE AND CONSTRUCTED ANGLE IRON FRAMES
LOCATION: PLACED AT EACH WELL HEAD

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BENNETT D PAD
SIGNAGE PLAN

DATE:	12/18/24	SHEET:	8 OF 8
SURVEY DATE:	9/24/24	DRAFTED BY:	KMG

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Adams County Oil and Gas Facility Application

Written Explanation

Bennett D Pad
SE/4 Section 34
Township 3 South Range 64 West

Prepared By: Crestone Peak Resources Operating, LLC
January 2025

Introduction

Crestone Peak Resources Operating, LLC (Crestone) is applying for an Oil and Gas Facility Permit (OGF) for the proposed Bennett D Pad Oil and Gas location. The application seeks to permit the drilling and completing of up twenty-six (26) horizontal wells and the installation of related surface production equipment on one (1) well pad, that will be serviced by (1) one existing access road in Adams County, Colorado.

These wells and associated production facilities have been proposed on a single pad in the southeast quarter of Section 34 Township 3S Range 64W, on parcel number 0181700000105. The horizontal drilling technique eliminates the need for multiple well pads, thus reducing the overall footprint on the surface if otherwise developed with vertical and or directional wells. This well pad and the subsequent 26 wells will develop and produce approximately 6,400 mineral acres across five drilling and spacing units (DSUs) in the Niobrara and Codell formations of the Denver-Julesburg (DJ) Basin.

The OGF, pursuant to Section 4-11-02-03-03 of the Adams County Development Standards and Regulations, will include a full Written Narrative of the site preparation, drilling, completion, production, maintenance and final abandonment processes. Additionally, the following plans and documents are included with the OGF permit application: conceptual review summary, neighborhood meeting summary, operations plan which includes the alternative site analysis, emergency preparedness and response plan, transportation plan, mitigation plans (i.e. – noise, light, odor, dust), visual aesthetics plan, community outreach plan, cumulative impacts plan, water and wildlife plans, engineering documents and surface owner documentation. A number of these plans are substantially equivalent to those prepared for Colorado Energy and Carbon Management Commission ("ECMC") and have been submitted with this application with little to no modifications. Additionally, Crestone will seek approval for an Air Quality Monitoring Plan with Colorado Department of Health & Environment ("CDPHE") prior to conducting operations.

Operations Introduction

The Written Narrative is divided into the site preparation, drilling phase, protection of fresh water, completion phase, production phase, and the abandonment and reclamation of wells and the site. All operations will be consistent with Adams County code and ECMC rules and regulations.

The following are anticipated commencement of operations (subject to change):
Construction: 2Q 2026; **Drilling**: 3Q 2026; **Completions**: 1Q 2027; **Production**: 3Q 2027

Site Preparation (60 days+)

The proposed oil and gas location will be 22.96 acres in size during construction, drilling and completions operations. Site preparation will include removal of current vegetation and stockpiling of topsoil, earthwork operations to grade the pad level for drilling operations, platting the pad with road base material, and improvements to the access road where necessary. No soil will be brought in for fill, as cut / fill will be balanced on the pad. Additionally, storm water controls and mitigation BMPs will be installed during construction of the pad.

Drilling Phase

A drilling prognosis will be prepared prior to drilling which details the landing points, formation tops, total depths, mud design, and wellbore logging and casing programs for each well.

The drilling phase typically proceeds as follows:

- A conductor rig is moved onto the location to set conductor casing for each well; typically, conductor casing takes one day for every two wells to set. Conductor casing is set at depths of 75-200' and hold back the loose gravels and soil types from falling into the hole. The conductor casing is then cemented to the surface.

- After the conductor casing is set, a surface, or "spudder," rig or drilling rig if the surface rig is unavailable, is moved onto location to set surface casing. It typically takes one day per well to set surface casing.

- For this site, surface casing will be set at least 50 feet below the deepest known aquifer in the area. Surface casing is then run and cemented from this depth to the surface. Typical surface casing designs in this area of the basin are between 2,000 – 2,500 deep.

- Next, the drilling rig is moved onsite and rigged up. Mobilization of the drilling rig typically takes 2 to 4 days, and a 24-hour drilling schedule is utilized. Under normal conditions, drilling is anticipated to take approximately 5 to 6 days per well.

- On multi-well pads, the wellheads are planned at 20 feet on center. The rig is set up on the first well to be drilled, then skids or walks to each subsequent well.

- Once the total depth is reached for a well, the drill string is removed from the hole.

- Prior to running production casing, at least one well per pad has open-hole logs run to meet ECMC requirements if an offset well's logs are not available or are insufficient. Logs are run to determine sufficient cement coverage and the stratigraphy of the formation. The objective target formations for this project are mapped and estimated to be between 7000-7600' vertical depth.

- Production casing is then run, set in the hole, and cemented in place to provide integrity and isolate the deeper hydrocarbon bearing formations.

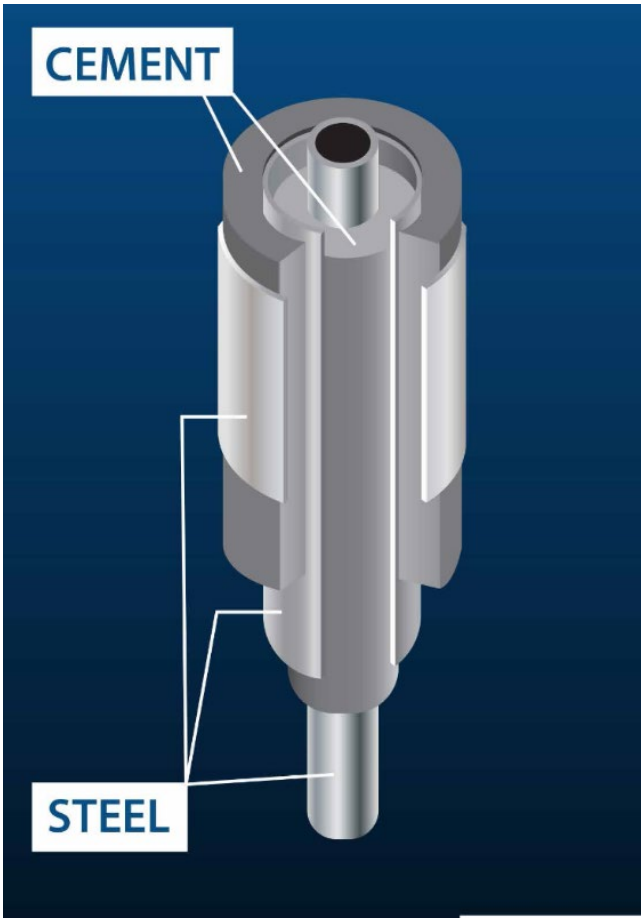
- Next, the blow out preventer is removed, the well is properly capped and secured and then the rig skids to the next well on the pad.

- Once all wells on site are drilled, cased, cemented and the well heads capped and secured, the drilling rig is demobilized and moved offsite.

Protection of Fresh Water

The ECMC sets forth specific requirements for casing setting depths necessary to protect ground water sources, and all drilling permits ensure that those setting depths have been approved. The Fox Hills sands of the late Cretaceous age are important freshwater aquifers in the western portion of the DJ Basin. In addition, there are numerous discontinuous sands of secondary importance that lie directly below the Fox Hills formation. These ground water sands are found from the surface to a depth of approximately five hundred (500) feet in the north and eastern portions of the basin and from the surface to a depth of approximately two thousand (2,000) feet or more in the south and western parts of the basin.

In order to ensure the protection of all freshwater resources, typically .9-5/8" steel surface casing is set to a depth at least fifty (50) feet below the base of the deepest known Fox Hills sands or water well, whichever is deeper, as required by the ECMC and is cemented from the bottom of the pipe up to the surface. The ECMC reviews all drilling permit applications for adequate surface casing setting depths and cementing programs based on subsurface ground water maps prepared by the State Water Engineer, offset well data and all available water well data.



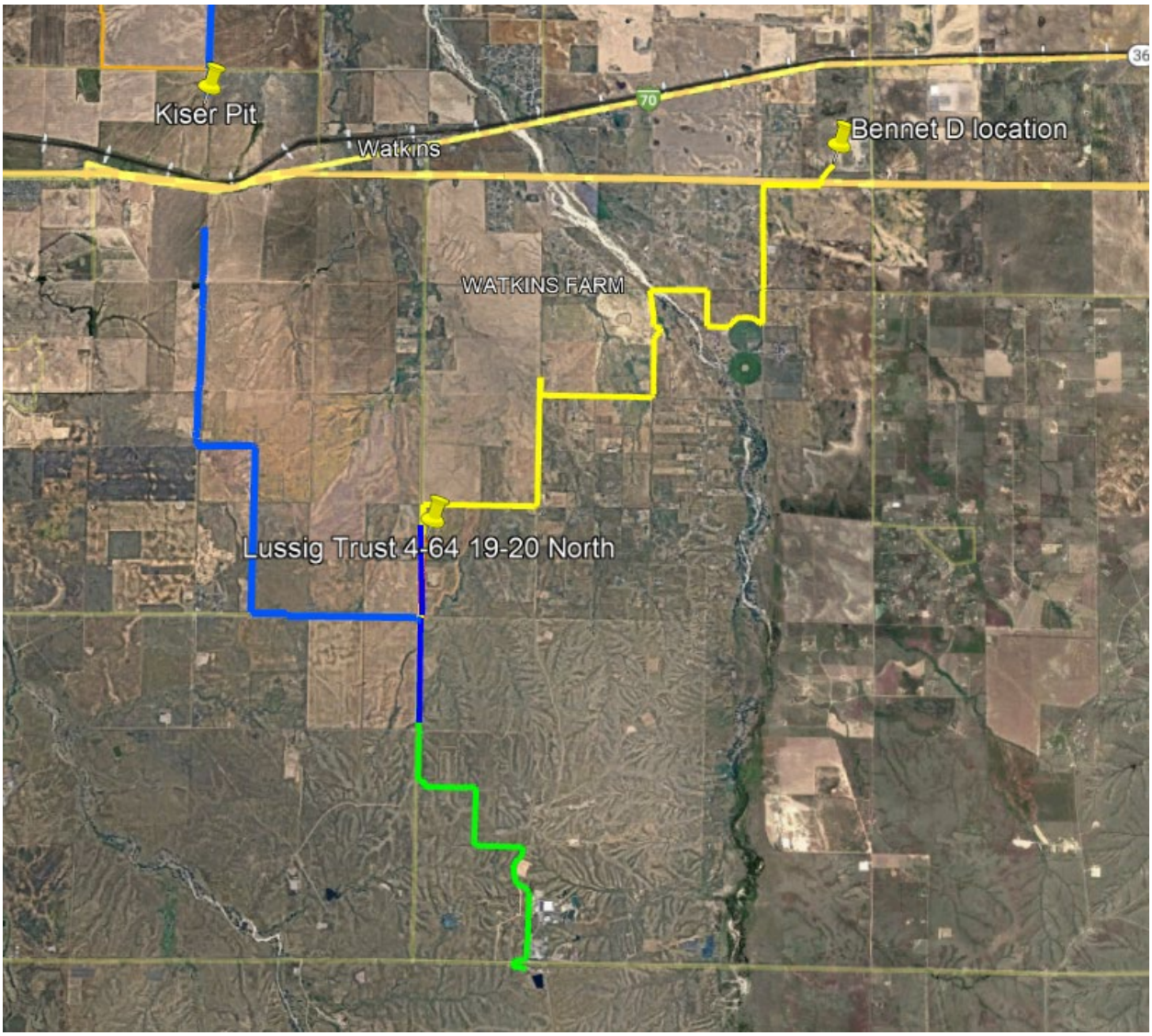
Completion Phase

Completion operations commence once the production casing cement has had sufficient time to cure. Typically, cement will cure to maximum strength within 72 hours. The quality is verified by a cement bond log (CBL).

Typically, the completion phase proceeds as follows:

- The well is perforated based on an open-hole log analysis. Perforation occurs at a specified intervals and pierces the steel casing, the cement and the formation.
- The well is then fractured hydraulically creating hairline cracks in the formation to produce tiny avenues that allow the hydrocarbons to flow from the formation. Sand is used as a propping agent to preserve the hairline cracks opened in the formation. Typically, six to nine fracturing operations or stages can be completed per day per well, at a rate of up to four wells simultaneously, including time to rig up, pump, and rig down. This process requires multiple, high-pressure, truck-mounted pumps and the associated portable equipment. Once the process is complete, all associated equipment is moved offsite.
- If necessary, tubing is run inside the casing to increase production efficiency. This process typically takes 1 to 3 days.
- The well is then flowed back for 1-20 days. The length of this process is dependent on the number of wells and the length of the laterals. These flow back fluids will be piped offsite.

The map on the following page shows the planned layflat route which will be used to transport water for completions. Please refer to the Cumulative Impacts Plan and Water and Wildlife Plan for additional details of water sources. The segment in blue currently has ROW acquired, which accounts for approximately 40% of the ROW. The green is State Land Board and Estates of Aurora and will have reacquire ROW on these properties. The yellow is additional ROW from a mix of landowners and Arapahoe County ROW which also needs to be reacquired. If requested by the Director Crestone will provide copies of ROW/easement documentation.



Proposed layflat route

Production Phase

New production facilities are constructed in accordance with ECMC rules and details are illustrated in the Production Layout Site Plan. The production facility consists of the following surface equipment listed below.

Equipment Type	Description	Height (ft) - includes base where applicable
Twenty-six horizontal wells	Wellhead above surface.	8
Five meter / sale buildings	Building which will house meters.	9.25
Three pigging stations	Area where pipeline pigs are launched and received in order to clean the pipelines.	3
Six separators	Separates production fluid into their constituent components of oil, gas and water.	13
One modular large volume tank (MLVT)	Temporary fresh water tanks for well completion operations will be used in lieu of historic in-ground pits or multiple mobile 500 bbl steel tanks.	15
Two gas compressors	Compressors utilized for gas lift to aid production.	14
One enclosed combustion device (ECD)	To be used only on an as-needed basis to incinerate natural gas that cannot be captured, processed and sold for commercial resale and/or in the event of an unplanned shut-down of the pad.	28
One instrument air skid	Compressed air to control valves.	12.5
One water surge vessel	To provide a control volume of fluid for the water pumps. Ensures adequate suction pressure for pumps.	15
Six oil pump skids	Pumps utilized for sending oil to pipeline.	9.5
One sale gas scrubber	Pressure vessel used to catch any liquids in the gas before it is sent to sales.	14
Twenty-six 3-phase meters	Measures production of gas, oil, and water for each well.	5
Two sales gas meters	Measure the amount of gas sent to sales.	9
One oil surge vessel	To provide a control volume of fluid for the oil pumps. Ensures adequate suction pressure for pumps.	15
One fuel gas (FG) scrubber	Pressure vessel used to catch any liquids in the gas before it is used for fuel gas.	5

Equipment Type	Description	Height (ft) - includes base where applicable
One LP knock out	Pressure vessel used to catch any liquids in the gas before it is sent to compression.	13
One maintenance vessel	Pressure vessel used on an as-needed basis to catch any liquids during maintenance events prior to waste gas being sent to the ECD.	9
Four water pump skids	Pumps utilized for sending water to pipeline.	9.5
Two 500bbl frac tanks (flowback sand management)	Tanks used temporarily for sand storage.	10
Twenty-six sand cans	Temporary equipment to remove sand from the production stream.	25

The wellheads will be connected to the facility via on-location flow lines that will be buried 3 to 4 feet deep. The flow lines are typically 2-inch-diameter schedule 160 welded steel, coated.

Once the production phase of the wells commences, daily monitoring of the wells begins. Daily reports consist of liquid measurements, gas production estimates, pressure readings, and general facility care and maintenance. This information is compiled and recorded in the ECMC monthly report. The production phase continues until a well is no longer productive, or it is no longer financially viable to continue production. It is estimated that the average life of each well at this location will be 20 to 30 years.

Plugging and Abandonment of Wells & Facilities

Crestone will plug the wells, remove production equipment, and reclaim the pad when it becomes uneconomical to continue operating the wells. This will include installation of a series of required cement plugs in the wells to eliminate future flow from the well, in accordance with Section 1000 of ECMC rules and regulations. After the well has been plugged, flow lines will be flushed of all hydrocarbons and capped or removed in accordance with Rule 1103 of ECMC rules and regulations. If the separator and tanks on the property surface are no longer needed for other wells, they will be removed. Surface restoration will include removal of any above-ground casing and installation of regulation markers that will not interfere with future surface use.

Site Reclamation

The Bennett D pad will have an interim reclamation period which includes re-contouring and reseeding around the edges of the pad but such as to allow for daily operations of the oil and gas facility, access to the wells, maintenance of the facility and wells, workovers, and normal production activity. The pad size will be reduced to 7.42 acres once the wells are on production.

All tanks and equipment, lines and roads will be removed from the entire multi well pad location upon permanent cessation of the operator's production and operations at the site. All reseeding shall be done with grasses consistent with the Rocky Mountain native mix. All site reclamation will be in conformance with Adams County regulations as well as the ECMC regulations.

Water Source

Crestone will source water from Farmers Reservoir and Irrigation Company out of Barr Lake which will then be transported by A&W Water Service to the location and will be stored in a temporary modular large volume tank (MLVT) for use during completions at the pad. For drilling, the water source will be from Rangeview Metropolitan District. Transportation of water to the pad will be completed using temporary "lay flat" water lines on the ground surface and removed after use. This technology eliminates the need to truck water to the pad during drilling and completion operations.

Weed Control

All areas, including well heads and production facilities, will be kept free of weeds, rubbish, and other waste material. As much as possible, all areas will be kept free of noxious weeds. If noxious weeds are identified on-site, the area will be treated as soon as possible in an effort to prevent the weed from flowering and spreading. To the greatest extent possible, machinery and equipment will not be parked or staged in weed infested areas.

Drainage & Erosion Control

Proper storm-water controls will be installed around the facility and drilling pad during construction. The wellhead access road will be crowned, ditched and graveled, and culverts for cross drainage will be installed if necessary. Storm-water controls will also be installed around the spoil piles to prevent sediment migration. No changes in the current drainage patterns are anticipated. A Storm Water/Erosion Control Plan has also been filed with the ECMC as part of the Oil and Gas Location Assessment (ECMC Form 2A). Crestone will work with Adams County to provide an easement for drainage and access to the OGF.

Sanitary Facilities

Crestone personnel and contractors will utilize portable sanitary toilets and wash stations. No personnel are on the location for a permanent period of time. No city services or permanent sanitary services of any kind are required. All personnel and contractors who visit the site are responsible for picking up and disposing of any debris.

Alternative Site Analysis

Crestone believes the proposed location is the most suitable site for this proposed activity. The location is collocated with a midstream oil and gas facility, is near I-70, and is sited to maximize mineral development with the least amount of surface disturbance. The proposed location has up to two residences within 2,000' and three additional parcels with up to residences are within 2,000'. Crestone is currently in conversations with surrounding landowners to confirm the number of residences, tenants and if homes are occupied. Additionally, there are isolated wetlands within 2,000' of the location. Crestone is currently seeking a jurisdictional determination from the US Army Corps of Engineers regarding these wetlands.

RPG Resources (RPG), on behalf of Crestone, conducted a wetland and waters survey of the proposed Bennett D Pad location to identify any wetland or waterway constraint(s) present within or surrounding the proposed construction area.

Please see the following page for a map to reference the features described herein. Three wetland and water features are located within the 500-foot survey area. Two of these features, 3 and 4, were verified present. Feature 2, an emergent wetland within a stormwater basin, is located outside of the buffer, approximately 711-feet north of the WPS and Needle spikerush (*Eleocharis acicularis)* dominates the wetland area. The boundaries of feature 3, an NWI-mapped wetland feature, were updated to reflect the current conditions in the field. The wetland is likely fed by a marsh/pond that is beyond the Civitas boundary line. Feature 4, a stormwater pond with fringe wetlands, was delineated and mapped to reflect the current wetland boundary. A drainage feature moves water downslope, from north to south, and into the pond.

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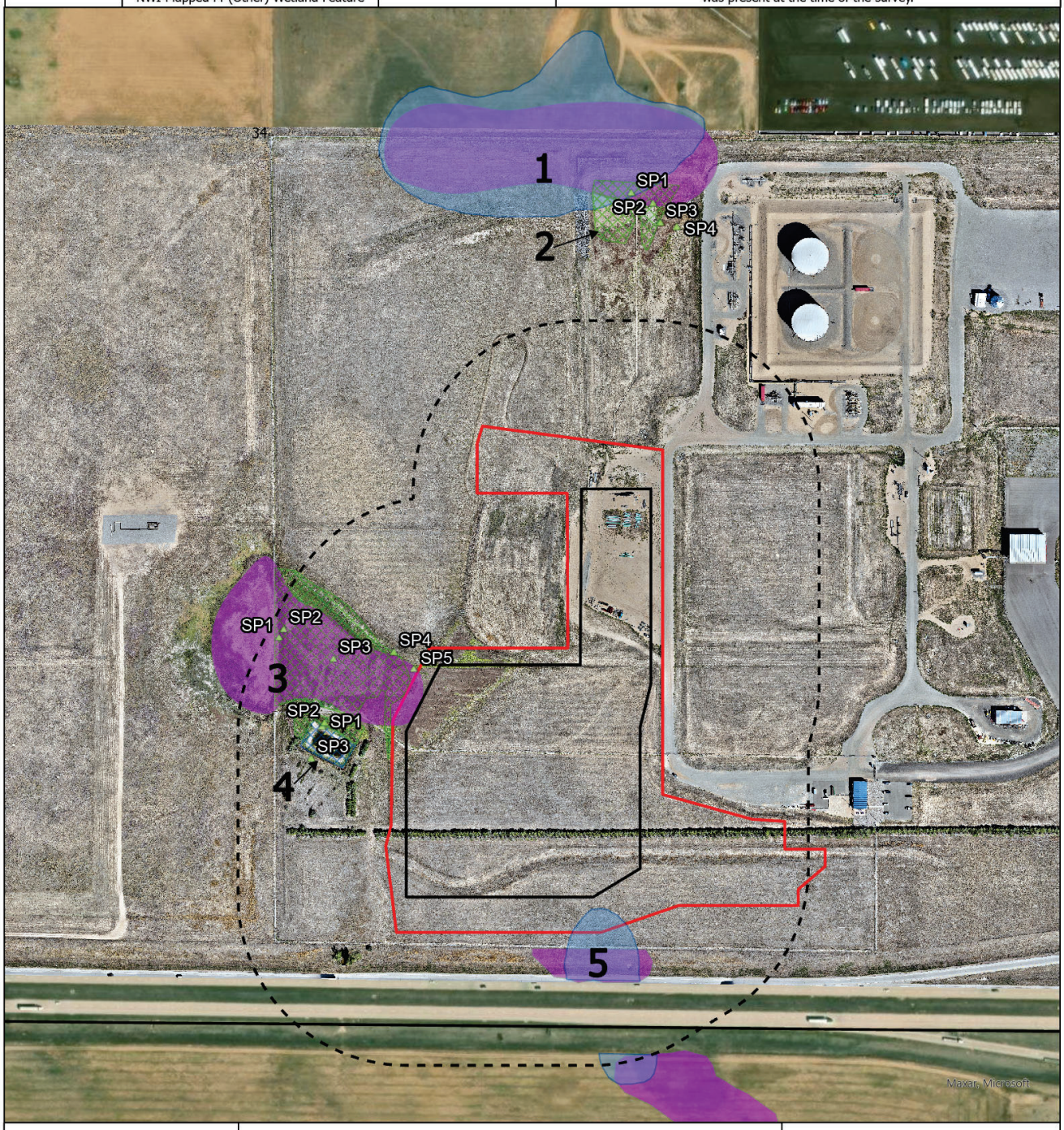
CIVITAS RESOURCES COMPANY, LLC
BENNETT D
SEC34 T3S R64W, R58W, 6th P.M.
ADAMS COUNTY, COLORADO

Produced for: CIVITAS Crestone Peak Resources, LLC

Produced by: RPG RESOURCES a System One company

Feature Number	Feature Classification	Distance and Direction	Observations
1	NHD-Mapped Intermittent Lake/Pond NWI-Mapped Pf (Other) Wetland Feature	Approximately 812-feet north	This feature was field verified NOT present. No hydric vegetation, soils, or hydrology was present at the time of the survey. There was no standing water or topography change within the mapped lake/pond area.
2	Emergent Wetland within Stormwater Basin	Approximately 710-feet north	A field verified wetland within a large depression used for drainage purposes. A concrete flowline passes through the wetland area and a 3-foot tall rock outfall creates a boundary to the west.
3	NWI-Mapped Pf (Other) Wetland Feature	Approximately 54-feet west	A field verified wetland fed by a marsh/pond beyond the Civitas property boundary. Surface water was present within 1 inch.
4	Stormwater Pond with Fringe Wetland	Approximately 150-feet west	A field observed stormwater pond with an OHWM. Fringe wetlands along the bed and bank of the pond were confirmed via wetland delineations.
5	NHD-Mapped Intermittent Lake/Pond NWI-Mapped Pf (Other) Wetland Feature	Approximately 40-feet south	This feature was field verified NOT present. No hydric vegetation, soils, or hydrology was present at the time of the survey.



SURVEY MAP

- Oil & Gas Location (OGL)
- Working Pad Surface (WPS)
- 500-Foot Buffer Around WPS
- NHD-Mapped Lake/Pond
- NWI-Mapped Other Wetland
- Delineated Wetland
- Delineated Lake/Pond
- Wetland Sample Point

Projection: WGS 1984
Date: 9/26/2024
Drafted by: HJL

0 250 500 Feet

N

1 inch equals 300 feet

Alternative location 1 has 60 residences within 2,000', and a number of mapped National Wetland Inventory (NWI) wetlands. If Crestone were to utilize this site, another oil and gas location would be necessary to target the same minerals. The surface disturbance would be approximately doubled compared to the proposed location.

Alternative location 2 has two residences and a number of NWI wetlands within 2,000'. The southern most wells would likely not be drilled as this step out is outside of what is technically feasible from a drilling and completions perspective. To reach the same minerals as the proposed Bennett D location the step outs would be an additional 4,500+ feet. The map on the following page illustrates this additional side sail needed to reach the same minerals. Crestone's drilling and completion teams do not support this design as the current plan is approaching the technical limits. With this additional wellbore some potential issues may revolve around risk of hole instability in the vertical section, reaching target depth while successfully pulling out of hole, and effectively cleaning out the wellbore after stimulation. Being all of the wells could not be drilled and minerals would be stranded, this location was not chosen as the preferred.

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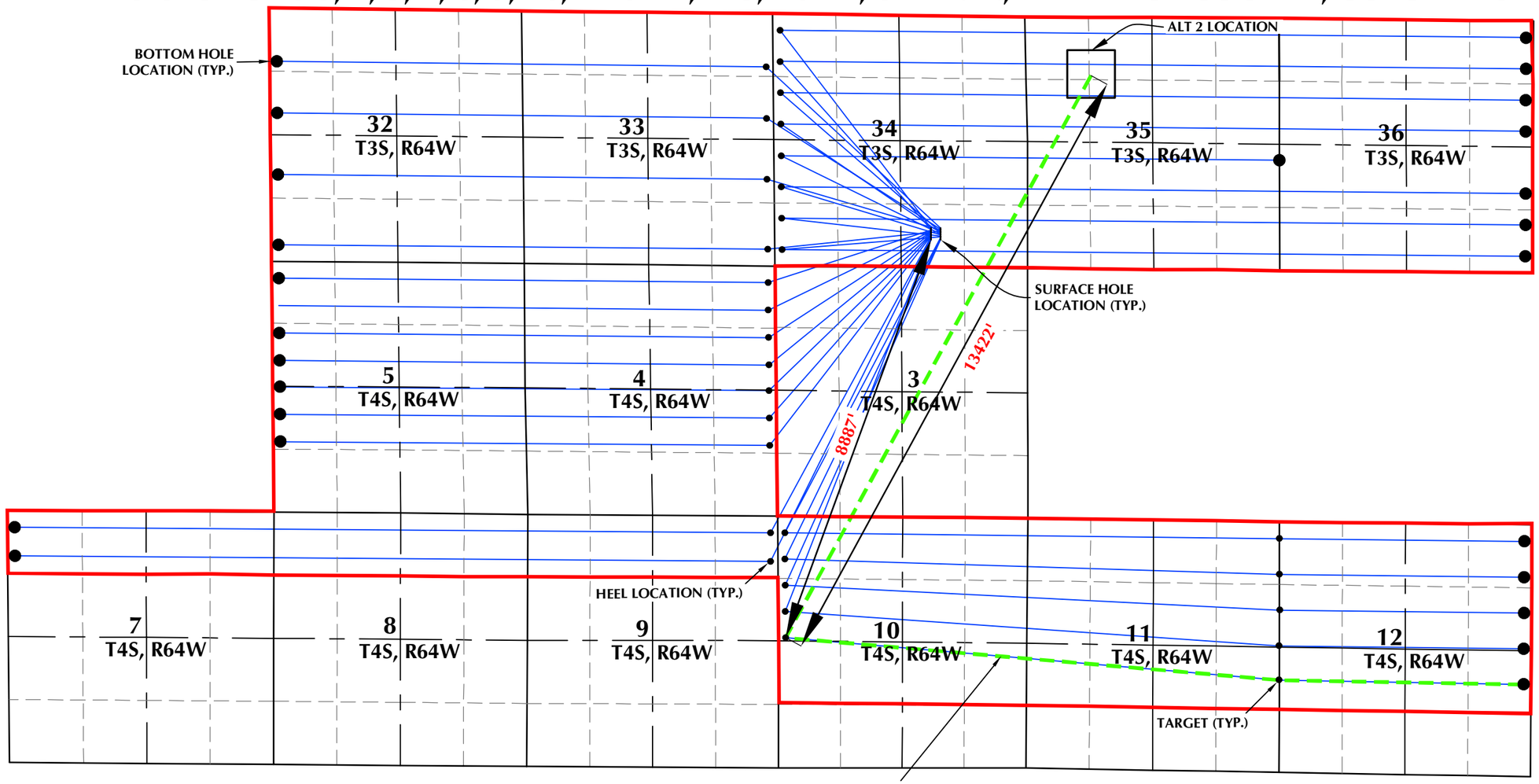
DIRECTIONAL WELL PLAT (ECMC) / MULTI-WELL PLAN (OGED)
SECTIONS 32, 33, 34, 35 & 36, T3S, R64W, 6TH P.M., ADAMS COUNTY, COLORADO
& SECTIONS 3, 4, 5, 7, 8, 9, 10, 11 & 12, T4S, R64W, 6TH P.M., ARAPAHOE COUNTY, COLORADO



WELL BORE LENGTH FROM
PROPOSED LOCATION = ±24,400'
ALT 2 LOCATION = ±28,950

LEGEND:
- DSU BOUNDARY
- WELLBORE TRAJECTORY
- HEEL LOCATION/TARGET
- BOTTOM HOLE LOCATION

GRID

0 2500' 3500'

HORIZONTAL SCALE: 1" = 2500'

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DENVER, CO 80202

WELL PAD - BENNET D

DIRECTIONAL WELL PLAT (ECMC) /MULTI-WELL PLAN (OGED)
FRASER FED 3-64 33-32 1BH, FRASER FED 3-64 33-32 2BH,
FRASER FED 3-64 33-32 3BH, FRASER FED 3-64 33-32 4BH,
TRANSPORT 3-64 34-35-36 2AH, TRANSPORT 3-64 34-35-36 2BH,
TRANSPORT 3-64 34-35-36 3AH, TRANSPORT 3-64 34-35-36 3BH,
TRANSPORT 3-64 34-35-36 4AH, TRANSPORT 3-64 34-35-36 4BH,
BOMHOFF EAST 4-64 10-11-12 1AH, BOMHOFF EAST 4-64 10-11-12 1BH,
BOMHOFF EAST 4-64 10-11-12 2AH, BOMHOFF EAST 4-64 10-11-12 3AH,
BOMHOFF EAST 4-64 10-11-12 2BH, BOMHOFF WEST 4-64 9-8-7 1BH,
BOMHOFF WEST 4-64 9-8-7 1AH, BD LAND 4-64 5-4 4AH,
BD LAND 4-64 5-4 3BH, BD LAND 4-64 5-4 3AH,
BD LAND 4-64 5-4 2BH, BD LAND 4-64 5-4 2AH,
BD LAND 4-64 5-4 1BH, BD LAND 4-64 5-4 1AH,
TRANSPORT 3-64 34-35-36 1BH & TRANSPORT 3-64 34-35-36 1AH
LOCATED IN SECTIONS 32, 33, 34, 35 & 36, T3S, R64W, 6TH P.M., ADAMS COUNTY , COLORADO
& SECTIONS 3, 4, 5, 7, 8, 9, 10, 11 & 12, T4S, R64W, 6TH P.M., ARAPAHOE COUNTY, COLORADO

DRAFTED BY:	SJM	CHECKED BY:	RKF
DATE DRAFTED:	10/18/24	DATE SURVEYED:	9/24/24
REVISED:		FILE NAME:	23-182

SHEET NO: 1 (1 OF 1)

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Alternative location 3 has one residence and surface waters within 2,000'. If Crestone were to utilize this site, another oil and gas location would be necessary to target the same minerals. The surface disturbance would be approximately doubled compared to the proposed location.

Crestone's preferred location is most suitable to develop the targeted minerals while collocating new development with existing oil and gas infrastructure. The proximity to the interstate ensures minimal amount of County Road will be utilized for ingress / egress at the location. The proximity of the proposed location to the Bennett Station allows Crestone to make the facility oil tankless and have pipeline takeaway for oil and gas. The BMPs to be utilized at this location will ensure our operations will be protective of public health, safety, welfare, the environment and wildlife resources.

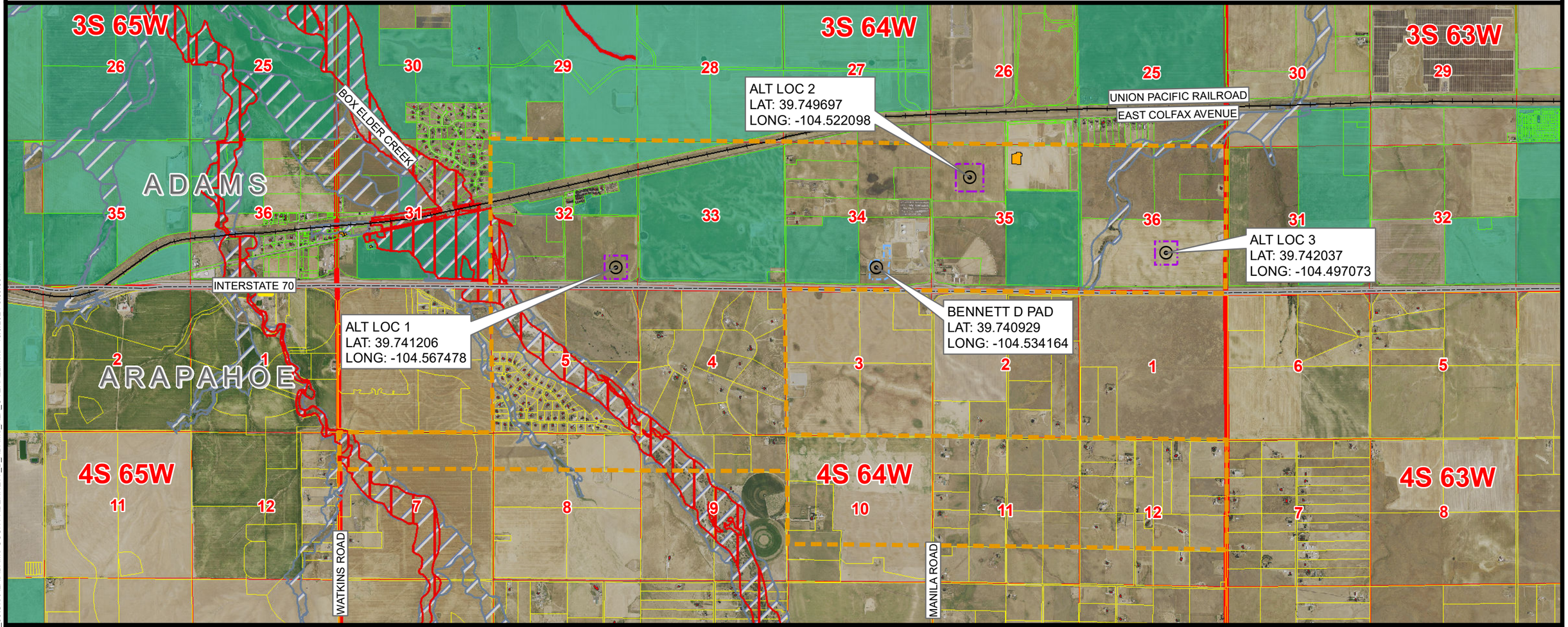
The following pages are site maps utilized for the Alternative Location Analysis

[remainder of the page intentionally left blank]

ALTERNATIVE LOCATION ANALYSIS - OVERVIEW

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- PROPOSED REFERENCE POINT
- PROPOSED WORKING PAD SURFACE
- ALTERNATE OIL AND GAS LOCATION
- PROPOSED MINERAL BOUNDARY
- COUNTY BOUNDARY
- ADAMS COUNTY PARCEL BOUNDARY
- ARAPAHOE COUNTY PARCEL BOUNDARY
- AURORA JURISDICTIONAL BOUNDARY
- 100-YEAR FLOODWAY (EFFECTIVE)
- 100-YEAR FLOODPLAIN (EFFECTIVE)
- HEALTH FACILITY
- SCHOOL FACILITY
- CHILD CARE FACILITY
- RAILROAD
- NON-RESIDENTIAL BUILDING UNIT
- HIGH OCCUPANCY BUILDING UNIT
- RESIDENTIAL BUILDING UNIT

NOTE:
THIS MAP IS A COMPILATION OF PUBLICLY AVAILABLE DATA. THE ACCURACY AND COMPLETENESS OF SAID DATA HAS NOT BEEN VERIFIED BY 609 CONSULTING, LLC. EXISTING CONDITIONS MAY DIFFER FROM WHAT IS SHOWN.

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Drawn by: KG **Date:** 4 Oct 2024
Revised: **Date:**

N

NAD83 CO-Nft
Scale: 1" = 3,500ft

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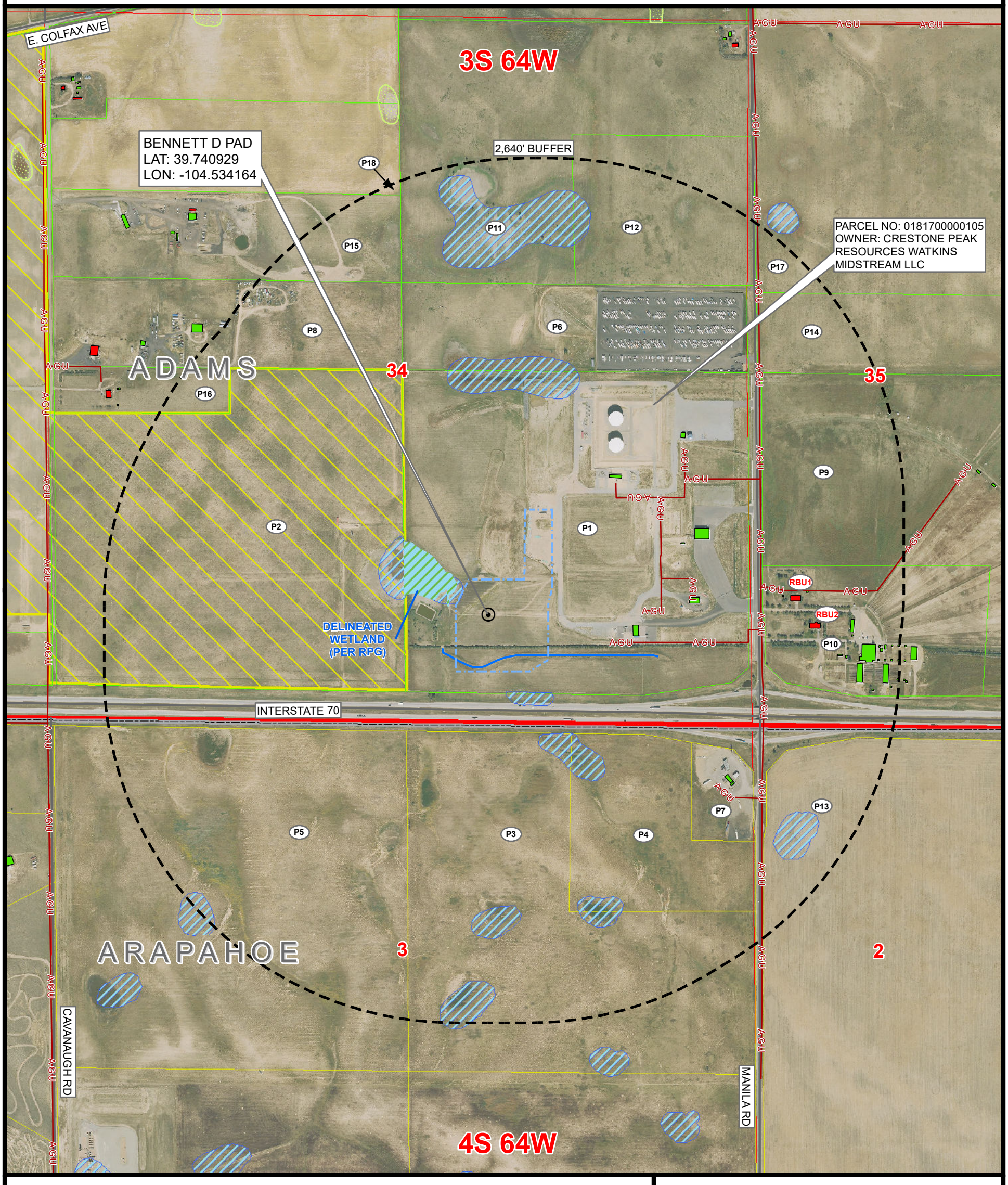
ALTERNATIVE LOCATION ANALYSIS - PROPOSED LOCATION

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- PROPOSED REFERENCE POINT
- PROPOSED WORKING PAD SURFACE
- BUFFER
- BUILDING
- NON-RESIDENTIAL BUILDING UNIT
- RESIDENTIAL BUILDING UNIT
- HEALTH FACILITY
- SCHOOL FACILITY
- CHILD CARE FACILITY
- ABOVE GROUND UTILITY
- PUBLIC ROAD
- RAILROAD
- DITCH/CANAL/DRAINAGE
- DISPROPORTIONATELY IMPACTED COMMUNITY
- ARAPAHOE COUNTY PARCEL BOUNDARY
- ADAMS COUNTY PARCEL BOUNDARY
- AURORA JURISDICTIONAL BOUNDARY
- RULE 411.b 2640' BUFFER
- 100-YEAR FLOODWAY (EFFECTIVE)
- 100-YEAR FLOODPLAIN (EFFECTIVE)
- COUNTY BOUNDARY
- RIPARIAN CORRIDOR
- DELINEATED WETLANDS
- RIVERINE CORRIDOR
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED/SHRUB WETLAND
- OTHER
- LAKE
- FRESHWATER POND

NOTE:
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Prepared For:

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NAD83 CO-Nft
Scale: 1" = 750ft

Drawn by: CPS Date: 4 Oct 2024
Revised: CPS Date: 22 Oct 2024

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ALTERNATIVE LOCATION ANALYSIS - PROPOSED LOCATION

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

	PARCEL ID	DISTANCE	PARCEL #	OWNER
PROPERTY LINE	P1	±0'	0181700000105	CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC
	P2	±383' W	0181700000149	ELEVATION MIDSTREAM LLC
	P3	±450' S	1979-00-0-00-599	CST METRO LLC
	P4	±556' SE	1979-00-0-29-001	B & D LAND COMPANY 600 LLC
	P5	±578' SW	1979-00-0-00-046	B & D LAND COMPANY 600 LLC
	P6	±1042' N	0181734100001	FRONT RANGE RV STORAGE LLC
	P7	±1237' SE	1979-00-0-29-002	CST METRO LLC
	P8	±1400' NW	0181700000304	JAVIER LOPEZ
	P9	±1569' E	0181700000276	THE LEWIS FAMILY TRUST
	P10	±1570' E	0181700000275	THE LEWIS FAMILY TRUST
	P11	±1698' N	0181734100004	LUBERSKI PROPERTIES LLC
	P12	±1705' N	0181734100003	LUBERSKI PROPERTIES LLC
	P13	±1834' SE	1979-00-0-00-116	SW MANILA LLC
	P14	±1851' NE	0181735200001	ROCKY MOUNTAIN MIDSTREAM LLC
	P15	±1946' NW	0181734200003	RH CHUAPOCO INVESTMENTS LLC
	P16	±2193' NW	0181700000148	THE 1950 CAVANAUGH LAND TRUST
	P17	±2233' NE	0181735200002	ROCKY MOUNTAIN MIDSTREAM LLC C/O AD VALOREM TAX
	P18	±2546' N	0181734200002	D & K LIMITED LIABILITY COMPANY
RESIDENTIAL/NON-RESIDENTIAL BUILDING UNIT	RBU1 ±1791' E, RBU2 ±1951' E			
HIGH OCCUPANCY BUILDING UNIT	N/A			
SCHOOL FACILITY	N/A			
PUBLIC ROAD	±229' S (INTERSTATE 70), ±1500' E (MANILA RD)			
ABOVE GROUND UTILITY	±461' E, ±487' E, ±695' E, ±811' E, ±1019' E, ±1562' E, ±1566' E, ±1567' SE			
RAILROAD	N/A			
DITCH/DRAINAGE/CANAL	±0'			
NWI WETLAND	±0', ±152' S, ±482' S, ±839' N, ±1739' S, ±1757' S, ±1844' N, ±2131' SE, ±2327' S, ±2531' SW			
FLOODPLAIN	N/A			
HIGH PRIORITY HABITAT	N/A			
OTHER	±51' W (DELINEATED WETLAND), ±371' W (AURORA JURISDICTIONAL BOUNDARY)			

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Legend

- PROPOSED REFERENCE POINT
- PROPOSED WORKING PAD SURFACE
- BUFFER
- BUILDING
- NON-RESIDENTIAL BUILDING UNIT
- RESIDENTIAL BUILDING UNIT
- HEALTH FACILITY
- SCHOOL FACILITY
- CHILD CARE FACILITY
- AGU ABOVE GROUND UTILITY
- PUBLIC ROAD
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NOTE:
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Drawn by: CPS **Date:** 22 Oct 2024
Revised: **Date:**

NAD83 CO-Nft
Scale: 1" = 750ft

HAUL ROUTE MAP

BENNETT D PAD

SE1/4 SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

NOTE:
PIPELINE ROUTE IS PRELIMINARY AND SUBJECT TO CHANGE

LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- TRAFFIC ROUTE
- PIPELINE ROUTE

TRAVEL PATH:
TAKE EXIT 299 OFF OF INTERSTATE 70 TO MANILA ROAD AND PROCEED IN A NORTHERLY DIRECTION FOR 0.1 MILES TO THE PROPOSED ACCESS ROAD TO THE WEST. EXIT LEFT ONTO THE PROPOSED ACCESS ROAD AND CONTINUE 0.4 MILES TO THE PROPOSED LOCATION.

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DATE SURVEYED:	9/24/24
DATE:	10/4/24
DRAFTER:	JFE
REVISED:	10/18/24

PREPARED FOR: CIVITAS
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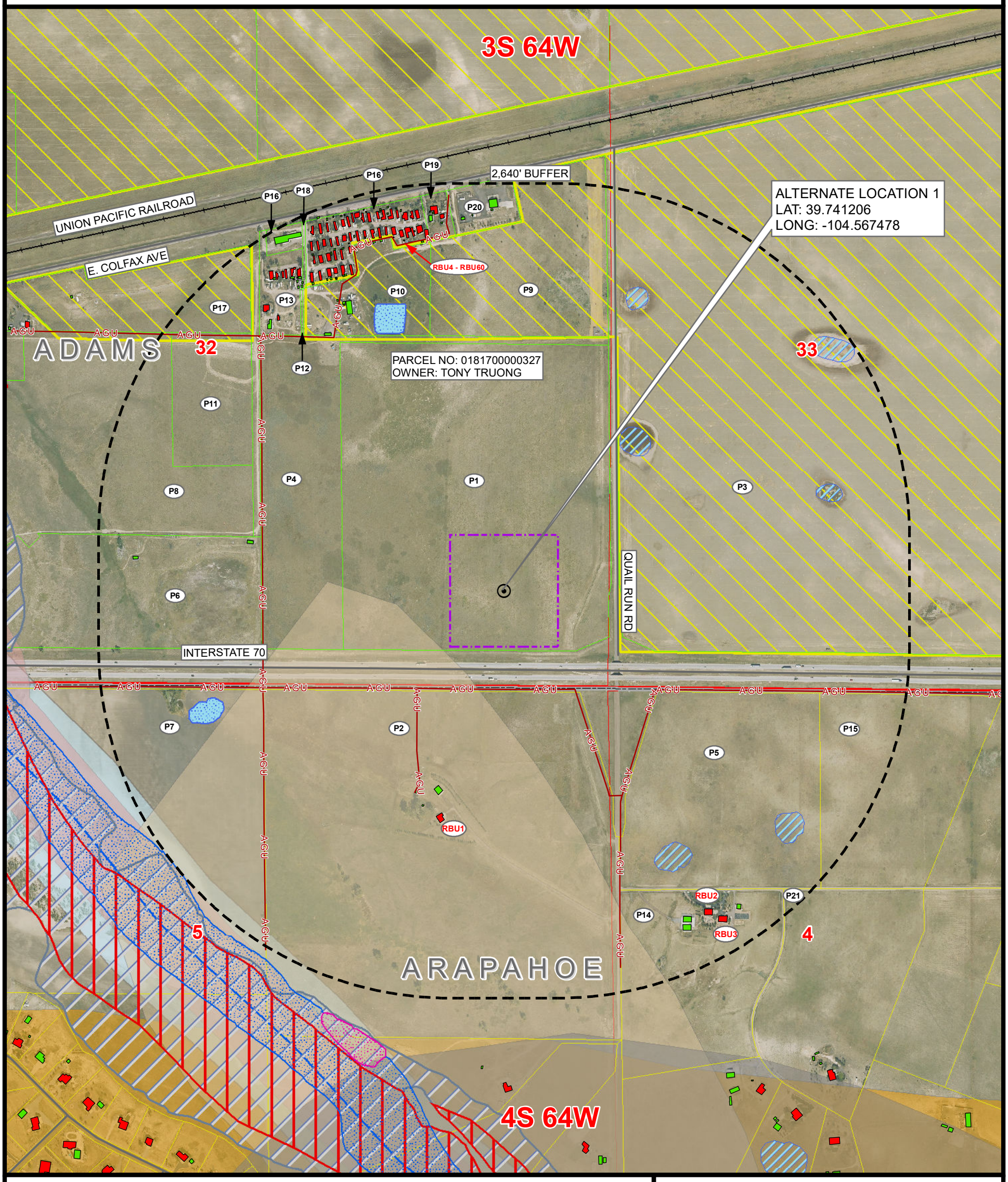
ALTERNATIVE LOCATION ANALYSIS - ALTERNATE LOCATION 1

BENNETT D PAD

SECTION 32, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- PROPOSED REFERENCE POINT
- ALTERNATE OIL AND GAS LOCATION
- BUFFER
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- NON-RESIDENTIAL BUILDING UNIT
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- MULE DEER WINTER CONCENTRATION AREA
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- MULE DEER MIGRATION CORRIDOR
- PRONGHORN WINTER CONCENTRATION AREA

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NAD83 CO-Nft
Scale: 1" = 750ft

Drawn by: CPS Date: 4 Oct 2024
Revised: CPS Date: 18 Oct 2024

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ALTERNATIVE LOCATION ANALYSIS - ALTERNATE LOCATION 1

BENNETT D PAD

SECTION 32, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

	PARCEL ID	DISTANCE	PARCEL #	OWNER
PROPERTY LINE	P1	±0'	0181700000327	TONY TRUONG
	P2	±328' S	1979-00-0-00-025	REVOCABLE TRUST AGREEMENT OF HYLAINE J HEIN
	P3	±450' E	0181700000250	WESTERN TRANSPORT LLC
	P4	±806' W	0181700000326	MORALES-ALEJANDRO HERIBERTO UND 62.5 % AND AYALA ROBERT AKA AYALA-ROSADO ROBERTO UND 37.5%
	P5	±811' SE	1979-04-1-00-017	PROSPER FARMS INVESTMENTS LLC
	P6	±1415' W	0181732300001	ARSIAN PROPERTIES LLC
	P7	±1440' W	1979-06-1-00-381	PROSPER FARMS INVESTMENTS LLC
	P8	±1480' W	0181700000245	GMJ FAMILY TRUST
	P9	±1493' N	0181700000280	WESTERN TRANSPORT LLC
	P10	±1506' N	0181700004001	JOHN B. BARANWAY
	P11	±1577' W	0181732300002	NWP HOLDINGS LLC
	P12	±1864' NW	0181700000253	JOHN B. BARANWAY
	P13	±1875' NW	0181700000091	JOHN B. BARANWAY
	P14	±1877' S	1979-04-1-00-004	1191 SNOW LAKE LLC
	P15	±1991' E	1979-04-1-00-018	MARCU RADU, MARCU FLOARE
	P16	±2063' N	0181700002001	JOHN B. BARANWAY
	P17	±2133' NW	0181700000242	JOHN B. BARANWAY
	P18	±2150' NW	0181700000254	JOHN B. BARANWAY
	P19	±2211' N	0181700000096	JOHN B. BARANWAY
	P20	±2248' N	0181700000097	BENNETT FIRE PROTECTION DISTRICT NO 7
	P21	±2481' SE	1979-04-1-00-008	JAMES M. SIMS, MELODI HANSEN, MERIE PATRICIA
RESIDENTIAL/NON-RESIDENTIAL BUILDING UNIT	RBU1 ±1250' S, RBU2 ±2258' SE, RBU3 ±2355' SE, RBU4 ±2058' NW, RBU5 ±2084' N, RBU6 ±2107' N, RBU7 ±2138' NW, RBU8 ±2138' NW, RBU9 ±2141' NW, RBU10 ±2160' NW, RBU11 ±2165' NW, RBU12 ±2219' N, RBU13 ±2231' N, RBU14 ±2237' N, RBU15 ±2241' N, RBU16 ±2242' NW, RBU17 ±2245' NW, RBU18 ±2252' N, RBU19 ±2256' NW, RBU20 ±2258' N, RBU21 ±2265' N, RBU22 ±2273' NW, RBU23 ±2275' NW, RBU24 ±2275' N, RBU25 ±2280' NW, RBU26 ±2290' N, RBU27 ±2292' N, RBU28 ±2298' NW, RBU29 ±2300' N, RBU30 ±2300' N, RBU31 ±2310' N, RBU32 ±2314' NW, RBU33 ±2325' N, RBU34 ±2327' N, RBU35 ±2328' N, RBU36 ±2336' NW, RBU37 ±2339' N, RBU38 ±2340' N, RBU39 ±2352' NW, RBU40 ±2361' NW, RBU41 ±2370' NW, RBU42 ±2374' N, RBU43 ±2386' N, RBU44 ±2387' N, RBU45 ±2390' N, RBU46 ±2410' N, RBU47 ±2410' N, RBU48 ±2413' N, RBU49 ±2419' N, RBU50 ±2425' N, RBU51 ±2433' N, RBU52 ±2433' N, RBU53 ±2436' N, RBU54 ±2440' N, RBU55 ±2449' N, RBU56 ±2451' N, RBU57 ±2457' N, RBU58 ±2458' NW, RBU59 ±2475' NW, RBU60 ±2481' N			
HIGH OCCUPANCY BUILDING UNIT	N/A			
SCHOOL FACILITY	N/A			
PUBLIC ROAD	±107' S (INTERSTATE 70), ±409' E (QUAIL RUN RD), ±2578' N (E. COLFAX AVE)			
ABOVE GROUND UTILITY	±317' S, ±398' SW, ±798' SE, ±1405' W, ±1720' NW			
RAILROAD	N/A			
DITCH/DRAINAGE/CANAL	N/A			
NWI WETLAND	±807' NE, ±1564' N, ±1691' SE, ±1760' W, ±1782' N, ±1959' E, ±2074' SE, ±2355' NE			
FLOODPLAIN	N/A			
HIGH PRIORITY HABITAT	±54' SW (MULE DEER SEVERE WINTER RANGE)			
	±2499' SW (AQUATIC NATIVE SPECIES CONSERVATION WATERS)			
	±2634' SW (MULE DEER MIGRATION CORRIDOR)			
OTHER	±455' E (AURORA JURISDICTIONAL BOUNDARY)			

Legend

- PROPOSED REFERENCE POINT
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NAD83 CO-Nft
Scale: 1" = 750ft

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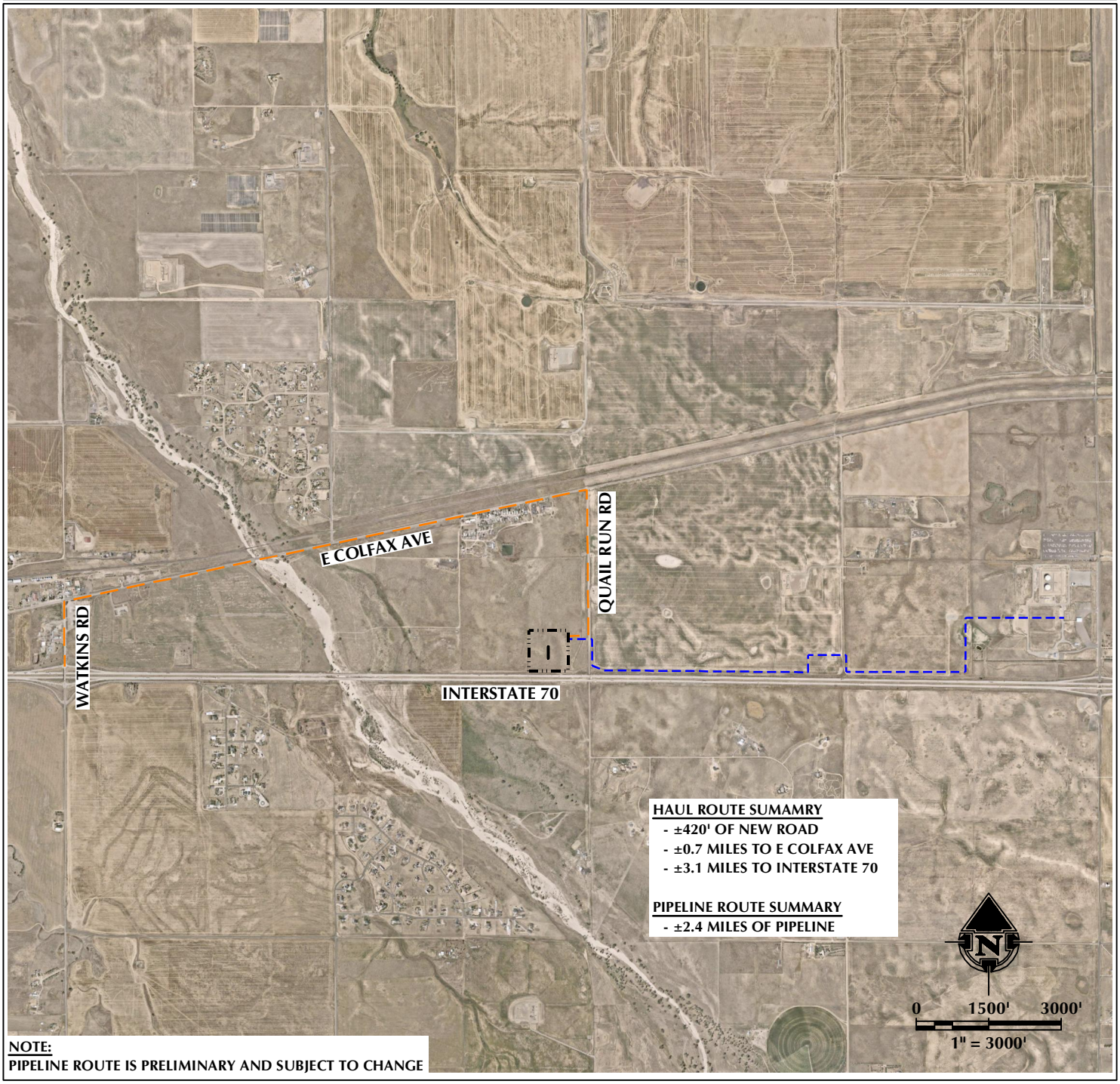
HAUL ROUTE MAP

BENNETT D PAD (ALT LOC 1)

SESE SECTION 32, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



NOTE:
PIPELINE ROUTE IS PRELIMINARY AND SUBJECT TO CHANGE

LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- TRAFFIC ROUTE
- PIPELINE ROUTE

TRAVEL PATH:
TAKE EXIT 295 OFF OF INTERSTATE 70 TO WATKINS ROAD AND PROCEED IN A NORTHERLY DIRECTION FOR 0.3 MILES TO EAST COLFAX AVENUE TO THE EAST. EXIT RIGHT ONTO EAST COLFAX AVENUE AND PROCEED IN A NORTHEASTERLY DIRECTION FOR 2.1 MILES TO QUAIL RUN ROAD TO THE SOUTH. EXIT RIGHT ONTO QUAIL RUN ROAD AND PROCEED IN A SOUTHERLY DIRECTION FOR 0.6 MILES TO THE PROPOSED ACCESS ROAD TO THE WEST. EXIT RIGHT ONTO THE PROPOSED ACCESS ROAD AND CONTINUE 0.1 MILES TO THE PROPOSED LOCATION.

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DATE SURVEYED:	9/24/24
DATE:	10/4/24
DRAFTER:	JFE
REVISED:	10/18/24

PREPARED FOR: CIVITAS
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DENVER, CO 80202

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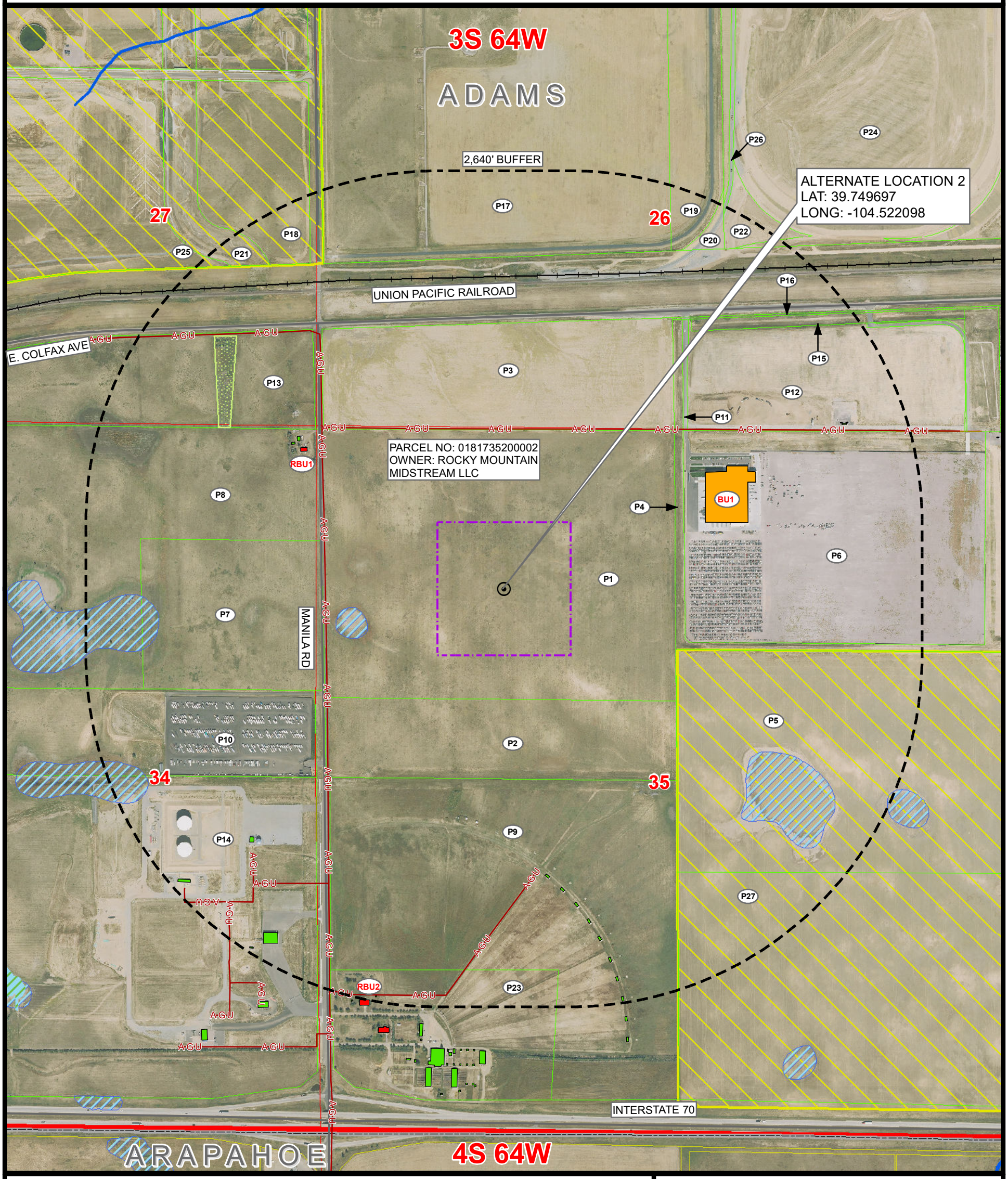
ALTERNATIVE LOCATION ANALYSIS - ALTERNATE LOCATION 2

BENNETT D PAD

SECTION 35, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



Legend

- PROPOSED REFERENCE POINT
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Scale: 1" = 750ft

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ALTERNATIVE LOCATION ANALYSIS - ALTERNATE LOCATION 2

BENNETT D PAD

SECTION 35, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

	PARCEL ID	DISTANCE	PARCEL #	OWNER
PROPERTY LINE	P1	±0'	0181735200002	ROCKY MOUNTAIN MIDSTREAM LLC
	P2	±320' S	0181735200001	ROCKY MOUNTAIN MIDSTREAM LLC
	P3	±695' N	0181700000264	ADAMS COUNTY
	P4	±779' E	0181735102002	ROCKY MOUNTAIN RAIL PARK METROPOLITAN DISTRICT
	P5	±786' E	0181735100001	PORT COLORADO INDUSTRIAL HOLDINGS LLC
	P6	±847' E	0181735102003	LKQ CENTRAL INC
	P7	±856' W	0181734100003	LUBERSKI PROPERTIES LLC
	P8	±874' W	0181734100004	LUBERSKI PROPERTIES LLC
	P9	±920' S	0181700000276	THE LEWIS FAMILY TRUST
	P10	±958' W	0181734100001	FRONT RANGE RV STORAGE LLC
	P11	±1090' NE	0181726402006	ROCKY MOUNTAIN RAIL PARK METROPOLITAN DISTRICT
	P12	±1114' NE	0181726402007	RAIL LAND COMPANY LLC
	P13	±1159' NW	0181700000065	LUBERSKI PROPERTIES LLC
	P14	±1286' SW	0181700000105	CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC
	P15	±1699' NE	0181726402001	ROCKY MOUNTAIN RAIL PARK METROPOLITAN DISTRICT
	P16	±1701' NE	0181726400001	RAIL LAND COMPANY LLC
	P17	±1973' N	0181700000264	ADAMS COUNTY
	P18	±2167' NW	0181727200002	WESTERN TRANSPORT LLC
	P19	±2174' N	0181726100001	ADAMS COUNTY
	P20	±2202' N	0181726400002	RAIL LAND COMPANY LLC
	P21	±2308' NW	0181727400001	CITY OF AURORA
	P22	±2355' NE	0181726401001	ROCKY MOUNTAIN RAIL PARK METROPOLITAN DISTRICT
	P23	±2362' S	0181700000275	THE LEWIS FAMILY TRUST
	P24	±2396' NE	0181726101002	RAIL LAND COMPANY LLC
	P25	±2470' NW	0181727200002	WESTERN TRANSPORT LLC
	P26	±2588' NE	0181723401006	RAIL LAND COMPANY LLC
	P27	±1814' SE	0181735400001	WESTERN TRANSPORT LLC
RESIDENTIAL/NON-RESIDENTIAL BUILDING UNIT	BU1 ±1014' E, RBU1 ±1114' NW, RBU2 ±2638' S			
HIGH OCCUPANCY BUILDING UNIT	N/A			
SCHOOL FACILITY	N/A			
PUBLIC ROAD	±851' W (MANILA RD), ±1512' N (E. COLFAX AVE)			
ABOVE GROUND UTILITY	±700' N, ±832' W, ±1626' S, ±1896' SW, ±2027' SW, ±2419' SW			
RAILROAD	±1775' N (UNION PACIFIC RAILROAD)			
DITCH/DRAINAGE/CANAL	N/A			
NWI WETLAND	±528' W, ±1551' SE, ±1714' NW, ±2095' W, ±2369' SW, ±2606' SE			
FLOODPLAIN	N/A			
HIGH PRIORITY HABITAT	N/A			
OTHER	±798' E (AURORA JURISDICTIONAL BOUNDARY)			

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Legend

- PROPOSED REFERENCE POINT
- ALTERNATE OIL AND GAS LOCATION
- BUFFER
- BUILDING
- NON-RESIDENTIAL BUILDING UNIT
- RESIDENTIAL BUILDING UNIT
- HEALTH FACILITY
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- OTHER
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- FRESHWATER POND

NOTE:
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Prepared For:

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N

NAD83 CO-Nft
Scale: 1" = 750ft

Drawn by: CPS Date: 4 Oct 2024
Revised: CPS Date: 18 Oct 2024

HAUL ROUTE MAP

BENNETT D PAD (ALT LOC 2)

NW 1/4 SECTION 35, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

NOTE:
PIPELINE ROUTE IS PRELIMINARY AND SUBJECT TO CHANGE

LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- TRAFFIC ROUTE
- PIPELINE ROUTE

TRAVEL PATH:
TAKE EXIT 299 OFF OF INTERSTATE 70 TO MANILA ROAD AND PROCEED IN A NORTHERLY DIRECTION FOR 0.5 MILES TO AN EXISTING ACCESS ROAD TO THE EAST. EXIT RIGHT ONTO THE EXISTING ACCESS ROAD AND PROCEED IN AN EASTERLY DIRECTION FOR 0.2 MILES TO THE PROPOSED ACCESS ROAD TO THE NORTH. EXIT LEFT ONTO THE PROPOSED ACCESS ROAD AND CONTINUE 0.2 MILES TO THE PROPOSED LOCATION.

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Phone 307-674-0609

DATE SURVEYED:	9/24/24
DATE:	10/4/24
DRAFTER:	JFE
REVISED:	10/18/24

PREPARED FOR: CIVITAS
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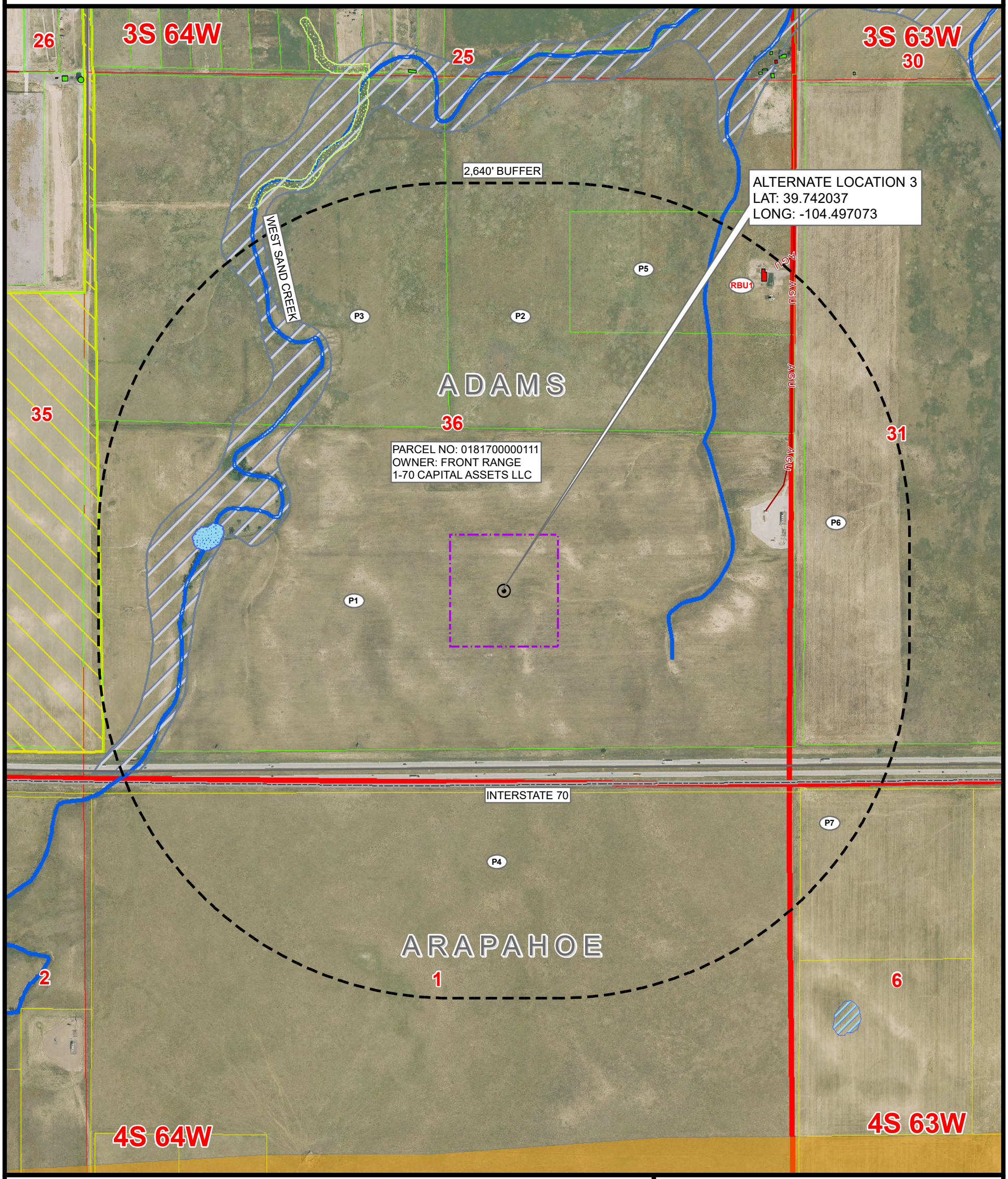
ALTERNATIVE LOCATION ANALYSIS - ALTERNATE LOCATION 3

BENNETT D PAD

SECTION 36, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



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- RIVERINE CORRIDOR
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- FRESHWATER FORESTED/SHRUB WETLAND
- OTHER
- LAKE
- FRESHWATER POND
- PRONGHORN WINTER CONCENTRATION AREA

NOTE:
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NAD83 CO-Nft
Scale: 1" = 750ft

Drawn by: CPS Date: 4 Oct 2024
Revised: CPS Date: 18 Oct 2024

ALTERNATIVE LOCATION ANALYSIS - ALTERNATE LOCATION 3

BENNETT D PAD

SECTION 36, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

	PARCEL ID	DISTANCE	PARCEL #	OWNER
PROPERTY LINE	P1	±0'	0181700000111	FRONT RANGE 1-70 CAPITAL ASSETS LLC
	P2	±793' N	0181700000295	SIEGMAN THOMAS AND PATRICIA TRUST
	P3	±807' N	0181700000285	TEAGUE ELSBETH L TRUST
	P4	±1090' S	1979-00-0-00-385	PROSPER FARMS INVESTMENTS LLC
	P5	±1524' N	0181700000294	SIEGMAN DAVID W
	P6	±1843' E	0181500000097	SAADATKHAH HAMID
	P7	±2107' SE	1981-00-0-00-243	KRUPA JOHN D KRUPA STEVEN M ADUGALSKI ADAM
RESIDENTIAL/NON-RESIDENTIAL BUILDING UNIT	RBU1 ±2440' NE			
HIGH OCCUPANCY BUILDING UNIT	N/A			
SCHOOL FACILITY	N/A			
PUBLIC ROAD	±853' S (INTERSTATE 70)			
ABOVE GROUND UTILITY	±1573' E			
RAILROAD	N/A			
DITCH/DRAINAGE/CANAL	±831' E, 1281' W			
NWI WETLAND	±821' E, ±1271' W, ±1699' W, ±1844' W, ±1906' W			
FLOODPLAIN	±1229' W			
HIGH PRIORITY HABITAT	N/A			
OTHER	±2620' W (AURORA JURISDICTIONAL BOUNDARY)			

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Scale: 1" = 750ft

Drawn by: CPS Date: 4 Oct 2024
Revised: CPS Date: 18 Oct 2024

HAUL ROUTE MAP

BENNETT D PAD (ALT LOC 3)

NWSE & SWSE SECTION 36, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO

NOTE:
PIPELINE ROUTE IS PRELIMINARY AND SUBJECT TO CHANGE

LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- TRAFFIC ROUTE
- PIPELINE ROUTE

TRAVEL PATH:
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Mitigation Measures and Best Management Practices

Wildlife & Environmental

The Bennett D pad and its respective production facility are not located within USFWS (United States Fish and Wildlife Service) and CPW (Colorado Parks and Wildlife) mapped layers for sensitive species or High Priority Habitat (HPH). The pad, wells and facilities are outside of the FEMA mapped flood plain area. A three-foot-tall berm shall be constructed on the western side of the well pad, and the pad will be designed to have any surface flow directed to the detention basin to the north. In the event of an incidental release of fluids the well pad is designed to protect adjacent wetlands to the west.

Noise Control

Any operations involving the use of a drilling rig, workover rig, completions and production of a well are subject to and will comply with the noise regulations set forth in Adams County's Development Standards and Regulations Section 4-11-02-03-03-03-14 and in ECMC Rule 423.

Idling Equipment – While idling engine/equipment, maintain at the lowest frequency possible, as well as, in a position/location that will prevent sound from carrying to nearby residents.

Unnecessary Sounds – Unnecessary sounds such as honking the horn, revving vehicle engines, loud music, and unwarranted metal hammering/banging are all examples of sound that can create nuisance; failure to eliminate unnecessary sound from location will be subject to an internal compliance assessment if reported by a landowner.

Noise has been modeled for the pre-production and production phase of operations. Although, it was deemed unnecessary to achieve compliance Crestone will utilize 32' sound walls to further mitigate noise originating from the location during drilling, completions and flowback.

Crestone will utilize utility power to energize the drilling rig and production facilities.

Crestone's contract drilling company will comply with ECMC Rules regarding noise abatement. In addition to following the ECMC Rules and, Crestone, whenever possible, will schedule deliveries and construction traffic to and from the site during daylight hours.

Visual and Light Mitigation

During the drilling and completions phases, temporary light plants will be present and relocated as needed for safe light levels. At move-in, rig-up and regularly during Drilling and Completion phases, operator will routinely walk around the outside of the disturbance area to identify obtrusive lighting leaving the site and reduce where possible. Additionally, for drilling through flowback, Crestone will utilize 2,260 linear feet of 32-foot-tall sound walls to further provide light mitigation and visual screening into the location.

In the event there are complaints from neighbors regarding obtrusive lighting, Operator is committed to adjust fixtures or install shielding on appropriate fixtures to minimize the offensive lighting where possible. In the event the grievance cannot be remedied due to safety concerns, Operator will work with the complainant to find an amenable solution.

There will be no lighting installed for permanent production operations.

All long-term facility structures will be painted a color that enables the facilities to blend in with the natural background color of the landscape, as seen from a viewing distance and location typically used by the public. Portable toilets for use on the Oil and Gas Location during the drilling and completion phases shall be screened by equipment, sound walls and/or mobile dwellings that are proposed on-location.

Odor and Air Quality

In an effort to mitigate potential odor impacts, Operator will use a mud filtration system and/or additives to the drilling and fracturing fluids to minimize odors. The Operator will not use fragrance to mask odors. Operator shall implement one or more of the following measures as necessary:

- Operator shall utilize a closed-loop, pit-less mud system for managing drilling fluids.
- Operator shall employ the use of drilling fluids with low to negligible aromatic contact during drilling operations after the surface casing is set and freshwater aquifers are protected.
- Operator shall remove drill cuttings daily and as soon as waste containers are full.
- Operator shall employ pipe cleaning procedures when removing drill pipe from the wellbore.
- Operator may increase concentration of odor-mitigating additives in mud system.

Crestone will comply with all applicable air quality requirements that regulate upstream production facilities. For the Bennett D Pad, these will include at a minimum:

- Colorado ECMC Rules
- Air Quality Control Commission 5 CCR 1001-5 Regulation 3
- Air Quality Control Commission 5 CCR 1001-9 Regulation 7
- NSPS 40 CFR Subpart OOOOa
- 40 CFR Part 98 Subpart W for Greenhouse Gas Reporting
- Have an Air Quality Monitoring Program approved by CDPHE

All gas encountered during post-separation flowback will be routed to a sales line. All flowback fluids will be produced to permanent facility infrastructure and be emissions controlled with a combustor, as necessary.

Equipment design and operation will be the primary path to mitigate emissions during production. Installation of equipment for on-site processing and separation will include instrument-air actuated pneumatic controllers. This location will utilize cutting edge production facilities that utilize utility powered fluid separation and oil tankless facilities which will greatly reduce production operation emissions. Should well maintenance be required, this activity will be sent to a pressurized vessel and controlled with an enclosed combustion device.

Crestone maintains a robust leak detection and repair ("LDAR") program as required by CDPHE using modern leak detection technologies such as infra-red cameras for equipment used on the Well Sites. Crestone will inspect the facility monthly for the first year and will then comply with Colorado Regulation 7. Operator shall conduct continuous pressure monitoring to detect leaks.

Auditory, Visual, and Olfactory (AVO) monitoring will be conducted monthly by trained staff at the site.

Crestone shall respond to Air Quality Action Day advisories posted by the Colorado Department of Public Health and Environment for the Front Range Area by implementing their suggested air emission reduction measures, as feasible. Emission reduction measures shall be implemented for the duration of an air quality Action Day advisory and may include measures such as:

- Minimize vehicle and engine idling
- Reduce truck traffic and worker traffic
- Delay vehicle refueling
- Suspend or delay use of fossil fuel powered ancillary equipment; and Postpone construction activities, if feasible

Signage

Crestone maintains all signage pursuant to Adams County and ECMC Rules and Regulations. Please see the signage plan / signage detail in the Operations Plan section of this OGF Application.

Access Roads & Maintenance

Crestone maintains all access roads in compliance with Adams County Code. Crestone will utilize an existing access road currently being utilized for the Bennett Station oil terminal. Access road will be bladed to minimize wet weather damage. Fugitive dust will be kept to a minimum by utilizing water to control dust when necessary. All lease roads leading to the drilling site, facility and surface equipment will be designated and maintained to support fire vehicles, equipment and apparatus.

Crestone will work with Adams County Road department to ensure any damage caused by Crestone activity is property repaired. Being a traffic impact study has already been conducted for the oil terminal, an Adams County Engineer told Crestone in a phone conversation on November 26, 2024, another traffic study is not required. A trip generation analysis has done by a professional engineer and is included in the Transportation Plan section of this OGF Application. Crestone will enter into a Road Maintenance Agreement for the portion of Manilla Road that will be used for oil and gas operations. Traffic is planned to exit Interstate 70 and drive north on Manilla Road for approximately $1/10^{th}$ of a mile to enter the location at the existing access road on the west. Leaving the location, heavy vehicles will routed to Interstate 70 following the directions in reverse limiting the use of Adams County road usage to only that portion of Manilla Road.

Waste Disposal

Crestone will dispose of all wastes in accordance with ECMC and/or the Colorado Department of Public Health and Environment rules and regulations. Crestone will provide the County copies of all waste management reports upon request.

Fencing

This proposed oil and gas facility will be collocated with a midstream oil terminal. The majority of the property is fenced to protect the critical infrastructure associated with the oil terminal. The Bennett D Pad will be inside the property's fence. No additional fence is being proposed inside the perimeter fence of this property.

Airport Height Overlay

The proposed location lies approximately 7,700 feet southwest from the southern end of existing Runway 35 at the Colorado Air and Space Port.

Crestone has no plans to utilize permanent or temporary equipment that will meet or exceed 200 feet. Crestone has been in communication with the FAA about this project and committed to conditions of approval such as flags and lights on the drill rig derrick, in addition to contacting the Space Port prior to and after moving the rig on and off location.

Emergency Preparedness and Response Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-10

Will Serve Letter (signed copy will be provided once returned)

Crestone Peak Resources Operating, LLC

SITE SAFETY AND EMERGENCY ACTION PLAN

District Office
650 Southgate Drive
Windsor, CO, 80550

Bennett D Pad

ADAMS COUNTY, COLORADO

Table of Contents

SECTION 1
SIGNATURE PAGE

Crestone Peak Resources			
Name	**Signature**	**Title**	**Date**
Lisa David		Director, PSM and Emergency Management	
Fire District			
Name	**Signature**	**Title**	**Date**

SECTION2
SITE SPECIFIC INFORMATION

a) Site Safety Requirements and General Information

The minimum personal protective equipment (PPE) to enter any Crestone Peak Resources production location includes hard hat, safety glasses, safety toe boots, fire resistant clothing (FRC), and a 4-gas monitor. All contractors and visitors are responsible for providing their employees with the appropriate training on and use of PPE while on Crestone Peak Resources locations. In addition, all contract personnel entering a Crestone Peak Resources location to perform work must understand and abide by Crestone Peak Resources' contractor expectations relating to environmental, health, and safety requirements.

The primary hazards that any person must be aware of while on a Crestone Peak Resources production location include, but are not limited to, the potential for release of hydrocarbon gases and/or liquids from production equipment/tanks, heavy truck and equipment traffic, loud noise, high pressures, and the potential for a flash fire. These hazards can vary depending on the work being performed.

b) Emergency Muster/Assembly point(s)

Bennett D Pad

Muster point is at the entrance to location. Muster locations will be identified during all safety briefings.

c) 911 Address and GPS coordinates

API# - Pending

Legal Description – S ½ Section 34, T4S, R64W, 6th P.M.

Address – Pending

Lat/Long: Lat: 39°44'34.80"N Long: 104°31'56.12"W Elevation: 5570ft

d) Site description

The Bennett D **Pad** is a Crestone Peak Resources oil and gas production facility that will have 26 horizontal oil and gas wells. All product will leave location via pipeline as this is a tankless facility.

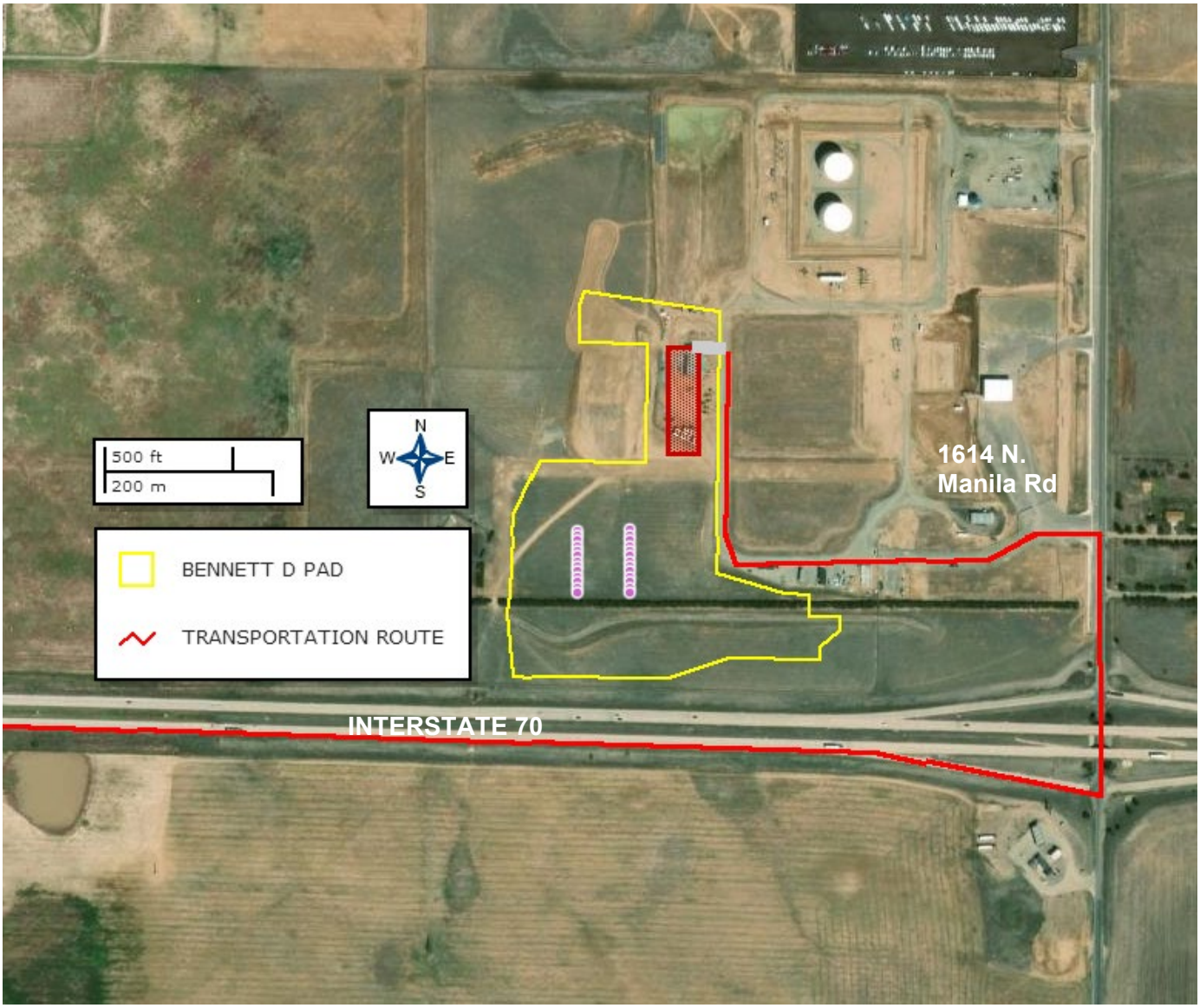
e) Nearby schools and other High Occupancy Buildings

No Schools near this location

No Residence are near this location

f) Directions to Project Locations

Bennett D Pad - Access to the well site will be from 1614 N Manila Rd, Bennett, CO. Proceed West approximately .27 miles, then North approximately .15 miles to the access road.



g) Location of SDS sheets

Depending on the operations taking place on location, the chemicals that may be present will vary. Regardless, hazard communication is a critical safety measure and Safety Data Sheets (SDS's) will be available from the Company Representative present or the contractor performing work on location. All SDS sheets are available through the following link, but can only be accessed by Civitas employees- https://chemmanagement.ehs.com/9/52B6C4F1-9454-4F70-86F1-15370D01243A

h) Sign-In Sheets, JSAs, and Safety Forms

During drilling and completion activities all employees and approved visitors to the **Bennett D Pad** will be required to enter through a manned security checkpoint at the location entrance where they will be required to sign in and will be provided with a detailed safety briefing of current operations and all safety precautions that must be adhered to while on location. In addition, all who enter the location must also sign out upon their departure. Security personnel are required to account for all persons entering or leaving location during active operations and in the event of an incident.

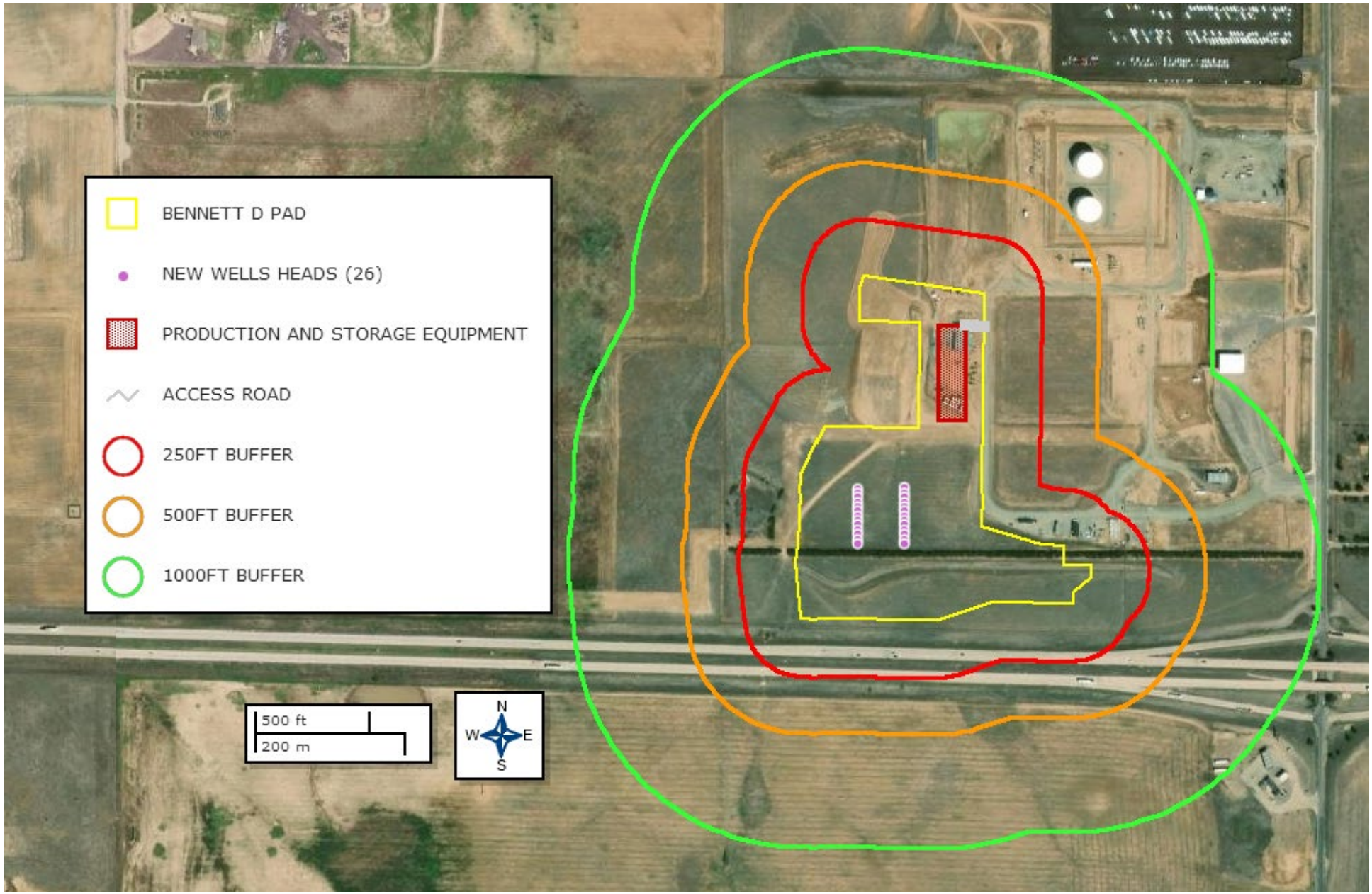
Once drilling and completion activities are finalized, the site will transition to its production phase and no unauthorized personnel will be allowed on location without first contacting a company representative. At this point, the primary chemicals stored on site will be crude oil and produced water.

Job Safety Analysis (JSA'S) are written every day, per task, or per shift if work crews are working 24/7 and can be found on location. This is performed by each contractor and kept in their files for review.

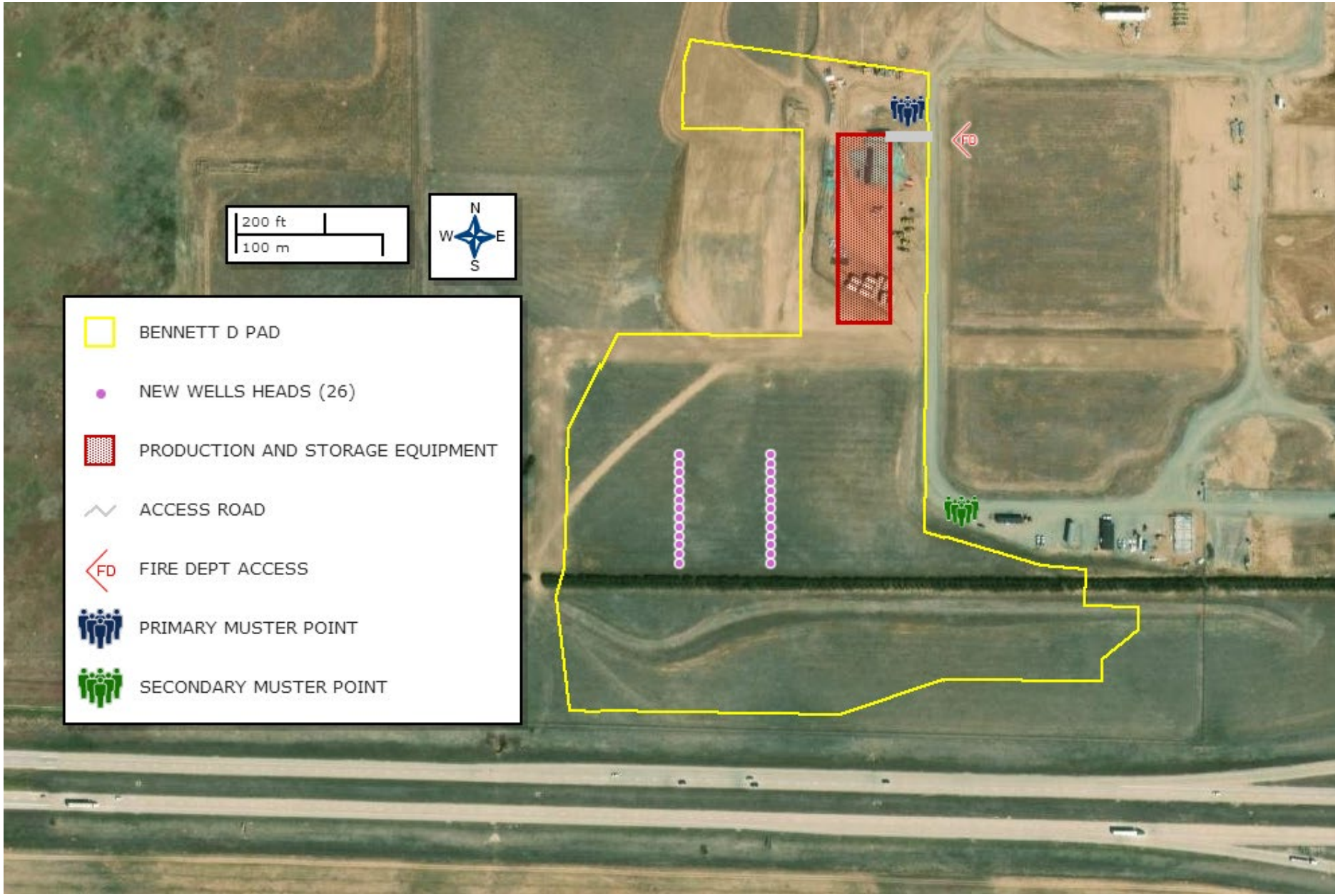
Section 3- Maps

Bennett D

250ft, 500ft, 1000ft, Buffer



Bennett D Pad Access Map and Muster Point



2500ft Buffer Map

Section 4

List of Emergency Contacts

a) Crestone Peak Resources

Name	Office Phone	Emergency/Cell
Field Office 650 Southgate Drive Windsor, Co. 80550	NA	303-659-7740
Crestone Peak Resources EHS on call emergency number	NA	720-927-1813
PSM, Emergency Management Director- Lisa David	NA	Cell 307-689-0000
EHS- Safety: Chris Burton	NA	Cell 720-315-9387
Environmental Luke Kelly	NA	Cell 720-315-8934

b) Crestone Peak Resources community/media relations

Name	Office	Cell Phone
Rich Coolidge	NA	303-312-8561

c) First Responders

Name	Emergency	Non-Emergency Dispatch	Office Number
Bennett Watkins Fire Rescue	911	303-288-1535	303-644-3572
Adams County Sheriff	911	303-288-1535	303-654-1850
Adams County OEM	911	303-288-1535	720-523-6600
Colorado State Patrol	911	303-239-4501	719-775-2964

d) Regulator Contacts

Name	Office Phone	Cell Phone
ECMC	303-894-2100	none
CDPHE	877-518-5608	none
Colorado Parks & Wildlife	303-291-7227	none
National Response Center	800-424-8802	none

e) Medical Facilities

Name	Office Phone	Cell Phone
University of Colorado Hospital	720-848-0000	*NA*
The Medical Center of Aurora	303-695-2600	*NA*

f) Spill Response Organization

Name	24/7 Emergency	Non-Emergency
EnviroServe	800-488-0910	NA

g) **Fire, explosion, associated with loss of well control.**

Name	Office Phone
Bennett Watkins Fire Rescue	911 or 303-644-3572
Wild Well Control, Inc.	281-353-5481
Northern Colorado Medical Facility (Burn Unit)	970-810-4121
Adams County Office of Emergency Management	911 or 720-523-6600

h) Government Agencies

Name	Office Phone
Adams County Sheriff	911 or 303-654-1850
ECMC	303-894-2100
CDPHE	877-518-5608
Adams County OEM	911 or 720-523-6600

i) **Railroad Emergency Response**

Name	Office Phone
Union Pacific Railroad	888-877-7267

Section 5
Spill Response and Clean Up

a) Spill Response

There are multiple types of hydrocarbons which can be released/spilled during oil and gas production and exploration. Most commonly released are unrefined products such as crude oil and produced water. Refined petroleum products such as diesel, gasoline, and motor oil spills are less common, but still equally important to mitigate. If a spill is found reportable, it will be mitigated in accordance with Colorado Energy and Carbon Management Commission (ECMC) and Colorado Department of Public Health and Environment (CDPHE) guidelines.

Once a release has been identified, it will be immediately stopped and contained if possible and is safe to do so. When containing a spill; pig blankets, snakes, absorbent materials, or earthen berms will be constructed around the release to keep material from spreading. These materials will be provided by APEX and the contract company and kept on-site. Diligent efforts will be made to minimize contact with live vegetation or open water if release is outside of secondary containment structures.

In the event of a large incident requiring outside assistance, Crestone Peak Resources has contracted with Wild Well Control who possesses a working knowledge of oil and gas operations, emergency response and Incident Command. Once notified Wild Well Control personnel can be on location from 6 to 12 hours.

b) Spill Reporting

What determines a reportable spill and to whom does the report go?

- Spill and leaks shall be reported to the local fire department by using 911 in accordance with the provisions contained in the adopted International Fire Code.
    - ***IFC § 5704.2.7.10 Leak reporting.*** *A consistent or accidental loss of liquid, or other indication of a leak from a tank or system, shall be reported immediately to the fire department, the fire code official and other authorities having jurisdiction.*
- A spill/release will be reported to the ECMC if released material is property of Crestone Peak Resources and meets the ECMC reporting thresholds (see below), an example would be crude oil released from a separator or produced water from a water vault.
- A spill/release will be reported to the Adams County LEPC if released material is

property of Crestone Peak Resources and meets the ECMC reporting thresholds (see below),

- A spill/release will be reported to the CDPHE if released material is in the custody of a third party for spills that meet CDPHE reporting thresholds, are of any size that impact or threaten to impact waters of the state, a residence or occupied structure, livestock or public byway. An example would be an oil hauler over filling a truck and spills product onto the ground next to a flowing irrigation ditch.

Spills are reportable to the ECMC in the following circumstances:

1. the spill or release impacts or threatens to impact any waters of the state, a residence or occupied structure, livestock, or a public byway.

2. a spill or release in which 1 barrel or more is released outside of berms or other secondary containment; or

3. any spill or release of 5 barrels or more. If the spill impacts or threatens to impact waters of the state (which include surface water, ground water and dry gullies or storm sewers leading to surface water), it must also be reported immediately to CDPHE (25-8-601 CRS).

4. Petroleum releases of 25 gallons or more

Once a spill is determined reportable, there is a 24-hour deadline to make initial notification to the ECMC or CDPHE depending on product ownership. Spills/releases in the custody of Crestone Peak Resources will be reported by a Company representative. Spills/releases in the custody of a third party will be reported by the responsible company's EHS Department to the appropriate agency and to Crestone Peak Resources.

These regulatory guidelines will be strictly followed by Crestone Peak Resources and any contractors operating under Crestone Peak Resources guidance during all activities.

Section 6
Reportable quantities

a) Reportable quantities

Mandated by Section 312 of the Emergency Planning and Community Right-To-Know Act (EPCRA) - also known as SARA Title III - the Tier II form captures information about the types, quantities, and locations of hazardous chemicals at a given facility. The form also lists contact information for the facility's designated emergency point-of-contact.

Any facility that is required to maintain MSDSs (or SDSs) under the Occupational Safety and Health Administration (OSHA) regulations for hazardous chemicals stored or used in the workplace. Facilities with chemicals in quantities that equal or exceed the lists of lists thresholds must report.

- Propane, benzene, propene, and methane are on the lists and are known to be in crude oil. In addition, diesel is on the lists and may be stored on sites during construction.

b. Reportable requirements

If your facility will meet the requirements under 40 CFR, you must submit your Tier II report to the state every year before March 1ST.

These regulatory guidelines will be strictly followed by Crestone Peak Resources and any contractors operating under Crestone Peak Resources guidance during all activities.

Section 7

Evacuation Information

a. Evacuation Plan Procedures (public)

The procedure to be used in alerting nearby persons in the event of any occurrence that could pose a threat to life or property will be arranged and completed with public officials in detail.

In the event of an actual emergency, the following steps will be immediately taken:

1. The Crestone Peak Resources representative will immediately notify proper authorities, including the fire department, sheriff's office, highway patrol, and any other public officials as described above and will enlist their assistance in warning residents and transients in the calculated radius of exposure.
2. The Crestone Peak Resources will coordinate with local authorities to warn residents' down-wind of the location and within radius of exposure from the well site. Additional evacuation zones may be necessary as the situation warrants.
3. The Crestone Peak Resources representative will coordinate with appropriate emergency personnel to divert traffic in the vicinity away from the potentially dangerous area. No trespassing and warning signs will be posted at the entrance to the well site. The contract company will monitor essential and non-essential traffic on-site.
4. General:
    a. The area included within the radius of exposure is the zone with the maximum potential hazard. When it is determined that conditions exist which create an additional area (beyond the initial zone of maximum potential hazard) vulnerable to possible hazard, public areas in the additional hazardous area will be evacuated.
    b. In the event of a disaster, after the public areas have been evacuated and traffic stopped, it is expected that local civil authorities will have arrived and within a few hours will have assumed direction of and control of the public, including all public areas. Crestone Peak Resources will fully cooperate with these authorities and will exert every effort by careful advice to such authorities to prevent panic or rumors.
    c. Crestone Peak Resources will dispatch appropriate personnel to the disaster site as soon as possible. The company's personnel will cooperate with and provide such information to civil authorities as they might require.

Section 8

Coordination with First Responder Agencies

a) Crestone Peak Resources will communicate site construction, drill spud, completion operations and Production Turn-In-Line dates to Bennett Watkins Fire Rescue and the Adams County Office of Emergency Management for coordination/communication with local first responders. These dates will be provided a minimum of 7 business days prior to commencement or change in oil and gas development operations.

b) In the event of an emergency requiring First Responders, Unified Command will be established between the Crestone Peak Resources appointed company man on location and First Responders present. Unified Command post will be established based on conditions present at time of incident.

c) While foam is not currently supplied for oil and gas emergency response, Crestone Peak Resources is an active member of Colorado Preparedness and Response Network (CPRN), and a solution is being sought through a cooperative effort including other operators, First Responders and Adams County. Crestone Peak Resources has an established source of foam sitting at our Hub Facility off WCR -6 and WCR – 7.

d) Crestone Peak Resources EHS representative and first responders identified in this Site Safety and Emergency Action Plan have reviewed this plan and discussed coordination efforts in the event of an emergency requiring first responder assistance.

e) Crestone Peak Resources will provide training or walkthroughs as requested by the local first responders.

December 17, 2023
Battalion Chief Caleb Connor
Bennett - Watkins Fire Rescue
355 4th St. - Command and Administration
Bennett, CO 80102

RE: Service to Civitas Resources Oil & Gas Facility – Bennett D Pad

Dear Captain Connor,

Civitas Resources (Crestone Peak Resources Operating LLC) is submitting an Oil and Gas Facility application to construct a proposed Oil & Gas well facility and associated infrastructure located in Section 34, Township 3 South, Range 64 West in Adams County, Colorado. Your referral package on the site is enclosed. Access to the site will be off Interstate 70 and north along Manilla Rd. for approximately 1/10 of a mile until you reach the access road on the west. Once on the property, follow the private access west about 1,500 feet. There will be a 1,500' long, 30' wide private access road that will lead west to the well pad. There are twenty-six wells planned for this site.

Adams County has asked that we notify Bennet - Watkins Fire Rescue of this facility and access route and gain assurance that requisite EMT and fire protection services can be provided to this site.

Upon review of the enclosed referral package, if said service can be provided, we would appreciate you indicating such by signing and returning a copy of this letter. Please do not hesitate to contact me directly at 303-294-7824, jpiekara@civiresources.com, with any questions or comments.

Emergency services, including EMT and fire protection services can be provided to the Bennett D oil and gas facility site via the access route herein described.

_____

Bennett – Watkins Fire Rescue Date
By:
Its:

Sincerely,

John Piekara

Noise Mitigation Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-14

Adams County Development Standards & Regulations
Noise Management Plan

Bennett D Pad
Adams County, Colorado

Prepared for:

Crestone Peak Resources Operating, LLC
555 17th Street, Suite 3700
Denver, CO 80202

*Crestone Peak Resources Operating, LLC operates as a wholly owned subsidiary of Civitas Resources, Inc.

Prepared by:

Urban Solution Group, LLC
3301 Lawrence Street, Suite 3
Denver, CO 80205

December 10, 2024

REV1

RECORD OF REVISIONS

Rev#	Date	By	Summary of Revisions
0	2024/11/04	GFS	Initial Release
1	2024/12/10	DCH	Updated perimeter wall layout and mitigated results for drilling and completions operations

TABLE OF CONTENTS

URBAN SOLUTION GROUP

Report Submitted to:
Jeff Annable
Civitas Resources, Inc.
(303) 312-8529
jannable@civiresources.com

Report Contact:
Gareth Svanda
Urban Solution Group
(720) 749-2916
gareth.svanda@urbansolutiongroup.com

1 EXECUTIVE SUMMARY

Urban Solution Group, LLC (Urban) was commissioned to prepare a Noise Management Plan (NMP) for the proposed Bennett D Pad to be operated by Crestone Peak Resources Operating, LLC (Crestone), a wholly owned subsidiary of Civitas Resources, Inc. (Civitas). Crestone is proposing to develop oil and natural gas wells at the Bennett D Pad located in Adams County, Colorado. The purpose of this plan is to assess predicted environmental noise impacts from the proposed operations on the surrounding area as compared to the maximum permissible noise level (MPNL) limits described in the Adams County Development Standards and Regulations Section 4-11-02-03-03-03-14 Noise Regulation.

To facilitate this work, the following analyses were completed:

- Pre-operational ambient sound level survey for the surrounding area
- Completion of a full site-specific Noise Impact Assessment (NIA) with individual models for:
  - Drilling operations with the Patterson-UTI APEX 1500 Series Drilling Rig on grid/line power (no gensets)
  - Completions operations with a Liberty Oilfield Services Quiet Fleet
  - Production operations with the equipment and layout proposed by Crestone
- Specification of Best Management Practices (BMPs) that will be implemented at the proposed Bennett D location such that all operations comply with the noise regulation and minimize the environmental noise impact on the surrounding area

The results of the analyses with full implementation of the BMPs for the Bennett D location are summarized as follows:

Analysis Type	Result
Noise points of compliance	• One A- and C-weighted compliance point located at the property line of existing building units within 2,000 feet of the proposed location. One additional receptor point to demonstrate noise levels at the property line of building units beyond 2,000 feet from the proposed location to the northwest.
Pre-Operational Ambient Sound Level Survey	• Ambient sound levels were measured at three locations near the site. • Ambient adjustments apply to all phases of operation as shown in Table 4.
Drilling Operations NIA	• Compliant without mitigation; Crestone to erect partial-perimeter sound wall consisting of 2,260 linear feet of 32-foot-tall, STC32 engineered sound wall due to sensitive nature of the area as part of BMPs.
Completions Operations NIA	• Compliant without mitigation; Crestone to erect partial-perimeter sound wall consisting of 2,260 linear feet of 32-foot-tall, STC32 engineered sound wall due to sensitive nature of the area as part of BMPs.
Flowback Operations	• Flowing back directly to permanent facility; leave perimeter sound walls in place until flows are initiated.
Production Operations NIA	• Compliant without mitigation.

2 REGULATIONS AND NOISE STANDARDS SUMMARY

Noise for energy related facilities located in Adams County, Colorado, is regulated through the Adams County Development Standards and Regulations Section 4-11-02-03-03-03-14 noise regulation (Adams County Regulation). This regulation sets the MPNLs, which limit noise emitted from energy facilities over a specified period, as measured at noise compliance points. These allowable limits are dependent on the land use zoning within the study area as defined in the Colorado Energy and Carbon Management Commission (ECMC) Rule 423 series noise regulation. An overview of the Adams County Regulation is presented below, followed by an overview of the ECMC regulation.

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-14 – Brief Overview

The Operator shall control noise levels as follows:

a. Prior to operations Operator shall obtain a baseline noise study that encompasses at least five (5) days, one of those days being a weekend. The Operator may use the baseline noise study submitted with the Development Application to fulfill this requirement, if that noise study is completed within twelve (12) months of any ground disturbing activities.

b. Beginning with construction and up to production, the County will require continuous noise monitoring for all oil and gas facilities located with one-half mile (1/2), or greater depending on the location, nature, and size of the facility, of the property line of any existing residences, schools, state licensed daycares or high occupancy building units. The County may require continuous noise monitoring be conducted by an approved third-party consultant based on the location, nature, and size of the facility.

c. The Operator shall conform to ECMC Regulations for noise level.

d. The Operator shall post 24-hour, 7 days per week contact information to deal with all noise complaints arising from Operator's oil and gas facility. Such posting shall be visible from the public rights-of-way.

e. For Oil and Gas Facilities located within 2,000 feet of a land use or zoning designation boundary the Operator shall be required to comply with the lower maximum permissible noise level as defined in ECMC regulations for noise of that corresponding land use or zone district. For locations within 2,000 feet of a land use or zoning designation boundary, noise must be attenuated to the maximum permissible noise levels for the corresponding land use or zone district, as specified in ECMC rules, at the land use designation boundary as determined by the Director of Community and Economic Development.

f. The Operator shall update the noise modeling study or noise impact analysis if the planned or actual equipment at the Oil and Gas Facility is expected to produce noise levels that will

exceed those previously presented to the County or if the noise modeling study or noise impact analysis was completed more than twelve (12) months prior to any ground disturbing activities.

g. To ensure the Operator controls noise to the allowable levels set forth above, one or more of the following may be required based on the location, nature, and size of the facility:

a. Acoustically insulated housing or cover enclosing the motor or engine;

ii. Noise management plan identifying hours of maximum noise emissions, type, frequency, and level of noise to be emitted, and proposed mitigation measures;

iii. Obtain all power from utility line power or renewable sources;

iv. Utilize the most current equipment to minimize noise impact during drilling, completions, and all phases of operation including the use of "Quiet Fleet" noise mitigation measures for completions;

v. Sound walls around well drilling and completion activities to mitigate noise impacts;

vi. Restrictions on the unloading of pipe or other tubular goods between 6:00 p.m. and 8:00 a.m.;

vii. Any abatement measures required by ECMC for high-density areas, if applicable.

viii. The use of electric drill rigs.

ix. Tier 4 or better diesel engines, diesel and natural gas co-fired Tier 2 or Tier 3 engines, natural gas fired spark ignition engines, or electric line power for hydraulic fracturing pumps.

x. Use of quiet design mufflers (also referred to as hospital grade or dual dissipative) or equivalent.

xi. The use of liquefied natural gas dual fuel hydraulic fracturing pumps.

h. Professional Consultant(s) Required: The baseline noise study and noise modeling shall be prepared by one (1) or more professionals deemed professionally qualified by the Community and Economic Development Department. Each professional shall be deemed qualified by the Department of Community and Economic Development based on education, professional certifications, experience in the field, and their understanding of the Adams County oil and gas regulations and ECMC rules pertaining to noise. The County shall maintain a list of qualified professional consultants. The applicant for an Oil and Gas Facility shall select one (1) or more individuals from the County's list of qualified consultants to prepare the required baseline noise studies and noise modeling reports.

i. Professional qualifications for review and consideration may be submitted to the County by the sound professional, the applicant, or the Operator.

Colorado ECMC Rule 423 Noise Regulation – Brief Overview

Section 4-11-02-03-03-03-14 of the Adams County noise code states that all Oil and Gas Operations will comply with the maximum permissible noise levels (MPNLs) outlined by the Colorado ECMC. Table 1 below shows the MPNLs unless otherwise required by Rule 423.

Table 1. *Maximum Permissible Noise Levels (Colorado ECMC Table 423-1)*

Zone	Daytime (7:00 a.m. – 7:00 p.m.)	Nighttime (7:00 p.m. – 7:00 a.m.)
Residential/Rural/State Parks & Wildlife Areas	55 dB(A)	50 dB(A)
Commercial/Agricultural	60 dB(A)	55 dB(A)
Light industrial	70 dB(A)	65 dB(A)
Industrial	80 dB(A)	75 dB(A)
All Zones	60 dB(C)	60 dB(C)

Exceptions to these MPNLs for Drilling, Completions and Flowback Operations are outlined in section 423.b (2) as follows:

A. In Residential/Rural or Commercial/Agricultural, MPNLs will be 60 dBA in the hours between 7:00 p.m. to 7:00 a.m. and 65 dBA in the hours between 7:00 a.m. to 7:00 p.m.; and

B. In all zones MPNLs will be 65 dBC in the hours between 7:00 p.m. to 7:00 a.m. and 65 dBC in the hours between 7:00 a.m. to 7:00 p.m.

These MPNLs are applied at "noise points of compliance". These points are chosen as outlined in section 423.a (5) of the Regulation:

(5) For proposed Oil and Gas Locations with a Working Pad Surface within 2,000 feet of one or more Residential Building Units (RBUs), at least one, and no more than six noise points of compliance where monitors will be located. Operators will identify noise points of compliance using the following criteria:

A. Provide one noise point of compliance in each direction in which an RBU is located within 2,000 feet of the proposed Working Pad Surface.

B. Noise points of compliance will be located at least 350 feet from the Working Pad Surface, and no less than 25 feet from the exterior wall of the RBU that is closest to the Working Pad Surface. If a Surface Owner or tenant refuses to provide the Operator with access to install a noise monitor, then the noise point of compliance will be located at either the next-closest RBU or an alternative location approximately the same distance and direction from the Working Pad Surface.

Demonstration of compliance with noise level limits during operation is outlined in section 423.c (2) as follows:

> A. In response to a complaint or at the Director's request, Operators will measure sound levels at 25 feet from the complainant's occupied structure towards the noise source for low frequency (dBC) indicated issues. For high frequency (dBA) measurement will be at the nearest point of compliance. For equipment installed at Oil and Gas Locations subject to a Form 2A approved prior to January 15, 2021, after the Commencement of Production Operations, no single piece of equipment will exceed the MPNLs listed in Table 423-1 as measured at a point 350 feet from the equipment generating the noise in the direction from which the complaint was received.

Finally, adjustments to the MPNLs based on the measured pre-existing ambient noise levels is allowed. However, the new maximum allowable noise levels for permanent facilities such as Production Operations are capped and based on cumulative noise levels. Ambient adjustments and cumulative noise levels are outlined in section 423.d of the Regulation as follows:

d. Cumulative Noise. All noise measurements will be cumulative.

> (1) Noise measurements taken at noise points of compliance designated pursuant to Rule 423.a.(5) will take into account ambient noise, rather than solely the incremental increase of noise from the facility targeted for measurement.
>
> (2) At new or substantially modified Oil and Gas Locations where ambient noise levels at noise points of compliance designated pursuant to Rule 423.a.(5) already exceed the noise thresholds identified in Table 423-1, then Operators will be considered in compliance with Rule 423, unless at any time their individual noise contribution, measured pursuant to Rule 423.c, increases noise above ambient levels by greater than 5 dBC and 5 dBA between 7:00 p.m. and 7:00 a.m. or 7 dBC and 7 dBA between 7:00 a.m. and 7:00 p.m. This Rule 423.d.(2) does not allow Operators to increase noise above the maximum cumulative noise thresholds specified in Table 423-2 after the Commencement of Production Operations.
>
> (3) After the Commencement of Production Operations, if ambient noise levels already exceed the MPNLs identified in Table 423-1, under no circumstances will new Oil and Gas Operations or a significant modification to an existing Oil and Gas Operations raise cumulative ambient noise above the following:

Table 2. *Maximum Cumulative Noise Levels (Colorado ECMC Table 423-2)*

Zone	Daytime (7:00 a.m. – 7:00 p.m.)	Nighttime (7:00 p.m. – 7:00 a.m.)
Residential/Rural/State Parks & Wildlife Areas	65 dB(A)	60 dB(A)
Commercial/Agricultural	70 dB(A)	65 dB(A)
Light industrial	80 dB(A)	75 dB(A)
Industrial	90 dB(A)	85 dB(A)
All Zones	75 dB(C)	70 dB(C)

Compliance Summary (Unadjusted)

The compliance points for both A- and C- weighted compliance are located at property line boundaries of existing building units located within 2,000 feet of the oil and gas location.

The location is zoned with an agricultural land use designation based on information from the Adams County Zoning Department. Adjacent parcels north of the location are zoned with an industrial land use designation; however, the Adams County regulation requires that operators comply with the lower MPNL of that corresponding land use/zoning district. Therefore, the operations at the Bennett D location will comply with the MPNLs for agricultural zoning as defined in the Colorado ECMC regulation for all compliance points included in this NMP. The applicable MPNLs are summarized in Table 3 below.

Table 3. *Compliance Summary, Maximum Permissible Noise Levels (Unadjusted)*

Zone	Operation	Daytime (7:00 a.m. – 7:00 p.m.)	Nighttime (7:00 p.m. – 7:00 a.m.)
Commercial/Agricultural	Drilling, Completions & Flowback	65 dB(A)	60 dB(A)
		65 dB(C)	65 dB(C)
	Production	60 dB(A)	55 dB(A)
		60 dB(C)	60 dB(C)

Maximum Permissible Noise Levels (Adjusted) - Summary

The results of the ambient sound level survey for the Bennett D location are presented in Section 7 of this document.

The Adams County noise regulation defers to the Colorado ECMC Regulation to set MPNLs at oil and gas locations. Section 423.d(2) of the Colorado ECMC Regulation allows for adjustments to the MPNLs if the measured ambient sound levels exceed the MPNLs. Colorado ECMC code allows for an adjustment of 7 dBA/dBC during daytime, and 5 dBA/dBC during nighttime for all operations (though production operations are also constrained by the cumulative maximums in Table 423-2 of Colorado ECMC Rule 423).

All adjusted MPNLs for the corresponding ambient measuring points are presented in Table 4 below. Corresponding receptor point locations are presented in Figure 2 of Section 5.

Table 4. *Adjusted Maximum Permissible Noise Levels for the Bennett D Location*

Phase	Receptor	Ambient Monitor Point #	Maximum Permissible Noise Levels	
			dBA	dBC
Construction, Drilling, and Completions	1	1	65 Day / **66.9** Night	**75.8** Day / **72.2** Night
	--	2	65 Day / **66.9** Night	**74.1** Day / **71.9** Night
	2	3	65 Day / 60 Night	65 Day / 65 Night
Production	1	1	**68.4** Day / **65** Night	**75** Day / **70** Night
	--	2	**67.6** Day / **65** Night	**74.1** Day / **70** Night
	2	3	60 Day / 55 Night	**69.4** Day / **66.4** Night

3 SUMMARY OF BMPS AND MITIGATION TO BE IMPLEMENTED

Best Management Practices (BMPs) are practices that are designed to prevent or reduce impacts caused by oil and gas operations on the environment and wildlife, and to minimize adverse impacts to public health, safety, and welfare.

The BMPs that Crestone plans to implement for the proposed Bennett D site are as follows:

- Crestone conducted a Noise Impact Assessment (NIA) for each phase of operations (drilling, completions, and production) to assess operational noise levels against the maximum permissible dBA and dBC noise levels stated in the regulation. Each phase of operation will comply with the MPNLs as summarized in Table 4 in Section 2 of this document.
- Prior to commencement of drilling and completion activities, a partial-perimeter, engineered sound wall consisting of approximately 2,260 linear feet of 32-foot-tall, STC32 wall will be installed around the edge of the well pad to reduce noise levels at the critical receptor points.
- The drilling rig that will be utilized to drill the wells to total depth will be powered by electric grid power. Thus, the three gensets that normally operate during all drilling operations will be completely shut down and only used for emergency backup in the case that the electric grid is temporarily unavailable.
- Crestone will utilize a low noise completions fleet for all completions operations.
- Flowback operations and equipment were reviewed as part of this Noise Mitigation Plan (NMP). The wells will flow back directly to the permanent facility. Perimeter sound walls will be left in place until drill out is complete and flows are initiated to appropriately manage noise levels for this operation.
- A pre-operational ambient sound level survey was conducted at the three locations outlined in Figure 3 of Section 7 to quantify pre-existing A- and C-weighted sound levels.
- Beginning with construction and up to production, Crestone will conduct continuous noise monitoring at Monitoring Point 1 shown in Figure 3 of Section 7 of this document.
- If the drilling rig or completions fleet is changed prior to commencement of operations, the mitigation measures employed will be equally or more protective.
- Crestone will post contact information to receive and address noise complaints arising from preproduction operations around the clock, 24 hours, 7 days per week. Upon receipt of a complaint, either directly to Crestone, or from Adams County, a Crestone representative will contact the associated stakeholder within 48 hours of receipt.

4 SITE INFORMATION

The proposed Bennett D location will be located north of Interstate 70 and west of Manilla Road, in Adams County, CO. The location is zoned with an Agricultural land use designation based on information from the Adams County online zoning portal. The closest road, Interstate 70, is a major highway that sees a high amount of traffic and is located approximately 250 feet south of the Bennett D Pad.

The Bennett D location is slated for drilling, completions, and production operations. Drilling is planned utilizing the Patterson-UTI APEX 1500 Series Drilling Rig (on grid power), and completions will be carried out with a Quiet Fleet from Liberty Oilfield Services. Planned production equipment is provided in Figure 16 of Appendix 1.

Detailed location information is presented below, and an aerial view of the proposed location is shown in Figure 1 below.

Location:	SE 1/4 SEC. 34, T3S, R64W, 6TH P.M.
Drilling Rig:	Patterson-UTI APEX 1500 Series Drilling Rig (on grid power)
Completions Equipment:	Liberty Oilfield Services Quiet Fleet
Production Equipment:	Details provided in Figure 16 of Appendix 1
Pad Location Coordinates:	39.742277°, -104.532774°
Regulation Noise Target:	Adams County Regulation Section 4-11-02-03-03-03-14

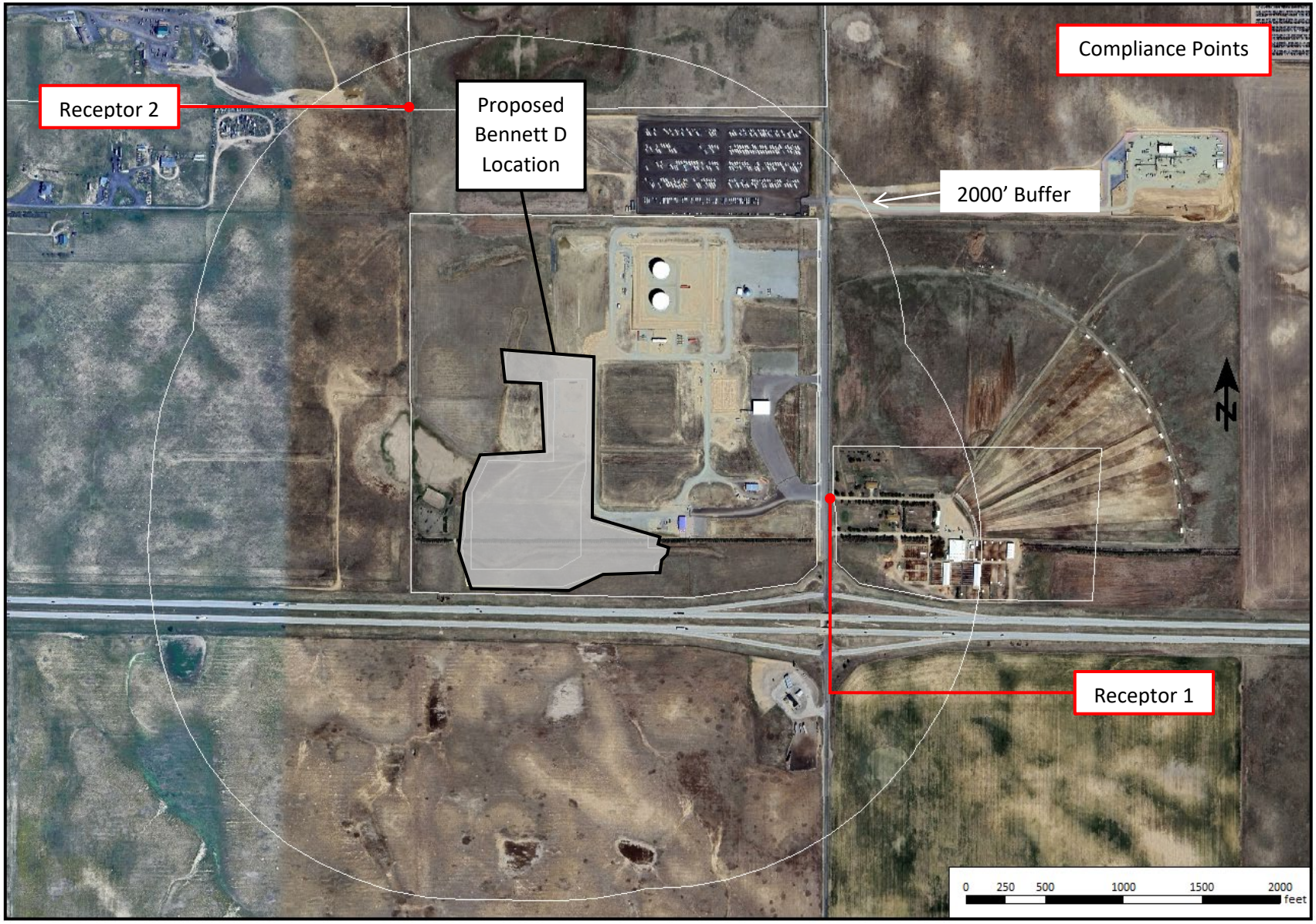
Figure 1. *Aerial View of the Proposed Bennett D Location*

5 COMPLIANCE POINTS

The MPNLs for all operations are applied at noise compliance points. These compliance points are chosen as outlined in the Adams County Regulation. The compliance points for both A- and C-weighted compliance are located at property line boundaries of existing building units located within 2,000 feet of the oil and gas location.

Figure 2 on the following page shows an aerial view of the Bennett D location as well as the noise compliance points. Two points are indicated in red for both A- and C- weighted compliance. One A- and C-weighted compliance point (Receptor 1) is located at the property line of existing building units within 2,000 feet of the proposed location. One additional receptor point (Receptor 2) is included to demonstrate noise levels at the property line of building units beyond 2,000 feet to the northwest of the proposed Bennett D location.

Figure 2. *Compliance Points*



6 ESTIMATED OPERATIONS & DURATION SCHEDULE

The following table reflects Crestone's planned construction and operations schedule for the Bennett D location at the time of this Noise Management Plan. The schedule in Table 5 below includes an estimated duration of each stage of operation, including construction, drilling, completion, flowback, and production.

The wells will flow back directly to the permanent facility instead of being directed to temporary tanks on the well pad. Therefore, there is no flowback operation dates or duration listed in Table 5.

Table 5. *Crestone's Planned Operations Schedule*

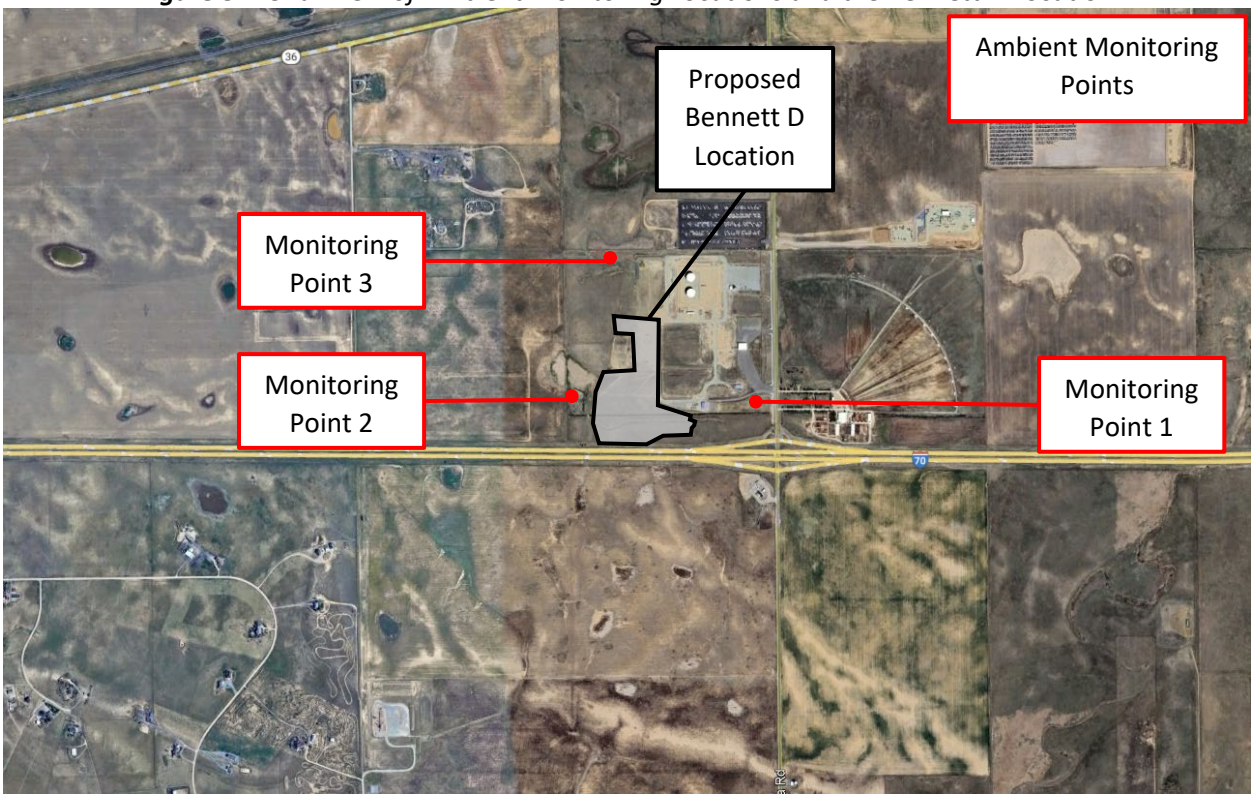
Phase	Duration (Days)	Estimated Start Date
Construction	60	Q2 2026
Drilling	150	Q3 2026
Completion	120	Q1 2027
Flowback	N/A	N/A
Production	9,125 (25 years)	Q3 2027

7 AMBIENT SOUND LEVEL SURVEY

The Adams County Regulation requires that the operator conduct a background ambient noise survey to establish baseline conditions for both A-scale and C-scale noise levels near the site. Urban conducted a 5-day (120-hour) ambient sound monitoring study to monitor and document pre-operational ambient sound levels using Type 1 noise monitoring stations. The sound level meters collect measurements of both A- and C-weighted decibel levels at each monitoring location and are calibrated before and after the measurement period. The Leq average values are calculated by averaging 1-minute Leq noise levels when the wind speed is below 5 miles per hour, per ECMC guidelines and environmental acoustical engineering best practices.

The ambient monitoring locations in relation to the Bennett D location are shown in Figure 3 below. A-weighted and C-weighted sound levels were collected at each of the three locations from Saturday, October 12, 2024, at 12:00 a.m., to Thursday, October 17, 2024, at 12:00 a.m., inclusive. Wind speed, direction, and other environmental data was recorded with a weather station attached to the sound level meter at Monitoring Point 1 situated approximately 800 feet east of the edge of the Bennett D location.

Figure 3. *Aerial View of Ambient Monitoring Locations and the Bennett D Location*



In addition to the ambient noise levels acquired, the sound level meters (SLMs) were set to record audio files when the levels exceed 55 dBA in the daytime (7:00 a.m. – 7:00 p.m.) and 50 dBA in the nighttime (7:00 p.m. – 7:00 a.m.). Based on the recordings, the most common sounds for the monitoring locations include vehicle traffic and aircraft flyovers.

Measured A- and C-weighted sound pressure level averages were not filtered for aircraft flyover events as these sounds can be considered part of the commonly occurring ambient acoustical environment. Because the Bennett D site and the ambient monitoring locations are in close proximity to four airports (Denver International Airport [DIA], Colorado Air and Space Port, Buckley Air Force Base, and Centennial Airport) and there are frequent, audible aircraft flyovers in the area (as observed in the recorded audio files), measurements taken during these flyovers were included in the ambient noise data processing.

Table 6 below presents the overall A- and C-weighted averages (Leq) for the 120-hour monitoring period for all three ambient monitoring locations. The averages shown represent the overall sound levels when the wind speed was below five (5) miles per hour. Data was filtered to remove values when wind speeds exceed five (5) miles per hour (as well as during periods of rain, thunder, etc.), per ECMC guidelines and environmental acoustical engineering best practices.

Table 6. *Overall Leq Background Ambient Noise Levels (Filtered for Wind Speed, Etc.)*

Location	Daytime Averages (L_{eq})		Nighttime Averages (L_{eq})		Overall Averages (L_{eq})	
	dBA	dBC	dBA	dBC	dBA	dBC
Monitoring Point 1	61.4	68.8	61.9	67.2	**61.7**	**67.8**
Monitoring Point 2	60.6	67.1	61.9	66.9	**61.5**	**67.0**
Monitoring Point 3	52.9	62.4	49.5	61.4	**51.1**	**61.8**

Figure 17 to Figure 19 in Appendix 2 contain charts with the unfiltered hourly averages and wind speeds for each of the monitoring points.

8 NOISE IMPACT ASSESSMENT

A Noise Impact Assessment (NIA) was conducted for the proposed Bennett D location using a three-dimensional computer noise modeling software. This is a predictive model to aid in ascertaining the environmental impact of the proposed facility during all planned operations on the surrounding environment. The results of this assessment will compare the predicted levels of the Bennett D location operations to the permissible noise level limits described in the Adams County noise regulation.

A brief explanation of the methodology is presented first, followed by noise model results for drilling, completions, and production.

Methodology

All computer models and predicted noise levels generated for the assessment are developed with the commercial noise modeling software SoundPLAN 9.0. The ISO 9613-1 and 2 international standards are utilized in this software as they are widely accepted both internationally as well as in North America. The algorithms used in the commercial software package are based on methods and theory accepted in the environmental acoustics community. Both detailed equipment technical information and location specific topography, are used to generate comprehensive noise predictions that take into account environmental conditions, buildings, ground cover and barriers (natural, topographical, and otherwise). Note that actual field measurements may differ from modeled noise levels on any given day due to ever changing environmental factors and other noise sources in the study area not explicitly in the computer model. Table 7 below lists the conditions used in the model.

Table 7. *Conditions Used in SoundPLAN 9.0 Software*

Parameter	Modeled Input and Description
Temperature	55°F – Represents typical summer nighttime temperature
Topography	Modeled as is, with proposed location modified per grading plan
Wind Velocity	2.2 - 11.2 mph – ISO 9613 uses a slight downwind condition from each noise source to each receiver
Wind Direction	From the noise source to the receptor points
Relative Humidity	40% - Typical summer nighttime relative humidity
Ground Absorption	Ranges from 0.0 for water bodies & major roadways up to 1.0 for thick grasslands

It is assumed that facility operating conditions do not change significantly between the daytime and nighttime periods. The resulting predicted noise levels are compared to the MPNLs outlined in the regulation to determine if the subject facility is compliant.

The noise levels generated in this predictive model are strictly from oil and gas operations at the proposed facility. Pre-existing sound sources such as those from animals, weather, road traffic, and all other ambient sounds are not included in the noise models.

Receptor points in this assessment are shown in Figure 2 of Section 5. The receptors are located at property line boundaries within 2,000 feet of the Bennett D location where there exists an occupied building unit on the parcel. The closest building unit is the occupied residence on the property near Receptor 1 and is located approximately 1,330 feet east of the edge of the Bennett D location.

Equipment Information and Site Layouts

Drilling operations at the Bennett D Pad are carried out using the Patterson-UTI APEX 1500 Series Drilling Rig (on grid power). The sound power levels used in this NIA are taken from a sound signature report prepared by Urban. The drilling equipment layout for the Bennett D Pad is shown in Figure 14 of Appendix 1.

Completions operations at the Bennett D Pad are carried out using the Liberty Oilfield Services (LOS) Quiet Fleet. The sound power levels used for the LOS Quiet Fleet in this NIA are taken from a sound signature report prepared by Urban. The completions equipment layout for the Bennett D Pad is shown in Figure 15 of Appendix 1.

Production operations at the Bennett D Pad are implemented per the equipment layout supplied by Crestone. The sound power levels used for the production equipment in this NIA are taken from the Urban Solution Group internal database. The production equipment layout for the Bennett D Pad is shown in Figure 16 of Appendix 1.

Sound power levels used in each of the noise models were derived from sound pressure level measurements made for each noise source in the field. For each source, sound pressure levels were measured at specific locations on predefined measurement surfaces surrounding each noise source in accordance with ISO 3744 and ISO 3746. After raw data from the field was collected, it was uploaded to a computer for further analysis and post processing. Calculated sound power levels were entered into SoundPLAN 9.0 where they are adjusted slightly to align theoretical sound pressure levels produced by the model with the actual sound pressure levels collected on site. This additional calibration step was done to ensure potential noise contamination from neighboring equipment during data collection was removed from reported sound power levels for each piece of equipment.

Drilling Noise Model Results

Results for both unmitigated and mitigated drilling operations are presented in Table 8 below. The receptor locations in the table correspond to the locations identified in Figure 2 of Section 5.

The results demonstrate that unmitigated drilling operational noise levels are below both the A- and C- weighted MPNLs (and therefore compliant without mitigation). However, Crestone plans to install noise mitigation consisting of a partial-perimeter, engineered sound wall to reduce the environmental noise impact on the area.

The sound wall layout is shown in Figure 14 of Appendix 1 and consists of approximately 2,260 linear feet of 32-foot-tall, engineered sound wall rated at STC32.

Table 8. *Drilling Operations Noise Model Results*

Receptor	Distance & Direction from the Edge of Location (feet)	Max Permissible Noise Level		Drilling Unmitigated		Drilling Mitigated	
		dBA	dBC	dBA	dBC	dBA	dBC
Receptor 1	1,100 E	65.0	**72.2**	44.9	69.4	43.5	66.1
Receptor 2	1,650 NW	60.0	65.0	41.6	62.1	40.5	62.0

The predicted levels only include sound levels from drilling operations and do not include ambient noise or noise contributions from other sources outside of the planned operations.

Noise contour maps are provided for the area surrounding the Bennett D location. The contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. Unmitigated drilling operations noise contour maps are presented in Figure 4 and Figure 5, whereas mitigated contours are shown in Figure 6 and Figure 7.

Figure 4. *Unmitigated Drilling Noise Contour Map (dBA)*

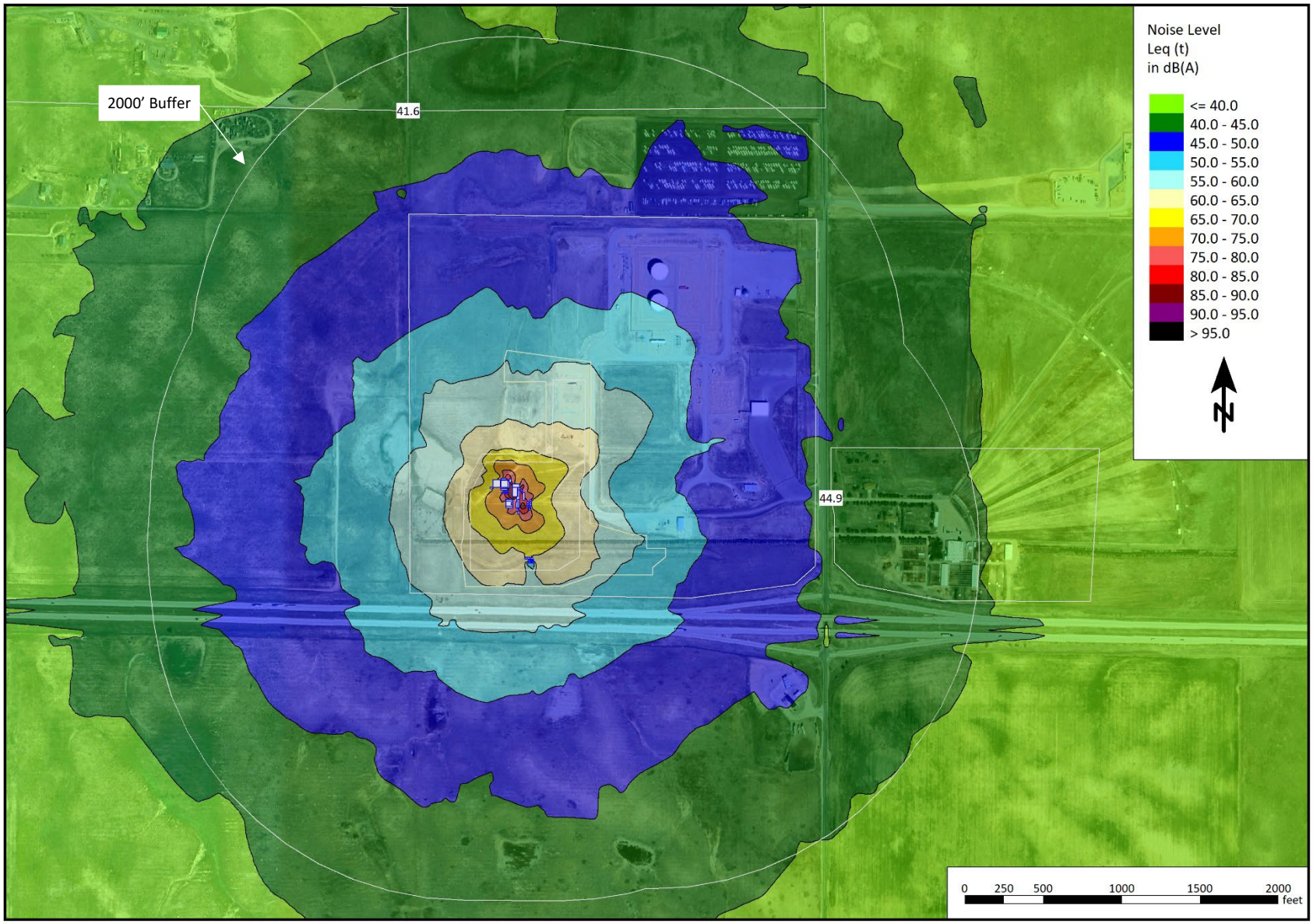


Figure 5. *Unmitigated Drilling Noise Contour Map (dBC)*

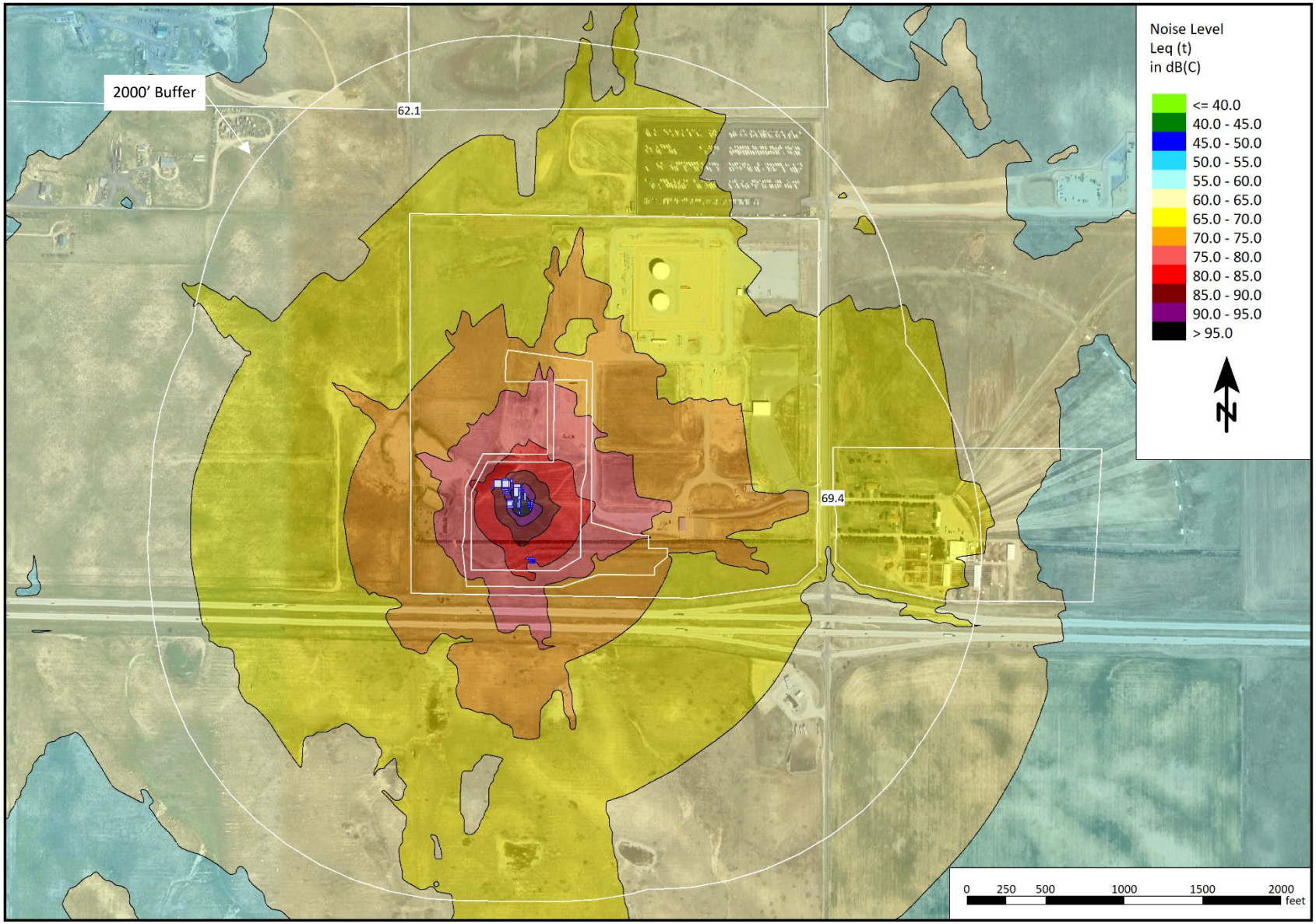


Figure 6. *Mitigated Drilling Noise Contour Map (dBA)*

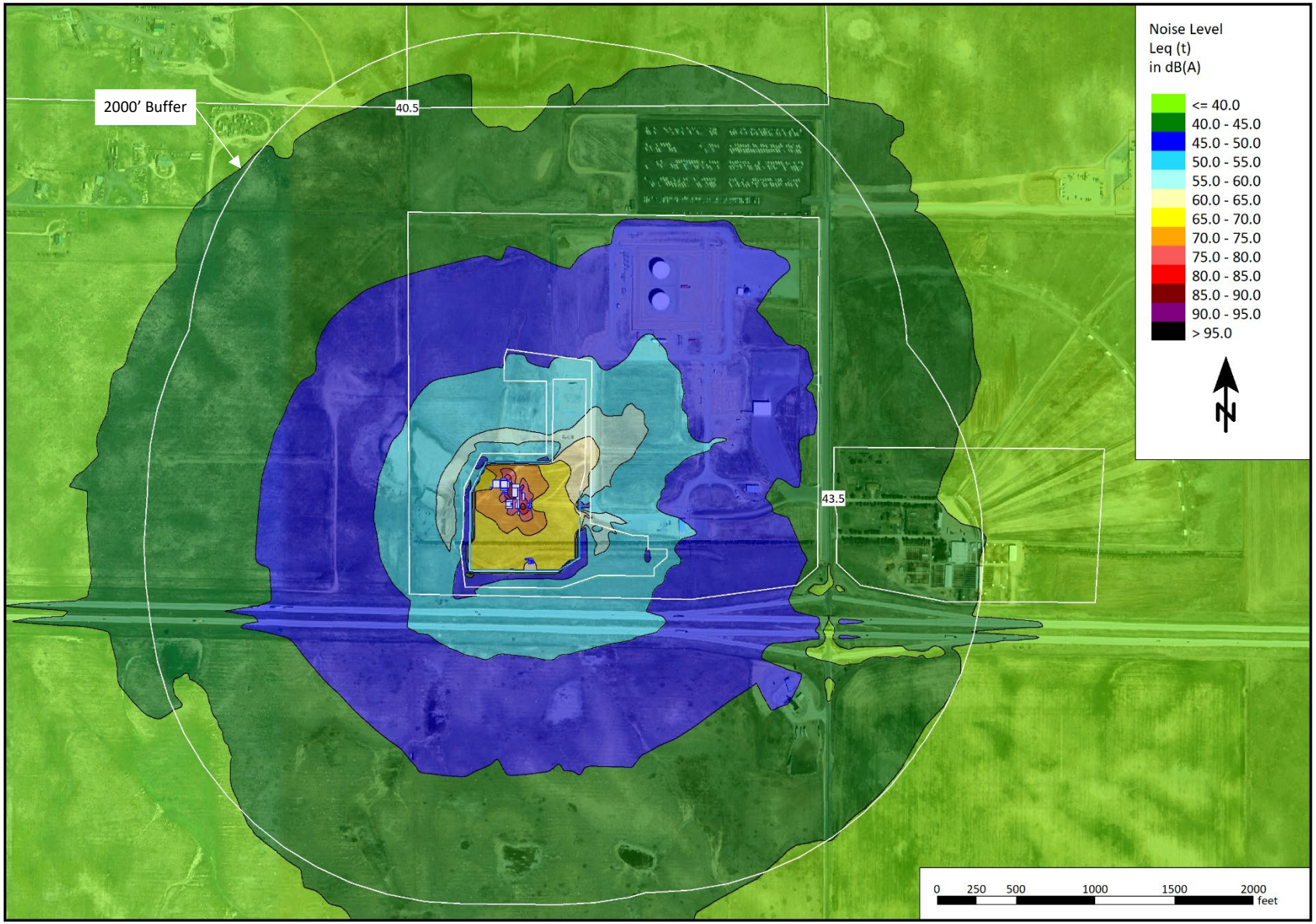
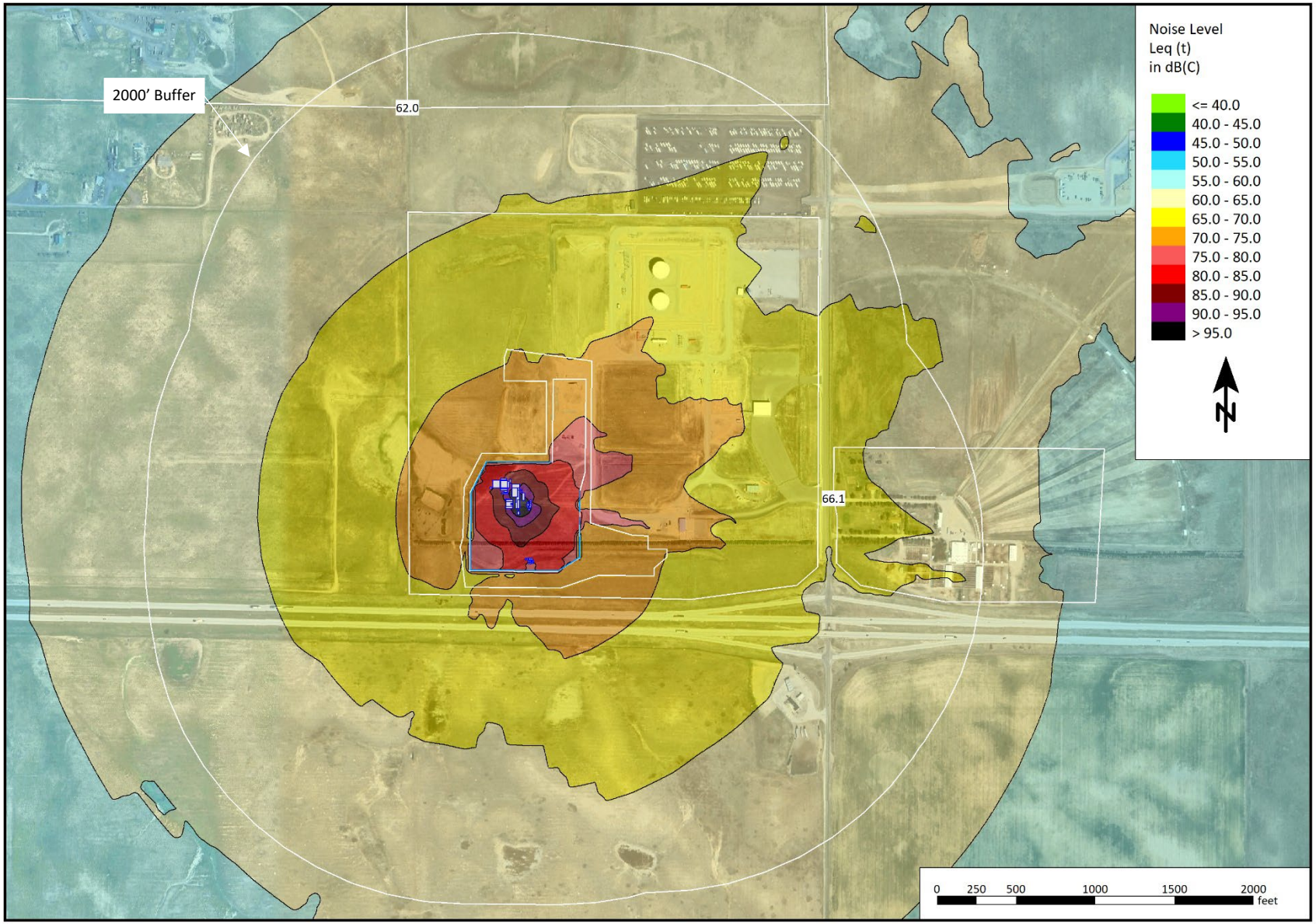


Figure 7. *Mitigated Drilling Noise Contour Map (dBC)*



Completions Noise Model Results

Results for both unmitigated and mitigated completions operations are presented in Table 9 below. The receptor locations in the table correspond to the locations identified in Figure 2 of Section 5.

The results demonstrate that unmitigated completions operational noise levels are below both the A- and C-weighted MPNLs (and therefore compliant without mitigation). However, Crestone plans to install noise mitigation consisting of a partial-perimeter, engineered sound wall to reduce the environmental noise impact on the area.

The sound wall layout is shown in Figure 15 of Appendix 1 and consists of approximately 2,260 linear feet of 32-foot-tall, engineered sound wall rated at STC32.

Table 9. *Completions Operations Noise Model Results*

Receptor	Distance & Direction from the Edge of Location (feet)	Max Permissible Noise Level		Completions Unmitigated		Completions Mitigated	
		dBA	dBC	dBA	dBC	dBA	dBC
Receptor 1	1,100 E	65.0	**72.2**	51.6	64.1	51.6	64.7
Receptor 2	1,650 NW	60.0	65.0	46.3	61.0	45.7	60.8

The predicted levels only include sound levels from completions operations and do not include ambient noise or noise contribution from other sources outside of the planned operations.

Noise contour maps are provided for the area surrounding the Bennett D location. The contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. Unmitigated completions operations noise contour maps are presented in Figure 8 and Figure 9, whereas mitigated contours are shown in Figure 10 and Figure 11.

Figure 8. *Unmitigated Completions Noise Contour Map (dBA)*

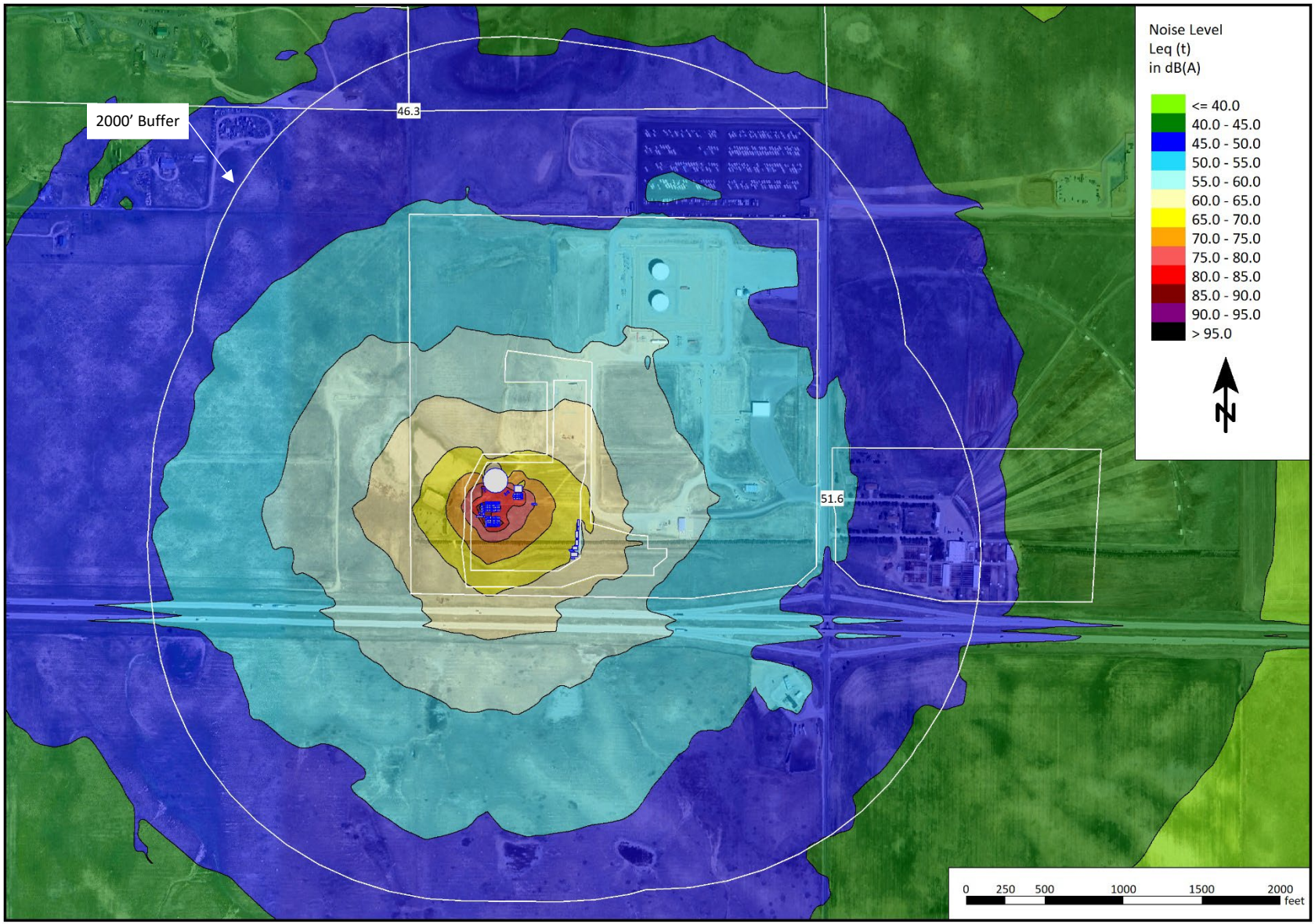


Figure 9. *Unmitigated Completions Noise Contour Map (dBC)*

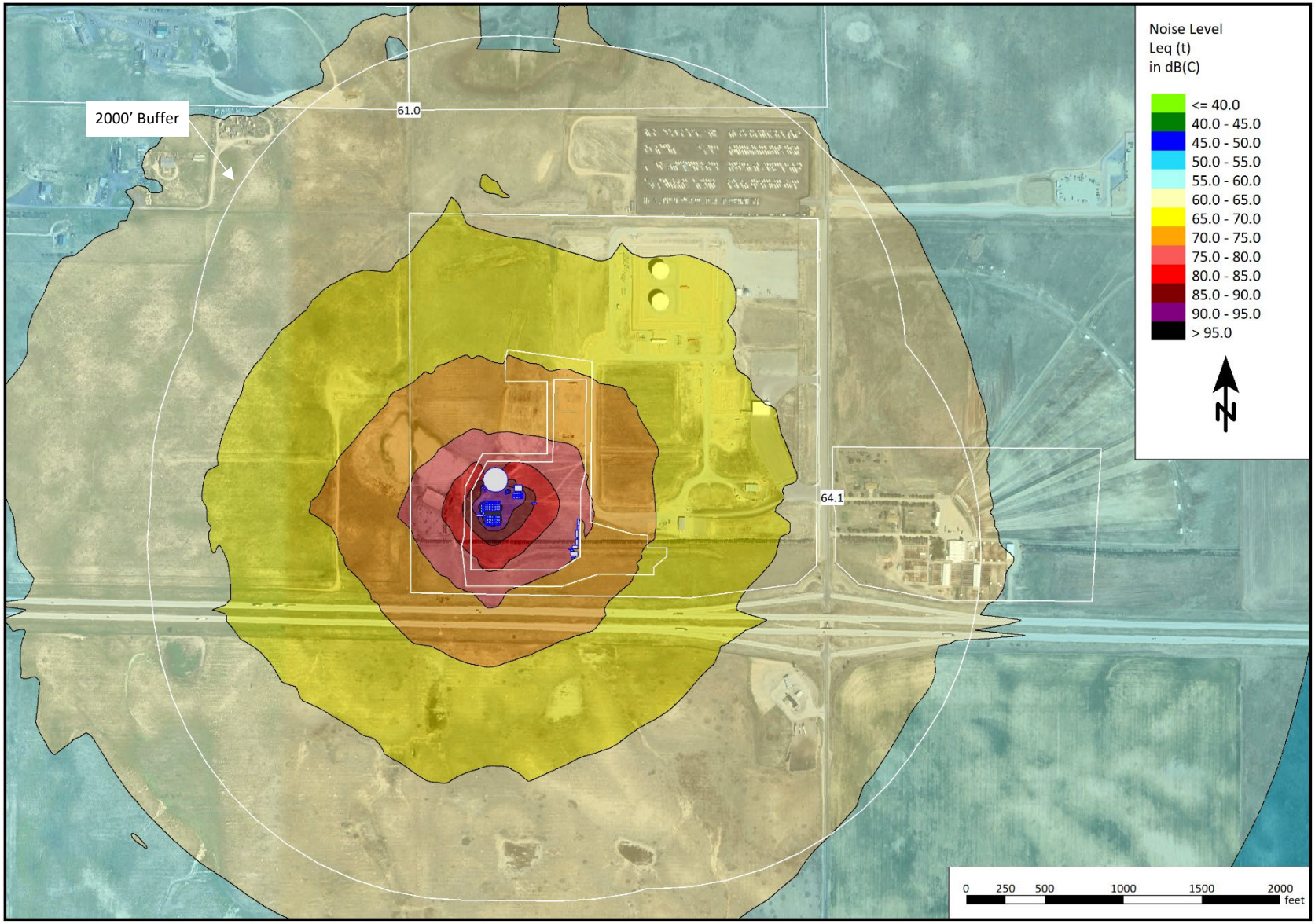


Figure 10. *Mitigated Completions Noise Contour Map (dBA)*

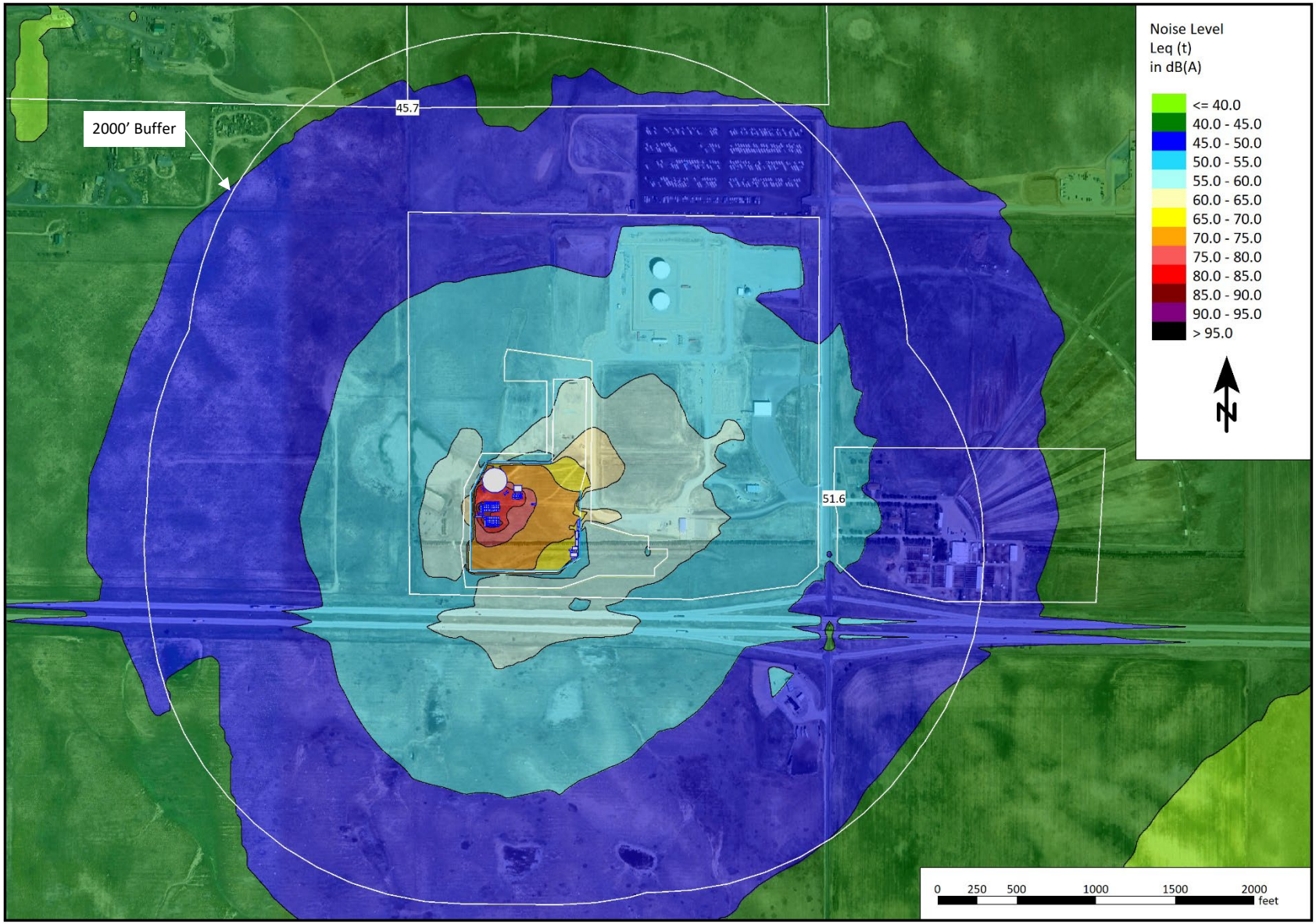
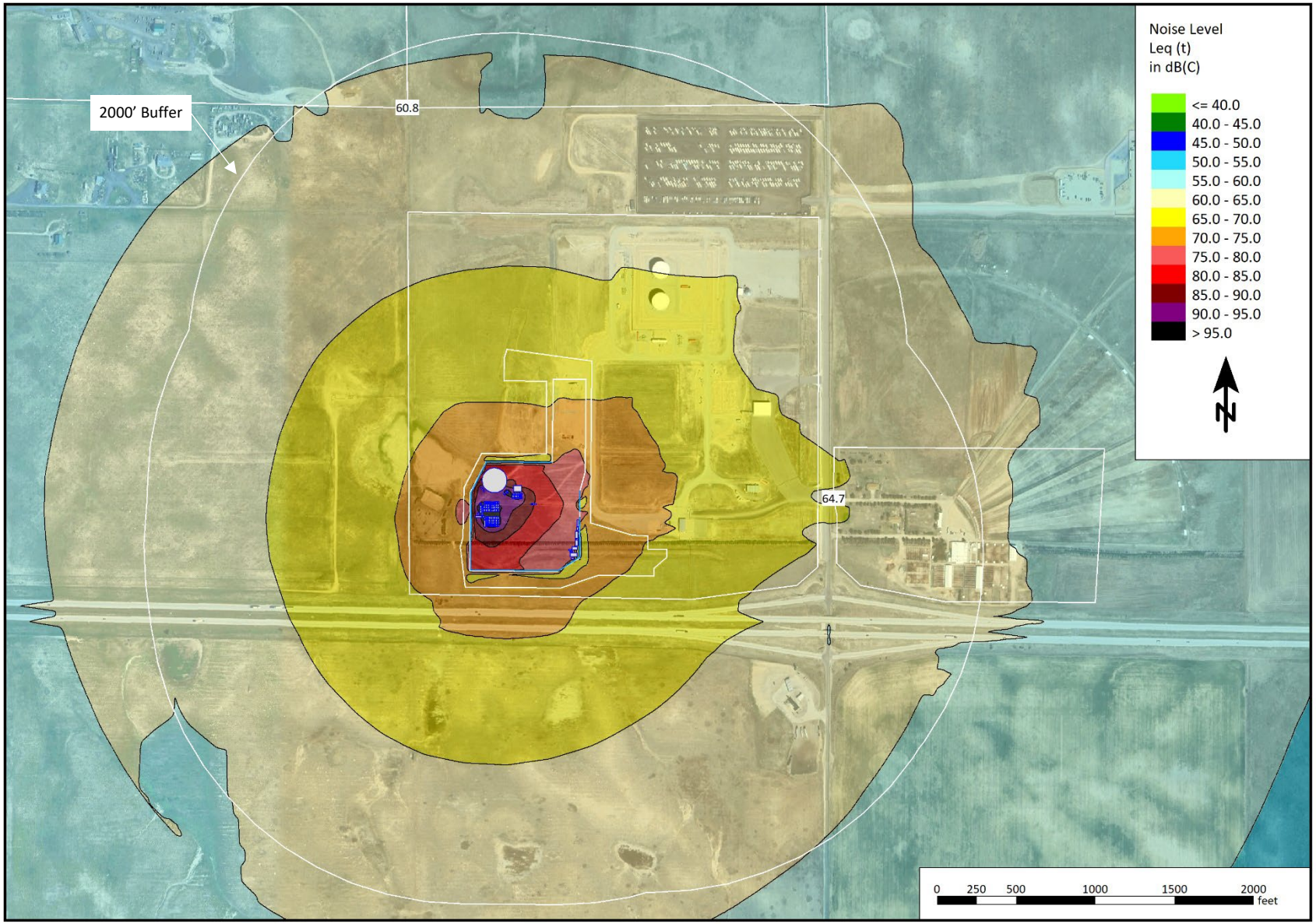


Figure 11. *Mitigated Completions Noise Contour Map (dBC)*



Production Noise Model Results

Results for unmitigated production operations are presented in Table 10 below. The receptor locations in the table correspond to the locations identified in Figure 2 of Section 5.

The results demonstrate that unmitigated production operational noise levels are below the MPNLs and thus do not require mitigation.

Table 10. *Production Operations Noise Model Results*

Receptor	Distance & Direction from the Edge of Location (feet)	Max Permissible Noise Level		Production Unmitigated	
		dBA	dBC	dBA	dBC
Receptor 1	1,100 E	**65.0**	**70.0**	45.1	57.6
Receptor 2	1,650 NW	55.0	**66.4**	42.2	52.9

The predicted levels only include sound levels from production operations and do not include ambient noise or noise contribution from other sources outside of the planned operations.

Noise contour maps are provided for the area surrounding the Bennett D location. The contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. Unmitigated production operations noise contour maps are presented in Figure 12 and Figure 13.

Figure 12. *Unmitigated Production Noise Contour Map (dBA)*

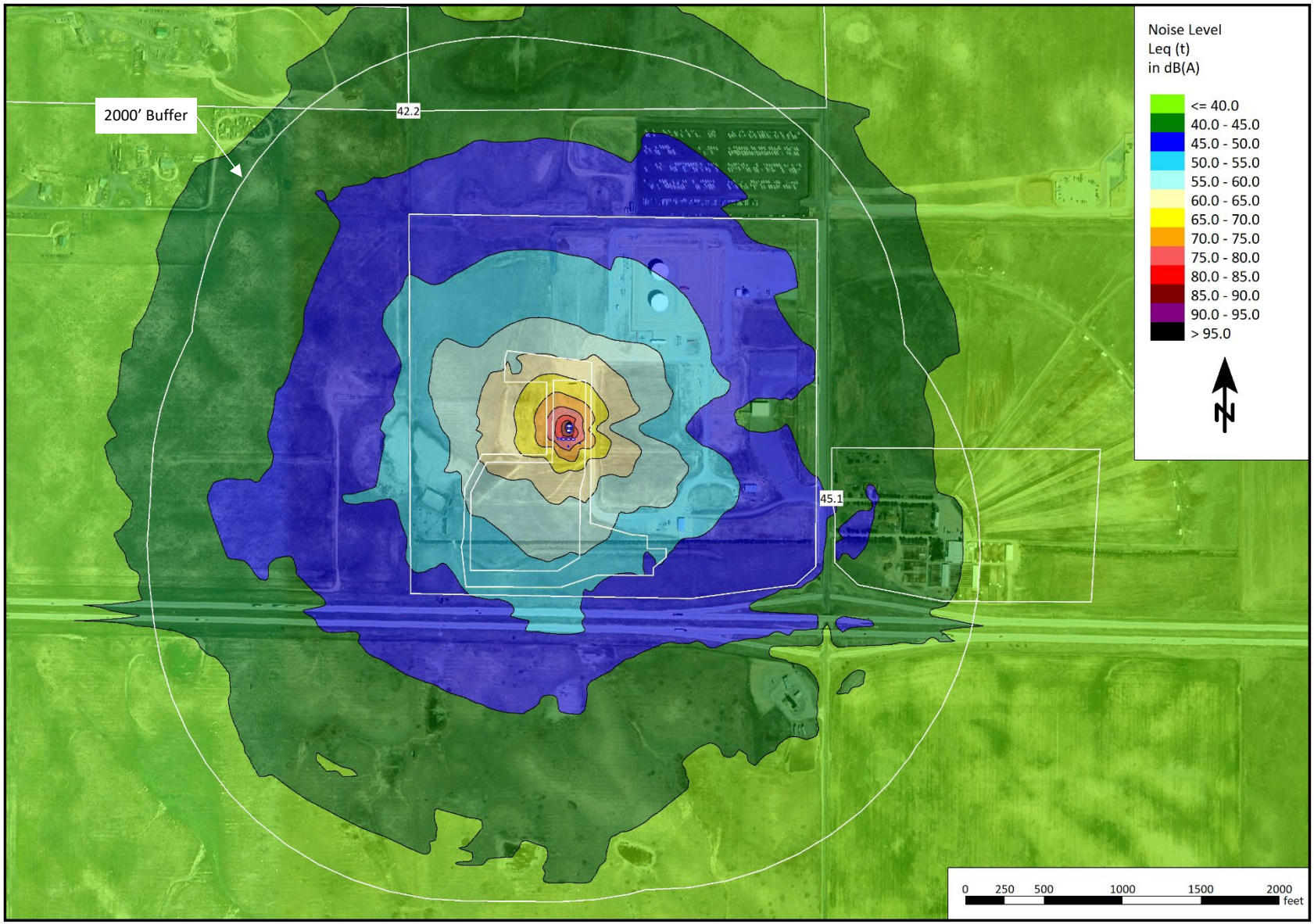
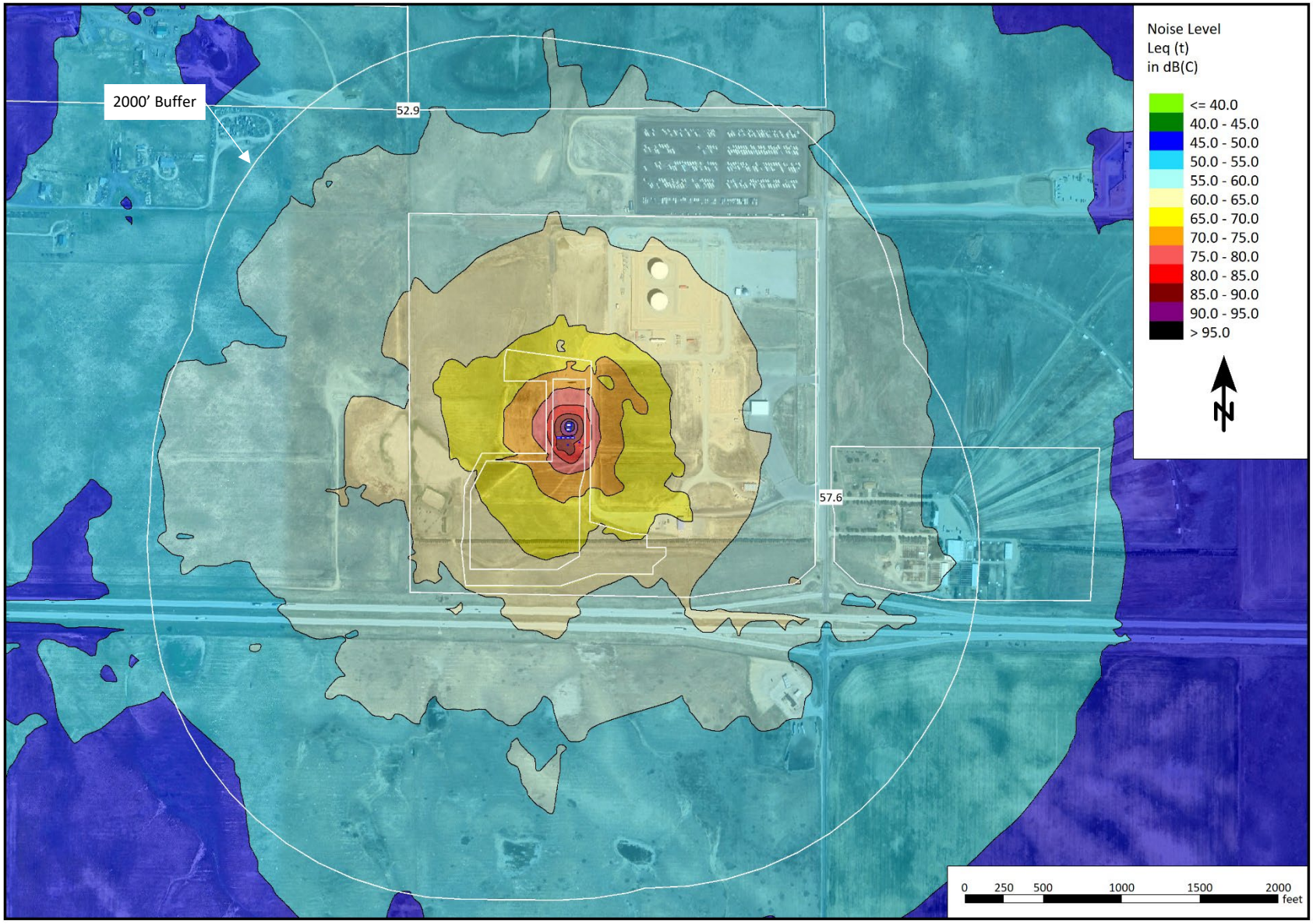


Figure 13. *Unmitigated Production Noise Contour Map (dBC)*



Flowback Operations Review

A review of flowback operations was carried out by Urban based on information supplied by Crestone. It was determined that flowback can be reduced to two simple, successive, operations from a noise perspective; these are “drill out” and “surface flow”. Both flowback operational components were assessed, and it was found that neither warrant noise modeling. The surface flow portion of the flowback operation will not be directed to temporary tanks as is usually done, but instead will flow directly to the newly constructed production facility.

9 CONTINUOUS MONITORING / COMPLAINT RESOLUTION

Beginning with construction up to production, Crestone will conduct Continuous Noise Monitoring at Monitoring Point 1 shown in Figure 3 of Section 7.

Continuous monitoring services are deployed to provide continuous noise level and compliance verification throughout preproduction operations. If a noise complaint is made to either Crestone directly (or to Adams County), and the Operator is notified of the complaint, Crestone is able to reference continuous monitoring data and identify the source of any sound level 'spike(s)' throughout the monitoring period.

The sound level meters collect measurements of A- and C-weighted decibel (dB) levels by continuously sampling sound levels, logging the specified data every minute. The meters are calibrated before and after the measurement period to ensure accuracy. They also have an internal system check function that runs daily and will issue an alert if necessary, so that any issues detected can be attended to promptly. The hourly Leq values shown in Continuous Noise Monitoring reporting are calculated by averaging 1-minute Leq noise levels when the wind is below 5 miles per hour, per ECMC guidelines and best practices.

Crestone will post contact information to receive and address noise complaints arising from preproduction operations around the clock, 24 hours, 7 days per week. Upon receipt of a complaint, either directly to Crestone or from Adams County, Crestone will contact the associated stakeholder within 48 hours of receipt.

10 CONCLUSION

The results of the proactive planning, noise modeling, and implementation of Best Management Practices as discussed in this NMP indicate that noise levels generated by Crestone's proposed oil and gas operations at the Bennett D location are expected to comply with permissible noise levels required by the Adams County noise regulation for all operations proposed (drilling, completions, flowback, and production).

11 NOTATIONS

The services provided for this project were performed in accordance with generally accepted professional consulting services. No warranty, expressed or implied, is made or intended by rendition of these consulting services or by furnishing oral or written reports of the findings made. Urban Solution Group generated this report for the exclusive use of Crestone Peak Resources Operating, LLC.

Appendix 1 – Equipment Layouts

Figure 14. *Drilling Equipment and Soundwall Layout for the Patterson Automated Walking Rig System*

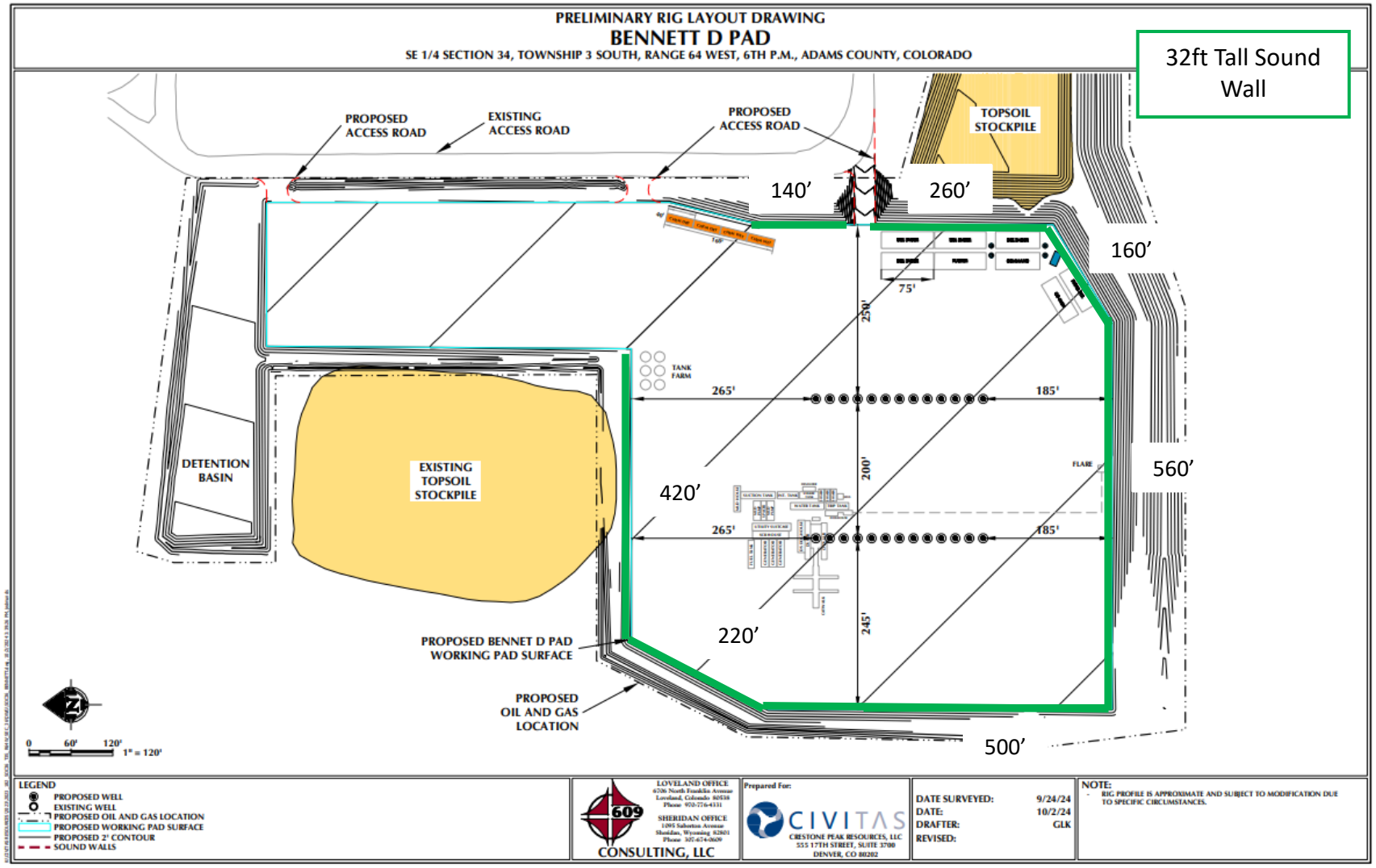


Figure 15. *Completions Equipment and Soundwall Layout for the Liberty Quiet Fleet*

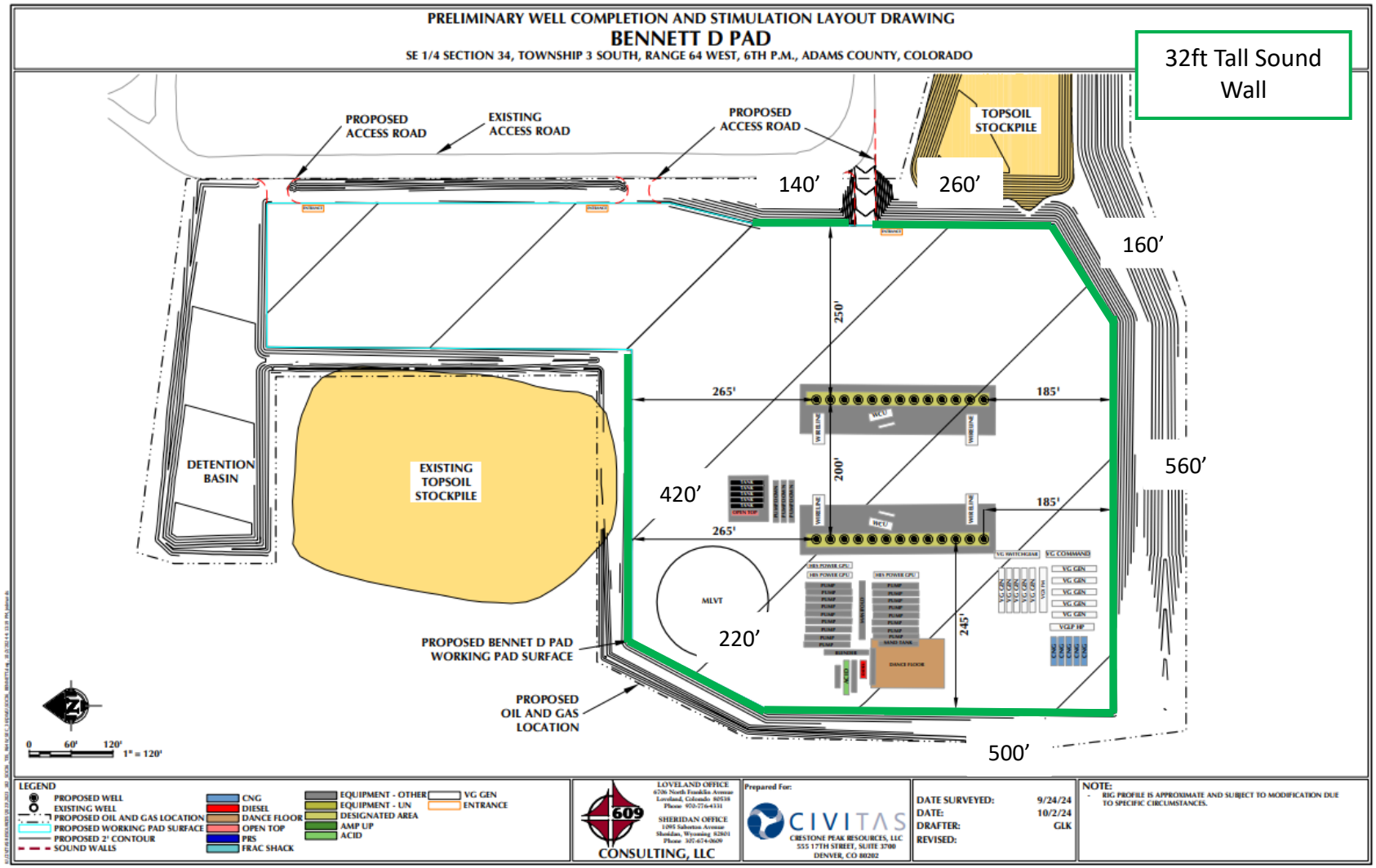
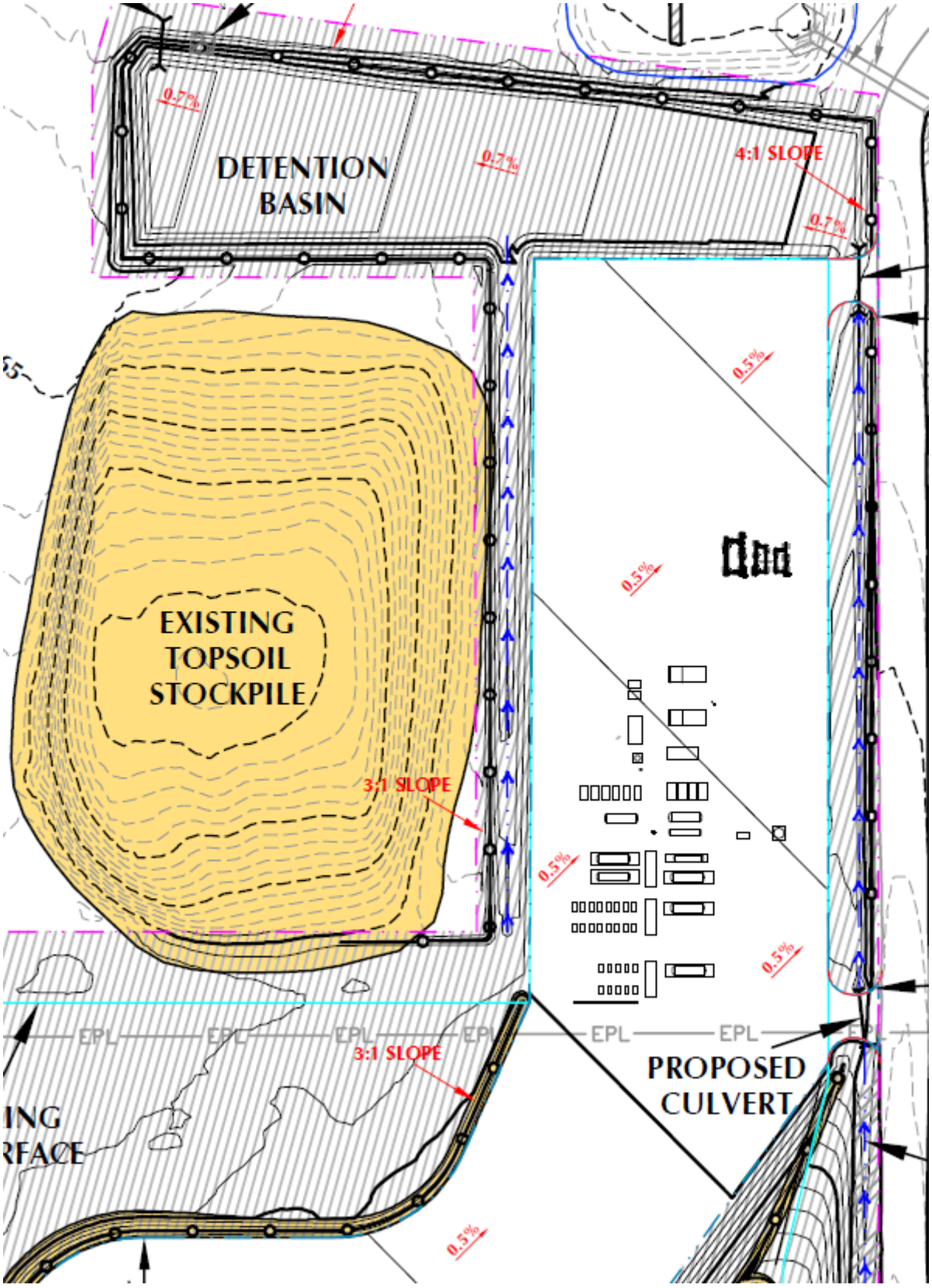


Figure 16. *Production Equipment Layout*



Appendix 2 – Ambient Data and Charts

Figure 17. *Chart of Unfiltered Hourly Averages for Monitoring Point 1*

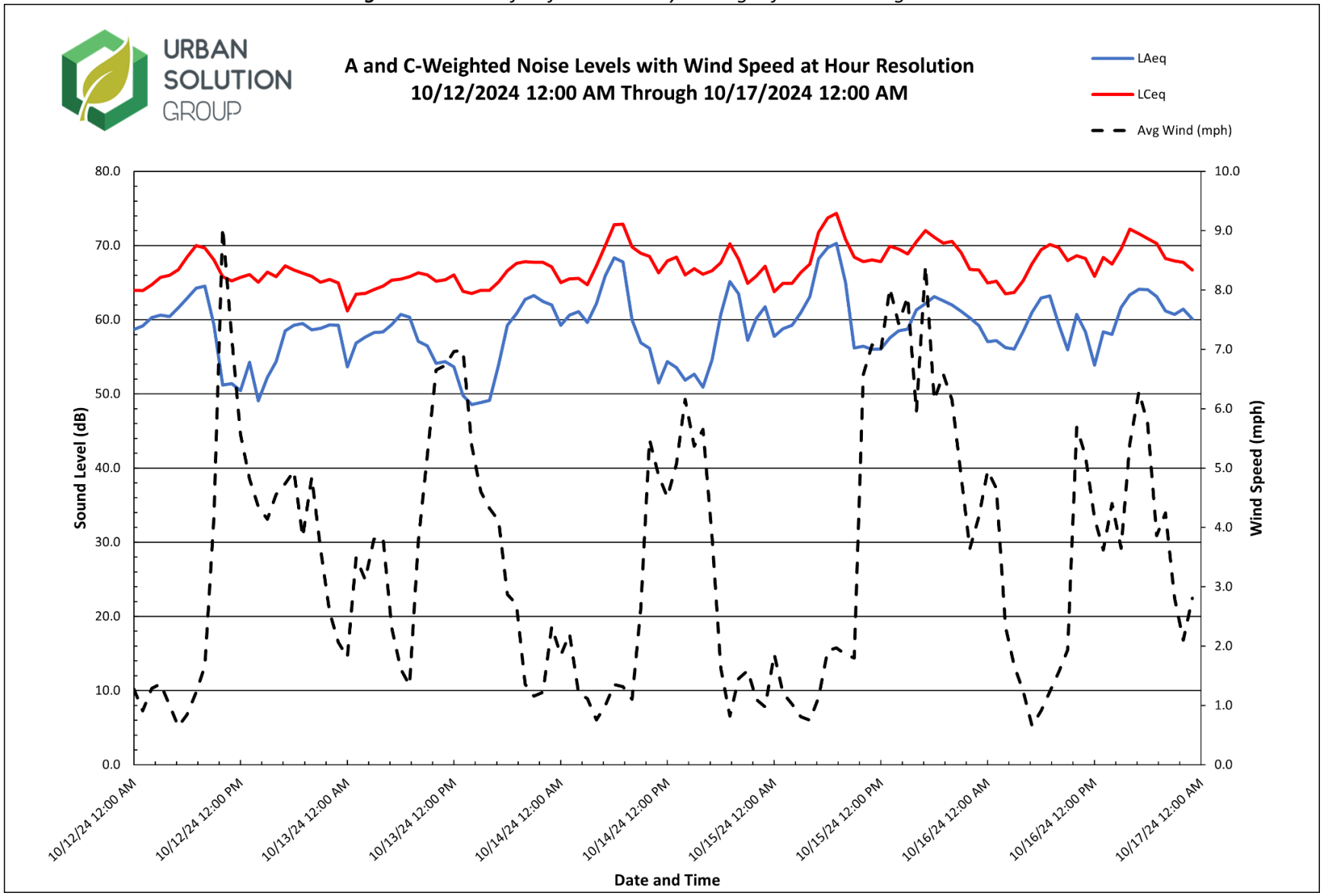


Figure 18. *Chart of Unfiltered Hourly Averages for Monitoring Point 2*

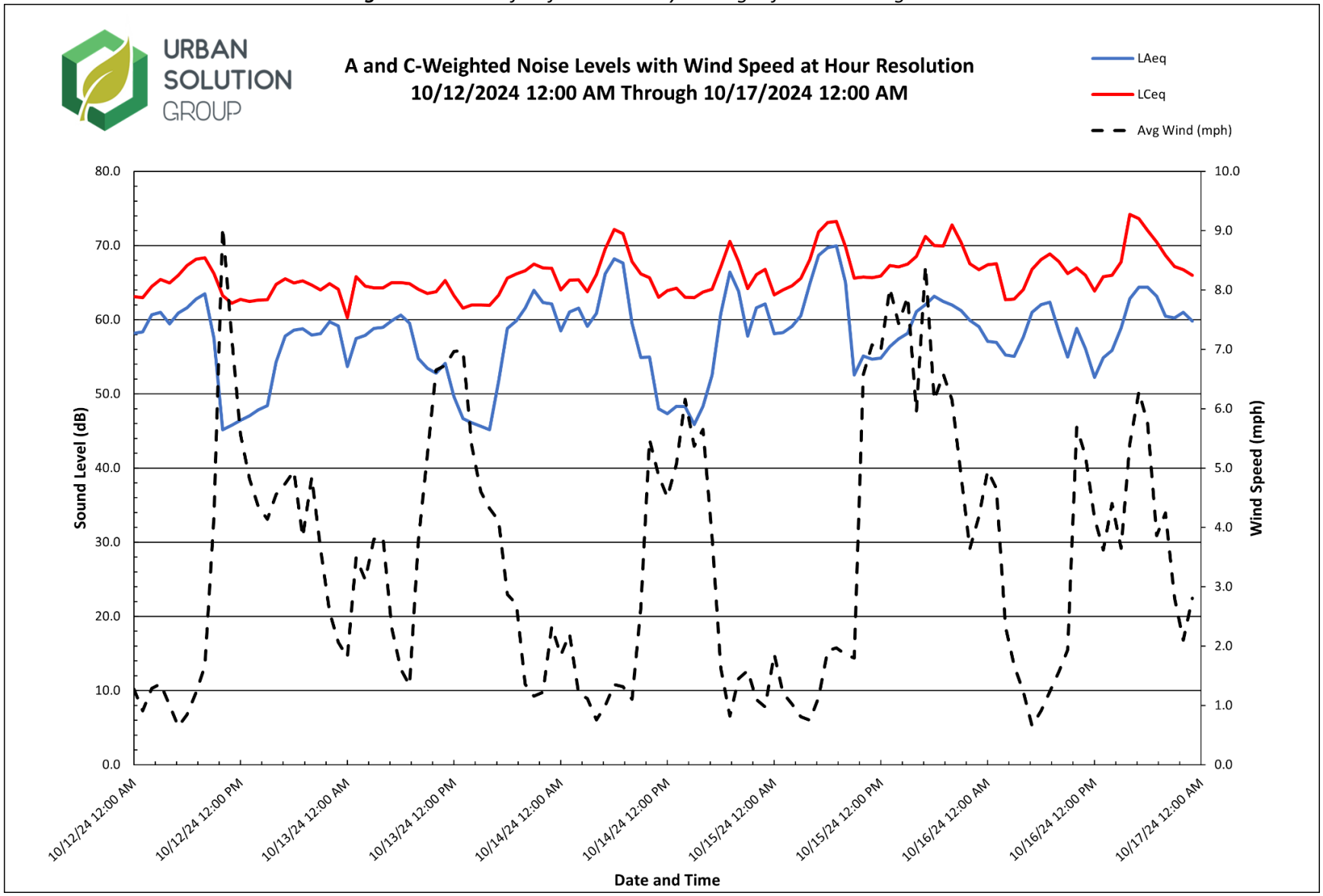
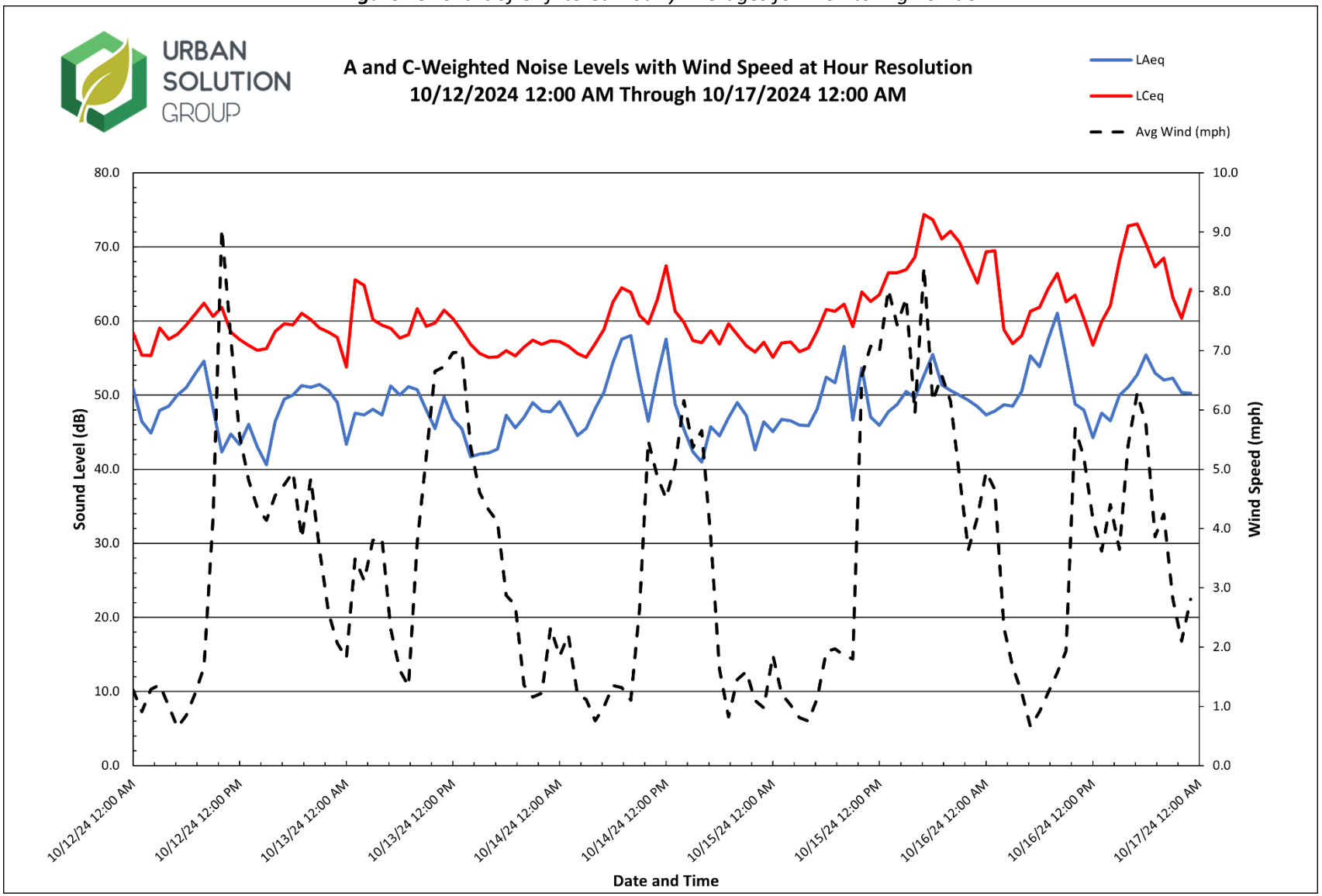


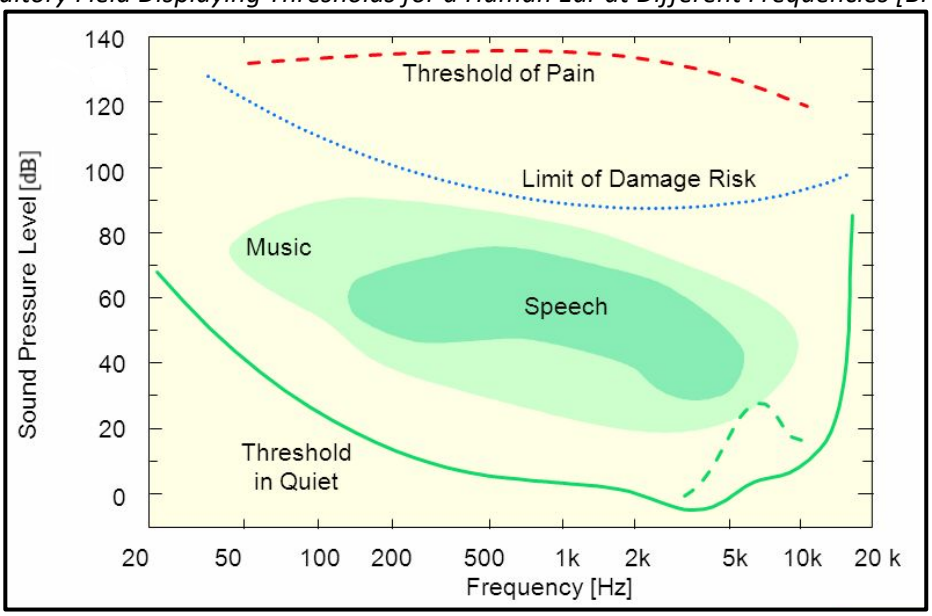
Figure 19. *Chart of Unfiltered Hourly Averages for Monitoring Point 3*



Appendix 3 – Sound Fundamentals

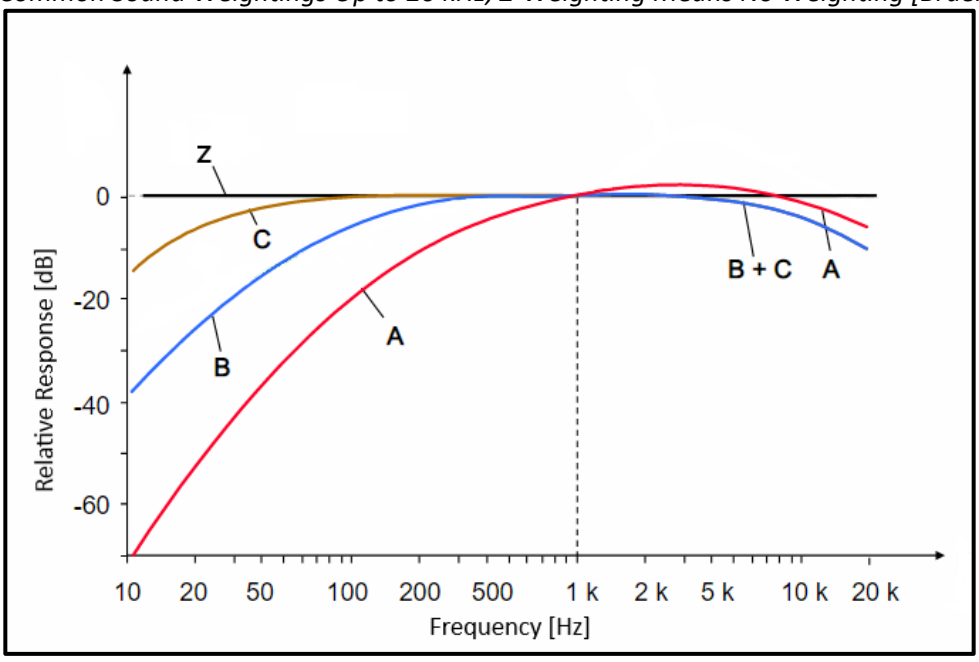
Sound is a series of vibrations transmitted through the air, or other medium, and can be heard when they are processed by the human ear. There are two important properties that describe sound; frequency and amplitude. Frequency is determined by the rate of movement and is measured in cycles per second, which is known as Hertz (Hz). A healthy human ear can hear 20 Hz – 20,000 Hz (Figure A). The sensation associated with frequency is commonly referred to as the pitch of a sound. High frequencies produce a higher pitch and vice versa. The amplitude of a sound is determined by the maximum displacement of air molecules produced by the vibrations. These displacements lead to pressure fluctuations in air, which are expressed in decibels (dB). Decibels are a logarithmic ratio of sound pressure over the standard threshold of hearing. The more energy a sound has, the larger the pressure fluctuations, resulting in a louder sound.

Figure A: *Auditory Field Displaying Thresholds for a Human Ear at Different Frequencies [Bruel and Kjaer]*



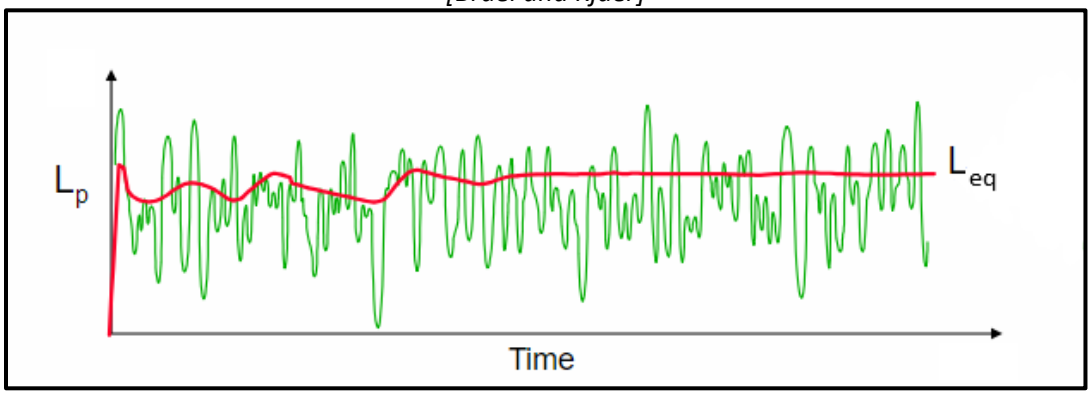
Frequency weightings are applied to measurements to provide a better match between measured results and human perception. Each weighting, in relation to their frequency components, allows for a consistent measurement of the different type of noise sources. A-weighted decibel sound pressure levels (dBA) are measurements recorded from a sound level meter measuring sounds similar to the response of the ear (Figure B). While C-weighted (dBC) measurements are for low-frequency components.

Figure B: *Common Sound Weightings Up to 20 kHz, Z-Weighting Means No Weighting [Bruel and Kjaer]*



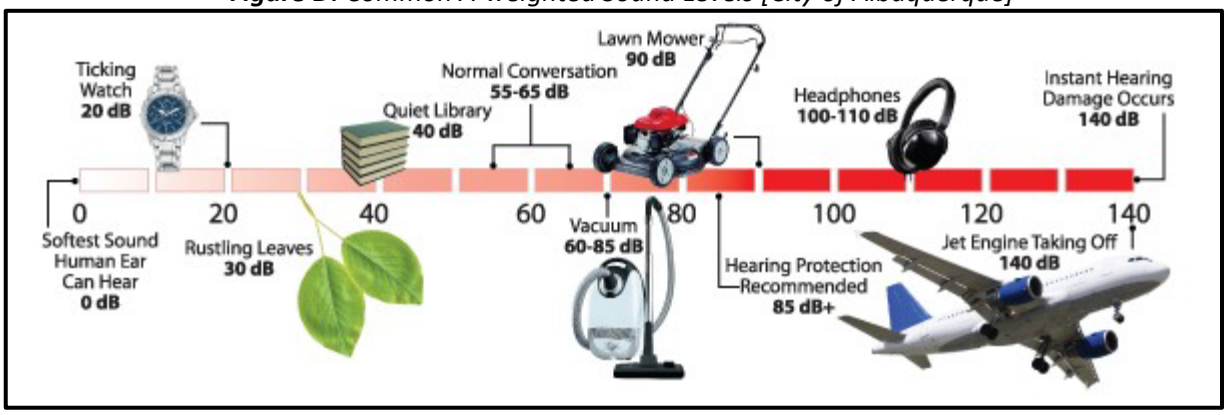
Each measurement has an exponential time factor. Slow time weighting is the most common for environmental noise measurements and will be used for these measurements. For recording over long periods of time, the sound level meter records each weighted decibel reading with an equivalent, or average, continuous sound level reading (Leq). Leq represents the same energy as the actual time varying sound signal (Figure C). LAeq refers to the equivalent continuous sound level for an A-weighted measurement.

Figure C: *Sound Level Recording Displaying Leq, a Steady-State Sound Level, Over a Noise Measurement [Bruel and Kjaer]*



Environmental noise is a combination of various noise sources. These sources may include; vehicle traffic, aircraft flyovers, wind, weather disturbances, commercial or industrial activities, and other short-term events. These sources create “background noise”. Background noise varies throughout the day, generally following the cycle of human activity. Figure D below presents typical A-weighted (dBA) sound levels for common sources of sound.

Figure D: *Common A-weighted Sound Levels [City of Albuquerque]*



Appendix 4 – Glossary

Ambient Noise
All noises that exist in an area and are not related to regulated operations and facilities. Ambient noise includes sound from other industrial noise not subject to this directive, transportation sources, animals and nature.

Average Sound Level
See Energy Equivalent Sound Level.

A-weighted sound level
The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.

Calibration
A procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.

C-weighted Sound Level
The C-weighting approximates the sensitivity of human hearing for relatively loud sounds. The C-weighted sound level is also commonly used to assess low- frequency noise in conjunction with the A-weighted sound level.

Day Night Sound Level (Ldn)
Is the average noise level over a 24-hour period. The noise between the hours of 22:00 and 07:00 is artificially increased by 10 dB. The nighttime noise is weighted to consider the decrease in community background noise.

Daytime Average Sound Level
The time-averaged A-weighted sound level measured between the daytime hours, usually defined as 7:00 am to 7:00 pm.

Decibel (dB)
A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. The basic unit of measurement for sound levels.

dBA
The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response. See dB and A-weighted Sound Level.

dBC
The decibel (dB) sound pressure level filtered through the C filtering network. See Decibel and C-weighted Sound Level.

Energy Equivalent Sound Level (L_{eq})
The Leq is regarded as the average sound pressure level, where the single sound level value represents an amount of energy equal to that of an entire time-varying acoustic signal over a given period.

Facility
Any operation used in exploration, processing, development and transportation of energy resources.

Frequency
The number of oscillations per second for a sound wave.

Impulse Noise
Unwanted, instantaneous sharp sounds that create sudden impulses of pressure similar to gunfire and explosions.

Noise Reduction
The numerical difference, in decibels, of the average sound pressure levels between two locations on either side of a sound wall, or silencer, etc.

Nighttime Average Sound Level (Lnight)
The time-averaged A-weighted sound level measured between the nighttime hours, usually defined as 7:00 pm to 7:00 am.

Ldn
See Day night sound level.

Leq
See Energy Equivalent Sound Level.

Noise
Generally understood as unwanted sound.

Noise Impact Assessment (NIA)
Identifies the expected sound level emitted from operations, and receptor points are placed in locations related to compliance. It also identifies what the permissible sound level is and how it was calculated.

Noise Reduction Coefficient (NRC)
A single number rating of the sound absorption properties for a material. An NRC value of zero indicates the material is purely reflective. An NRC value of one indicates perfect absorption.

Octave Band
An octave band is a frequency band that spans one octave. A band is said to be an octave in width when the upper band frequency is twice the lower band frequency. Octave bands are commonly used in engineering acoustics. The nine common octave bands used for the study of industrial noise are identified by their center frequencies as 31.5Hz, 63Hz, 125Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz.

Point Source
A source that radiates sound from a single point. Generally used to model equipment when looking at the sound impact over a large area.

Receiver
A person or piece of equipment that is affected by noise.

Sound
A series of vibrations transmitted through the air, or other medium, and can be heard when they are processed by the human ear.

Sound Level Meter (SLM)
An instrument that contains a microphone and filter used to measure sound levels, using standard frequency-weightings and exponentially weighted time averaging.

Sound Power Level
A physical measurement of the amount of power a sound source radiates into the surrounding air. It is the rate at which sound energy is emitted, or received, per unit time.

Sound Pressure Level (SPL)
The sound level received at a given location. The decibel equivalent of the rate of sound pressure waves at a measured location, usually with a microphone.

Sound Transmission Class (STC)
An integer rating that measures how well a barrier or building partition attenuates sound. Indicates how well a barrier is at stopping sound from transmitting through it.

1/3 Octave Band
The 1/3 octave band analysis provides a finer breakdown of sound energy distribution (compared to full octave band) as a function of frequency.

Lighting Mitigation Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-19

CIVITAS

Crestone Peak Resources, LLC

LIGHT MITIGATION PLAN

FOR

Bennett D Pad

Prepared For:

ADAMS COUNTY
COLORADO

4430 S. Adams County Pkwy.
Brighton, CO 80601
www.adcogov.org

Prepared By:

RPG RESOURCES
a System One company

1720 South Bellaire Street, Suite 400
Denver, CO 80222
www.rpgres.com

Date Prepared: December 2024

Table of Contents

1. PLAN PURPOSE

This Light Mitigation Plan was prepared by RPG Resources (RPG), on behalf of Crestone Peak Resources (Crestone) for the proposed Bennett D Pad. This plan was prepared to comply with State and local Light Mitigation Plan requirement for new oil and gas locations, and it addresses Crestone Peak Resources' plans to adhere to maximum permissible light levels and recommended mitigation measures. Implementation of this plan will serve to avoid or minimize adverse effects to local communities and wildlife populations during the development of the Site.

2. SITE DESCRIPTION

Crestone Peak Resources Bennet D Pad (Site) is located in Township 3 South, Range 64 West, Section 34 in Adams County, CO. The Site is located in the Western Great Plains Range and Irrigated Region Land Resource Region (LRR) of the Central High Plains, Southern Part Major Land Resource Region (MLRA; NRCS 2006).

The area in which the Site is located is zoned A-3 Agricultural Zoning by Adams County. The land type according to the field observations is rangeland. Elevation at the Site is 5,574 feet.

The Site is not located within any Colorado Parks and Wildlife High Priority Habitats (HPHs). There are two residential buildings within 2,000 feet of the Site. The closest Residential Building Unit is located 1,791 feet east of the Site. The next closest Residential Building Unit is 1,951 feet east of the Site. The closest Building Unit is approximately 486 feet to the northeast. The next closest building is 501 feet away to the northeast.

3. OPERATIONAL STAGES & TIMELINE

The current estimated operation stage timelines and light levels are as follows:

Table 3.1 – Bennett D Pad Operational Phase Light Levels

PHASE	ESITMATED START	ESTIMATED LIGHT LEVEL
Drilling Rig	July 2026	2.87 Lumens/SQFT
Completions	January 2027	2.09 Lumens/SQFT
Flowback	June 2027	N/A
Production	August 2027	N/A

The information above is subject to change based on permit approval timing, project adjustments or operational delays, weather conditions, and/or other unforeseen factors. Please refer to Appendix A for Photometric Plans.

4. BEST MANAGEMENT PRACTICES

The following lighting BMPs will be used to minimize and control light pollution at the Bennett D Well pad:

Construction: During pad construction, operations will occur only during daytime thus eliminating and light mitigation considerations.

Drilling and Completions: Crestone Peak Resources will direct site lighting downward at a 20-degree angle and will not shine light above a horizontal plane passing through the center point light source. Crestone will provide sufficient on-site lighting to ensure the safety of personnel on or near the site.

Drilling and Completions: Where a noise barrier is present, lighting fixtures will be placed beneath the barrier, except for those on the drilling rig.

Drilling and Completions: Crestone Peak Resources will use low-glare and no-glare lighting where feasible to minimize safety hazards.

Flowback: Flowback will be piped directly into the facility with no temporary equipment or operations anticipated. For that reason, no temporary lighting is being proposed during this phase.

Production: Crestone Peak Resources will not have permanent lighting on location.

LITERATURE CITED

Energy and Carbon Management Commission. 2024. 400 Series: Operations and Reporting

Colorado Energy and Carbon Management Commission. 2014. Surface Use Agreement: Form 2A Attachment Guidance. Chapter 21, Article V – Guidelines and Regulations for Oil and Gas Exploration and Production in Colorado. [PDF]

APPENDIX A

Photometric Plans

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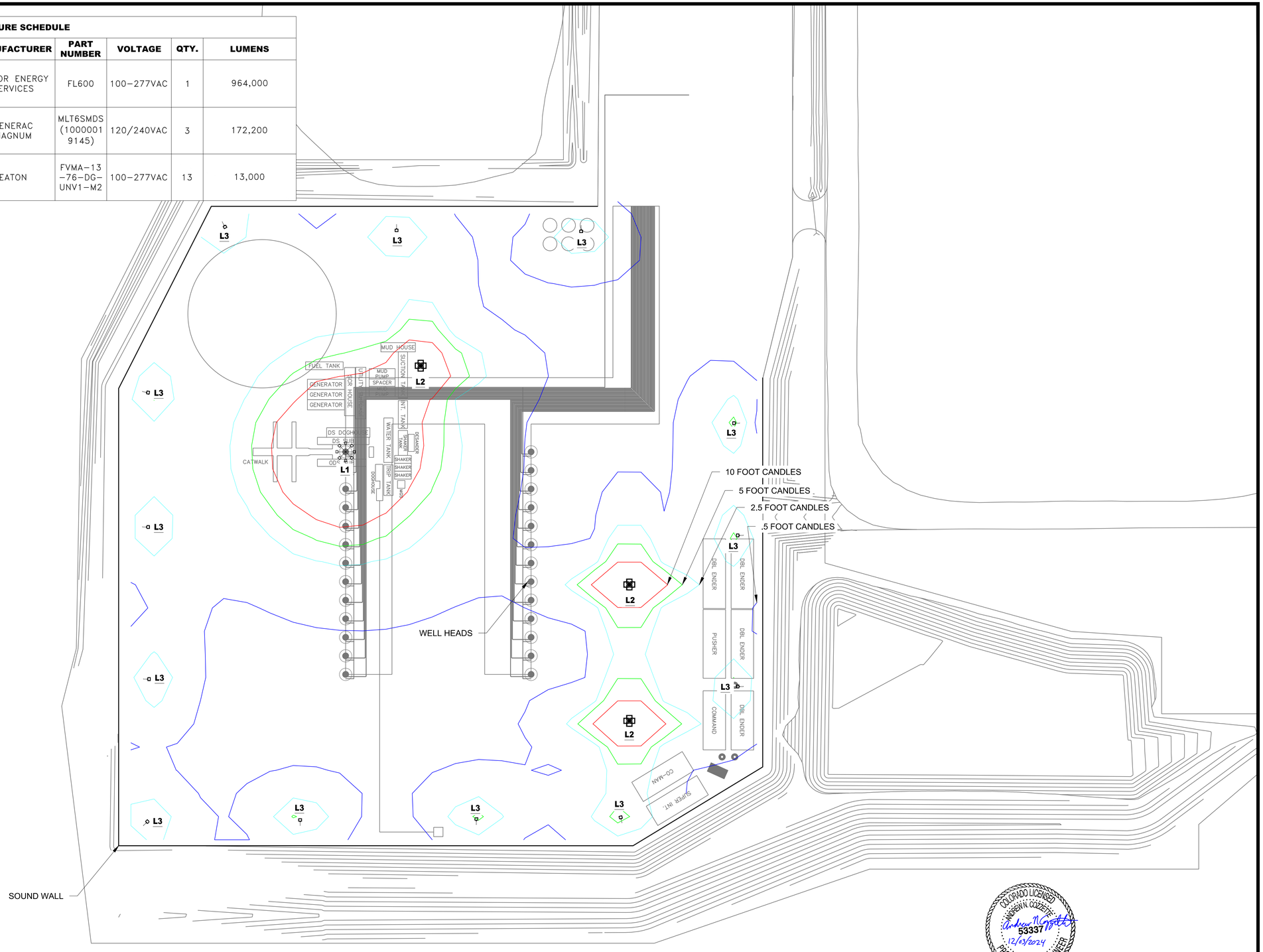
LIGHTING FIXTURE SCHEDULE

TYPE	SYMBOL	DESCRIPTION	MOUNTING	MANUFACTURER	PART NUMBER	VOLTAGE	QTY.	LUMENS
L1		COMPACT LED HIGH PERFORMANCE SPORT LIGHT (8 LIGHTS TOTAL) (600W EACH LIGHT)	180'	C-MOR ENERGY SERVICES	FL600	100-277VAC	1	964,000
L2		MOBILE LIGHT TOWER (4 LED LIGHTS MOUNTED PER TRAILER) (296W LED - EACH LIGHT)	23' MAST HEIGHT	GENERAC MAGNUM	MLT6SMDS (10000019145)	120/240VAC	3	172,200
L3		CHAMP FMVA LED FLOODLIGHT	20'	EATON	FVMA-13-76-DG-UNV1-M2	100-277VAC	13	13,000

SITE TOTALS - DRILLING RIG	
TOTAL LUMENS	1,649,600 LUMENS
SITE PERMANENT DISTURBANCE SQUARE FOOTAGE	574,992 SQFT
LUMENS/SQ.FT	2.87 LUMENS/SQFT
ILLUMINATION AT 1-MILE	<0.1 LUX



COLORADO LICENSED
ANDREW N. COZZITE
53337
12/03/2024
PROFESSIONAL ENGINEER

1/4"=1'-0" 0 2' 4' 8'

NOTES:

1. ALL LIGHT FIXTURES AND INSTALLATION MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST ISSUE OF LOCAL AND NATIONAL ELECTRICAL CODES, ELECTRICAL SPECIFICATIONS AND DRAWINGS.
2. PRODUCTION FACILITY SHALL BE SIMULTANEOUSLY CONSTRUCTED. PERMANENT PRODUCTION FACILITY LIGHTING SHALL NOT BE IN USE DURING DRILLING AND IS NOT TAKEN INTO ACCOUNT IN THESE CALCULATIONS. THIS DRAWING IS BASED ON A TYPICAL DRILLING RIG AND IS SUBJECT TO VARIATIONS IN DESIGN AND LAYOUT. EACH LAYOUT IS DESIGNED BY OTHERS BUT SHALL NOT EXCEED THE FIXTURE COUNTS LISTED ON THIS DRAWING.
3. RIG LIGHTING WILL VARY DEPENDING ON PARTICULAR WELL BEING DRILLED.

LDIS LLC

REFERENCE DRAWINGS

No	PROJ. NUMBER	REVISIONS	BY	CHKD	APVD	DATE
1		RE-ISSUED FOR CONSTRUCTION	ACR	SRB	RDH	12/02/24
0		ISSUED FOR CONSTRUCTION	ACR	SRB	RDH	11/07/24

	BY	DATE
DRAWN	CMS	03/27/24
CONST.		
MECH.		
CIV./STRUCT.		
ELECT.		
PIPING		
INSTR.		
PM		
PROCESS		

BENNETT D WELL PAD
ELECTRICAL
LIGHTING PLAN - DRILLING RIG

DRAWING NUMBER	SCALE	REVISION
BD-ELE-7500	NA	1

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PLOT DATE: Monday, December 02, 2024 - 1:30:30 PM
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10 FOOT CANDLES
5 FOOT CANDLES
2.5 FOOT CANDLES
.5 FOOT CANDLES

WELL HEADS

SOUND WALL

1/4"=1'-0"

0 2' 4' 8'

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PROCESS		

BENNETT D WELL PAD
ELECTRICAL
LIGHTING CALCULATIONS – DRILLING RIG

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LIGHTING FIXTURE SCHEDULE								
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L1		MOBILE LIGHT TOWER (4 LED LIGHTS MOUNTED PER TRAILER) (296W LED – EACH LIGHT)	23' MAST HEIGHT	GENERAC MAGNUM	MLT6SMDS (10000019145)	120/240VAC	6	172,200
L2		CHAMP FMVA LED FLOODLIGHT	20'	EATON	FVMA-13-76-DG-UNV1-M2	100-277VAC	13	13,000

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TOTAL LUMENS	1,202,200 LUMENS
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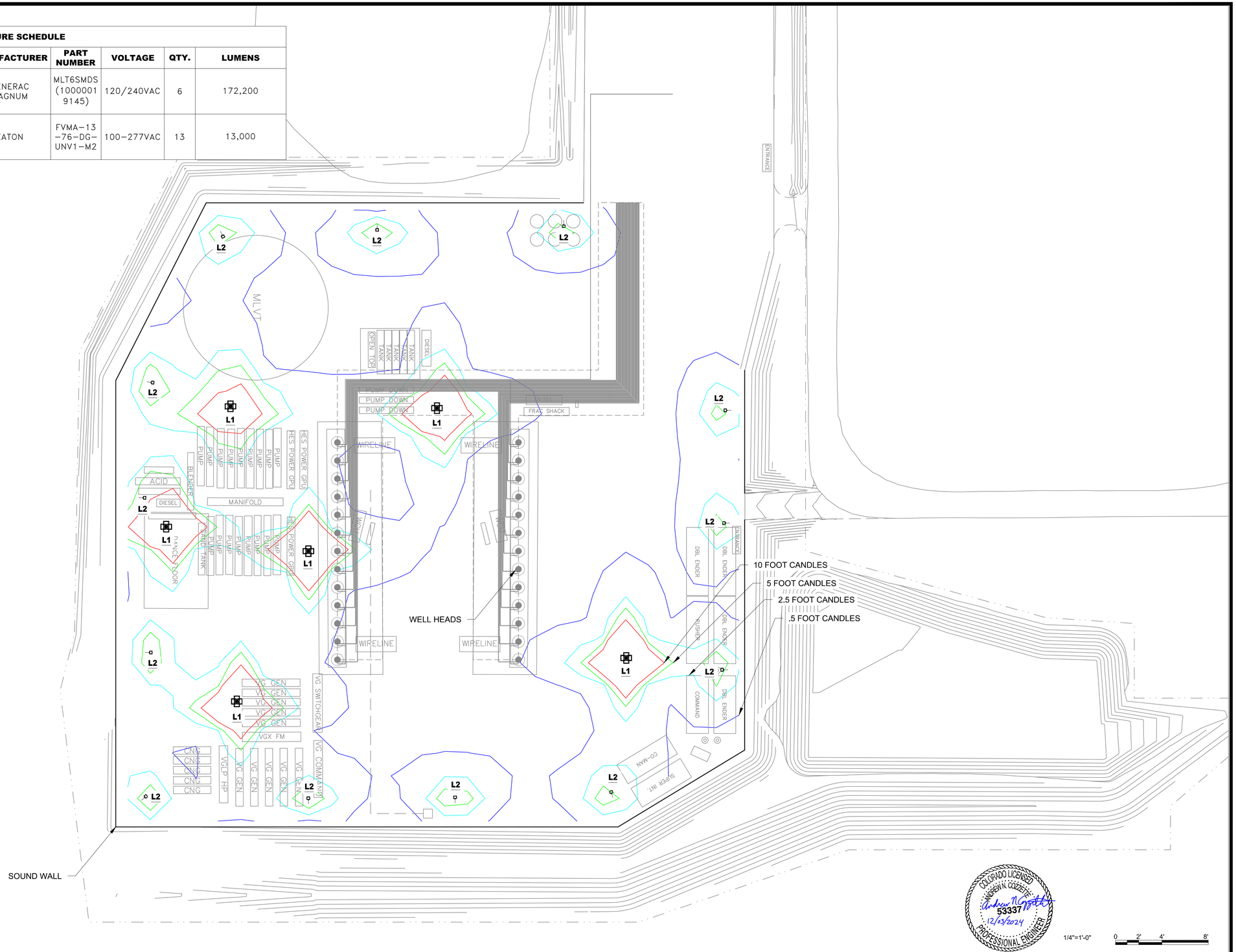
LUMENS/SQ.FT	2.09 LUMENS/SQFT
ILLUMINATION AT 1-MILE	<0.1 LUX



COLORADO LICENSED
ANDREW N. COZZETTI
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12/03/2024
PROFESSIONAL ENGINEER

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4. LIGHTING SHALL BE DOWNCAST AND SHALL NOT SHINE BEYOND THE BOUNDARIES OF THE OIL AND GAS LOCATION.

LDIS LLC

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PIPING		
INSTR.		
PM		
PROCESS		

BENNETT D WELL PAD
ELECTRICAL
LIGHTING PLAN – WELL COMPLETION

DRAWING NUMBER	SCALE	REVISION
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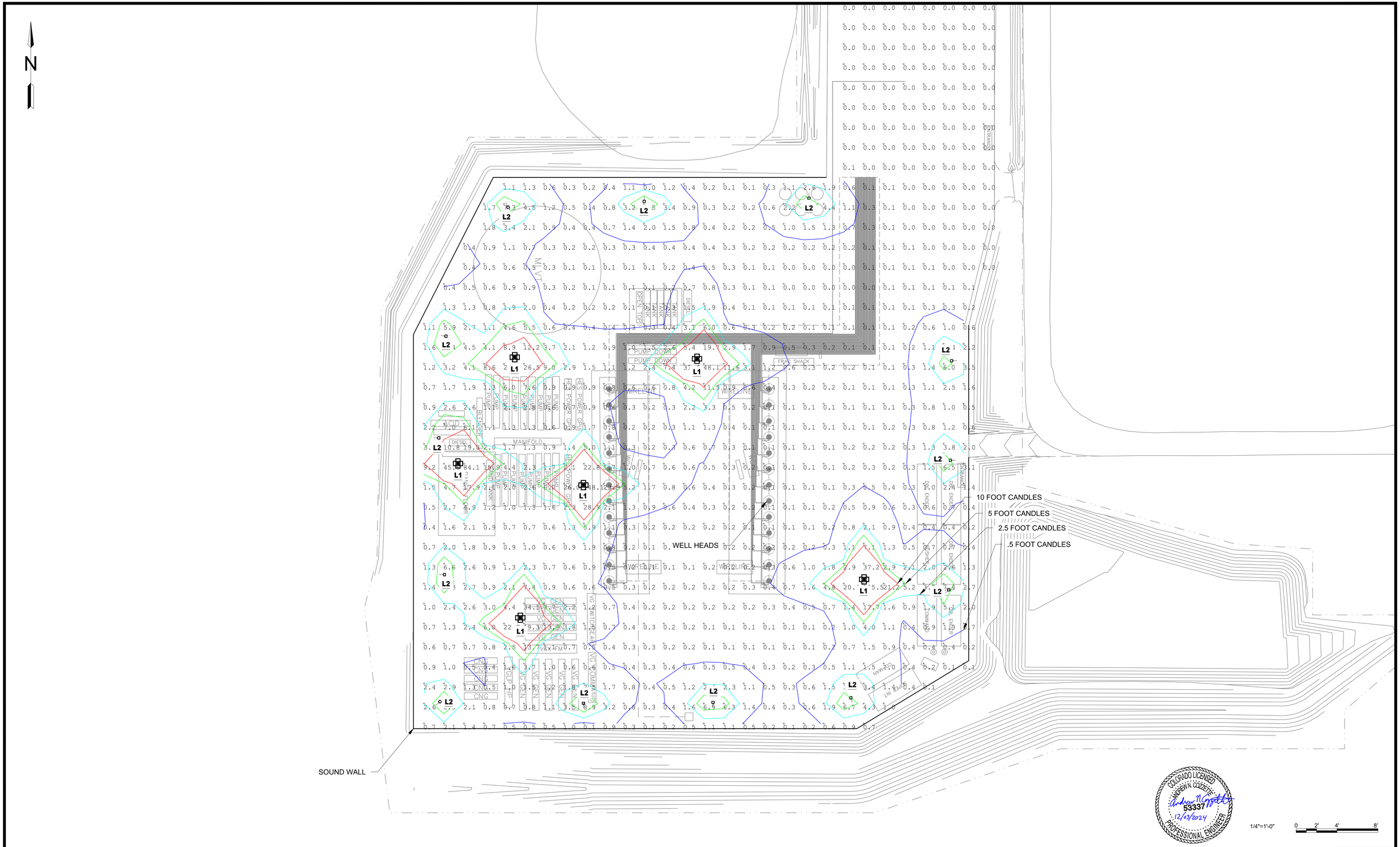

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INSTR.		
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PROCESS		

BENNETT D WELL PAD
ELECTRICAL
LIGHTING CALCULATIONS – WELL COMPLETION

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APPENDIX B

Cutsheets

THE INFORMATION CONTAINED HEREIN SHALL BE CONSIDERED THE SOLE PROPERTY OF JCA COMPANIES, JCA RENTALS, LLC/C&M OILFIELD RENTALS, LLC/C-MOR ENERGY SERVICES, LLC AND RECIPIENT THEREOF AGREES NOT TO DISCLOSE SAID INFORMATION TO PARTIES OUTSIDE THE RECIPIENTS ORGANIZATION AND TO USE, MODIFY, CHANGE OR DUPLICATE SAID INFORMATION FOR ANY PURPOSES EXCEPT AS SPECIFIED BY JCA RENTALS, LLC/C&M OILFIELD RENTALS, LLC/C-MOR ENERGY SERVICES, LLC WITH THE WRITTEN PERMISSION OF JCA COMPANIES, JCA RENTALS, LLC/C&M OILFIELD RENTALS, LLC/C-MOR ENERGY SERVICES, LLC.

C-MOR™
ENERGY SERVICES

TECHNICAL INFORMATION SHEET FOR CROWN JEWEL LIGHT SYSTEM

INTENDED USE

The C-MOR Crown Jewel system is designed to be installed on the crown handrails of most drilling rigs

SPECIFICATIONS:

- Designed to mount to undamaged guardrails which meet OSHA 1910.29(b)(1)
- Engineered mount system (RADesign 1085035) meets API 4F 4th Edition land-based wind loads (180’ @ 90 mph)
- 600 W LED instant start lights
- Dropped object report RADTM-18-1001-01
- Light and junction box retention nets: Dropsafe 7500185
- Rig light safety cables: Kennedy 250 LBS WLL
- Mount system weight: 21 lbs/ light
- Light and bracket assembly weight: 32 lbs/ light
- Junction box weight: 33 lbs/ rig
- Appleton Locking connectors + cable 3.2 lbs/ light
- Complete individual light/mount/cable weight 57 lbs.
- Typical 8 light Crown Jewel full installation: 489 lbs

CONFIDENTIAL AND PROPRIETARY
US PATENT 10,473,282

Description

The FL series is a compact LED fixture designed for high performance sport lighting applications. Compare the FL500 to 1500 WATTS metal halide.

Certification

ETL / DLC

CONFIDENTIAL AND PROPRIETARY

PATENT PENDING

Specifications

Part No.:	FL600
Wattage:	600 W
Efficacy:	150 LM/W
Lumens:	120,500 LM
Input Voltage:	100-277 V
Power Factor:	.92
CCT:	5000K
CRI:	80+
IP Rating:	IP66
Dimensions:	15.7” x 15.7” x 10”
Weight:	38 lbs. 17.2 kg
Lifespan:	80,000 L70 Hours
EPA Rating	1.2 ft^2
Standard Colors:	Black

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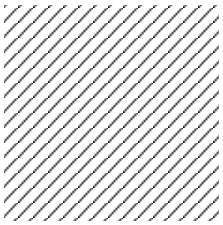
C-MOR™

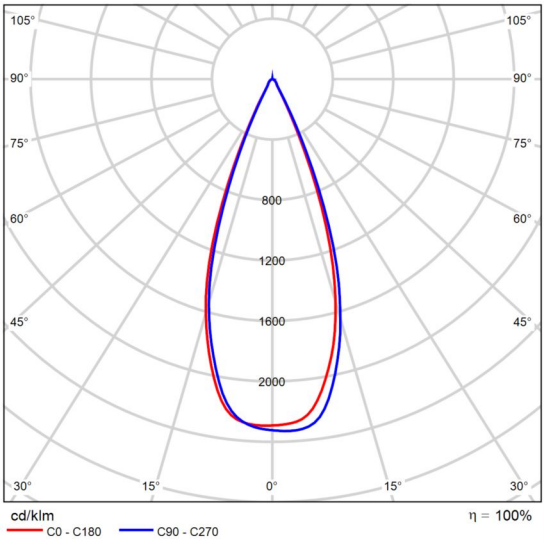
ENERGY SERVICES

Product data sheet

LED LIGHTING DYNAMO 3 STADIUM FLOOD LIGHT 600W



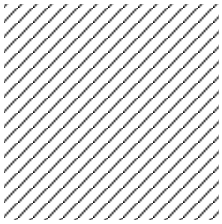
P	600.0 W
Φ_{Lamp}	96000 lm
$\Phi_{Luminaire}$	95951 lm
η	99.95 %
Luminous efficacy	159.9 lm/W
CCT	5000 K
CRI	100

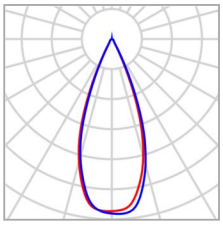


Polar LDC

Site 1

Luminaire layout plan





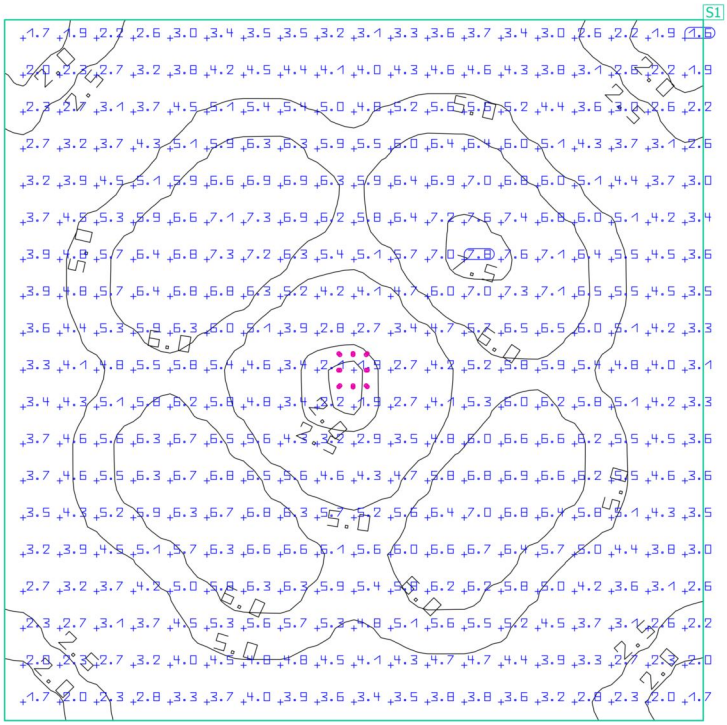
Manufacturer	LED LIGHTING
Article name	DYNAMO 3 STADIUM FLOOD LIGHT 600W

Individual luminaires

X	Y	Mounting height	Luminaire
133.270 ft	-131.361 ft	180.400 ft	1
144.270 ft	-131.361 ft	180.400 ft	2
133.270 ft	-144.361 ft	180.400 ft	3
144.270 ft	-144.361 ft	180.400 ft	4
133.270 ft	-137.861 ft	180.400 ft	5
138.770 ft	-131.361 ft	180.400 ft	6
144.270 ft	-137.861 ft	180.400 ft	7
138.770 ft	-144.361 ft	180.400 ft	8

Site 1

Calculation surface 1



Properties	Ē	E_{min}	E_{max}	Ē/E_{min}	E_{max}/E_{min}	Index
Calculation surface 1 Perpendicular illuminance Height: 1.000 ft	4.70 fc	1.61 fc	7.78 fc	2.92	4.83	S1

Utilisation profile: DIALux preset, Default (Drive Aisles/Parking Areas)

MLT6SM

MOBILE LIGHT TOWER

GENERAC MAGNUM

SPECIFICATIONS

ENGINE

- Mitsubishi® L3E- liquid cooled, diesel engine; Final Tier 4
  - Standby - 12.2 hp @ 1800 rpm
  - Prime - 10.5 hp @ 1800 rpm
  - 3 cylinder
  - 0.95 L displacement
- Polyethylene Fuel Tank:
  - Fuel Type: Diesel
  - Fuel Capacity: 39.9 gal (151.04 L)
  - External 3.5 in. (89 mm) fill port
- Fuel Consumption:
  - Full Load: 0.59 gph (2.24 Lph)*
  - Lights Only: 0.43 gph (1.62 Lph)*
  - Maximum Runtime (Lights Only): 93 hours*
- Cooling system capable of operating at 120°F (49°C) ambient
- 750-hour** service interval
- Full flow filter, spin on type
- Dry type cartridge air filter
- 60 Hz engine/generator
- Wind Rating: 65 mph (105 kph)

**Results based on engine manufacturer and field test data after 100-hour engine break-in period and may vary based on factors including age and maintenance of equipment, environmental conditions and fuel density. Consult the Owner's Manual for fuel and maintenance recommendations.*

***To achieve maximum service interval, replacement of oil filter after 50-hour break-in period is required. Consult Owner's Manual for required oil filter model number.*

GENERATOR

- Marathon Electric®, Brushless
- Up to 6kW power output
- 120/240 VAC – 50/25A
- +/-6% capacitor voltage regulation

ENGINE CONTROLS

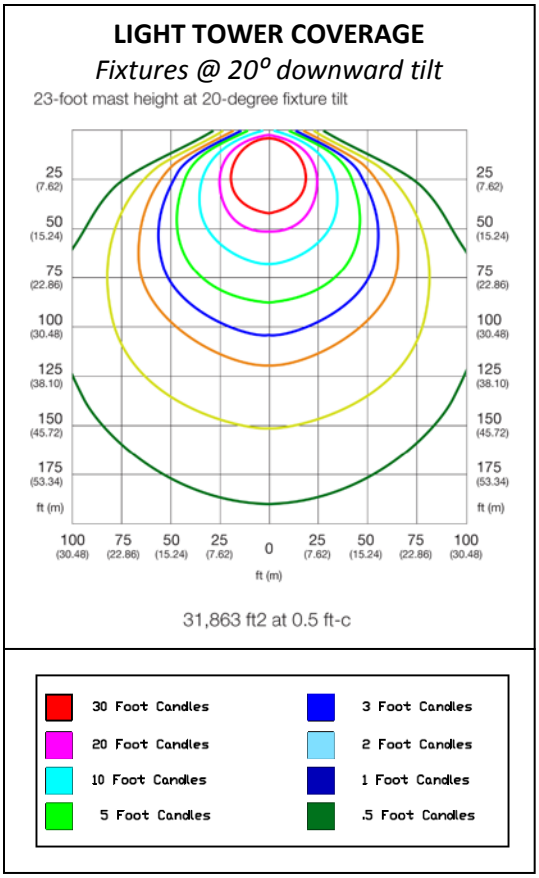
- External, illuminated control panel with sealed switches
- Four position keyed switch – (off, run, glow start)
- Digital hour meter
- Automatic low oil pressure/high temperature shutdown system

ELECTRICAL SYSTEM

- 30A start trip breaker (assures no load condition exists before starting)
- Individual floodlight circuits with sealed 15A breakers
- Standard individually breakered convenience outlets:
  - (1) 120 VAC 20 Amp GFCI duplex outlet (NEMA 5-20R type)
  - (1) 240 VAC 30 Amp twist lock outlet (NEMA L6-30R type)
- Wiring is sized and fused to the amperage draw required
- 440CCA wet cell battery

FLOODLIGHTS

- Four (4) 1,100 watt metal halide
  - 132,000 bare bulb lumens each
  - 70,356 fixture lumens each
  - Total bare bulb lumens (x4): 528,000
  - Total fixture lumens (x4): 281,424
- Coverage @ 0.5 ft-c: 31,863 ft2 (2,960 m2)
- Efficiency: 120 lumens per watt
- Oval aluminum reflector
- Tempered glass lens
- Silicone gaskets for moisture and dust protection
- Friction disc mounting for tool less positioning
- Individual floodlight On/Off switches



MAST

- Vertical mast; 23 ft. (7 m), 5-section with ground adjustable light fixtures
- Dual handle manual winch for ease of deployment; electric winch optional
- Distinctive angle fixture mount for common light distribution
- 359° ground rotational mast with mast fully extended
- Industrial black powder coat finish with polymer guides

ENCLOSURE

- Injection-molded hood enclosure with UV protected colorant
- Flip hood engine compartment for ease of service
- Multi-lingual operating/safety decals
- License plate holder with light
- Manual holder with operating manual
- 68 dB(A) at 23 ft. (7 m) – prime power

TRAILER

- Tubular steel frame
- (3) 1200 lb. (544 kg) tube and sleeve leveling jacks
- All jacks transport and lock in position for storage
- Side outriggers deployed – 10 in. (25.4 cm) span
- 7800 lb. (3538 kg) safety chains with spring loaded safety hooks
- 2 in. (50.8 mm) ball hitch
- Molded polyethylene fenders
- DOT-approved LED tail, side, brake, and directional lights
- 2200 lb. (907 kg) leaf spring axle
- ST175/80D13 – 6 ply
- 47 in. (119.4 cm) track width

WEIGHT & DIMENSIONS

- Dry weight: 1290 lbs. (585 kg)
- Operating weight: 1560 lbs. (708 kg)
- Mast stowed: 118 x 57 x 101 in (3 x 1.45 x 2.6 m)

WARRANTY

1 Year, Unlimited Hours / 2 Years, 2000 Hours

CERTIFICATIONS

CSA Approved / Listed

OPTIONS

Contact sales representative or factory for a list of current available options.

For more information, consult the Owner's Manual at http://www.generacmobileproducts.com/resources-tools/manuals

Product specifications

Eaton FMVA-13-76-DG-UNV1-M2

Catalog Number: FMVA-13-76-DG-UNV1-M2

Eaton Crouse-Hinds series Champ FMVA LED floodlight, 0.91 - 0.32A, Cool white, 3/4" entry, Diffused glass lens, 13000 lumens, 154 lm/W, Die cast aluminum, Yoke mount, 7x6 optics, Gray epoxy powder coat, 100-277 Vac, 90W

General specifications

Product Name
Eaton Crouse-Hinds series Champ FMVA LED floodlight

Catalog Number
FMVA-13-76-DG-UNV1-M2

UPC
662277148801

Product Length/Depth
16.12 in

Product Height
14.94 in

Product Width
9.94 in

Product Weight
24.95 lb

Powering Business Worldwide

Certifications and compliances

Area classification

Hazardous/Classified Locations

Standards type

NEC/CEC

NEC hazardous rating

Class I, Division 2

Class II, Division 2

NEMA Rating

4X

Ingress protection (IP) ratings

IP67

Product specifications

Lamp type

LED

Lumens

13000

Lumens per watt

154

Color temperature

Cool white

Mounting Method

Yoke

Voltage rating

100-277 Vac

Frequency rating

50/60 Hz

Optical distribution

7x6

Entry size

3/4"

Lens material

Diffused glass

Wattage

90W

Power factor

> 0.90

Amperage Rating

0.91 - 0.32A

Material

Die cast aluminum

Special features

Gray epoxy powder coat

Resources

3D models

SP3D Design Package - Champ FMVA LED Hazardous Area Floodlights

Brochures

Crouse-Hinds series Champ FMVA LED Floodlights - 9,000 to 15,000 lumens brochure

Catalogs

Crouse-Hinds series Champ FMVA LED Floodlights - 9,000 to 15,000 lumens catalog page

Installation instructions

IF 1956 - Champ FMVA M2 9L-15L LED Luminaire

Specifications and datasheets

Crouse-Hinds series FMVA LED Floodlights IES photometric files

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Eaton Corporation plc
Eaton House
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Odor Mitigation Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-16

CIVITAS

Crestone Peak Resources Operating, LLC

Bennett D Pad
Odor Mitigation Plan

Section 34, Township 3 South, Range 64 West
Adams County, CO

Potential Receptors

Operator will strive to minimize or eliminate odor from being a nuisance to the Residential Building Units (RBUs) within 2000' of the proposed working pad. Prevailing wind direction is coming from the south at this location *(source: Western Regional Climate Center, Denver Airport)*. The highest risk for odor nuisances would be for the residential building units to the north of the pad.

Development Phase

Operator will comply with the requirements of Colorado Energy and Carbon Management Commission (ECMC) Rule 426 during development through the mitigation methods outlined below. In addition to what is being proposed, Operator reserves the right to incorporate evolving technologies aimed at reducing odor during operations should conditions warrant additional controls. The Operator will endeavor to prevent odors from emanating from the Oil and Gas Location by proactively addressing known sources of odor – i.e., drilling mud.

The Operator will use a filtration system and additives to the drilling and fracturing fluids to minimize odors. Use of fragrance to mask odors is prohibited. In order to meet the requirements of ECMC Rule 426, Operator shall implement the following measures:

- Operator shall utilize a closed-loop, pit-less mud system for managing drilling fluids.
- Operator shall employ the use of drilling fluids with low to negligible aromatic contact (IOGP Group III) during drilling operations after the surface casing is set and freshwater aquifers are protected.
- Operator shall remove drill cuttings daily and as soon as waste containers are full.
- Operator shall employ pipe cleaning procedures when removing drill pipe from the hole; these procedures may include "wiping" the pipe before racking it in the derrick.

In the event a person living in a residential Building Unit within 2000' or in the direction of prevailing winds from the Oil & Gas Location's working pad surface complains of odor, Operator shall assess current operations and atmospheric conditions at the time of the complaint to determine whether the odor may have been caused by the Operator's operations. Once a preliminary determination is made, the Operator will provide its findings to the complainant, the Director, and Relevant or Proximate Local Government within 24 hours. If the complaint is justified and unable to be resolved, Operator will work with the Director on necessary and reasonable actions to reduce odor including but not limited to the following:

- Operator may increase concentration of odor-mitigating additives in mud system.

Production Phase

Operator will comply with the requirements of ECMC Rule 426 during development by utilizing the following best management practices outlined below. The primary source of odors during the production phase is gas that is vented during maintenance or normal production operations.

- Operator will utilize a maintenance vessel system which eliminates venting from the location during maintenance operations.
- Operator will utilize a pneumatic air system to actuate the facilities on location which will eliminate the small amount of venting that would normally occur during production operations.
- Operator will utilize a tankless system with three-phase takeaway eliminating odors associated with truck load out.

Additional Air Quality Requirements

Operator will submit an Air Monitoring plan to the Colorado Department of Public Health and Environment which will be approved prior to construction. The air monitoring will be in place prior to construction through 6 months of production.

Proposed Best Management Practices

1. Operator will use a filtration system and additives in the drilling and fracturing fluids that minimize odors.

2. Operator shall utilize a closed-loop, pit-less mud system for managing drilling fluids.

3. Operator shall employ the use of drilling fluids with low to negligible aromatic content (IOGP Group III) during drilling operations after the surface casing is set and freshwater aquifers are protected.

4. Operator shall remove drill cuttings daily and as soon as waste containers are full.

5. Operator shall employ pipe cleaning procedures when removing drill pipe from the hole; these procedures may include “wiping” the pipe before racking it in the derrick.

6. If a justified complaint is received, Operator may increase concentration of odor-mitigating additives in mud system.

7. Operator will utilize a maintenance vessel system.

8. Operator will utilize a pneumatic air system to actuate the facilities on location.

9. Operator will utilize a tankless system with three-phase takeaway eliminating odors associated with truck load out.

Dust Mitigation Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-17

CIVITAS

Crestone Peak Resources Operating LLC

Bennett D Pad

Dust Mitigation Plan

Section 34, Township 3 South, Range 64 West
Adams County, CO

Introduction

In accordance with Colorado Energy & Carbon Management Commission (ECMC) Rule 427, Crestone Peak Resources Operating LLC provides the following information outlining existing conditions at the proposed Oil and Gas Location as well the best practices that will be employed to meet the dust mitigation requirements in these rules.

- NRCS Soil Survey data shows the access road, location, and disturbance area consists of the following soils:
  - Type A
    - Truckton loamy sand (3 to 9 percent slopes)
  - Type B
    - Ascalon-Platner association (0 to 5 percent slopes)

- The Operator will post an access road speed limit not to exceed 20 miles per hour to minimize fugitive dust emissions from vehicle traffic traveling on the access road.

- The Operator will perform regular inspections and road maintenance to ensure the integrity of the access road and associated features is maintained throughout the life of this project. Maintenance consists of re-compacting the road base/recycled asphalt mix on an as-needed basis.

Please refer to the associated Form 2B (Doc ID 403951729) or Transportation Plan for the estimated truck trips for each phase of development.

Well Pad Construction Phase

Fugitive dust emissions associated with well pad construction are generally caused by soil excavation, earthwork and site development activities. The Operator will minimize dust emissions throughout all phases of well pad construction including dust resulting from the use of unimproved road surfaces. Dust suppression during initial construction will be accomplished by the application of freshwater to the access road(s) and exposed earthen surfaces to reduce the transportability of dust when atmospheric conditions are conducive to sustained winds and/or periodic gusts. All dust suppression efforts will consist of only freshwater unless otherwise requested and approved as applicable.

The initial disturbance area will be 22.96 acres.

The surface of the working pad surface of the Location (~13.24 acres) will be covered with Class 6 aggregate material or recycled asphalt. The use of this material greatly reduces the generation and transport of dust.

At the entrance to the location, the Operator will install and maintain vehicle tracking controls (i.e., coarse aggregate, a tracking pad, or cattle guard) to further reduce and remove loose mud and dirt on construction equipment and vehicles servicing location. These controls reduce and minimize the tracking of dirt and mud on public roads. The tracking controls are continually maintained and remain in place during pre-production operations. Topsoil stockpiles will be seeded, straw mulched, and crimped in order to promote the establishment of plants and associated vegetation used to stabilize the stockpiles and prevent the origination of dust and other erosion from occurring.

Well Drilling and Completions Phases

Once the well pad is constructed and covered with aggregate or recycled asphalt, dust emissions will be minimal. Little if any dust emissions are anticipated during the drilling phase. The only notable source of dust during the completions phase is associated with handling of proppant (e.g., north white sand) that is used during hydraulic fracturing.

To minimize sand-related dust emissions, the Operator will be utilizing containerized box technology for sand transport, storage and use during the completions phase. These sand containers (or "sand boxes") are sealed containers that protect the sand from exposure to wind and prevent dust generation. While fracturing operations are taking place, sand is dispensed from the sand boxes using transport hoses that keep the sand contained with a sealed system and not exposed to the wind or other atmospheric conditions. The sand is then pumped directly down the wellbore. Using this configuration, the Operator is able to avoid surface stockpiles of unused sand that could generate fugitive dust emissions when subjected to periodic wind events.

Interim Reclamation Phase

Once the wells have been put into production, the Oil and Gas Location will be partially reclaimed to 7.42 acres; only those areas necessary for production and maintenance operations will remain. During interim reclamation, earthmoving activities will be required to reduce the original footprint of the well pad. The movement of earthen materials may create dust. As described above for well pad construction, dust will be controlled on an as-needed basis through application of freshwater on disturbed soils and exposed surfaces.

Those previously disturbed areas that have been graded will be stabilized and revegetated. Revegetated areas may return to prior agricultural use or usage pursuant to the contractual provisions between the operator and the Surface Owner(s).

Production Phase

During the production phase, traffic in and out of the Oil and Gas Location will be limited. Typical maintenance and production operations require less than 10 small pickup trucks per day. Occasionally, larger trucks and associated equipment may be required for maintenance or workover activities, in addition to produced water trucks, which should be less than two trucks per day after the first several months of production.

As a result, long term traffic-related dust will be minimal if not insignificant. As described above, vehicle tracking control (i.e., coarse aggregate, a paved apron, or cattle guard) will be maintained after the terminus of the Apron to minimize tracking of dirt or mud onto public roads. Should dirt or mud tracking on public roads occur, the Operator will use a street sweeper to clean the road surface and minimize the potential for dust generation from muddy roads.

Proposed Best Management Practices

1. On Location, dust suppression during high traffic periods on site will be accomplished by the application of water to the well pad and exposed earthen surfaces to reduce the transportability of dust when atmospheric conditions are conducive to sustained winds and/or periodic gusts. All dust suppression efforts will consist of only freshwater unless otherwise requested and approved as applicable.

2. Off Location, dust suppression during high traffic periods on site will be accomplished by the application of approved methods to the access road(s) and haul route to reduce the transportability of dust when atmospheric conditions are conducive to sustained winds and/or periodic gusts. All dust suppression efforts will consist of, but may not be limited to, the use of fresh water and/or mag-chloride as a dust suppressant.

3. To minimize sand-related dust emissions, the operator will be utilizing containerized box technology for sand transport, storage and use during the completions phase. These sand containers (or “sand boxes”) are sealed containers that protect the sand from exposure to wind and prevent dust generation.

4. The operator will post an access road speed limit not to exceed 20 miles per hour to minimize fugitive dust emissions from vehicle traffic traveling on the access road.

5. The operator will perform regular inspections and road maintenance to ensure the integrity of the access road and associated features is maintained throughout the life of this project. Maintenance consists of re-compacting the road base/recycled asphalt mix on an as-needed basis.

6. The operator will install and maintain vehicle tracking controls (i.e., coarse aggregate, a tracking pad, paved apron, or cattle guard) to further reduce and remove loose mud and dirt on construction equipment and vehicles servicing location.

7. The pad will be plated with aggregate road base material to further minimize fugitive dust.

Visual Aesthetics Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-18

Crestone Peak Resources, LLC

Visual Aesthetics Plan

Bennett D Pad

Introduction

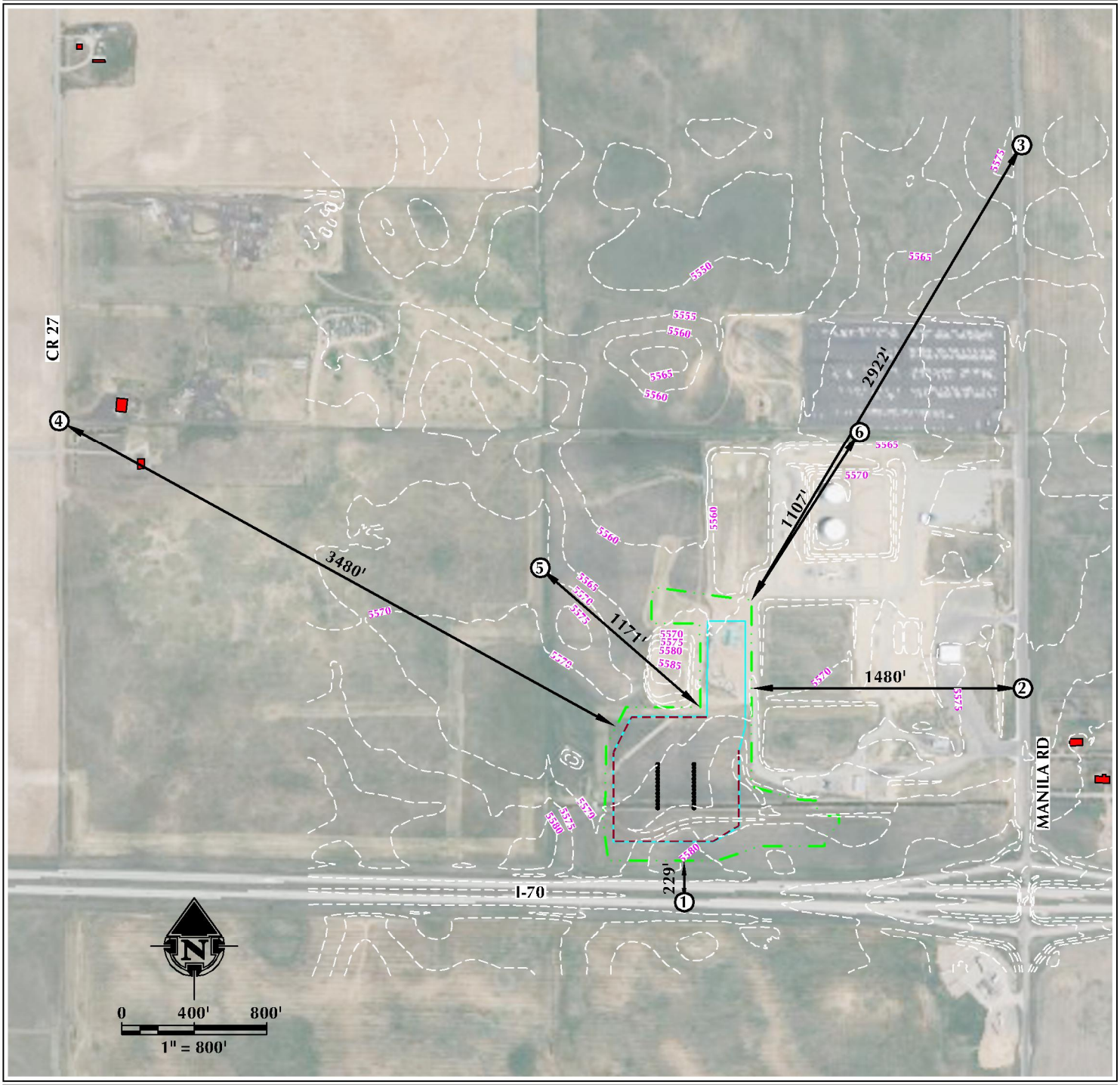
Per Adams County Development Standards and Regulations, Section 4-11-02-03-03-03-18, and the Colorado Energy and Corbon Management Commission's (ECMC), Rule 425, all permanent equipment at new and existing Oil and Gas Facilities, regardless of construction date, which are observable from any public highway, road, or publicly- maintained trail, will be painted with uniform, non-contrasting, non-reflective color tones (similar to the Munsell Soil Color Coding System), and with colors matched to but slightly darker than the surrounding landscape.

Visual Mitigation

Thirty-two foot walls will be utilized for drilling, completions and flowback operations around the majority of the well pad. Please refer to the site plans for the wall placement. Although not necessary to meet noise compliance, the walls will provide further sound mitigation and offer visual screening from Interstate 70 and the surrounding residents in the vicinity of this proposed oil and gas location. The wall color will blend with the natural background of the area.

During pre-production operations the drill rig's derrick will be visible above the walls, and some other equipment may be visible during completions. During production, the permanent equipment will blend in with the surrounding landscape and be compatible with the other uses on the property. The following pages show renderings of drilling operations and while the wells are on production from multiple locations in the area.

IMAGE RENDERING LOCATIONS
BENNETT D PAD
SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- WORKING PAD SURFACE
- RESIDENTIAL BUILDING UNIT
- 32' SOUND WALL
- (#) PICTURE LOCATION

SHEET NO: 1 OF 7

609 CONSULTING, LLC

LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331

SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

Prepared For:

CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

DATE SURVEYED:	9/24/24
DATE:	12/16/24
DRAFTER:	JFE
REVISED:	

DATA SOURCES & NOTES:

- AERIAL IMAGERY COURTESY OF GOOGLE.
- THIS EXHIBIT IS NOT A PROPERTY BOUNDARY SURVEY AND CANNOT BE RELIED UPON TO DETERMINE OWNERSHIP.

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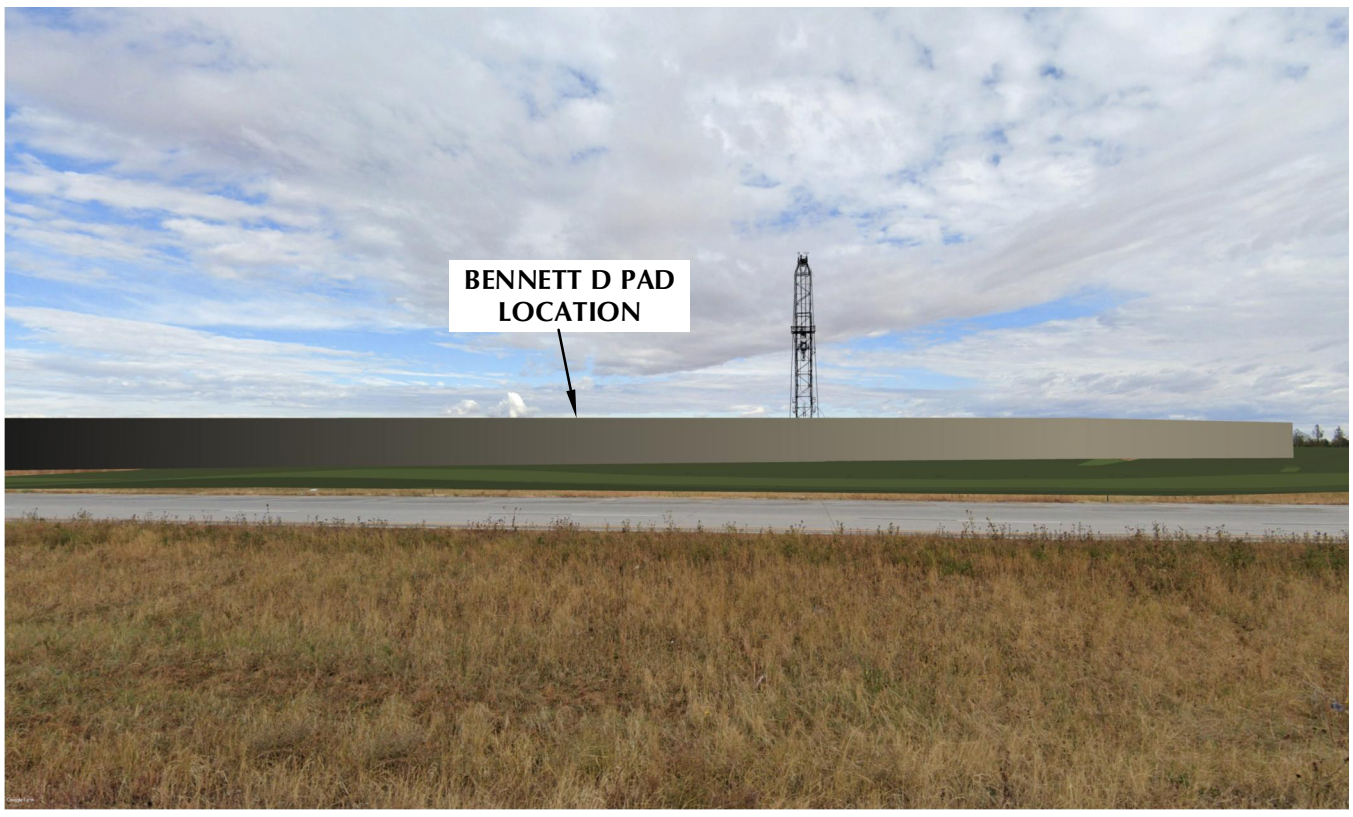
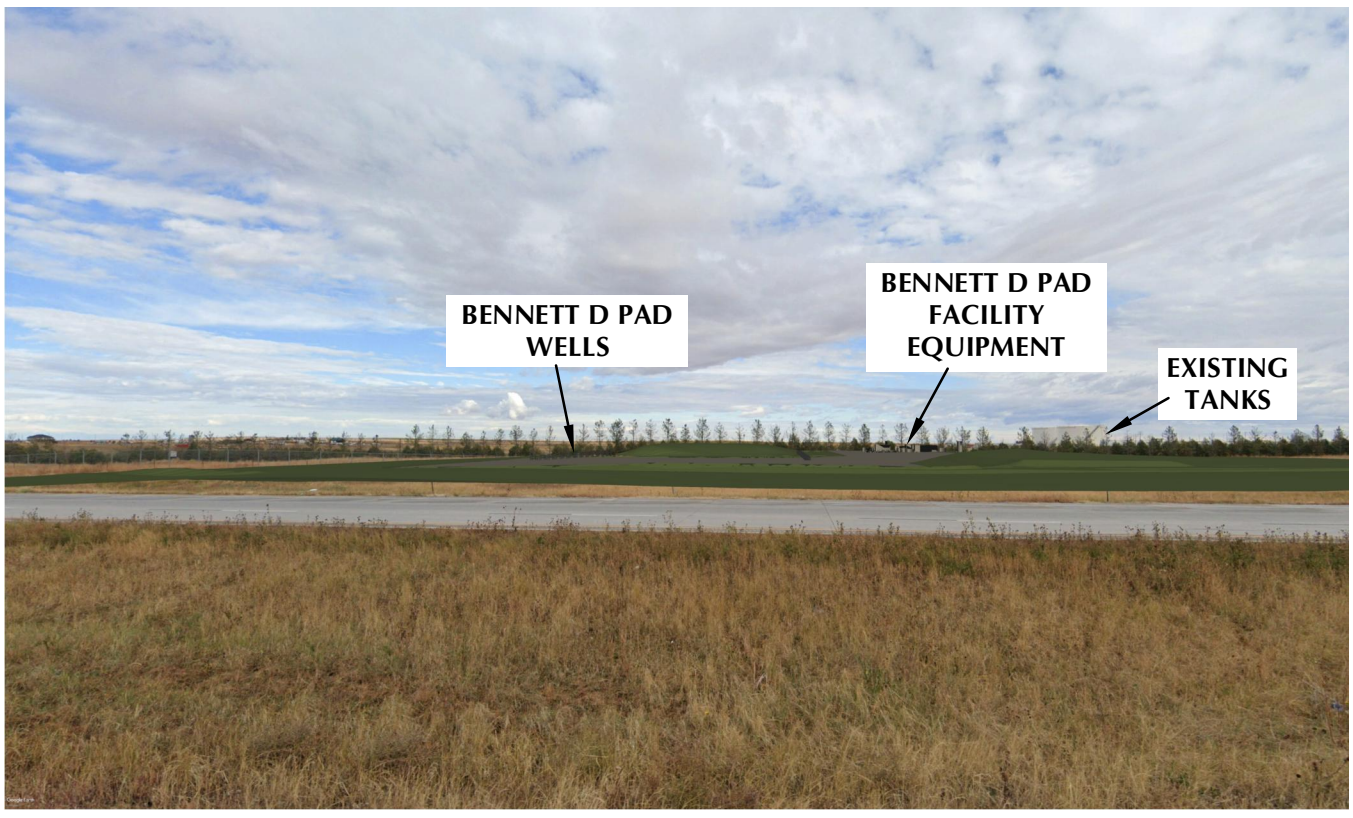
PHOTO LOCATION 1
I-70 - LOOKING NORTH
229' TO EDGE OF OIL AND GAS LOCATION



DRILLING PHASE



PRODUCTION PHASE

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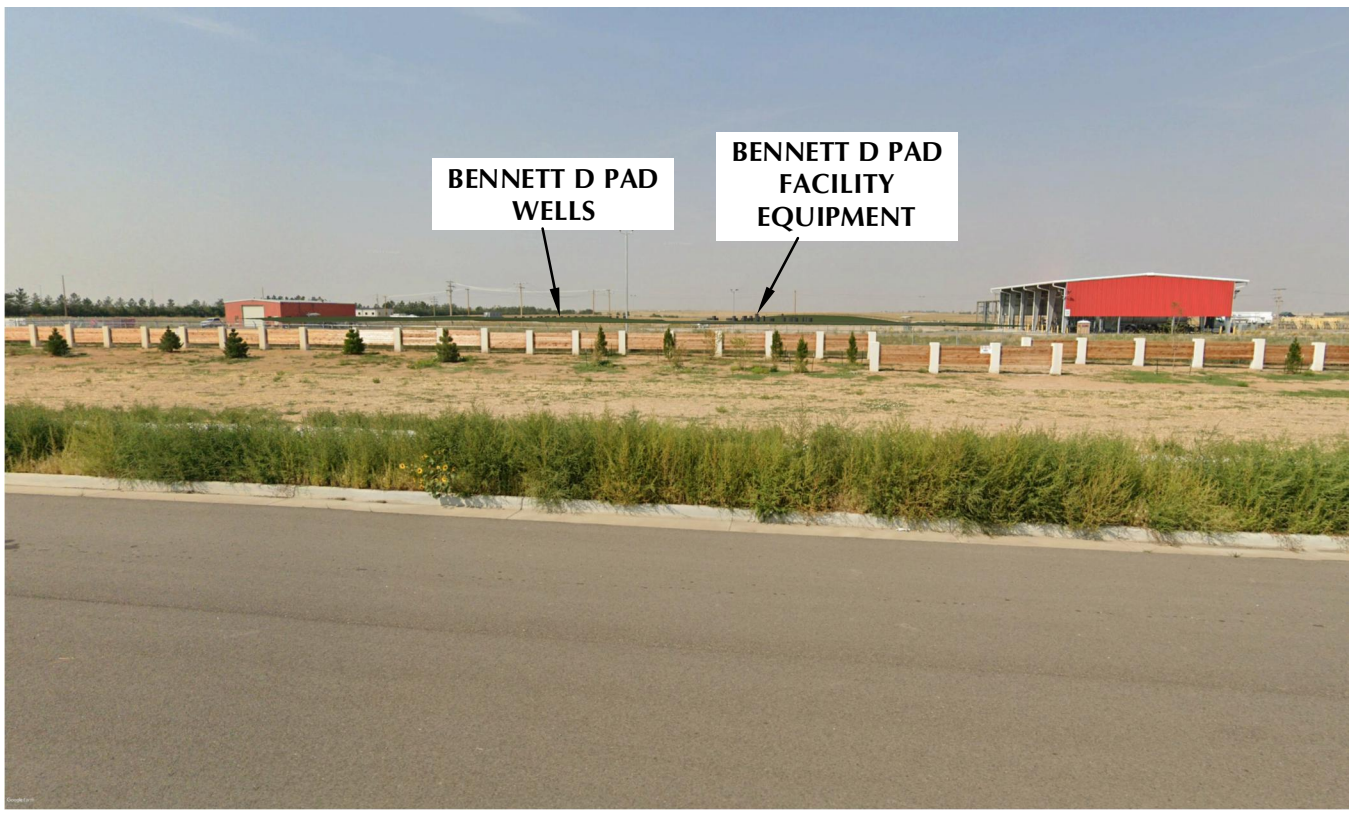
BENNETT D PAD **SIMULATION PICTURES** **LOCATED IN SECTION 34** **T3S, R64W, 6TH P.M.** **ADAMS COUNTY, COLORADO**	**Prepared For:** CIVITAS CRESTONE PEAK RESOURCES, LLC 555 17TH STREET, SUITE 3700 DENVER, CO 80202	**GROUND LEVEL PICTURE** **LOCATION 1 - I-70** **DRILLING & PRODUCTION**	609 CONSULTING, LLC SHERIDAN OFFICE 1095 Saberton Avenue Sheridan, Wyoming 82801 Phone 307-674-0609 LOVELAND OFFICE 6706 North Franklin Avenue Loveland, Colorado 80538 Phone 970-776-4331	**NOTE:** - IMAGERY COURTESY OF GOOGLE.
			SCALE: NTS DATE: 12/16/24 REVISED:	SHEET NO: **2** 2 OF 7

PHOTO LOCATION 2
MANILA RD - LOOKING WEST
1,480' TO EDGE OF OIL AND GAS LOCATION

DRILLING PHASE



PRODUCTION PHASE

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BENNETT D PAD

SIMULATION PICTURES

LOCATED IN SECTION 34
T3S, R64W, 6TH P.M.
ADAMS COUNTY, COLORADO

Prepared For:
CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

GROUND LEVEL PICTURE

LOCATION 2 - MANILA RD

DRILLING & PRODUCTION

609 CONSULTING, LLC
SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609
LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331

NOTE:
- IMAGERY COURTESY OF GOOGLE.

SCALE: NTS | DATE: 12/16/24 | SHEET NO: 3 3 OF 7

REVISED:

PHOTO LOCATION 3
MANILA RD - LOOKING SOUTHWEST
2,922' TO EDGE OF OIL AND GAS LOCATION

DRILLING PHASE

PRODUCTION PHASE

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BENNETT D PAD **SIMULATION PICTURES** **LOCATED IN SECTION 34** **T3S, R64W, 6TH P.M.** **ADAMS COUNTY, COLORADO**	**Prepared For:** CIVITAS CRESTONE PEAK RESOURCES, LLC 555 17TH STREET, SUITE 3700 DENVER, CO 80202	**GROUND LEVEL PICTURE** **LOCATION 3 - MANILA RD** **DRILLING & PRODUCTION**	609 CONSULTING, LLC SHERIDAN OFFICE 1095 Saberton Avenue Sheridan, Wyoming 82801 Phone 307-674-0609 LOVELAND OFFICE 6706 North Franklin Avenue Loveland, Colorado 80538 Phone 970-776-4331	**NOTE:** - IMAGERY COURTESY OF GOOGLE.
			SCALE: NTS **DATE:** 12/16/24 **REVISED:**	**SHEET NO:** 4 4 OF 7

PHOTO LOCATION 4
MANILA RD - LOOKING SOUTHEAST
3,480' TO EDGE OF OIL AND GAS LOCATION

DRILLING PHASE

PRODUCTION PHASE

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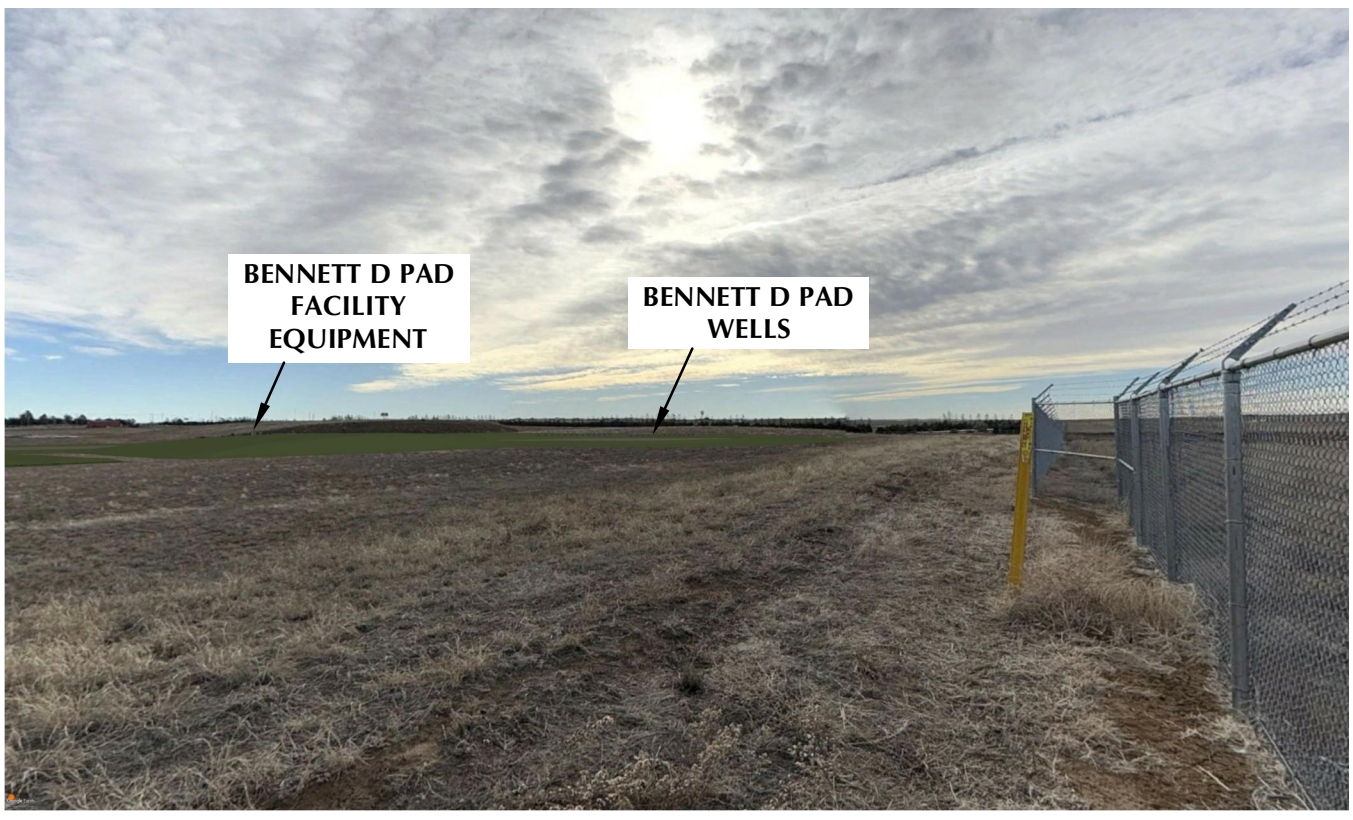
BENNETT D PAD **SIMULATION PICTURES** **LOCATED IN SECTION 34** **T3S, R64W, 6TH P.M.** **ADAMS COUNTY, COLORADO**	**Prepared For:** CIVITAS CRESTONE PEAK RESOURCES, LLC 555 17TH STREET, SUITE 3700 DENVER, CO 80202	**GROUND LEVEL PICTURE** **LOCATION 4 - CR 27** **DRILLING & PRODUCTION**	609 CONSULTING, LLC SHERIDAN OFFICE 1095 Saberton Avenue Sheridan, Wyoming 82801 Phone 307-674-0609 LOVELAND OFFICE 6706 North Franklin Avenue Loveland, Colorado 80538 Phone 970-776-4331	**NOTE:** - IMAGERY COURTESY OF GOOGLE.

SCALE: NTS	**DATE: 12/16/24**	**SHEET NO:** **5** 5 OF 7
REVISED:		

PHOTO LOCATION 5
NORTHWEST OF LOCATION - LOOKING SOUTHEAST
1,171' TO EDGE OF OIL AND GAS LOCATION

DRILLING PHASE



PRODUCTION PHASE

BENNETT D PAD **SIMULATION PICTURES** **LOCATED IN SECTION 34** **T3S, R64W, 6TH P.M.** **ADAMS COUNTY, COLORADO**	**Prepared For:** CIVITAS CRESTONE PEAK RESOURCES, LLC 555 17TH STREET, SUITE 3700 DENVER, CO 80202	**GROUND LEVEL PICTURE** **LOCATION 5 - NORTHWEST OF LOCATION** **DRILLING & PRODUCTION**	609 CONSULTING, LLC SHERIDAN OFFICE 1095 Saberton Avenue Sheridan, Wyoming 82801 Phone 307-674-0609 LOVELAND OFFICE 6706 North Franklin Avenue Loveland, Colorado 80538 Phone 970-776-4331
		NOTE: - IMAGERY COURTESY OF GOOGLE.	SCALE: NTS DATE: 12/16/24 REVISED: SHEET NO: 6 6 OF 7

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PHOTO LOCATION 6
FRONT RANGE RV STORAGE - LOOKING SOUTHWEST
1,107' TO EDGE OF OIL AND GAS LOCATION

DRILLING PHASE

PRODUCTION PHASE

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BENNETT D PAD **SIMULATION PICTURES** **LOCATED IN SECTION 34** **T3S, R64W, 6TH P.M.** **ADAMS COUNTY, COLORADO**	**Prepared For:** CIVITAS CRESTONE PEAK RESOURCES, LLC 555 17TH STREET, SUITE 3700 DENVER, CO 80202	**GROUND LEVEL PICTURE** **LOCATION 6 - FRONT RANGE RV STORAGE** **DRILLING & PRODUCTION**	609 CONSULTING, LLC SHERIDAN OFFICE 1095 Saberton Avenue Sheridan, Wyoming 82801 Phone 307-674-0609 LOVELAND OFFICE 6706 North Franklin Avenue Loveland, Colorado 80538 Phone 970-776-4331	**NOTE:** - IMAGERY COURTESY OF GOOGLE.
			SCALE: NTS	**DATE:** 12/16/24
			REVISED:	**SHEET NO:** 7 OF 7

Community Outreach Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-20

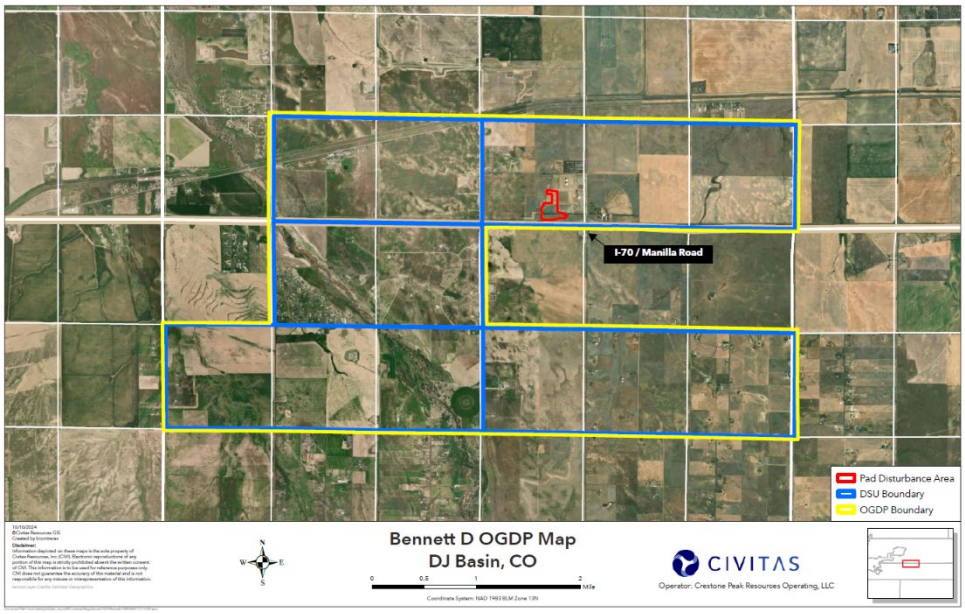
CIVITAS

Crestone Peak Resources Operating LLC

Bennett D Pad Community Outreach Plan

Location

Crestone Peak Resources Operating, LLC (Crestone), a wholly owned subsidiary of Civitas Resources, Inc. is proposing a new oil & gas operation consisting of one well pad with 26 horizontal wells. The new development is located near the intersection of I-70 and Manilla Road in Adams County.



Community Outreach Planning

As a longtime operator in Colorado, local community relationships are extremely important to Crestone Peak Resources. Our Community Outreach plan is comprised of best management practices that are as inclusive as possible to reach any impacted landowners.

On November 25, 2024, Crestone held a pre-application neighborhood meeting for the Bennett D Pad Oil and Gas Facility. The meeting was held at the Bennett Community Center, 1100 E Colfax Ave, Bennett, CO 80102 which sits just a few miles from the proposed location. The meeting was held from 6:00 p.m. to approximately 7:00 p.m. The invitation was sent to 49 addresses on November 8, 2024, arriving two weeks prior to the event. Four members of the public, a representative from Adams County and six representatives from Crestone were in attendance. Poster boards were on display detailing drilling, casing / cementing program, and completions. Handouts were available illustrating proposed drilling and completion layouts and the location once wells are in production. The meeting started with a brief presentation followed by questions from the public.

There are up to five residences whose properties are within 2,000 feet of the project. We have had multiple conversations with a couple property owners and tenants to answer any questions and concerns they may have about the project. Crestone is actively trying to coordinate conversations with the remaining property owners but has not had conversations with two at this time. Having discussions will confirm the number of residences / tenants on these parcels. Crestone is currently pursuing

Informed Consents from each of owners of the residents and tenants, if present, and will provide to the Director as they become available.

The following table illustrates the property owners Crestone will be coordinating with to discuss Informed Consent and the possible number needed for each property.

Parcel #	Total number of Informed Consents (IC) and details
1 - 0181700000275	2 ICs – one surface owner, one tenant; one building is unoccupied
2 - 0181700000304	1 IC – surface owner
3 - 0181734200003	0 or 1 IC – business on property; presence of residence on property is currently unknown.
4 - 0181734100004	1 or 2 ICs – surface owner/potential tenant

Crestone is committed to transparent and consistent community outreach. To that end, we will have a dedicated project website that will be regularly updated to provide news and detailed updates. We will conduct quarterly meetings once the Oil and Gas Facility Permit is approved with Adams County. We will send Activity Notices prior to each phase of development throughout the

To encourage feedback, notices will include several methods for recipients to provide feedback, i.e. the Civitas Community Relations phone number and email address, a postage paid return envelope, or a QR code linked to a response form.

Any feedback from these notices will be logged and brought to the project team for consideration. All areas of feedback will be extensively tracked, including any applicable mitigation measures that are undertaken by the project team. It's our overall goal to incorporate community feedback into operations plans where we can.

Community Outreach Commitments

In an effort to maintain above-and-beyond contact to area residents, Crestone is committed to the following communication vehicles:

- Quarterly meeting once the Oil and Gas Facility Permit is approved with Adams County
- A website dedicated to the Bennett D Pad Project that will provide regular updates
- Activity Notices sent to arrive at least two weeks before each stage of the project
- Several methods of receiving feedback and questions from the public (Community Relations phone number and email, a postage paid return envelope, or a QR code linked to a response form)

CIVITAS

Crestone Peak Resources Operating LLC

Sample Neighborhood Communication

Crestone Peak Resources is seeking approval from the Colorado Energy Carbon Management Commission to construct a new oil & gas well pad, near intersection of I-70 and Manilla Road in Adams County.

Safe and responsible operations are at the core of our company values. Above all, our approach is defined by our commitment to working with our communities. You will receive regular updates as the project continues describing the next phase of operations, the estimated timeline and what you might see when that phase begins.

Your feedback is important to us. Please do not hesitate to contact us with questions about this proposed development. You can reach us via email at CommunityRelations@civiresources.com or via phone at 720-279-9842.

Site-specific Impact Mitigation and Best Management Practices by Phase

Construction

Site Specific Impact Mitigation

- Existing Access Road will be upgraded and utilized, with minimal new road construction.

Best Management Practices

- Freshwater will be used as a dust suppressant, when necessary, on the pad and access road.
- Crestone will conduct additional avian surveys prior to the commencement of construction to ensure no conflicts have developed since the prior survey(s).
- Topsoil stockpiles will be stabilized with appropriate vegetation to provide both short- and long-term stabilization to prevent erosion.
- Tracking controls will be installed at the entrance of the access the road to prevent mud-tracking and associated dust on the public roadway.

Drilling

Site-specific Impact Mitigation

- Rig will utilize grid power.
- Use of Group III drilling fluids.

Best Management Practices

- Installation of polyethylene liner on location during drilling operations. The drilling rig and associated equipment (including fluid storage area) will be placed atop the liner.
- Utilize closed-loop, pit-less fluid management system.
- Remove drilling cuttings daily.

- Lighting will be angled in a downward manner and placed at reasonable heights to limit the halo effect off location.
- Although not necessary for noise compliance, sound walls will be utilized around majority of the well pad.

Completions

Site-specific Impact Mitigation

- Crestone will utilize a Tier IV (or equivalent) completions fleet.

Best Management Practices

- Crestone will install a polyethylene liner across portions of the location as an isolation barrier. The completion fleet and associated equipment (including fluid storage areas) will be placed atop the liner.
- Use of sealed containers (e.g., sandboxes) for the storage and transportation of sand used in hydraulic fracturing.
- Any gas encountered during flowback will be routed to a gas sales pipeline or combusted with a minimum of 98% destruction efficiency.
- Lighting will be angled in a downward manner and placed at reasonable heights to limit the halo effect off location.
- Although not necessary for noise compliance, sound walls will be utilized around majority of the well pad.

Production

Site-specific Impact Mitigation

- Utilize compressed air pneumatics for all pneumatic actuation on location.
- Utilize pipeline for oil and gas takeaway.
- Utilize a pressurized maintenance vessel during maintenance operations.
- Will not install permanent lighting, thereby reducing light pollution and disturbance to nearby receptors during the production period.
- Facility will run on grid power.

Best Management Practices

- Equipment will be painted “desert tan” (or similar) to avoid creating a marked contrast with the surrounding landscape.
- Wells, facilities, and equipment will be equipped to be shut in remotely.
- Tankless facility.
- Bulk and test facility design reduces number of separators which decreases facility footprint.
- Development of a site-specific SPCC plan.

Proposed Construction Timeline

- 2Q2026 – Construct Pad and prepare for drilling operations
- 3Q2026 – Commence drilling operations
- 1Q2027 – Commence completion operations
- 3Q2027 – Complete completion operations, begin production operations

Cumulative Impacts Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-21

Water Resources Exhibit (Potential Contaminate Migration Pathway)

CIVITAS

Crestone Peak Resources Operating, LLC

Bennett D Pad
Cumulative Impact Plan[1]

Section 34, Township 3 South, Range 64 West
Adams County, CO

[1] ECMC 304 c. 19.A.-D.

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1.0 Introduction

All human activities carry the potential for cumulative environmental impacts. These are gradual, incremental effects that, while seemingly minor on their own, can combine to create significant consequences. For example, air and water quality or dust levels may be marginally affected by individual projects, but the combined effect of many projects in a concentrated area can be substantial.

Crestone Peak Resources Operating, LLC (Crestone) acknowledges the importance of considering these cumulative impacts and adheres to relevant regulations, Colorado Energy & Carbon Management Commission (ECMC) Rules 304.c.(19) and 303.a.(5), as well as documenting the potential impacts on the ECMC Form 2B.

EXPERT-LED PLANNING FOR MINIMIZED IMPACTS

The Operator assembles teams of specialists in air quality, wildlife biology, and cultural resources during the planning stages of every project. These experts guide the selection of well and facility locations to minimize environmental impact from the outset.

PROJECT LIFECYCLE FOCUS ON IMPACT REDUCTION

The Operator's commitment to responsible development extends throughout the project lifecycle. These subject matter experts remain involved to ensure that potential environmental impacts are identified, and when possible, avoided entirely. If complete avoidance is not achievable, The Operator prioritizes minimizing and mitigating impacts through various best management practices.

BALANCING DEVELOPMENT WITH ENVIRONMENTAL PROTECTION

The Operator strives to strike a balance between responsible subsurface resource development and minimizing the above-ground footprint of its operations. Bennett D exemplifies this approach, aiming to protect public health, safety, the environment, and wildlife resources.

DETAILED MITIGATION STRATEGIES

This Cumulative Impact Plan (CIP) outlines The Operator's project plan in detail. It covers facility design, operational procedures, and ongoing maintenance practices, all specifically tailored to minimize environmental impact throughout each development phase. The plan will also provide a roadmap for eliminating, minimizing, or mitigating potential impacts to water, soil, and wildlife.

2.0 Air Resources

Ambient air quality is a complex tapestry woven from the interplay of pollutant emissions, regulations, and environmental factors. The quantity and chemical properties of pollutants released locally and upwind significantly influence air quality. Regulations act as a control mechanism, limiting allowable emissions from various sources. However, the story doesn't end there. Topography, with its mountains and valleys, plays a crucial role in pollutant transport and dispersion, potentially creating pockets of higher concentrations. Meteorological factors like wind speed, air turbulence, and mixing depths further influence how pollutants move and disperse, ultimately affecting their ambient concentrations. Land use, whether agricultural fields, urban landscapes, or forests, also plays a part, impacting how pollutants interact with surfaces and disperse into the atmosphere. This intricate interplay between emissions, regulations, and environmental factors ultimately dictates air quality.

The surrounding area is agricultural and irrigated land primarily used for cropland, rangeland, and recreational activities. While current air emissions are limited, the expansion of the Bennett D Pad as part of this OGDP has the potential to increase air pollutant concentrations. The Best Management Practices (BMPs) outlined in this section for all operational phases aim to mitigate these impacts. Significant cumulative impacts to air quality are not expected, but close monitoring and adherence to BMPs are crucial to ensure this prediction is accurate.

This section dives into the potential air quality impacts associated with each development phase of the proposed oil and gas location expansion Bennett D Pad. The Cumulative Impacts Data Evaluation Repository (CIDER) provides a comprehensive record of estimated emissions ("Bottom Up" estimates) for each phase. Additionally, the Form 2B accompanying this OGDP details the estimated air emissions specifically generated by this location. This combined information allows for a thorough assessment of potential air quality effects.

2.1 Phases of Oil & Gas Development

The following section describes the life cycle of a well pad. The Pre-Production Operations phases – e.g., construction, drilling, and completions – comprise a much shorter time than the Production Operations phase and subsequent abandonment.

2.2 Pre-Production Operations

2.2.1 CONSTRUCTION

Timing and Description

Well pad construction could take place over an estimated period of around 2 month and will consist of the construction of a graded, level surface for wells and support equipment.

During the construction phase of the pad, there will be limited air emissions. Emissions will be limited to those resulting from the use of earth-moving equipment (i.e., internal combustion engines) and dust generated from construction activities and vehicular traffic. These types of emissions are consistent with those generated during agricultural activities or other land development activities.

Cumulative Impact Reduction

The siting of this pad will allow for the following cumulative impact reductions:

- Utilization of an existing access point and 2315' of existing access road reduces the need for new disturbance reducing cumulative impacts related to soil resources and potential dust emissions.
- The equipment used to build the pad will be Tier IV emission rated. This signifies the equipment meets the strictest standards for off-road diesel engines, minimizing air pollution from construction activities.

Additionally, the operator will utilize the following best practice procedures to reduce cumulative impacts associated with the construction phase of pre-production activities.

- The operator will utilize freshwater on the access road to minimize the generation and transportation of dust during pre-production activities.
- Mud-tracking devices will be incorporated on the road access before the apron.

2.2.2 DRILLING

Timing and Description

Each well usually takes 5 to 7 days to drill to total depth. The drilling rig that will be utilized to drill the wells to total depth will be powered by the local power grid using an electric drilling engine.

During drilling operations, air emissions can be summarized in three (3) categories:

1. emissions resulting from the use of the drilling rig and associated support equipment (i.e., front end loader, crane, etc.),
2. emissions resulting from drilling operations (i.e., mud break-out, pipe connections, etc.), and
3. dust emissions generated from vehicular traffic.

Cumulative Impact Reduction

The Operator will utilize the following best management practice and site specific equipment to reduce cumulative impacts associated with the drilling stage of development.

- The Operator will employ pipe cleaning procedures when removing drill string from the well and remove drill cuttings daily.
- The operator will utilize a closed loop, pit-less fluid management system.
- The operator pledges to utilize a grid-connected electric drilling rig, thereby mitigating the cumulative environmental impacts associated with internal combustion engine operation.

2.2.3 COMPLETIONS

This stage prepares the wellbore for long-term oil and gas production. Key activities include:

- *Hydraulic Fracturing:* A process that injects fluid at high pressure to create fractures in the rock formation, allowing trapped oil and gas to flow more easily.
- *Wellbore Cleanup (drill-out, tube-up):* Removing drilling debris and installing production tubing within the wellbore to transport oil and gas to the surface.
- *Well Flowback:* Recovering fluids used during fracking and initial wellbore cleanup.

2.2.3.1 HYDRAULIC FRACTURING

Timing and Description

Hydraulic fracturing, or stimulation of the reservoir, utilizes high-pressure fluid injected through hydraulic pumps and portable equipment to create cracks in rock formations around the wellbore, enhancing oil and gas flow. To optimize efficiency during this process, wells are stimulated in groups of three to four, but each undergoes individual fracturing in multiple stages lasting approximately five days per group (depending on wellbore length and fracturing parameters).

The Operator is committed to minimizing air quality impacts. Potential emissions during completion operations originate from three sources:

1. Emissions resulting from internal combustion engines that power hydraulic pumps and other associated equipment.
2. Emissions resulting from wellhead and related operations (i.e., swapping of equipment, wellbore preparation between stages, etc.).
3. Dust emissions generated from the use of sand and vehicular traffic.

Cumulative Impact Reduction

The Operator is committed to minimizing air quality impacts throughout the hydraulic fracturing stage. Here's how we'll achieve this:

- The Operator will utilize Tier IV equivalent or better rated completion equipment to minimize emissions from on-site combustion engines.
- The Operator will employ "block and isolate" practices whenever possible on equipment, piping, and tank connections to prevent leaks and fugitive emissions.
- The Operator will transport fresh water for completion operations using lay-flat pipelines, significantly reducing truck traffic and associated dust generation.
- Sand will be stored and transported in sealed containers. This eliminates the need for open-top hoppers and conveyor belts, drastically reducing the risk of airborne sand particles.

2.2.3.2 DRILL-OUT & TUBE-UP

Timing and Description

The drill-out process utilizes a coiled-tubing unit (CTU) to drill out the plugs that were installed in the horizontal wellbore following each stage of the well stimulation. It takes between 3-4 days to drill-out a horizontal well in the DJ Basin.

Once all the plugs have been drilled out from the horizontal wellbore, production tubing will be installed. Production tubing can usually be installed in one (1) day for a single well. Installation of production tubing is done when the wellbore is pressurized thereby requiring specialized equipment.

Cumulative Impact Reduction

Throughout this process, the wellbore is overbalanced whereby the pressure within the wellbore is greater than the reservoir pressure which prevents the reservoir fluids and gases from entering the wellbore. It is possible that minor amounts of reservoir fluids will be entrained in the wellbore fluid and brought to surface. When this occurs, these fluids or gases will be routed to an emissions-controlled tank (i.e., oil, water) or to combustion device (i.e., gas) with a destruction efficiency of at least 98%.

It has been The Operator's experience that these practices employed during drill-out and tube-up result in negligible emissions into the atmosphere.

The Operator will utilize the following best management practices and site specific equipment to reduce cumulative impacts associated with the drill-out and tube-up process.

The operator will employ the best practice of “block and isolate” whenever possible on equipment, piping, and/or tank connections.

2.2.3.3 WELL FLOWBACK

Timing and Description

This process typically takes between 30 to 60 days before the temporary equipment is removed and the well produces primarily oil and gas with small amounts of produced water. Flowback is essential to bring a well into production. Here's what happens during this stage:

- *Temporary Equipment:* Sand knockouts (SKOs) and a frac tank are installed to assist in "cleaning up the well."
- *Well Cleanup:* The well produces large amounts of water and sand along with small amounts of oil and gas. The SKOs remove sand from the production stream before it enters the separator.
- *Emptying the SKOs:* Just like a full kitchen garbage can, SKOs need to be emptied periodically. Compressed air blows the sand into an open-top tank for temporary storage. The open-top tank is then loaded onto a truck and hauled to an approved disposal facility.
- *Transition to Production:* Once the well is clean, temporary equipment is removed, and the well primarily produces oil and gas with minimal water.

Cumulative Impact Reduction

The Operator is committed to minimizing environmental impact during flowback. Here's how:

- The well stream is routed through permanent production equipment, and all salable produced gas is directed into a sales pipeline. This eliminates the need for venting or flaring salable gas.

2.3 Production Operations

Timing and Description

This is the final and longest phase of the well pad's operation and can continue as long as 30 years. During this phase, oil and gas are continuously produced from the wells and separated into individual components for transport. Here's a breakdown of the process:

- *Three-Phase Separation:* The well stream, a mixture of oil, gas, and water, is separated into these three individual components.

- *Gas Routing:* Once separated from liquids, the captured natural gas will travel to a new sales pipeline installed before production begins. To meet the pressure requirements for transport in midstream pipelines, the gas may sometimes need compression. This compression often occurs alongside additional separation processes using vapor recovery units (VRUs). VRUs essentially act as extra stages to squeeze more gas out of the liquid mixture extracted from the well, improving overall natural gas recovery efficiency.

- *Oil Storage and Transport:* Separated oil is then sent to a dedicated pipeline, eliminating emissions associated with truck traffic and storage tanks.

- *Water Handling:* Produced water is then sent to a dedicated pipeline, eliminating emissions associated with truck traffic and storage tanks.

- *Automated Monitoring:* The entire production process is continuously monitored by an automated system that tracks parameters like pressure, temperature, flow rates, and more. This 24/7 monitoring allows for quick identification and response to any potential issues. If something deviates from acceptable ranges, alarms are triggered, and personnel are notified. Depending on the problem, operators can take steps to isolate it, redirect the process, or shut down wells, equipment, or the entire facility to prevent emission events and protect public health and safety.

Cumulative Impact Reduction

The Operator will utilize the following best management practices and site specific equipment to reduce cumulative impacts associated with the proposed development:

- The operator will utilize the existing oil pipeline to the location. Reducing air emissions associated with truck traffic.
- The operator will utilize a tankless facility design eliminating the emissions that originate from storage tanks on location.
- The operator will utilize compressed air pneumatics for all pneumatic actuation on location. Eliminating the use of natural gas vented to the atmosphere during valve actuation and associated processes.
- The operator will utilize a pressurized maintenance vessel during maintenance operations. Eliminating gas that would otherwise be vented to the atmosphere during maintenance operations.
- The operator will electrify the permanent production facilities.
- Wells, facilities, and equipment will be equipped to be shut-in remotely.

3.0 Public Health Impacts

Public concerns exist in Colorado regarding air quality impacts from oil and gas development on nearby communities. Studies by the Colorado Department of Public Health and Environment (CDPHE) in 2017 assessed these risks, finding measured air concentrations below safe levels. Subsequent dispersion modeling performed by CDPHE in 2019 showed there was a risk of potential health impacts under perfect meteorological conditions 2000' from oil and gas locations. The oil and gas industry, including The Operator, has developed, and implemented improved practices, particularly during flowback, which eliminate the use of open tanks and significantly reduce potential emissions during both pre-production and production operations.

The Operator is committed to responsible development and has undertaken independent monitoring efforts. In 2019, The Operator partnered with CTEH, LLC to conduct studies evaluating the short- and long-term air quality impacts of various operational phases at our development sites. These studies, conducted alongside best management practices, confirmed adherence to health guidelines established by the Agency for Toxic Substances and Disease Registry (ATSDR). Furthermore, The Operator's operations have been monitored by the Colorado Air Monitoring Mobile Lab (CAMML), providing independent verification of air quality data. The best management practices proposed at the Bennett D location meet or exceed the best management practices that were implemented at the locations that were being monitored during the CTEH study and CAMML air monitoring.

There are two residential units (RBUs) within 2,000 feet of the working pad, with one RBU being used as an office. The closest RBU is the structure used as an office.

The Operator believes the proposed development will have no public health impacts. This conclusion is based on the following:

- *Implementation of Committed BMPs:* The project will utilize BMPs including a utility-powered electric rig, Tier IV or better rated completion equipment, a tankless facility, three-phase takeaway, and electrified facilities.

- *Extensive Monitoring Data:* The Operator has access to air monitoring data from similar projects that employed more impactful mitigation strategies. This data supports the expectation of no health impact to the two (2) RBUs within 2000' of the proposed working pad surface.

3.1 Cumulative Impact Reduction

The Operator prioritizes responsible air quality management throughout the project lifecycle.

- *Pre-Production Monitoring:* Continuous air monitoring will be implemented around the well pad even before construction operations begin. This proactive approach allows us to establish baseline air quality data.

- *Ongoing Monitoring:* Air monitoring will continue through the first 6 months of production, providing real-time data to ensure our operations are not creating adverse cumulative impacts on the surrounding area.

- *Regulatory Oversight:* The air monitoring plan will be submitted to the Colorado Department of Public Health and Environment (CDPHE) for review and approval, ensuring it meets all regulatory requirements.

4.0 Water Resources

There are above- and below-ground mechanisms by which hydraulic fracturing activities have the potential to impact water resources. These mechanisms include water withdrawals in times of, or in areas with, low water availability; spills of hydraulic fracturing fluids or produced water; below ground migration of liquids and gases resulting from poor wellbore construction practices; and inadequate treatment and discharge of wastewater.

4.1 Water Sourcing

Water is a major component of most hydraulic fracturing operations. It typically makes up more than 90% of the mass injected into a well. The water used in hydraulic fracturing activities represents less than 1% of total annual water use and consumption in the United States. Coordination with other water users is necessary to minimize potential conflicts with end users – i.e., agriculture, irrigation, etc.

4.1.1 WATER MINIMIZATION

The Operator prioritizes water conservation in its completion operations and has recently changed its wellbore spacing strategy. The current methodology has helped minimize impacts that result from water acquisition by using fewer wells but maximizing the resource development of the wells.

4.1.2 WATER RECYCLING

The Operator is actively seeking ways to minimize its environmental impact. One of the ways to accomplish this is by continuously evaluating new water recycling technologies to see if they can be implemented sustainably while meeting state and local regulations. Once a technology proves effective and compliant, the Operator will substantially reduce their dependence on freshwater resources by integrating the use of recycled water into its completion operations.

4.2 Groundwater Protection

Groundwater is a vital resource, and its protection is paramount during oil and gas well drilling operations. Colorado mandates a strict casing and cementing program for all wells drilled within the State. This ensures isolation of the wellbore from usable groundwater sources.

The following types of groundwaters require isolation from the wellbore and all potential flow zones:

- Domestic Use-Quality,
- Agricultural Use-Quality,
- Surface Water Quality Protection,
- Potentially Usable Quality pursuant to 5 C.C.R. §1002-41,
- Groundwater that has not been classified by statute but exhibits total dissolved solids less than 10,000 mg/l.

The Operator uses 9-5/8" steel surface casing that is set to a depth at least fifty (50) feet below the base of the deepest known groundwater subject to the above-captioned criteria. Surface casing is usually set at 1500' below ground surface and typically correlates with the regional base of the Fox Hills, or the base of the Upper Pierre aquifer (or its correlative geologic unit). Once the casing is set, it is fully cemented in place using the displacement method thereby placing specialized cement from the bottom of the 9-5/8" casing back to surface.

The ECMC reviews all Form 02 (Permit to Drill) Applications for adequate surface casing setting depths and cementing programs based on the following factors:

- Subsurface ground water maps prepared by the State Water Engineer,
- Offset well data,
- All available water well data.

Offset wells are all existing wells within 1,500 of the completed portions of the proposed wells. The Operator and the ECMC take further steps to ensure groundwater protection by reviewing these offset wells. This review confirms that the offset wells have sufficient protections in place, including:

- Proper plugging and abandonment for wells no longer in use.
- Adequate casing and cementing for all other existing wells.

Prior to operations, The Operator will check for depth of ground water and soil suitability. The estimated depth of the water table is more than 400ft. This estimate is based on data from a water well in the vicinity of the Bennett D Pad.

4.3 Surface Water Protection

Oil and gas development can pose risks to surface waters through accidental spills or increased soil erosion. The Operator prioritizes protecting surface water and implements several mitigation measures. The Operator enlisted biologists and hydrologists to conduct a comprehensive site assessment. This assessment included a detailed field survey within a 500-foot radius and a broader desktop survey covering a 2,640-foot area surrounding the proposed location for Bennett D Pad. The surveys identified five surface water features located downstream (downgradient) within 2,640 feet of the project site. Two of these features are isolated wetlands, and the other three are NWI-mapped wetlands and a intermittent lake/pond. To safeguard these wetlands and surface waters of the state, the Operator has developed a Stormwater Protection Plan, which is included with the Form 2A. This plan detail the specific measures that will be taken to protect these downgradient surface water features.

Beyond these plans, The Operator intends to implement the following robust procedures throughout the development phase to further minimize potential impacts on surface waters.

4.3.1 PREVENTING SPILLS AND LEAKS

The Operator prioritizes preventing spills and leaks through various containment measures. During drilling and completion stages, a large polyethylene liner isolates the drilling rig, equipment, and storage areas. This liner captures any potential spills, preventing them from reaching the ground.

4.3.2 ENGINEERED CONTAINMENT FOR PRODUCTION FACILITIES

For the production phase, The Operator utilizes a robust, engineered containment system around the separators. This system features post-driven perimeter walls with a geotextile base, all coated with a durable polyurea liner. This liner is resistant to punctures, UV rays, weather extremes, and common oil and gas chemicals.

4.3.3 SPILL RESPONSE PLAN

Despite these preventative measures, The Operator recognizes the possibility of accidental spills. A comprehensive spill response plan ensures a swift and effective response. In case of a release, immediate notification goes to designated personnel who initiate a series of response procedures. These procedures prioritize stopping the discharge at the source whenever safe to do so. Spill response resources are then deployed to contain the spill, assess the impact, and develop a clear path for cleanup and disposal. The Operator maintains a comprehensive record of all spills, including documentation, lab analyses, and proper waste disposal.

4.3.4 STORMWATER SEDIMENTATION AND PROTECTION

The Operator prioritizes preventing negative impacts on nearby surface water features through a comprehensive stormwater management plan. This plan incorporates sediment controls to prevent runoff laden with sediment from reaching these water bodies.

For more specific details on the stormwater control measures planned for this site, please refer to the Stormwater and Erosion Control Plan.

In summary, The Operator prioritizes protecting surface water resources at the Bennett D Pad through preventative measures and a robust spill response plan.

5.0 Terrestrial and Aquatic Wildlife Resources and Ecosystems

The proposed Bennett D Location is a new well pad and is located in rangeland, near the interstection of Interstate 70 and Manilla Road. This property also has midstream oil infrastructure where this pad will be co-located.

5.1 Terrestrial Wildlife Resources and Ecosystems

Oil and gas operations can disrupt wildlife and ecosystems in several ways:

Habitat Loss: Construction of well pads, roads, and pipelines can fragment and destroy wildlife habitat.

Disturbance: Noise, light pollution, and human activity can stress wildlife, affecting their breeding, feeding, and migration patterns.

Spills and Leaks: Accidental spills of oil and completion fluids can contaminate water sources and soil, harming wildlife and their food sources.

Habitat Fragmentation: Roads and infrastructure can divide wildlife populations, making it harder for them to find food, mates, and shelter.

These impacts can affect a wide range of wildlife, including birds, mammals, reptiles, amphibians, and insects.

5.1.1 ENVIRONMENTAL REVIEW, FIELD STUDIES, AND DESKTOP ANALYSIS

A robust environmental review was completed by a third-party consultant during the initial planning phase for the proposed location. Based on desktop analyses and field investigations, no potential conflicts were identified regarding the presence of High-Priority Habitat or State/Federal Sensitive, Threatened, or Endangered species. More information regarding the environmental review and analysis can be found in the attached Wildlife Protection Plan.

Eagles: Field surveys found no bald eagle or golden eagle nests, or nesting activities were observed within ½ mile of the proposed Location.

Burrowing Owls: No suitable burrowing owl habitat (i.e., prairie dog town) was identified within ¼ mile of the Site.

Other Raptors: Three inactive non-eagle raptor nests were observed within ½ mile of the Site. One nest is located approximately 365 feet southwest of the Site, a second nest is located approximately 700 feet west from the Site, and a third nest is located approximately 700 feet east of the Site.

Migratory Birds: No migratory bird nests or nesting activity were observed; however, suitable nesting habitat, including surface topography, vegetation, and artificial structures, is present at and immediately surrounding the Location.

5.1.2 PRE-CONSTRUCTION WILDLIFE SURVEYS PLANNED

Based on the findings, a consulting biologist recommended additional wildlife surveys before operations begin. These surveys will focus on the four bird categories mentioned above (details in the Wildlife Protection Plan). The operator will incorporate these surveys into pre-construction planning and deploy a biologist before construction starts.

5.1.3 ACTIVE NEST MANAGEMENT

If active nests are discovered, the operator will collaborate with the relevant agency to determine appropriate next steps, potentially including site-specific mitigation measures.

5.1.4 LAND MANAGEMENT AND RECLAMATION

The operator's weed management and interim reclamation plans aim to minimize disruption to existing vegetation and preserve topsoil. Interim reclamation, involving replanting with the input of the landowner, will occur shortly after production begins. The goal is to revegetate the area in a way that supports continued agricultural use of the land.

5.1.5 HABITAT DISTURBANCE MINIMIZATION

The Operator designed the project to minimize its footprint. The Bennet D location is partially on previously disturbed land adjacent to a midstream facility. This will result in a more efficient and less disruptive development by locating near similar land use.

5.2 Aquatic Wildlife Resources and Ecosystems

Oil and Gas operations have the potential to impact aquatic wildlife and ecosystems in the following ways:

Water Contamination: Spills of oil, completion fluids, or produced water can pollute rivers, streams, and lakes. These contaminants can be toxic to fish, invertebrates, and other aquatic life, disrupting food chains and causing population decline.

Sedimentation: Activities like road construction and well pad clearing can increase erosion, leading to increased sediment runoff into waterways. This sediment can smother fish eggs and other aquatic life, reducing oxygen levels in the water and harming overall ecosystem health.

A robust environmental review was completed by a third-party consultant during the initial planning phase for the proposed location.

5.2.1 DESKTOP AND FIELD STUDIES

A review of the area surrounding the proposed location for Bennett D Pad, including desktop analysis and field investigations, identified potential aquatic habitats within 1,000 feet. These features are depicted on the attached Hydrology Map.

- *Ditches:* Ditches were identified, but are determined to be low quality for aquatic wildlife as they are dry for large portions of the year. The ditches are utilized for stormwater controls. The ditch in the southern part of the location will be rerouted.
- *Wetlands/Ponds:* Two (2) field verified wetlands and one (1) stormwater pond.
    - Field-verified isolated wetlands located 54 and 150 feet west of the WPS.
    - A stormwater pond situated 150 feet west of the WPS.

To safeguard these potential aquatic habitats, the Operator has developed a Stormwater Protection Plan, which is included with Form 2A. This plan detail the specific measures that will be taken to protect these downgradient surface water features. Crestone plans to install a three foot berm at the edge of the WPS in the direction of the wetlands.

Furthermore, the project will incorporate full wrap sound walls. These walls will help shield potential aquatic habitats from noise and light disturbances.

5.2.2 SPILL PREVENTION MEASURES

Given the surrounding aquatic features, The Operator will utilize its robust set of spill protection and response measures to aid in preventing potential discharges of fluids off location. In the unlikely event of a spill on location, The Operator has implemented BMPs to capture discharged fluids before reaching any surface waters (*see Water Resources section*).

5.2.3 STORMWATER SEDIMENTATION AND PROTECTION

The operator prioritizes preventing negative impacts on nearby surface water features through a comprehensive stormwater management plan. This plan incorporates sediment controls to prevent runoff laden with sediment from reaching these water bodies. For more specific details on the stormwater control measures planned for this site, please refer to the Stormwater and Erosion Control Plan.

5.2.4 PLATTE RIVER STEWARDSHIP

Civitas Resources, Inc, parent company of The Operator, is an active member of the South Platte Water Related Activities Program ("SPWRAP"), a Colorado nonprofit corporation established by Colorado water users for the purpose of representing water users' interests and partnering with the State of Colorado to implement the Platte River Recovery Implementation Program in central Nebraska. This program provides a venue and mechanism to address possible Endangered Species Act issues on and along the Platte River including to assist in the recovery of threatened or endangered species within this important river corridor and elsewhere in the river basin. Additional information about this unique organization can be found here - http://cospwrap.org/ .

6.0 Soil Resources

Oil and gas operations has the potential to impact Soil Resources in the following ways:

- *Compaction:* Heavy equipment used during construction can compact the soil, reducing pore space and air circulation. This can harm plant growth and hinder the soil's ability to absorb water, potentially leading to erosion.
- *Stripping and Stockpiling:* Removing topsoil during construction activities exposes the underlying subsoil. Stockpiling topsoil for later use can also damage its structure and fertility.
- *Contamination:* Accidental spills of oil, completion fluids, or produced water can contaminate soil, rendering it unsuitable for plant growth and potentially harming soil organisms.
- *Loss of Topsoil:* Improper erosion control measures can lead to topsoil being washed away by wind or rain, reducing soil fertility and productivity.

These impacts can significantly degrade the quality and function of topsoil, making it difficult to reclaim the land for its original use after oil and gas operations cease.

Crestone prioritizes topsoil preservation throughout the development process.

6.1 Pre-Construction Soil Assessment

A qualified soil scientist conducts a thorough survey to assess the depth and characteristics of different soil layers, especially the crucial topsoil. This analysis (details available in the Topsoil Protection Plan) helps determine the final grading plan and identify the Best Management Practices (BMPs) needed to protect the soil during construction and ensure its future viability.

6.2 Topsoil Stockpiling

- To preserve valuable topsoil, it will be stockpiled within designated areas permitted for disturbance.
- To prevent oxygen depletion, stockpile height will be kept low.
- Safe and efficient seeding will be ensured by maintaining slopes no steeper than 4:1.

6.3 Topsoil Seeding

Following final grading, a custom seed mix specifically designed for the project will be drill-seeded into the stockpiles. This mix, detailed in the Interim Reclamation Plan, prioritizes:

- *Native, perennial grasses and forbs:* These contribute to a natural ecosystem and require less maintenance.
- *Deep-rooted species like alfalfa:* These enhance soil stability by anchoring it from within.
- *Compatibility with local soil:* Choosing species suited to the soil type ensures optimal growth.

6.4 Interim Reclaimed Area Seeding

An analysis will be conducted to determine the most effective soil amendments for optimal seed germination and plant establishment.

An annual cover crop will also be included in the seed mix, detailed in the Interim Reclamation Plan to:

- Quickly establish vegetation and provide initial ground cover.
- Aid in soil stabilization by reducing erosion.

Offer temporary cover until the permanent plant mix matures.

6.5 Spill Prevention and Response

Crestone recognizes the potential for leaks or spills to impact soil resources. As referenced in the Water Resources section, a robust set of spill prevention measures are implemented:

- Trained personnel for spill identification and response.
- Industry best practices to identify and remediate impacted soil.
- Adherence to ECMC's 900-Series Rules and other relevant regulations.

These comprehensive measures minimize the risk of spills and ensure a rapid response in the unlikely event of a discharge.

By employing these practices, the Operator strives to minimize cumulative impacts, protect valuable topsoil and facilitate successful land reclamation after project completion.

7.0 Public Welfare

The following narrative is intended to supplement the above-described resources and potential impacts. Although this information is contained elsewhere within the application materials, brief summaries of impacts and mitigations for several key areas, often referred to as nuisances, are:

7.1 Noise

7.1.1 PRE-PRODUCTION OPERATIONS - NOISE

POTENTIAL IMPACT

Relative to ambient levels, temporary increases in sound levels are expected during drilling and completion operations.

MITIGATION

Sound walls. Sound walls will be erected around the location prior to the commencement of the drilling phase and will remain until the completions phase is finalized. The walls will stand 32' tall and utilize acoustic fabric to aid in the attenuation of sound emanating from equipment on the location.

Utility Powered Electric Rig. A utility powered electric rig reduces noise by eliminating the noise associated with on-site power generation.

Quiet Completions Fleet. A 'quiet completions fleet' will be utilized for hydraulic fracturing.

7.1.2 PRODUCTION OPERATIONS - NOISE

POTENTIAL IMPACT

Relative to ambient, intermittent temporary increases in sound levels are expected during ongoing production operations.

MITIGATION

Grid Power. The Operator will utilize electric grid power to energize the facility eliminating most noise sources on the planned location.

7.2 Light

7.2.1 PRE-PRODUCTION OPERATIONS - LIGHT

POTENTIAL IMPACT

The drilling and completions phases occur 24-hours per day, which means lighting is required by regulation for worker safety during nighttime hours. Illuminating the location may cast halos or shadows that are perceptible from a distance. Headlights on vehicles may also be visible during the overnight hours when vehicles enter/exit location.

MITIGATION

Lighting Orientation. Lights will be angled in a downward manner to limit the 'halo effect' from impacting nearby receptors.

Lighting Height. Lights on location and those affixed to the sound walls will be placed at reasonable heights to limit 'light spillage' off location.

Essential Use Only. Only lights necessary to maintain a safe and regulatory compliant working environment will be used.

7.2.2 PRODUCTION OPERATIONS - LIGHT

POTENTIAL IMPACT

Artificial lighting at the well pad during production operations may create light impacts through halos, shadows, or headlights from entering/exiting vehicles.

MITIGATION

No Permanent Lighting. No permanent lighting is planned to be installed at this location, minimizing ongoing lighting impacts.

7.3 Odor

7.3.1 PRE-PRODUCTION OPERATIONS - ODOR

POTENTIAL IMPACT

Temporary odoriferous emissions during drilling and completions operations may be anticipated; these odors can generally be characterized as having a "petroleum scent" or a "burning metal" scent. Additionally, exhaust from diesel powered equipment may be identifiable from time to time.

MITIGATION

The use of these BMPs is anticipated to eliminate odor as a potential nuisance to receptors.

Closed Loop Systems. The operator will utilize closed-loop fluid management systems.

Low-Emission Drilling Fluids. The operator will utilize IOGP Group III drilling fluids.

Prompt Waste Removal. The operator will remove drill cuttings on a daily basis or as soon as waste containers are full.

Pipe Cleaning Procedures. The operator will employ pipe cleaning procedures when removing drill pipe from the hole.

7.3.2 PRODUCTION OPERATIONS - ODOR

POTENTIAL IMPACT

Occasional odors similar to those experienced during drilling and completion may occur.

MITIGATION

The Operator will utilize the following mitigation measures.

Electric Operations. The operator will utilize electric power for production facilities which eliminates potential odors from on-site combustion engines.

Pneumatic Systems. The operator will employ instrument air pneumatics which removes the need to vent gas during valve operation and reduces the potential for odor release.

Closed-Loop Maintenance. The operator will use a dedicated maintenance vessel to capture gas during maintenance procedures, preventing it from escaping into the atmosphere.

Tankless Location. The operator plans to operate this pad as a tankless location. This will reduce the source of potential odors associated with tank emissions.

7.4 Dust

7.4.1 PRE-PRODUCTION OPERATIONS – DUST

POTENTIAL IMPACT

Dust generated from the movement of equipment and materials on location may occur; vehicular traffic may generate dust while traversing the access road.

MITIGATION

Mud Tracking Control. The operator will install vehicle tracking controls at the entrance of the access road.

Dust Suppression. The operator will use freshwater as a dust suppressant on the pad and access road as atmospheric conditions warrant. This will serve to minimize potential dust generated from the location.

7.4.2 PRODUCTION OPERATIONS – DUST

POTENTIAL IMPACT

Dust generated from the movement of equipment and materials on location may occur; vehicular traffic may generate dust while traversing the access road.

MITIGATION

Dust Suppression. The operator will use freshwater as a dust suppressant on the pad and access road as atmospheric conditions warrant. This will serve to minimize potential dust generated from the location.

7.5 RECREATION & SCENIC VALUES

Oil and gas development can introduce several changes that can negatively impact recreation and scenic values. These include:

- *Visual alterations:* Drilling rigs, wellheads, and pipelines create physical structures that can disrupt the natural landscape. This can be particularly significant in areas valued for scenic beauty or wilderness experiences.
- *Noise disruptions:* Machinery and vehicles used in oil and gas operations generate noise that can detract from the tranquility of recreational areas.
- *Reduced visitation:* Studies suggest a correlation between oil and gas development and decreased visitation rates in nearby recreational areas. This could be due to a combination of the factors mentioned above.

7.5.1 RECREATION

There are no parks or other public spaces in the vicinity of the proposed Location.

PRE-PRODUCTION OPERATIONS MITIGATION

The operator will utilize the pre-production mitigation measures outlined previously to mitigate potential impacts to the identified recreational feature related to noise, light, odor, and dust.

PRODUCTION OPERATIONS MITIGATION

Due to the current land use as an oil midstream facility along with the production mitigation measures outlined previously to mitigate potential impact, it is not anticipated that there will be any impacts to the recreation.

7.5.2 SCENIC VALUES

The installation of the necessary equipment and facilities will have little effect on the viewshed as this is an existing oil terminal. Depending on the vantage point of the observer, the proposed project may slightly modify the viewshed when looking westward. However, the viewshed will not be "blocked;" the observer should be able to reposition themselves for a vantage point that is free and clear of the proposed location. No permanent impacts are anticipated.

8.0 Proposed Best Management Practices

8.1 Public Health Cumulative Impacts Mitigation Measures

1. The operator will monitor this pad during each operational phase through its FLIR camera program to verify that sites are operating correctly and in compliance with regulations.

2. The operator will implement a continuous air monitoring plan that will be compliant with the requirements outlined in CDPHE Regulation 7.

8.2 Construction

1. The operator will conduct additional avian surveys prior to the commencement of construction to ensure no conflicts have developed since the prior survey.

2. Use of freshwater to minimize the generation and transportation of dust.

3. Topsoil will be stockpiled on location with slopes not greater than 4:1.

4. Topsoil stockpiles will be stabilized with appropriate vegetation to provide both short- and long-term stabilization to prevent erosion.

5. Tracking controls will be installed at the entrance of the access the road to prevent mud-tracking and associated dust emissions on the public roadway.

6. Prior to drilling operations, a sound barrier (minimum rating of STC-30) will be installed around the pad site. This sound barrier will be 32 feet tall and remain onsite through completions operations.

8.3 Drilling

1. Employ pipe cleaning procedures when removing drill string from hole.
2. Utilize closed-loop, pit-less fluid management system.
3. Use of freshwater to minimize the generation and transportation of dust.
4. The operator commits to using an electric powered rig during drilling operations.
5. The operator will install a polyethylene liner across portions of the location as an isolation barrier. The drilling rig and associated equipment (including fluid storage areas) are placed atop the liner.
6. Lighting will be angled in a downward manner to limit the halo effect off location.
7. Lights will be placed at reasonable heights to limit spillage off location.
8. The operator will utilize IOGP Group III drilling fluids.
9. The operator will remove drill cuttings on a daily basis or as soon as waste containers are full.

8.4 Completions

1. The operator will utilize Tier IV or equivalent rated completion equipment. This helps to minimize the cumulative impacts to air resources that are associated with the use of internal combustion engines.

2. A "quiet completions fleet" will be used for hydraulic fracturing operations.

3. Employ the practice of "block and isolate" whenever possible on equipment, piping, and/or tank connections.

4. Use of sealed containers (e.g., sandboxes) for the storage and transportation of sand used in hydraulic fracturing.

5. Any gas encountered during flowback will be routed to a gas sales pipeline or combusted with a minimum of 98% destruction efficiency.

6. Any fluids encountered during flowback will be sent to the oil and produced water pipelines that will service the location.

7. Use of freshwater to minimize the generation and transportation of dust.

8. The operator will install a polyethylene liner across portions of the location as an isolation barrier. The completion fleet and associated equipment (including fluid storage areas) will be placed atop the liner.

9. Lighting will be angled in a downward manner to limit the halo effect off location.

10. Lights will be placed at reasonable heights to limit spillage off location.

8.5 Production

1. The operator will install an oil pipeline to the location prior to first production. Reducing air emissions associated with truck traffic and the transfer of oil from storage tanks to tanker trucks.

2. The operator will utilize compressed air pneumatics for all pneumatic actuation on location. Eliminating the use of natural gas vented to the atmosphere during valve actuation and associated processes.

3. The operator will utilize a pressurized maintenance vessel during maintenance operations. Eliminating gas that would otherwise be vented to the atmosphere during maintenance operations.

4. The operator will electrify the permanent production facilities.

5. Development of a site-specific SPCC plan.

6. Wells, facilities, and equipment will be equipped to be shut in remotely.

7. The operator will conduct additional avian surveys prior to the commencement of construction to ensure no conflicts have developed since the prior survey(s).

8. Equipment will be painted “desert tan” (or similar) to avoid creating a marked contrast with the surrounding landscape.

9. The operator will not install permanent lighting.

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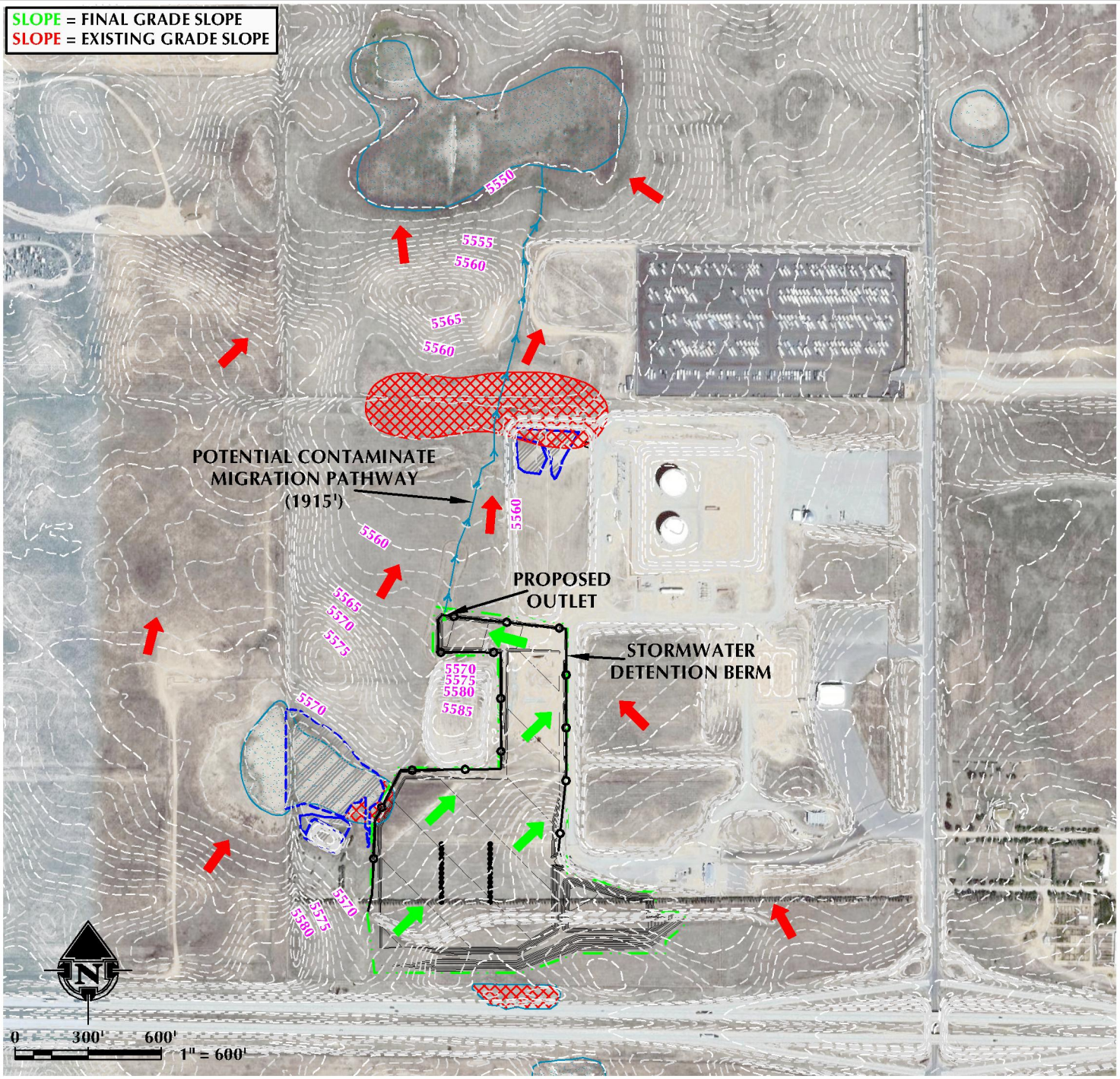
WATER RESOURCES EXHIBIT

BENNETT D PAD

SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST, 6TH P.M., ADAMS COUNTY, COLORADO



LEGEND

- PROPOSED WELL
- PROPOSED OIL AND GAS LOCATION
- DELINEATED WETLAND (PER RPG)
- NWI WETLAND
- NWI WETLAND (FIELD VERIFIED TO NOT BE PRESENT PER RPG)
- EXISTING GRADE CONTOUR (1' INTERVAL)
- FINAL GRADE CONTOUR (1' INTERVAL)
- POTENTIAL CONTAMINATE MIGRATION PATHWAY

609 CONSULTING, LLC

LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331

SHERIDAN OFFICE
1095 Sabertón Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

DATE SURVEYED:	9/24/24
DATE:	12/13/24
DRAFTER:	KMG
REVISED:	

DATA SOURCE:
- AERIAL COURTESY OF NEARMAP.

PREPARED FOR:

Prepared for:
CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

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Water and Wildlife Plan

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-23

Crestone Peak Resources, LLC

WATER AND WILDLIFE PROTECTION PLAN

FOR

Bennett D Pad

Prepared For:

ADAMS COUNTY
COLORADO

4430 S. Adams County Pkwy.
Brighton, CO 80601
www.adcogov.org

Prepared By:

RPG RESOURCES
a System One company

1720 South Bellaire Street, Suite 400
Denver, CO 80222
www.rpgres.com

Date Prepared: December 2024

Table of Contents

1. INTRODUCTION

This Water and Wildlife Protection Plan (WWPP) was prepared by RPG Resources (RPG), on behalf of Crestone Peak Resources Operating, LLC (Civitas Resources, Inc.; hereafter Crestone), for the proposed Bennett D Pad (Site). This plan was prepared to adhere to Adams County's development standards and regulations. The WWPP serves as a framework for waters and wildlife protection and a communication tool to foster cooperative relationships between Crestone and its stakeholders. Implementation of this plan will serve to avoid or minimize environmental impacts, adverse effects to wildlife populations, their associated habitats, and respective productivity levels in anticipation of the development of Crestone oil and gas resources.

This WWPP addresses Crestone's plans to comply with all applicable operating requirements and includes a site-specific environmental site assessment. Additional measures may be implemented based on any new environmental constraints that arise or site-specific recommendations.

2. SITE DESCRIPTION

The Site boundaries are defined as the limits of disturbance (LOD) for the proposed pad and access road. The Site is located in Section 34 of Township 3 South, Range 64 West in Adams County, Colorado. It is in the Western Great Plains Range and Irrigated Region Land Resource Region (LRR) of the Central High Plains, Southern Part Major Land Resource Region (MLRA; NRCS 2006). The proposed location is a pad expansion, and the surrounding land type is rangeland.

3. WATER QUALITY MEASURES

During the drilling and pad construction phase the water supply source will be groundwater from the Rangeview Metropolitan District (39.650200, -104.659873), with a volume of 24,500 barrels. During the completions phase the water supply source will be surface water from FRICO (39.95392778, -104.74666667) with a volume of 14.85 million barrels.

Crestone is currently evaluating the feasibility to incorporate temporary produced water recycling equipment on the Bennett D Pad during completions. We are still assessing the details and full scope of the operations. The equipment will likely consist of multiple 500bbl tanks and chemical treatment which will fit within the limits of the permitted disturbance. It is possible Crestone will have to truck water to the oil and gas facility from other sites in the area. Utilizing recycled produced water will reduce the need for fresh water in completions. If Crestone determines it will pursue recycling, we will submit a minor amendment with full details of the operation to the Director for approval.

Groundwater will be sampled in accordance with the ECMC's Rule 615. Initial and periodic groundwater samples will be collected from up to four water sources within a half-mile radius of proposed site, prioritizing proximity, type, and aquifer diversity. Sampling will occur before drilling, at specific intervals after completion, and post-abandonment. Analysis will include testing for pH, dissolved gases, hydrocarbons, and various chemical constituents. Refer to the ECMC's Rule 615 for more information.

4. BMP AND SAFETY REQUIRMENTS

4.1. Environmental and Operational Safety BMP's

Crestone minimizes environmental impacts by integrating site-specific guidance into development plans and implementing additional protection measures as needed. The following Best Management Practices (BMPs) and safety measures ensure environmental protection and operational safety throughout all phases of operation:

1. During drilling, completion, and production operations, regular Auditory, Visual, and Olfactory Monitoring (AVO) inspections are performed on equipment containing hydrocarbons, fluids, or associated chemicals. AVO inspections include taking the time to look, smell and listen for leaks.
2. Operator utilizes a polyethylene liner beneath the drilling rig during drilling operations and beneath the areas where completions equipment (including pump trucks and other heavy equipment) during completion operations to ensure there is an impermeable layer between the rig and the earth. The use of this liner prevents hydrocarbons and other fluids from reaching the soil in the unlikely event a leak does occur. The liner is inspected for integrity throughout drilling operations and maintenance/repair to the liner occurs as needed.
3. Routine Spill Prevention, Control, and Countermeasure (SPCC) inspections will be conducted and documented pursuant U.S. EPA requirements. The location will be equipped with a Supervisory Control and Data Acquisition (SCADA) system that allows for remote monitoring and shut-in capabilities.
4. Operator has developed a robust Leak Detection and Repair (LDAR) program, which utilizes Forward Looking Infrared (FLIR®) cameras to identify and fix leaks. These inspections will begin during the drilling phase and continue throughout the life of the Oil & Gas Location.
5. Any spill or release reported to the ECMC shall also be reported to Adams County Local Government Department (LGD).
6. A 3-foot berm will be constructed on the western side of the pad to prevent any incidental spills from reaching the adjacent wetlands.

4.2. Wildlife BMP's

When possible, seasonal avoidance of important breeding, nesting, and winter habitats is the primary protection measure to reduce oil and gas development impacts on wildlife populations, productivity, and habitat use. Consultation with CPW and/or other wildlife agencies may be initiated to determine which other site-specific protection measures, if any, should be included in each project. Data collected during preliminary survey efforts is considered during project planning and design, and subsequent follow-up surveys and/or monitoring efforts are scheduled as needed. Protection measures are not limited to those identified in wildlife plans, and Crestone recognizes the nature of fluctuating wildlife conditions and remains adaptable to new wildlife constraints that may arise.

1. Ensure all personnel and contractors are aware of and adhere to applicable wildlife protection measures and BMPs;
2. Personnel and contractors will not harm any wildlife observed on site and will maintain recommended buffer distances related to wildlife;

3. Personnel and contractors will report any wildlife concerns, including the discovery of injured or orphaned wildlife, to on-site management and applicable EHSR personnel;
4. Consult CPW and/or other applicable agencies/personnel, upon the discovery of new wildlife constraints, as needed;
5. Use qualified third-party contractors for wildlife surveys, monitoring, and other consultation purposes; and
6. Document any wildlife-related issues or changes.

5. ENVIRONMENTAL SITE ASSESSMENT

RPG conducted a comprehensive Environmental Site Assessment (ESA) of the proposed Site and provided recommendations based on site-specific observations. RPG's considerations included, but were not limited to, resources protected under the Bald and Golden Eagle Protection Act (BGEPA), Migratory Bird Treaty Act (MBTA), Endangered Species Act, Colorado Nongame, Endangered, or Threatened Species Conservation Act, and the Clean Water Act (CWA). The ESA included a desktop review of aerial imagery, agency-mapped sensitive natural resources, and a site-specific U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) report. Following the desktop review, RPG conducted field surveys on July 31, 2024 and September 19, 2024 to assess the potential for other protected or sensitive natural resources to be impacted by operations. Detailed results of the ESA are provided in Appendix A and an Environmental Site Map is provided in Appendix B.

Note: A consultation with Colorado Parks and Wildlife (CPW) is not required, as the pad is not located within HPH. However, CPW was involved in obtaining the chemical storage waiver per ECMC Rule 1202.a.(3) due to the location's proximity to delineated wetlands. Additionally, on November 6, 2024, CPW participated in the Conceptual Review/Pre-Application meeting with Adams County, Crestone, CDPHE, and ECMC staff.

The Site is also located outside Adams County's Natural Resource Conservation Overlay.

5.1 Eagles

There is no suitable nesting habitat for bald eagles (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*) within ½ mile of the Site, and no eagle activity was observed during the survey.

There are no CPW-mapped bald eagle winter night roost areas within ½ mile of the Site.

No further action recommended.

5.2 Burrowing Owls

No suitable burrowing owl (Athene cunicularia) habitat (i.e., prairie dog town) was identified within ¼ mile of the Site, however, burrowing owls were observed approximately 0.42 miles west of the site, further than the CPW-recommended species-specific buffer.

If construction begins between March 15 and October 31, a burrowing owl habitat survey is recommended by qualified biologists prior to construction to confirm no new habitat has been established. If new habitat is observed, burrowing owl surveys will be conducted in accordance with CPW-recommended protocol, and CPW will be consulted if owls are determined to be present.

5.3 Other Raptors

Three inactive non-eagle raptor nests were observed within ½ mile of the Site. One nest is located approximately 365 feet southwest of the Site, a second nest is located approximately 700 feet west from the Site, and a third nest is located approximately 700 feet east of the Site.

If construction begins between February 1 and July 31, additional raptor nesting surveys are recommended. If active raptor nests are observed within CPW's recommended species-specific buffers, consultation with CPW is recommended to determine appropriate mitigation measures.

5.4 Migratory Birds

No migratory bird nests or nesting activity were observed; however, suitable nesting habitat, including surface topography, vegetation, and artificial structures, is present at and immediately surrounding the Site.

If construction begins between April 1 through August 31, migratory bird nesting surveys are recommended. If MBTA-protected active nests are found, Crestone will provide work zone buffers around them while they remain active.

5.5 Threatened, Endangered, and Candidate Species

The IPaC report included six (6) federally listed threatened, endangered, or candidate species that have potential to exist within or in the immediate vicinity of the Site. These species include: piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), pallid sturgeon (*Scaphirhynchus albus*), Ute ladies'-tresses (*Spiranthes diluvialis*), western prairie fringed orchid (*Platanthera praeclara*), and monarch butterfly[1] (*Danaus plexippus*). No suitable habitat for any of these species was identified at the Site.

The Colorado state-listed T&E species that have potential to occur in the same area as the Site are the burrowing owl and the Preble's meadow jumping mouse (PMJM). The burrowing owl is discussed above in Section 5.2. No suitable habitat for the PMJM was observed at the Site.

No further action is recommended.

5.6 Wetlands, Waters of the U.S., and Floodplains

There are three National Hydrography Dataset (NHD)- National Wetland Inventory (NWI)- mapped aquatic features within 500 feet of the Site, however, only two features were field verified present at the time of the survey. Feature one, an NWI-mapped wetland, is mapped within the western edge of the WPS, however, the boundaries determined in the field approximate the wetland 54-feet west of the WPS. Feature two is a stormwater pond with wetland fringe, is located approximately 150-feet west of the WPS. The pond has an ordinary high-water mark (OHWM) and fringe wetlands along the bed and bank. A drainage feature moves water downslope, from north to south, and into the pond. Feature three is an

[1] The monarch butterfly is currently a USFWS candidate species and is not yet listed as threatened or endangered. There are generally no section 7 requirements for candidate species; however, efforts to conserve this species and its associated habitats are strongly encouraged while an official federal listing determination is being considered.

NHD-mapped intermittent lake/pond and NWI-Mapped wetland and is located approximately 40-feet south of the WPS. This feature was field verified not present at the time of the survey.

No additional wetlands, water bodies, or floodplains were documented or observed within or adjacent to the Site. As a result, no impacts to any potential wetlands or waters of the U.S. are expected as a result of project activities associated with the Site.

The Site is not located within a Federal Emergency Management Agency (FEMA)-mapped 100-year floodplain.

Stormwater Best Management Practices are recommended on the western perimeter of the Site to prevent impacts to any wetlands or waters.

5.7 High Priority Habitats

The Site is not located within any CPW-mapped High Priority Habitats.

No further action is recommended.

5.8 Safety or Other Concerns

No safety issues or other concerns were identified at the Site.

No further action is recommended.

6. SUMMARY

The Bennett D Pad is not located within any High Priority Habitats.

Suitable nesting habitat for raptors and other migratory birds exists within CPW-recommended species-specific buffers. Additional wildlife surveys are recommended before construction to ensure no sensitive wildlife resources are impacted.

Groundwater will be sampled in accordance with ECMC Rule 615. Environmental impacts will be mitigated by incorporating site-specific guidance into development plans and implementing additional protection measures as needed.

Crestone and all associated contractors agree to adhere to all relevant operating requirements outlined in this WWPP. In addition to the standard operating requirements, supplementary measures and protocols may be implemented in response to specific needs identified at the Site.

PHOTOS

1. From north of Site facing south.

2. From west of Site facing east.

3. From south of Site facing north.

4. From east of Site facing west.

5. From northeast of the Site facing west.

6. From northwest of the Site facing east.

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APPENDIX A

Environmental Site Assessment Results

CIVITAS
Crestone Peak Resources, LLC

ENVIRONMENTAL SITE ASSESSMENT

RPG RESOURCES
a System One company

Project Name:	Bennett D Pad	**County, State:**	Adams County, CO
Report Date:	9/19/2024	**Region:**	DJ Basin
Inspection Date:	7/31/2024, 9/19/2024, 9/24/2024	**Field Name:**	Wattenberg
Inspector Name:	Miranda Roberts	**Location:**	S34 T3S R64W
ESA Type:	Pad Expansion	**Project Lat-Long:**	39.742061, -104.534070

RAPTORS

Bald and Golden Eagle Habitat:	No	**Status:**	**CLEARED**
Bald and Golden Eagle Active Nests:	No		

No bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*) nests or nesting activity were observed within ½ mile of the Site during the field surveys. There is no suitable eagle nesting habitat (e.g., trees and cliffs) within ½ mile of the Site.

Bald Eagle Winter Night Roost/Communal Roost:	No	**Status:**	**CLEARED**

There are no CPW-mapped bald eagle winter night roosts / communal roosts within 1/2 mile of the Site.

***Burrowing Owls and Black-Tailed Prairie Dog Habitat:**	No	**Status:**	**TEMPORARILY CLEARED**
***Burrowing Owl nests:**	No		

No suitable burrowing owl (*Athene cunicularia*) habitat (i.e., prairie dog town) was identified within ¼ mile of the Site, however, burrowing owls were observed approximately 0.42 miles west of the site, further than the CPW-recommended species-specific buffer.

Other Raptor Habitat:	Yes	**Status:**	**TEMPORARILY CLEARED**
Other Raptor Nests:	Yes		

Three inactive non-eagle raptor nests were observed within ½ mile of the Site. One nest is located within the working pad surface, a second nest is located approximately 217 feet east of the Site, and a third nest is located approximately 283 feet east of the Site.

OTHER BIRDS

Grouse or Prairie Chicken High Priority Habitats:	No	**Status:**	**CLEARED**

The Site is not within any grouse or prairie chicken HPHs.

Non-Raptor Migratory Bird Habitat:	Yes	**Status:**	**TEMPORARILY CLEARED**
Non-Raptor Migratory Bird Nests:	No		

Suitable non-raptor nesting habitat (e.g., surface topography and vegetation) is present at and immediately surrounding the Site, however, no nests or nesting activity were observed during the field surveys.

MAMMALS

Big Game High Priority Habitats:	No	**Status:**	**CLEARED**

The Site is not located within any CPW-mapped High Priority Habitats. Not a constraint.

****Preble's Meadow Jumping Mouse (PMJM) Habitat:**	No	**Status:**	**CLEARED**

There is no suitable PMJM habitat at the Site. Not a constraint.

Swift Fox Habitat:	No	**Status:**	**CLEARED**
Swift Fox Dens:	No		

The Site is not within CPW-mapped swift fox overall range, and no swift fox habitat was observed during the survey. Swift fox habitat is mapped approximately 0.50 miles south of the Site.

VEGETATION

****Ute ladies'-tresses orchid (ULTO):**	No	**Status:**	**CLEARED**

There is no suitable Ute ladies'-tresses orchid habitat at the Site. Not a constraint.

Colorado State Noxious Weeds - List A,B,C:	No	**Status:**	**CLEARED**

No noxious weeds were identified at the Site. Not currently a constraint.

Current Land Use:	Rangeland and O&G	**Future Land Use:**	Rangeland and O&G

CIVITAS
Crestone Peak Resources, LLC

ENVIRONMENTAL SITE ASSESSMENT

RPG RESOURCES
a System One company

AQUATIC HABITATS

Aquatic High Priority Habitats:	No	**Status:**	**CLEARED**
There are no Aquatic High Priority Habitats within 1000 feet of the Site.			
Wetlands/WOUS:	Yes	**Status:**	**CLEARED - Waiver Request Approved**

There are three National Hydrography Dataset (NHD)- National Wetland Inventory (NWI)- mapped aquatic features within 500 feet of the Site, however, only two features were field verified present at the time of the survey. Feature one, an NWI-mapped wetland, is mapped within the western edge of the WPS, however, the boundaries determined in the field approximate the wetland 54-feet west of the WPS. Feature two is a stormwater pond with wetland fringe, is located approximately 150-feet west of the WPS. The pond has an ordinary high-water mark (OHWM) and fringe wetlands along the bed and bank. A drainage feature moves water downslope, from north to south, and into the pond. Feature three is an NHD-mapped intermittent lake/pond and NWI-Mapped wetland and is located approximately 40-feet south of the WPS. This feature was field verified not present at the time of the survey.

OTHER/SAFETY

Other Issues:	No	**Status:**	**CLEARED**
None.			
Safety Issues:	No	**Status:**	**CLEARED**
None.			

FORM 2A

Is HPH Present (309.e(2)A)?	No
If NO, then Wildlife Protection Plan Needed (1201.a)?	Yes
If YES, then Wildlife Mitigation Plan Needed (1201.b)?	No
Is project in State Park or Wildlife Area (309.e(2)A)?	No
Is project in federally designated critical habitat (309.e(2)B)?	No
*****Federal or *Colorado T&E Species Present (309.e(2)B)?***	No
CPW Consultation Needed?	Yes
Vegetation removal scheduled April 1 to August 31 (1202.a(8))?	TBD
Working Pad Surface 500 to 1000' hydraulically upgradient from a HPH (1202.a(10))?	No
Density of O&G locations exceed 1 per square mile w/in HPH (1202.d)?	No
If YES, then Compensatory Mitigation Plan Needed (1203.a(1))	No

FIELD DATA COLLECTED		GENERAL COMMENTS
Site Photos?	Yes	There is suitable non-eagle raptor and migratory bird nesting habitat present. Additional wildlife surveys are recommended prior to the start of construction to ensure no sensitive wildlife resources will be impacted.
Reference Area Photos?	Yes	
Updated Aerial Imagery Taken?	Yes	
Ground Control Points?	Yes	
Wetland Determination Data Form?	Yes	

Reviewed By: Russell Beam **Title:** Senior Environmental Manager

Signature: 

APPENDIX B

Environmental Site Map

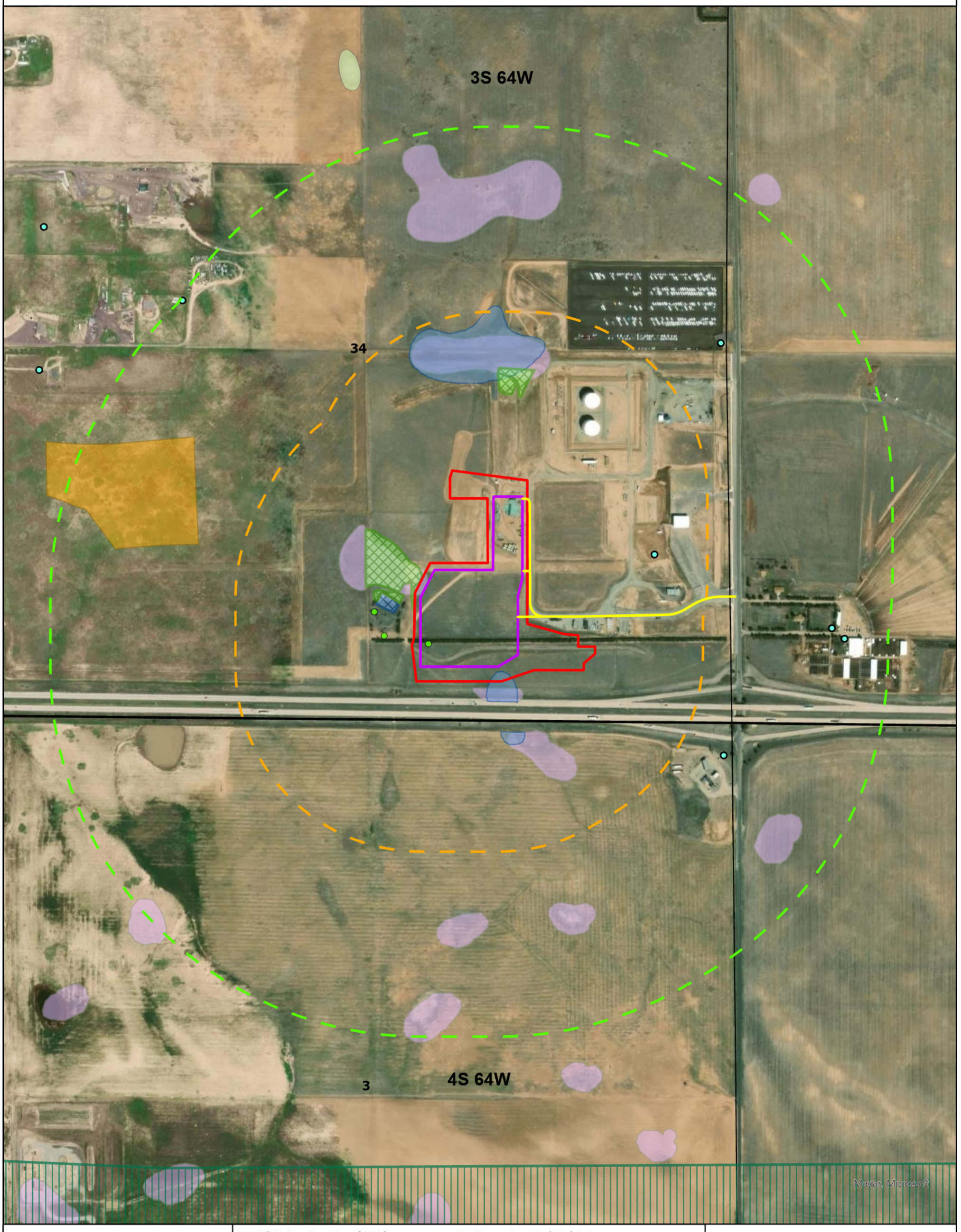
CIVITAS RESOURCES COMPANY, LLC
BENNETT D PAD
SEC34 T3S R64W 6th P.M.
ADAMS COUNTY, COLORADO

Produced for:

CIVITAS
Crestone Peak Resources, LLC

Produced by:

RPG RESOURCES
a System One company



ENVIRONMENTAL SITE MAP

- Oil & Gas Location (OGL)
- Working Pad Surface (WPS)
- Existing Access Road
- 0.25-Mile Buffer Around WPS
- 0.5-Mile Buffer Around WPS
- Inactive Non-Eagle Raptor Nest
- Pronghorn Winter Concentration Area
- HPH
- Burrowing Owl Habitat
- Delineated Wetland
- Delineated Lake/Pond
- NHD-Mapped Lake/Pond
- NWI-Mapped Freshwater Emergent Wetland
- NWI-Mapped Other Wetland
- Constructed Water Well

Projection: WGS 1984
Date: 11/18/2024
Drafted by: HJL

0 500 1,000 Feet

N

1 inch equals 650 feet

Engineering Documents

Site Plans – see Operations Plan

Haul Routes – see Transportation Plan and Written Narrative

Operations and Maintenance (O&M) plan for the existing pond – N/A

Construction Plans – N/A

Pavement Design Report – N/A

Grading Erosion and Sediment Control

Drainage study/technical drainage letter/plan

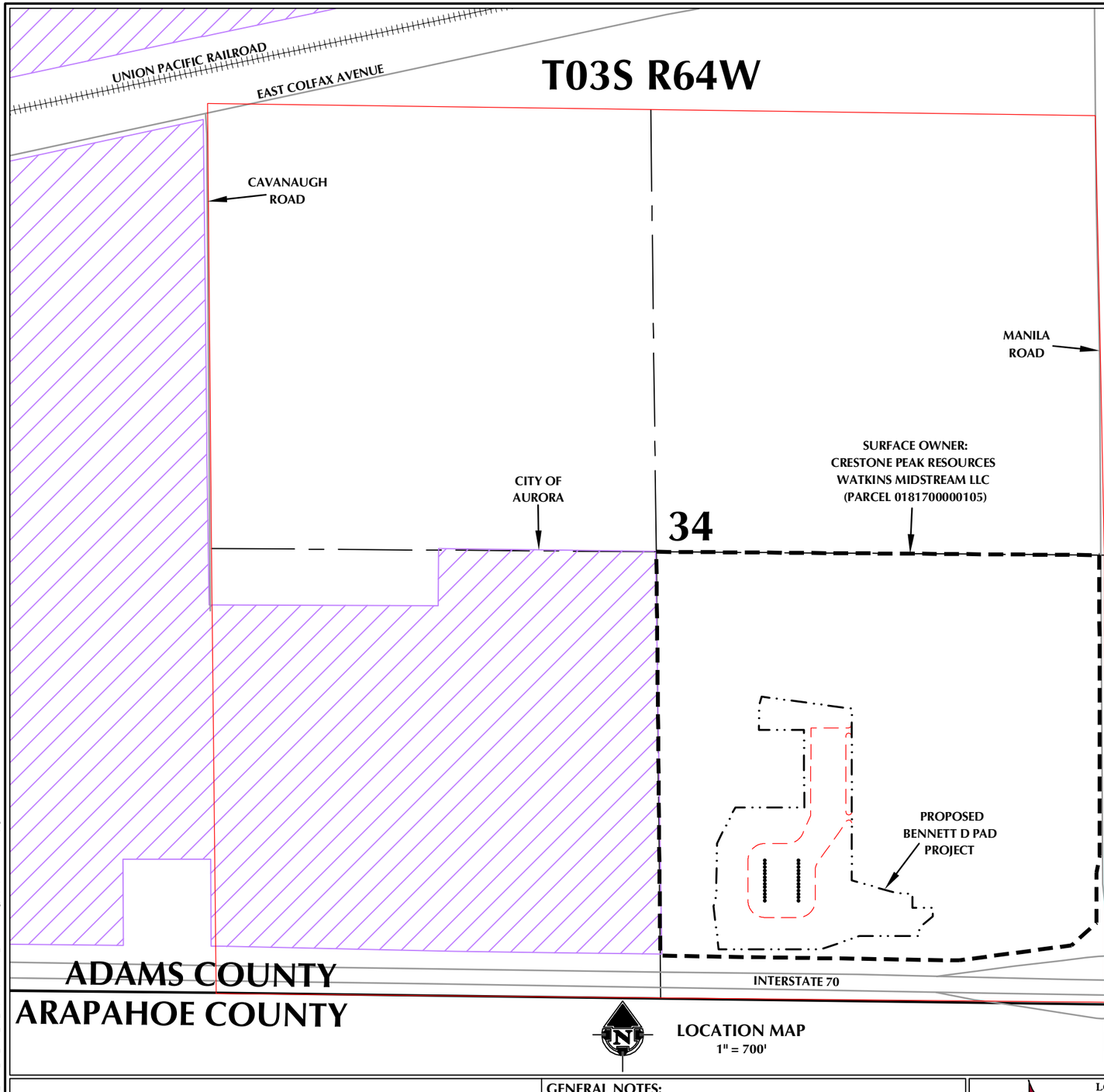
Stormwater Management Plan

Floodplain Use Permit – N/A

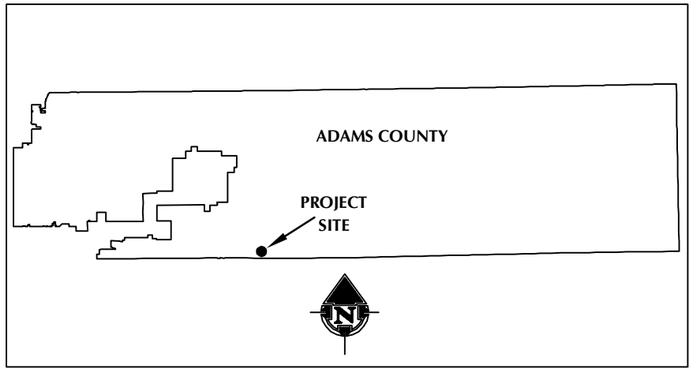
CDPHE storm water discharge permit

BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN

LOCATED IN SECTION 34, T3S, R64W, 6TH P.M.
ADAMS COUNTY, COLORADO



LOCATION MAP
1" = 700'



VICINITY MAP

PAGE INDEX

GENERAL NOTES:

1. THIS DRAINAGE AND EROSION CONTROL PLAN WAS PREPARED FOLLOWING ADAMS COUNTY DEVELOPMENT STANDARDS & REGULATIONS WITH ADDITIONAL DESIGN GUIDANCE PROVIDED BY MILE HIGH FLOOD DISTRICT.
2. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF SEDIMENT AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
3. ORIGINAL DOCUMENT SIZE: 11" X 17"

609 CONSULTING, LLC
LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
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Sheridan, Wyoming 82801
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Prepared For:
CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
COVER SHEET

SCALE:	VARIES	PAGE:	1 OF 8
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

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GENERAL NOTES

1. ALL CONSTRUCTION PROJECTS, REGARDLESS OF THE SIZE, SHALL INSTALL, MAINTAIN AND REPAIR STORMWATER POLLUTION CONTROL MEASURES (CMS) TO EFFECTIVELY MINIMIZE EROSION, SEDIMENT TRANSPORT, AND THE RELEASE OF POLLUTANTS RELATED TO CONSTRUCTION ACTIVITY. CMS EXAMPLES INCLUDE SEDIMENT CONTROL LOGS (SCL), SILT FENCE (SF), DIKES/SWALES, SEDIMENT TRAPS (ST), INLET PROTECTION (IP), OUTLET PROTECTION (OP), CHECK DAMS (CD), SEDIMENT BASINS (SB), TEMPORARY/PERMANENT SEEDING AND MULCHING (MU), SOIL ROUGHENING, MAINTAINING EXISTING VEGETATION AND PROTECTION OF TREES. CMS MUST BE SELECTED, DESIGNED, ADEQUATELY SIZED, INSTALLED AND MAINTAINED IN ACCORDANCE WITH GOOD ENGINEERING, HYDROLOGIC AND POLLUTION CONTROL PRACTICES. CMS/BMPS INSTALLATION AND MAINTENANCE DETAILS SHALL CONFORM TO MILE HIGH FLOOD DISTRICT'S URBAN DRAINAGE FLOOD CONTROL CRITERIA MANUAL VOLUME 3, OR THE COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARDS & SPECIFICATIONS (GREEN BOOK). CMS MUST FILTER, SETTLE, CONTAIN OR STRAIN POLLUTANTS FROM STORMWATER FLOWS IN ORDER TO PREVENT BYPASS OF FLOWS WITHOUT TREATMENT. CMS MUST BE APPROPRIATE TO TREAT THE RUNOFF FROM THE AMOUNT OF DISTURBED AREA, THE EXPECTED FLOW RATE, DURATION, AND FLOW CONDITIONS (I.E., SHEET OR CONCENTRATED FLOW). CMS/BMPS SHALL BE SPECIFIED IN THE SWMP (IF APPLICABLE), AND THE LOCATIONS SHOWN ON THE EC PLAN.
2. PRIOR TO CONSTRUCTION, PROJECTS DISTURBING 1 OR MORE ACRES OF LAND, OR ANY PROJECT BELONGING TO A COMMON PLAN OF DEVELOPMENT DISTURB 1 OR MORE ACRES, MUST OBTAIN:
   - A GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES, FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, AND
   - AN ADAMS COUNTY STORMWATER QUALITY PERMIT WITHIN THE UNINCORPORATED ADAMS COUNTY MS4 AREA.
3. PERMITTED PROJECTS SHALL DEVELOP A STORMWATER MANAGEMENT PLAN (SWMP), AKA EROSION AND SEDIMENT CONTROL PLAN (ESCP), IN COMPLIANCE WITH CDPHE MINIMUM REQUIREMENTS. THE APPROVED SWMP, INCLUDING EROSION CONTROL (EC) PLAN (SITE MAP), SHALL BE KEPT ON SITE AND ALWAYS UPDATED. THE QUALIFIED STORMWATER MANAGER IS RESPONSIBLE FOR IMPLEMENTING THE SWMP AND CMS (AKA BMPS) DURING CONSTRUCTION.
4. PERMITTED PROJECTS SHALL PERFORM REGULAR STORMWATER INSPECTIONS EVERY 7 CALENDAR DAYS; OR EVERY 14 CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY PRECIPITATION OR SNOWMELT EVENT THAT CAUSES SURFACE EROSION. INSPECTION FREQUENCY CAN BE REDUCED FOR POST-STORM EVENT INSPECTIONS AT TEMPORARILY IDLE SITES AND FOR STORMWATER INSPECTIONS AT COMPLETED SITES WAITING FOR FINAL STABILIZATION. INSPECTION REPORTS MUST IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE.
5. TRACKING OF DIRT ONTO PAVED PUBLIC OR PRIVATE PAVED ROADS IS NOT ALLOWED. THE USE OF DIRT RAMPS TO ENTER/EXIT FROM AN UNPAVED INTO A PAVED AREA IS PROHIBITED. VEHICLE TRACKING CONTROLS SHALL BE IMPLEMENTED, OTHERWISE ENTRANCE AREA MUST DRAIN THROUGH A CM TOWARDS THE PRIVATE SITE.
6. TRUCKLOADS OF FILL MATERIAL IMPORTED TO OR CUT MATERIAL EXPORTED FROM THE SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF THE MATERIAL DURING TRANSPORTATION ON PUBLIC ROW. HAUL ROUTES MUST BE PERMITTED BY THE COUNTY. NO MATERIAL SHALL BE TRANSPORTED TO ANOTHER SITE WITHOUT APPLICABLE PERMITS.
7. CONTROL MEASURES DESIGNED FOR CONCRETE WASHOUT WASTE MUST BE IMPLEMENTED. THIS INCLUDES WASHOUT WASTE DISCHARGED TO THE GROUND AND WASHOUT WASTE FROM CONCRETE TRUCKS AND MASONRY OPERATIONS.
8. TEMPORARY CMS/BMPS SHALL BE REMOVED AFTER THE SITE HAS REACHED FINAL STABILIZATION.
9. DEWATERING OPERATIONS DISCHARGING OFF-SITE INTO ANY WATERS CONVEYANCE SYSTEMS INCLUDING WETLANDS, IRRIGATION DITCHES, CANALS, RIVERS, STREAMS OR STORM SEWER SYSTEMS, REQUIRE A STATE CONSTRUCTION DEWATERING PERMIT.
10. PERMITTED PROJECTS SHALL KEEP THE CDPHE'S STORMWATER DISCHARGE PERMIT, STORMWATER MANAGEMENT PLAN (SWMP) AND INSPECTION LOGS AVAILABLE ON-SITE THROUGHOUT THE DURATION OF THE PROJECT, AND FOR AN ADDITIONAL 3 YEARS AFTER PERMIT CLOSE-OUT.
11. PERMITTED LANDOWNER AND/OR CONTRACTOR SHALL CLOSE THE STATE AND CITY/COUNTY PERMIT ONCE FINAL STABILIZATION IS REACHED. STORMWATER INSPECTIONS SHALL CONTINUE UNTIL INACTIVATION NOTICE IS FILED WITH CDPHE.

PERFORMANCE STANDARD NOTES

1. STORMWATER RUNOFF FROM DISTURBED AREAS MUST FLOW TO AT LEAST ONE (1) CM TO MINIMIZE SEDIMENT IN THE DISCHARGE. DO NOT ALLOW SEDIMENT TO LEAVE THE SITE. THE BEST WAY TO PREVENT SEDIMENT OR POLLUTANTS FROM ENTERING THE STORM SEWER SYSTEM IS TO STABILIZE THE SITE AS QUICKLY AS POSSIBLE, PREVENTING EROSION AND STOPPING SEDIMENT RUN-OFF AT ITS SOURCE.
2. PHASE CONSTRUCTION TO MINIMIZE DISTURBED AREAS, INCLUDING DISTURBANCE OF STEEP SLOPES (I.E., THE ENTIRE PROJECT SITE SHOULD NOT BE DISTURBED IF CONSTRUCTION WILL ONLY BE OCCURRING IN ONE SECTION OF THE SITE). LIMIT SOIL EXPOSURE TO THE SHORTEST POSSIBLE PERIOD OF TIME. PROTECT NATURAL FEATURES AND EXISTING VEGETATION WHENEVER POSSIBLE. REMOVAL OF EXISTING VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATIONS. MAINTAIN PRE-EXISTING VEGETATION (OR EQUIVALENT CMS) FOR AREAS WITHIN 50 HORIZONTAL FT OF RECEIVING WATERS.
3. SOIL COMPACTION MUST BE MINIMIZED FOR AREAS WHERE INFILTRATION CMS WILL OCCUR OR WHERE FINAL STABILIZATION WILL BE ACHIEVED THROUGH VEGETATIVE COVER.
4. ALL SOIL IMPORTED TO OR EXPORTED FROM THE SITE SHALL BE PROPERLY COVERED TO PREVENT THE LOSS OF MATERIAL DURING TRANSPORT.
5. DUST EMISSIONS RESULTING FROM GRADING ACTIVITIES OR WIND SHALL BE CONTROLLED.
6. INSTALL CONSTRUCTION FENCE (ORANGE) TO PROTECT WETLANDS AND OTHER SENSITIVE AREAS AND TO PREVENT ACCESS, AND TO DELINEATE THE LIMITS OF CONSTRUCTION. DO NOT USE SILT FENCE TO PROTECT WETLANDS SINCE TRENCHING MAY IMPACT THESE AREAS.
7. CMS INTENDED TO CAPTURE OVERLAND, LOW VELOCITY SHEET FLOW AT A LEVEL GRADE SHALL ONLY BE INSTALLED ALONG CONTOURS.
8. INSTALL CMS, SUCH AS CHECK DAMS, PERPENDICULAR TO THE CONCENTRATED FLOWS TO REDUCE FLOW VELOCITY.
9. STORM DRAIN INLETS WITHIN AND ADJACENT TO THE CONSTRUCTION SITE MUST BE PROTECTED. ANY PONDING OF STORMWATER AROUND INLET PROTECTION MUST NOT CAUSE EXCESSIVE FLOODING OR DAMAGE ADJACENT AREAS OR STRUCTURES.
10. INSTALL VEHICLE TRACKING CONTROL (VTC) TO ENTER/EXIT UNPAVED AREA. DO NOT USE RECYCLED CRUSHED CONCRETE OR ASPHALT MILLINGS FOR VEHICLE TRACKING PADS.
11. STRAW BALES SHALL NOT BE USED FOR PRIMARY EROSION OR SEDIMENT CONTROL (I.E., STRAW BALES MAY BE USED FOR REINFORCEMENT BEHIND ANOTHER BMP SUCH AS SILT FENCE).
12. OUTLETS SYSTEMS (SUCH AS SKIMMER OR PERFORATED RISER PIPE) SHALL BE INSTALLED TO WITHDRAW WATER FROM OR NEAR THE SURFACE LEVEL WHEN DISCHARGING FROM BASINS. WATER CANNOT DRAIN FROM THE BOTTOM OF THE POND.
13. TEMPORARY STABILIZATION MUST BE IMPLEMENTED FOR EARTH DISTURBING ACTIVITIES ON ANY PORTION OF THE SITE WHERE LAND DISTURBING ACTIVITIES HAVE PERMANENTLY OR TEMPORARILY CEASED (FOR MORE THAN 14 CALENDAR DAYS). TEMPORARY STABILIZATION METHODS EXAMPLES: TARPS, SOIL TACKIFIER, AND HYDROSEED. TEMPORARY STABILIZATION REQUIREMENT MAY EXCEED THE 14-DAY SCHEDULE WHEN EITHER THE FUNCTION OF THE SPECIFIC AREA REQUIRES IT TO REMAIN DISTURBED, OR PHYSICAL CHARACTERISTICS OF THE TERRAIN AND CLIMATE PREVENT STABILIZATION AS LONG AS THE CONSTRAINTS AND ALTERNATIVE SCHEDULE IS DOCUMENTED ON THE SWMP, AND LOCATIONS ARE IDENTIFIED ON THE EC PLAN (SITE MAP).
14. RUNOFF FROM STOCKPILE AREA MUST BE CONTROLLED. SOILS THAT WILL BE STOCKPILED FOR MORE THAN 30 DAYS SHALL BE PROTECTED FROM WIND AND WATER EROSION WITHIN 14 DAYS OF STOCKPILE CONSTRUCTION. INSTALL CMS/BMPS 5 FT AWAY FROM THE TOE OF THE STOCKPILE'S SLOPE.
15. WATER USED TO CLEAN CONCRETE TRUCKS SHALL BE DISCHARGED INTO A CONCRETE WASHOUT AREA (CWA). THE PREDEFINED CONTAINMENT AREA MUST BE IDENTIFIED WITH A SIGN AND SHALL ALLOW THE LIQUIDS TO EVAPORATE OR DRY OUT. CWA DISCHARGES THAT MAY REACH GROUNDWATER MUST FLOW THROUGH SOIL THAT HAS BUFFERING CAPACITY PRIOR TO REACHING GROUNDWATER. THE CONCRETE WASHOUT LOCATION SHALL NOT BE IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT AND WOULD RESULT IN BUFFERING CAPACITY NOT BEING ADEQUATE, SUCH AS NEAR NATURAL DRAINAGES, SPRINGS, OR WETLANDS. IN THIS CASE, A LINER UNDERNEATH IS NEEDED FOR AREAS WITH HIGH GROUNDWATER LEVELS. CWA SHALL NOT BE PLACED IN LOW AREAS, DITCHES OR ADJACENT TO STATE WATERS. PLACE CWA 50 FT AWAY FROM STATE WATERS.
16. WASTE, SUCH AS BUILDING MATERIALS, WORKERS' TRASH AND CONSTRUCTION DEBRIS, MUST BE PROPERLY MANAGED TO PREVENT STORMWATER POLLUTION.
17. INSTALL STABILIZED STAGING AREA (SSA) TO STORE MATERIALS, CONSTRUCTION TRAILERS, ETC.
18. IF CONDITIONS IN THE FIELD WARRANT ADDITIONAL CMS/BMPS TO THE ONES ORIGINALLY APPROVED ON THE SWMP OR EC PLAN (CIVIL DRAWING), THE LANDOWNER OR CONTRACTOR SHALL IMPLEMENT MEASURES DETERMINED NECESSARY, AS DIRECTED BY THE COUNTY.
19. PERMANENT CMS/BMPS FOR SLOPES, CHANNELS, DITCHES, OR DISTURBED LAND AREA SHALL BE PERFORMED IMMEDIATELY AFTER FINAL GRADING. CONSIDER THE USE EROSION CONTROL BLANKETS ON SLOPES 3:1 OR STEEPER AND AREAS WITH CONCENTRATED FLOWS SUCH AS SWALES, LONG CHANNELS AND ROADSIDE DITCHES.
20. THE DISCHARGE OF SANITARY WASTE INTO THE STORM SEWER SYSTEM IS PROHIBITED. PORTABLE TOILETS MUST BE PROVIDED, SECURED AND PLACED ON PERMEABLE SURFACES, AWAY FROM THE CURBSIDE, STORM INLETS AND/OR DRAINAGE WAYS.
21. REMOVE TEMPORARY CMS/BMPS ONCE FINAL STABILIZATION IS REACHED, UNLESS OTHERWISE AUTHORIZED.
22. FINAL STABILIZATION MUST BE IMPLEMENTED. FINAL STABILIZATION IS REACHED WHEN ALL SOIL DISTURBING ACTIVITIES HAVE BEEN COMPLETED, AND EITHER A UNIFORM VEGETATIVE COVER HAS BEEN ESTABLISHED WITH AN INDIVIDUAL PLANT DENSITY OF AT LEAST 70% OF PRE-DISTURBANCE LEVELS, OR EQUIVALENT PERMANENT ALTERNATIVE METHOD HAS BEEN IMPLEMENTED.
23. PROVIDE SPILL PREVENTION AND CONTAINMENT MEASURES FOR CONSTRUCTION MATERIALS, WASTE AND FUEL STORAGE AREAS. BULK STORAGE (55 GALLONS OR GREATER) OF PETROLEUM PRODUCTS AND LIQUID CHEMICALS MUST HAVE SECONDARY CONTAINMENT, OR EQUIVALENT PROTECTION, IN ORDER TO CONTAIN SPILLS AND TO PREVENT SPILLED MATERIAL FROM ENTERING STATE WATERS.
24. REPORT SPILLS OR RELEASES OF CHEMICAL, OIL, PETROLEUM PRODUCT, SEWAGE, ETC., WHICH MAY REACH THE STORM SEWER OR ENTER STATE WATERS WITHIN 24-HOURS FROM TIME OF DISCOVERY. GUIDANCE AVAILABLE AT HTTPS://CDPHE.COLORADO.GOV/REPORT-CONCERN-EMERGENCY STATE OF COLORADO SPILL-LINE: 1-877-518-5608. ADAMS COUNTY STORMWATER HOTLINE: SWQ@ADCOGOV.ORG; PUBLIC WORKS 720-523-6875 OR PUBLICWORKS@ADCOGOV.ORG AND ADAMS COUNTY PUBLIC HEALTH DEPARTMENT AT 303-288-6816

MAINTENANCE STANDARD NOTES

1. MAINTAIN AND REPAIR CMS ACCORDING TO APPROVED EROSION CONTROL PLAN (CIVIL DRAWING) TO ASSURE THEY CONTINUE PERFORMING AS ORIGINALLY INTENDED.
2. CMS/BMPS REQUIRING MAINTENANCE OR ADJUSTMENT SHALL BE REPAIRED IMMEDIATELY AFTER OBSERVATION OF THE FAILING BMP.
3. CMS SHALL BE CLEANED WHEN SEDIMENT LEVELS ACCUMULATE TO HALF THE DESIGN UNLESS OTHERWISE SPECIFIED.
4. SWMP AND EC PLAN SHALL BE CONTINUOUSLY UPDATED TO REFLECT NEW OR REVISED CMS/BMPS DUE TO CHANGES IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, TO ACCURATELY REFLECT THE ACTUAL FIELD CONDITIONS. A NOTATION SHALL BE MADE IN THE SWMP, INCLUDING DATE OF CHANGES IN THE FIELD, IDENTIFICATION OF THE CMS REMOVED, MODIFIED OR ADDED, AND THE LOCATIONS OF THOSE CMS. UPDATES MUST BE MADE WITHIN 72-HOURS FOLLOWING THE CHANGE.
5. MAINTAIN VEHICLE TRACKING CONTROL (VTC), IF SEDIMENT TRACKING OCCURS, CLEAN-UP IMMEDIATELY. SWEEP BY HAND OR THE USE STREET SWEEPERS (WITH VACUUM SYSTEM). FLUSHING OFF PAVED SURFACES WITH WATER IS PROHIBITED.
6. CWA MUST BE CLEANED ONCE WASTE ACCUMULATION REACHES ¾ OF THE WET STORAGE CAPACITY OF THE STRUCTURE. LEGALLY DISPOSED OF CONCRETE WASTE. DO NOT BURY ON-SITE.
7. CLEAN-UP SPILLS IMMEDIATELY AFTER DISCOVERY OR CONTAIN UNTIL APPROPRIATE CLEANUP METHODS CAN BE EMPLOYED. FOLLOW MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP, ALONG WITH PROPER DISPOSAL METHODS. RECORDS OF SPILLS, LEAKS, OR OVERFLOWS THAT RESULT IN DISCHARGE OF POLLUTANTS MUST BE DOCUMENTED AND MAINTAINED.
8. REMOVE SEDIMENT FROM STORM SEWER INFRASTRUCTURE (PONDS, STORM PIPES, OUTLETS, INLETS, ROADSIDE DITCHES, ETC.), AND RESTORE VOLUME CAPACITY UPON COMPLETION OF PROJECT OR PRIOR TO INITIAL ACCEPTANCE OF PUBLIC IMPROVEMENTS (IF APPLICABLE). DO NOT FLUSH SEDIMENT OFFSITE, CAPTURE ON-SITE AND DISPOSED OF AT AN APPROVED LOCATION.

GENERAL NOTES:

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CRESTONE PEAK RESOURCES, LLC
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BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
NOTES

SCALE:	N/A	PAGE:	2 OF 8
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

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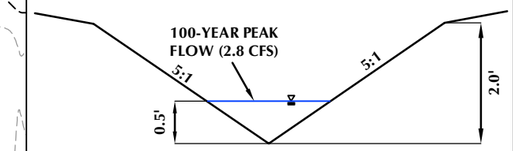
CULVERT ID	SIZE	LENGTH (FT)	ELEVATION (FT)		GRADE
			INLET INVERT	OUTLET INVERT	
PC1	12" CMP	40	5572.5	5571.1	3.5%
PC2	12" CMP	40	5570.0	5568.8	3.0%
PC3	12" CMP	40	5566.1	5566.0	0.3%

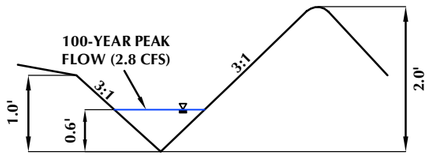
EXISTING CULVERT
EXISTING CULVERT
EXISTING DETENTION POND
400'
EXISTING 400' X 850' MAINTENANCE EASEMENT
SURFACE OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC (PARCEL 0181700000105)
PROPOSED CULVERT #3 (PC3)
PERMANENT ACCESS ROAD
PERMANENT DITCH #1
PERMANENT ACCESS ROAD
EXISTING DITCH
PROPOSED CULVERT #1 (PC1)
TOPSOIL STOCKPILE
TEMPORARY DITCH RE-ROUTE
TEMPORARY ACCESS ROAD
PROPOSED CULVERT #2 (PC2)
BENNETT D PAD FACILITY
100-YEAR STORAGE ELEVATION 5564.9'
PERMANENT DITCH #2
EXISTING TOPSOIL STOCKPILE
SPILLWAY
DETENTION BASIN
DETENTION BASIN OUTLET
CUT
FILL
BENNETT D PAD WELL PAD
INTERSTATE 70
PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
EXISTING 20' ACCESS EASEMENT
DELINEATED WETLAND
EXISTING POND
20' X 20' X 3' SEDIMENT TRAP
0.5% SLOPE
A
A'
B
B'
C
C'

0 100' 200'
1" = 200'
1' CONTOURS

EXISTING DITCH CROSS SECTION



PERMANENT DITCH #1 CROSS SECTION



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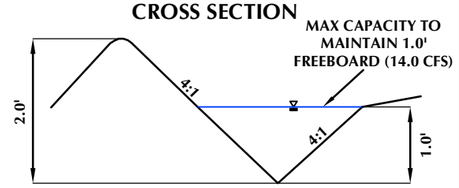
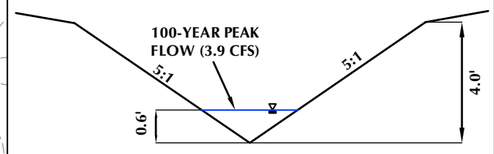


TEMPORARY DITCH RE-ROUTE CROSS SECTION



LEGEND

- EXISTING CONTOUR
- EXISTING ROAD
- EPL — EXISTING PIPELINE
- UGP — EXISTING BURIED POWERLINE
- OHP — EXISTING OVERHEAD POWERLINE
- PROPOSED OIL AND GAS LOCATION
- PROPOSED CONTOUR
- PROPOSED ACCESS ROAD/PAD
- PROPOSED WELL
- PROPERTY LINE
- PROPOSED DIVERSION DITCH
- PROPOSED BERM / OFF-SITE FLOW DEFLECTION
- PROPOSED CULVERT PROTECTION / RIPRAP
- PROPOSED SEDIMENT TRAP WITH PROTECTED OUTLET
- SP — PROPOSED SLOPE PROTECTION
- 100-YEAR STORMWATER STORAGE FOOTPRINT
- STORMWATER DRAINAGE
- EASEMENT/ROW
- EXISTING DITCH

GENERAL NOTES:

1. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF SEDIMENT AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).
3. SLOPE PROTECTION USED FOR TEMPORARY EROSION CONTROL ON CUT/FILL SLOPES AND SOIL STOCKPILES.

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CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
CONSTRUCTION PHASE SITE PLAN

SCALE:	1" = 200'	PAGE:	3 OF 8
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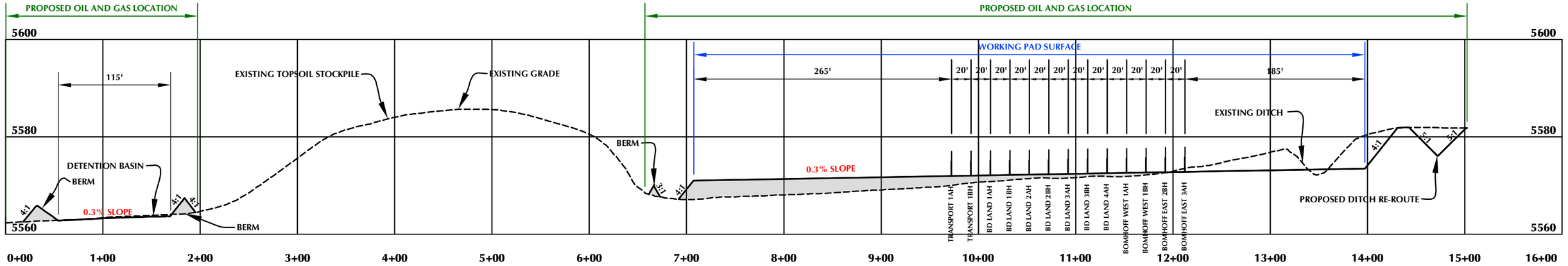

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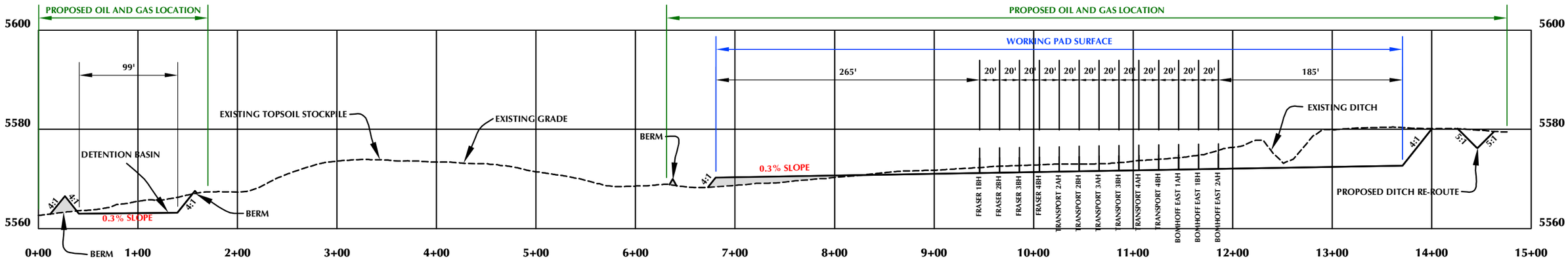

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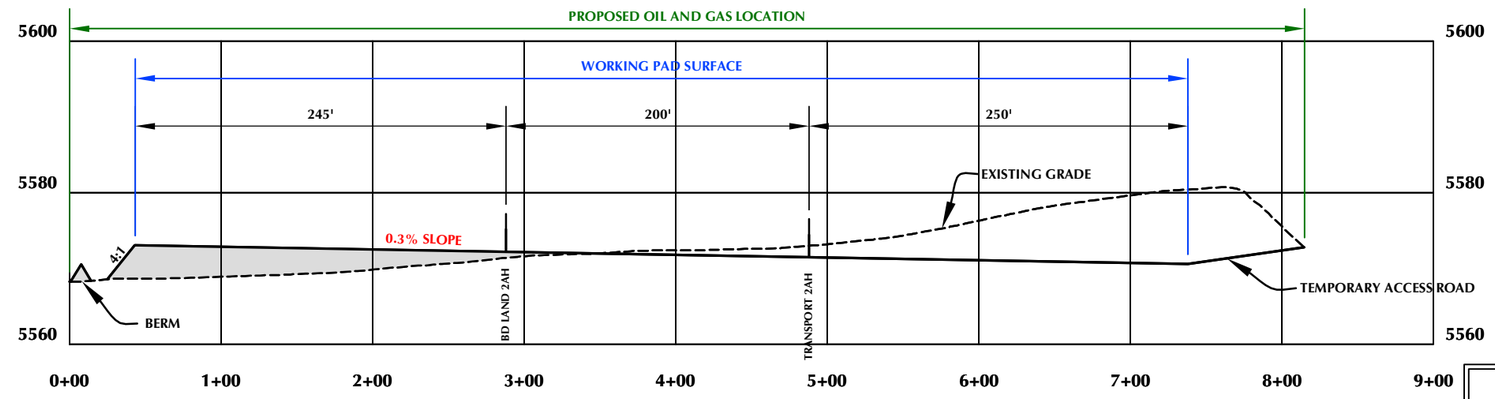

CROSS SECTION C-C'

HORIZONTAL 0 50' 100' 1" = 100'

VERTICAL 0 10' 20' 1" = 20'

GENERAL NOTES:

1. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).

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DENVER, CO 80202

BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
CROSS SECTIONS

SCALE:	1" = 100'	PAGE:	4 OF 8
JOB NUMBER:	23-182	DATE:	10/21/24
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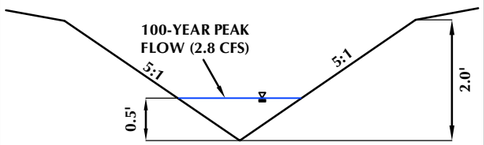
CULVERT ID	SIZE	LENGTH (FT)	ELEVATION (FT)		GRADE
			INLET INVERT	OUTLET INVERT	
PC1	12" CMP	40	5572.5	5571.1	3.5%
PC2	12" CMP	40	5570.0	5568.8	3.0%

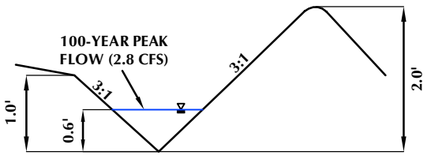
EXISTING CULVERT
EXISTING CULVERT
EXISTING DETENTION POND
400'
EXISTING 400' X 850' MAINTENANCE EASEMENT
SURFACE OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC (PARCEL 0181700000105)
PROPOSED CULVERT #3 (PC3)
PERMANENT ACCESS ROAD
PERMANENT DITCH #1
PERMANENT ACCESS ROAD
PROPOSED CULVERT #2 (PC2)
EXISTING DITCH
BENNETT D PAD FACILITY
100-YEAR STORAGE ELEVATION 5564.0'
0.5% SLOPE
SEEDED TOPSOIL STOCKPILE (FOR FINAL REC)
PERMANENT DITCH #2
EXISTING TOPSOIL STOCKPILE
DETENTION BASIN
SPILLWAY
DETENTION BASIN OUTLET
BENNETT D PAD WELL PAD
DRAINAGE SWALE
INTERSTATE 70
PRODUCTION PHASE OPERATIONAL AREA (7.42 ACRES)
PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
EXISTING 20' ACCESS EASEMENT
DELINEATED WETLAND
EXISTING POND

0 100' 200'
1" = 200'
1' CONTOURS

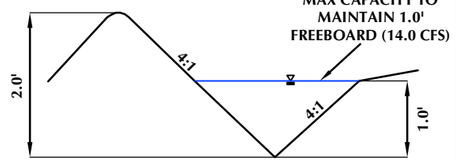
EXISTING DITCH CROSS SECTION



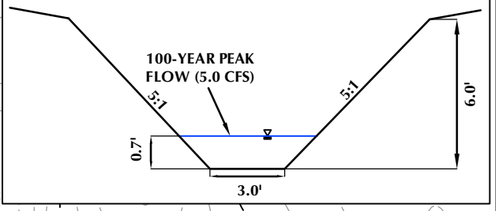
PERMANENT DITCH #1 CROSS SECTION



PERMANENT DITCH #2 CROSS SECTION



DRAINAGE SWALE CROSS SECTION



LEGEND

- EXISTING CONTOUR
- EXISTING ROAD
- EXISTING PIPELINE
- EXISTING BURIED POWERLINE
- EXISTING OVERHEAD POWERLINE
- PROPOSED OIL AND GAS LOCATION
- PROPOSED CONTOUR
- PROPOSED ACCESS ROAD/PAD
- PROPOSED WELL
- PROPERTY LINE
- PERMANENT DIVERSION DITCH
- PROPOSED BERM / OFF-SITE FLOW DEFLECTION
- PROPOSED CULVERT PROTECTION / RIPRAP
- RECLAMATION BOUNDARY
- PROPOSED PERMANENT SEEDING
- 100-YEAR STORMWATER STORAGE FOOTPRINT
- STORMWATER DRAINAGE
- EASEMENT/ROW
- EXISTING DITCH

GENERAL NOTES:

1. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).
3. RECLAIMED AREA WILL BE RE-SEEDED AND RE-VEGETATED.

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BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
PRODUCTION PHASE SITE PLAN

SCALE:	1" = 200'	PAGE:	5 OF 8
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DRAFTED BY:	KMG	REVISED:	

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OUTLET PROTECTION

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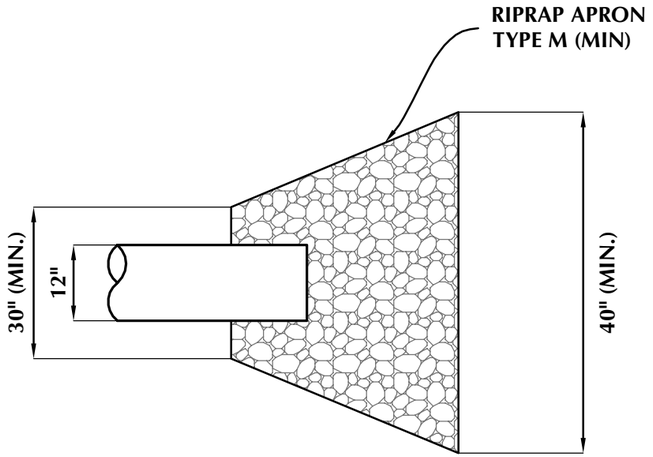
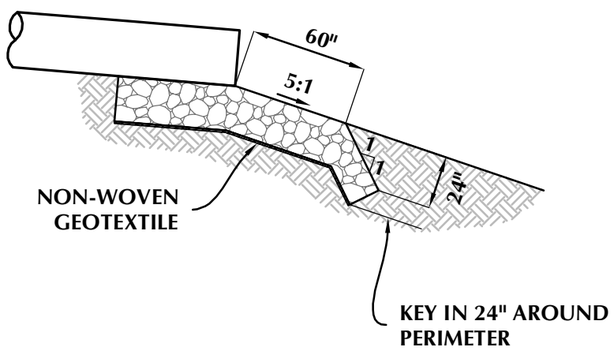
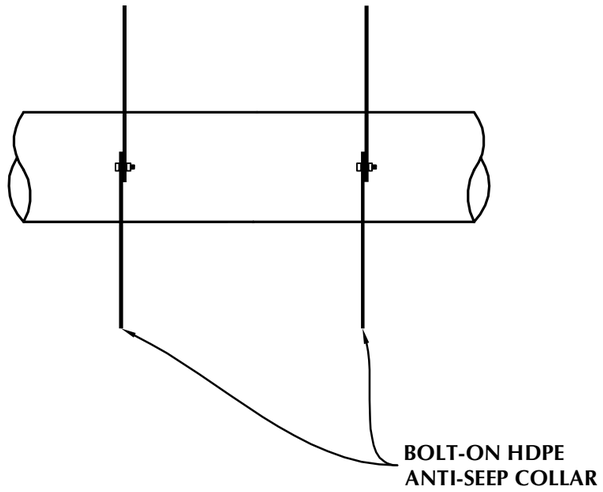
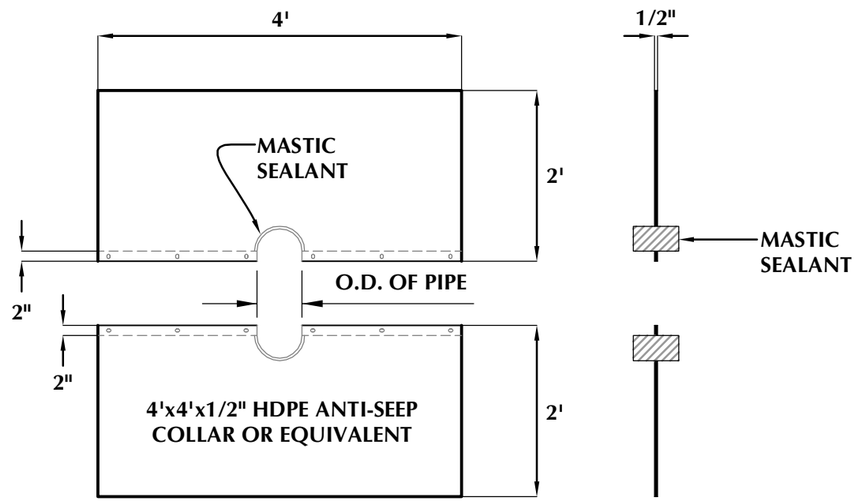




ANTI-SEEP COLLAR

SCALE: NTS





GENERAL NOTES:

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BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
OUTLET DETAILS

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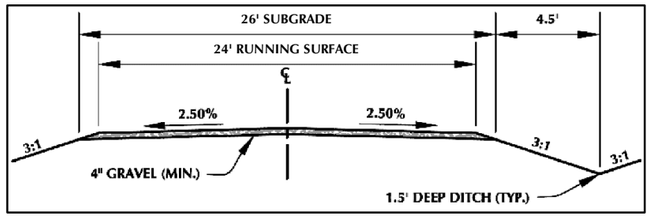


CROSS-SECTION
NTS

Temporary and Permanent Seeding (TS/PS)

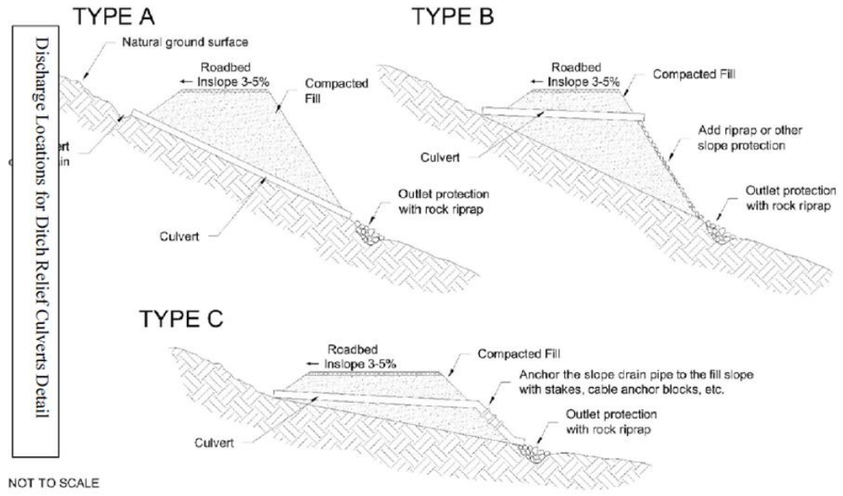
TS/PS

ADAMS COUNTY, COLORADO

SEED MIX	APPLICATION RATE (lbs/acre)
PBSI Dryland Aggressive Mix	25
(20%) Green Needlegrass, Lodorm	
(20%) Slender Wheatgrass, Native	
(20%) Western Wheatgrass, Native	
(20%) Pubescent Wheatgrass, Luna	
(20%) Intermediate Wheatgrass, Oahe/Rush	
PBSI Native Prairie Mix	15
(25%) Blue Grama	
(10%) Buffalograss	
(20%) Green Needlegrass	
(20%) Sideoats Grama	
(25%) Western Wheatgrass	
PBSI Native Sandyland Mix	15
(20%) Yellow Indiangrass	
(10%) Little Bluestem	
(10%) Indian Rice Grass	
(10%) Sideoats Grama	
(10%) Sand Lovegrass	
(10%) Prairie Sandreed	
(20%) Switchgrass	
PBSI Premium Irrig. Pasture Mix #1	25
(75%) Meadow Bromegrass, Paddock/Fleet	
(25%) Orchardgrass, Elsie/Megabite/Paiute	

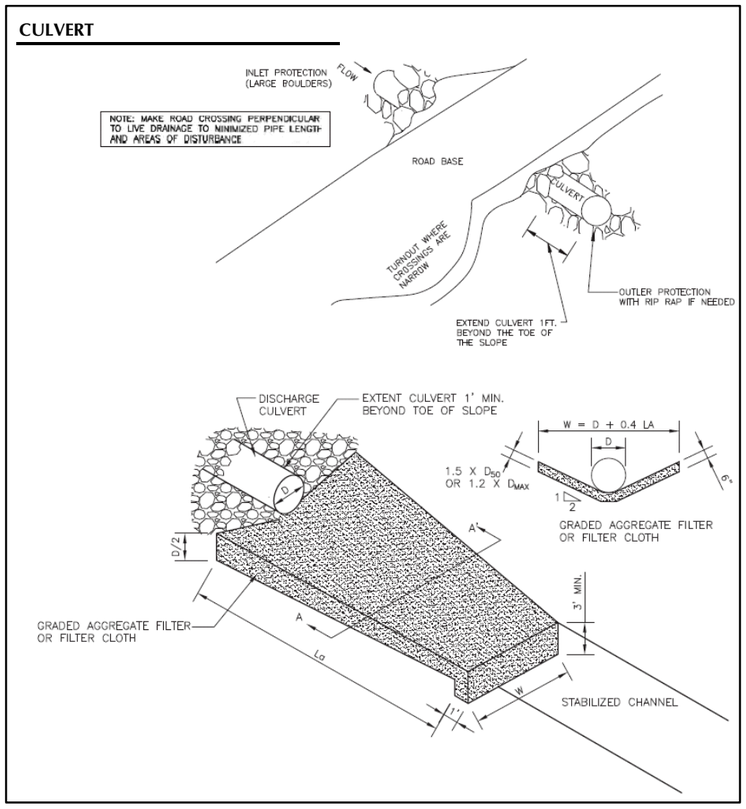
Notes:
lbs/acre = pounds per acre
% = percent

CULVERT



NOT TO SCALE

CULVERT



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BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
BMP TYPICALS (A)

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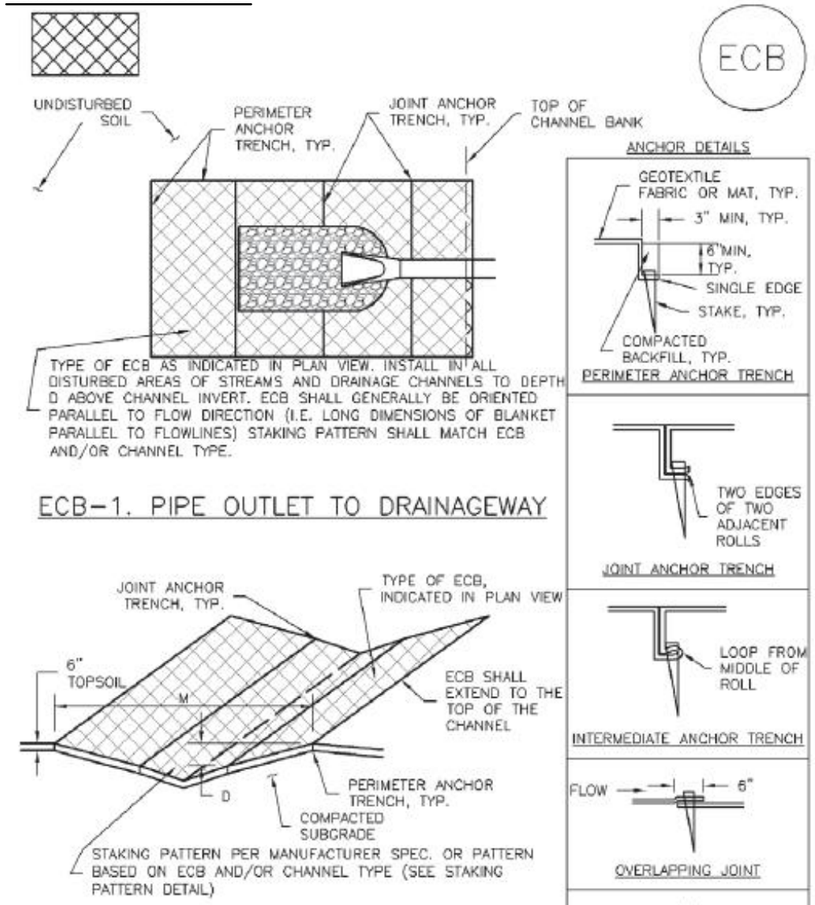
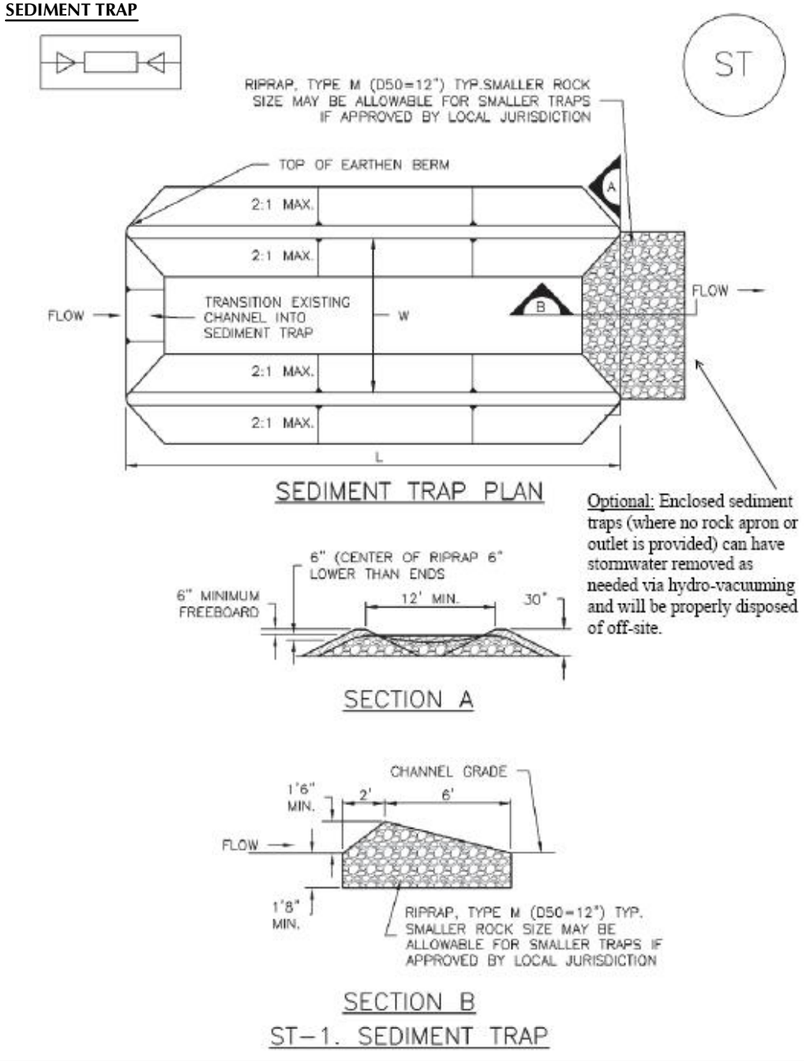
EROSION CONTROL BLANKET



SEDIMENT TRAP



Optional: Enclosed sediment traps (where no rock apron or outlet is provided) can have stormwater removed as needed via hydro-vacuuming and will be properly disposed of off-site.

GENERAL NOTES:

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BENNETT D PAD
GRADING, EROSION AND SEDIMENT CONTROL PLAN
BMP TYPICALS (B)

SCALE:	VARIES	PAGE:	8 OF 8
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DRAFTED BY:	KMG	REVISED:	

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Preliminary Drainage Report for Bennett D Pad

Prepared for:

Crestone Peak Resources Operating LLC

A Wholly-Owned Subsidiary of Civitas Resources, Inc.

555 17th Street

Suite 3700

Denver, Colorado 80202

Submitted to:

Adams County Planning & Development Department

4430 South Adams County Parkway

1st Floor, Suite W2000

Brighton, Colorado 80601

October 2024

609 Consulting, LLC

Engineering, Surveying, Consulting & Design

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Letter of Transmittal

To: Adams County Planning & Development Department
4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, Colorado 80601

cc: Mr. Dan Harrington, Crestone Peak Resources Operating LLC
Mr. Jeff Annable, Crestone Peak Resources Operating LLC

From: Ms. Kathleen Goles, PE
609 Consulting
1095 Saberton Avenue
Sheridan, Wyoming 82801

Date: October 21, 2024

Subject: Bennett D Pad - Preliminary Drainage Report

To Adams County Planning & Development Department:

On behalf of Crestone Peak Resources Operating LLC, a wholly-owned subsidiary of Civitas Resources, Inc., we are pleased to submit the Preliminary Drainage Report for Bennett D Pad. The purpose of this report is to discuss and summarize the stormwater drainage analysis and design performed for the proposed Bennett D Pad well pad and production facility. The proposed project will be located in the southeast quarter of Section 34 of Township 3 South, Range 64 West in Adams County, Colorado.

The drainage analysis and design were prepared referencing the Adams County Development Standards & Regulations as well as the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual. We believe the analysis and design satisfy all Adams County drainage requirements.

We greatly appreciate your time and consideration in reviewing this submittal. We look forward to your review and comments. Please contact us with any questions you may have.

Respectfully,

Kathleen M. Goles

Kathleen Goles
Registered Professional Engineer
State of Colorado No. 63868

ENGINEER CERTIFICATION OF DRAINAGE REPORT

I hereby certify that this report (plan) for the Preliminary Drainage design of Bennett D Pad was prepared by me or under my direct supervision in accordance with the provisions of Adams County Storm Drainage Design and Technical Criteria for the owners thereof. I understand that Adams County does not and will not assume liability for drainage facilities designed by others.

Date

Kathleen Goles
Registered Professional Engineer
State of Colorado No. 63868

DEVELOPER CERTIFICATION OF DRAINAGE FACILITIES

Crestone Peak Resources Operating LLC, a wholly-owned subsidiary of Civitas Resources, Inc., hereby certifies that the drainage facilities for Bennett D Pad shall be constructed according to the design presented in this report. I understand that Adams County does not and will not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that Adams County reviews drainage plans pursuant to Colorado Revised Statues Title 30, Article 28; but cannot, on behalf of Bennett D Pad, guarantee that final drainage design review will absolve Crestone Peak Resources Operating LLC, a wholly-owned subsidiary of Civitas Resources, Inc., and/or their successors and/or assigns the future liability for improper design. I further understand that approval of the Final Plat and/or Final Development Plan does not imply approval of my engineer's drainage design.

Date

Crestone Peak Resources Operating LLC
A wholly-owned subsidiary of Civitas Resources, Inc.

Name of Developer

Authorized Signature

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APPENDICES

1.0 PROJECT DESCRIPTION AND LOCATION

Crestone Peak Resources Operating LLC is proposing the construction and development of an oil/gas well pad and production facility, Bennett D Pad, located in the southeast quarter of Section 34, Township 3 South, Range 64 West in Adams County, Colorado. Per the requirements outlined in the Adams County Development Standards & Regulations and through a direct request from Adams County, this report was prepared to discuss the analysis and design of stormwater drainage at the proposed project site. The Drainage Plan, developed in conjunction with this report, can be found in Appendix A. A Drainage Report and Drainage Plan Checklist provided by Adams County can be found in Appendix B.

1.1 Project Description

The proposed project consists of the construction and operation of the Bennett D Pad well pad and production facility containing infrastructure and operations for 26 oil/gas wells. The Energy & Carbon Management Commission (ECMC) Proposed Oil and Gas Location will have a permitted disturbance area of 22.96 acres during the construction phase which includes topsoil stripping and pad earthwork, well drilling and hydraulic fracturing, installation of permanent pipelines and facilities, and setup of temporary equipment and a modular large volume tank (MLVT) area. Construction phase grading and layout for the well pad and facility can be found in Appendix A.

Once all wells have been drilled and completed, portions of the Proposed Oil and Gas Location will be reclaimed back to existing grade and re-seeded during interim reclamation. The remaining operational area during the production phase will be approximately 7.42 acres. Production phase grading and layout for the well pad and facility can be found in Appendix A.

1.2 Project Location

Bennett D Pad is located on property owned by Crestone Peak Resources Watkins Midstream LLC (Parcel 0181700000105). The project area is approximately 0.1 miles north of Interstate 70 and 0.3 miles west of Manila Road. An existing access road running west from Manila Road will provide access to the project area. Figure 1 shows the location of Bennett D Pad.

Soils data for the project area were taken from NRCS Soil Data Viewer. The project area is comprised of Ascalon-Platner association (0 to 5 percent slopes) with a Hydrologic Soil Group (HSG) classification of Group B soils and Truckton loamy sand (3 to 9 percent slopes) with a HSG classification of Group A soils. The soils report for the project area can be found in Appendix C. Bennett D Pad will be constructed on partially developed industrial land. According to the 2019 National Land Cover Database, the project area is grassland/herbaceous.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (Panel 08001C0960H, Effective Date: 3/5/2007), the proposed project is in an area of minimal flood hazard (Zone X) and is therefore determined to be outside the 500-year floodplain. The corresponding FIRMette displaying the flood zone classification at the project site can be found in Appendix D.

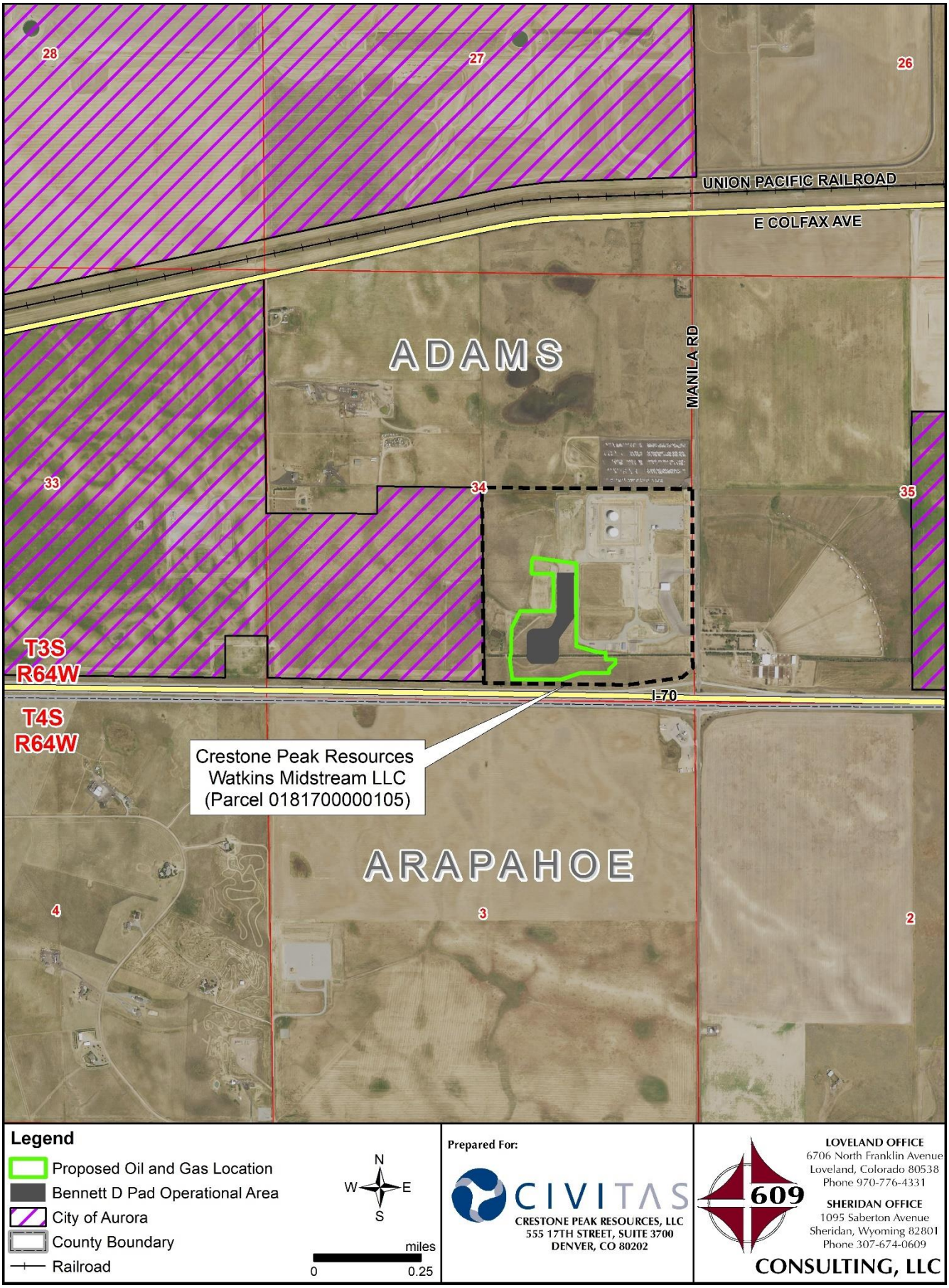

Figure 1. Project Location

1.3 Drainage Summary

Bennett D Pad lies within the *Town of Manila* Hydrologic Unit Code Level 12 (HUC 12): 101900030902. The HUC 12, approximately 47.9 square miles in area, consists of predominately agricultural lands that drain to an unnamed tributary of West Sand Creek. Currently, there has not been a master drainage plan developed for this area.

Historically, stormwater from the proposed location drains from the south to the northwest/north. A delineated wetland and existing pond are located to the west of the site while an existing detention pond is located to the north. In order to avoid outflowing towards any of these areas, stormwater will be routed to a detention basin on the north edge of the project area and the outlet will direct flow around the west side of the existing detention pond. The delineated wetland and existing ponds will not be impacted by this project.

2.0 HYDROLOGIC ANALYSIS

The following sections outline the methods used and corresponding results for the hydrologic analysis of the project site and drainage design including historic runoff, design flow, and stormwater volume.

2.1 Historic Runoff

Historic runoff, calculated assuming the site is undeveloped with a 2.0 percent imperviousness, was calculated for the proposed project site. The rational method was chosen to estimate historic peak flows. As discussed in the Mile High Flood District (MHFD) manual *Urban Storm Drainage Criteria Manual Volume I* (USDCM VI), it is acceptable to use the rational method for design storm analysis of catchments that are not complex and are 90 acres or less in size.

The MHFD spreadsheet model *Peak Runoff Prediction by the Rational Method Version 2.00* (UD-Rational) was used to calculate peak flows using the rational method. One-hour point rainfall data were obtained from the Adams County Development Standards & Regulations using the NOAA Atlas 14 Point Precipitation Frequency Estimates. One-hour point rainfall data are summarized in Table 1.

Table 1. Point Rainfall Data (NOAA Atlas 14 Point Precipitation Frequency Estimates)

Storm Event Frequency	One-Hour Point Rainfall, in
2-year	1.00
5-year	1.42
10-year	1.68
50-year	2.35
100-year	2.71

Historic peak flows were calculated for the Proposed Oil and Gas Location. Overland flow length, overland flow slope, channelized flow length, and channelized flow slope parameters were estimated using field survey, LiDAR, and imagery. HSG was derived from an area-weighted average using NRCS Soil Data Viewer. USDCM VI was referenced for the recommended conveyance factor (K). Computed Time of Concentration (T_c) was used since historic conditions have an imperviousness of less than 20 percent. Historic peak flow estimates calculated using the rational method are summarized in Table 2 and spreadsheet model inputs and results can be found in Appendix E.

Table 2. Historic Peak Flow Estimates Using the Rational Method

Storm Event Frequency	Historic Peak Flow, cfs
2-year	0.2
5-year	0.5
10-year	3.4
50-year	22.0
100-year	32.8

2.2 Design Flow

Design flows for Bennett D Pad were calculated for stormwater derived within the project disturbance area (on-site) as well as the broader drainage to and around the project area. Both the construction phase and the production phase were analyzed and used to aid in the hydraulic design.

The rational method was chosen to estimate peak flows for the proposed culverts, diversion ditches, sediment trap, drainage swale, and detention basin areas. Locations for peak flow calculations are summarized in Table 3. Outlets and drainage area delineations and their corresponding time of concentration routes during the construction phase are shown in Figure 2 and Figure 3, respectively. Outlets and drainage area delineations and their corresponding time of concentration routes during the production phase are shown in Figure 4 and Figure 5, respectively.

Table 3. Summary of Outlets and Drainage Areas

Outlet	Description	Total Drainage Area, acre	
		Construction Phase	Production Phase
ST	Sediment Trap	8.62	-
PC1	Proposed Culvert #1	1.75	-
PC2	Proposed Culvert #2	2.09	2.65
PC3	Proposed Culvert #3	2.30	2.86
DB	Detention Basin Area	17.84	10.49
DS	Drainage Swale	-	9.28

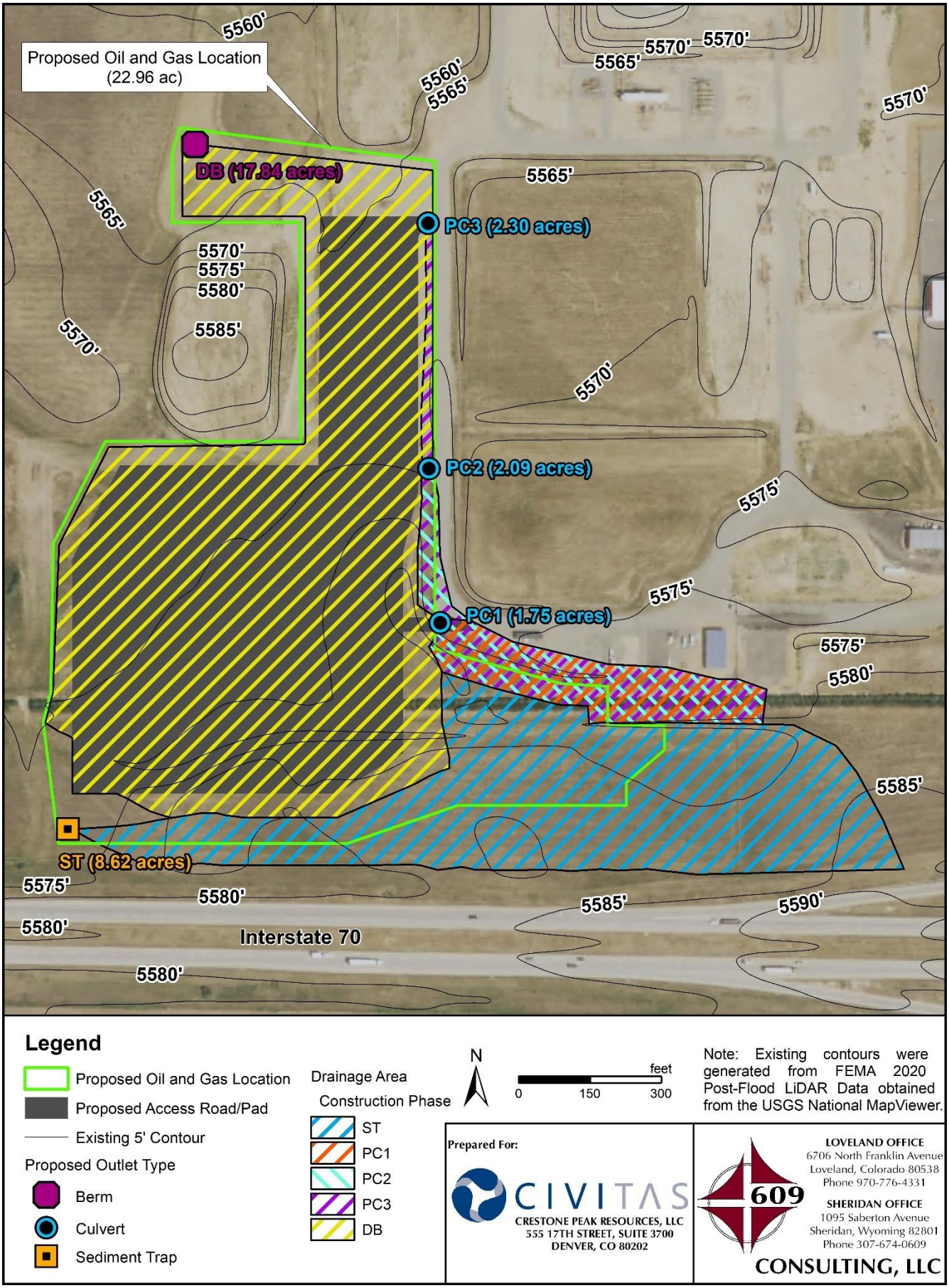

Figure 2. Construction Phase Outlets and Drainage Areas

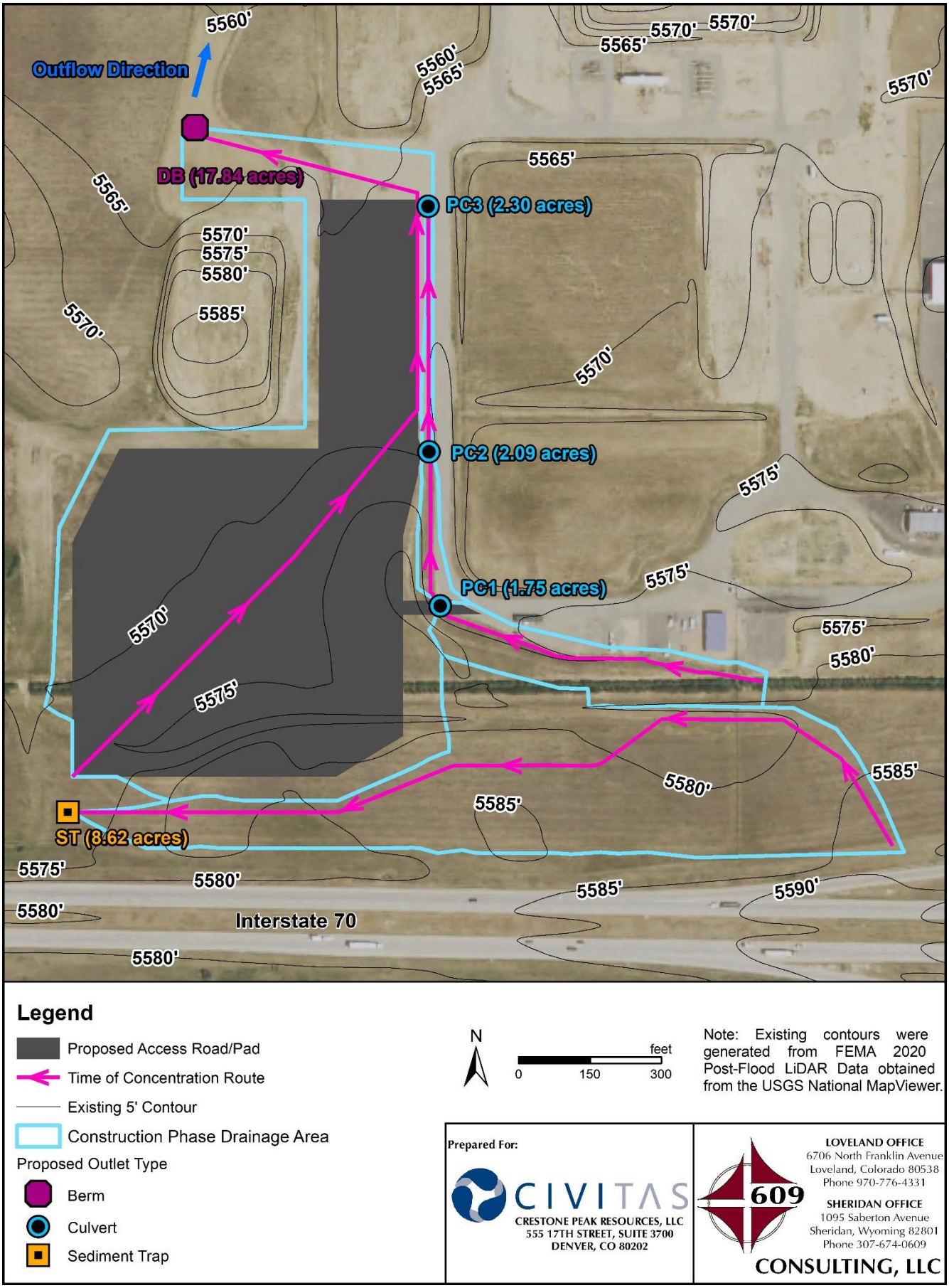

Figure 3. Construction Phase Time of Concentration Routes

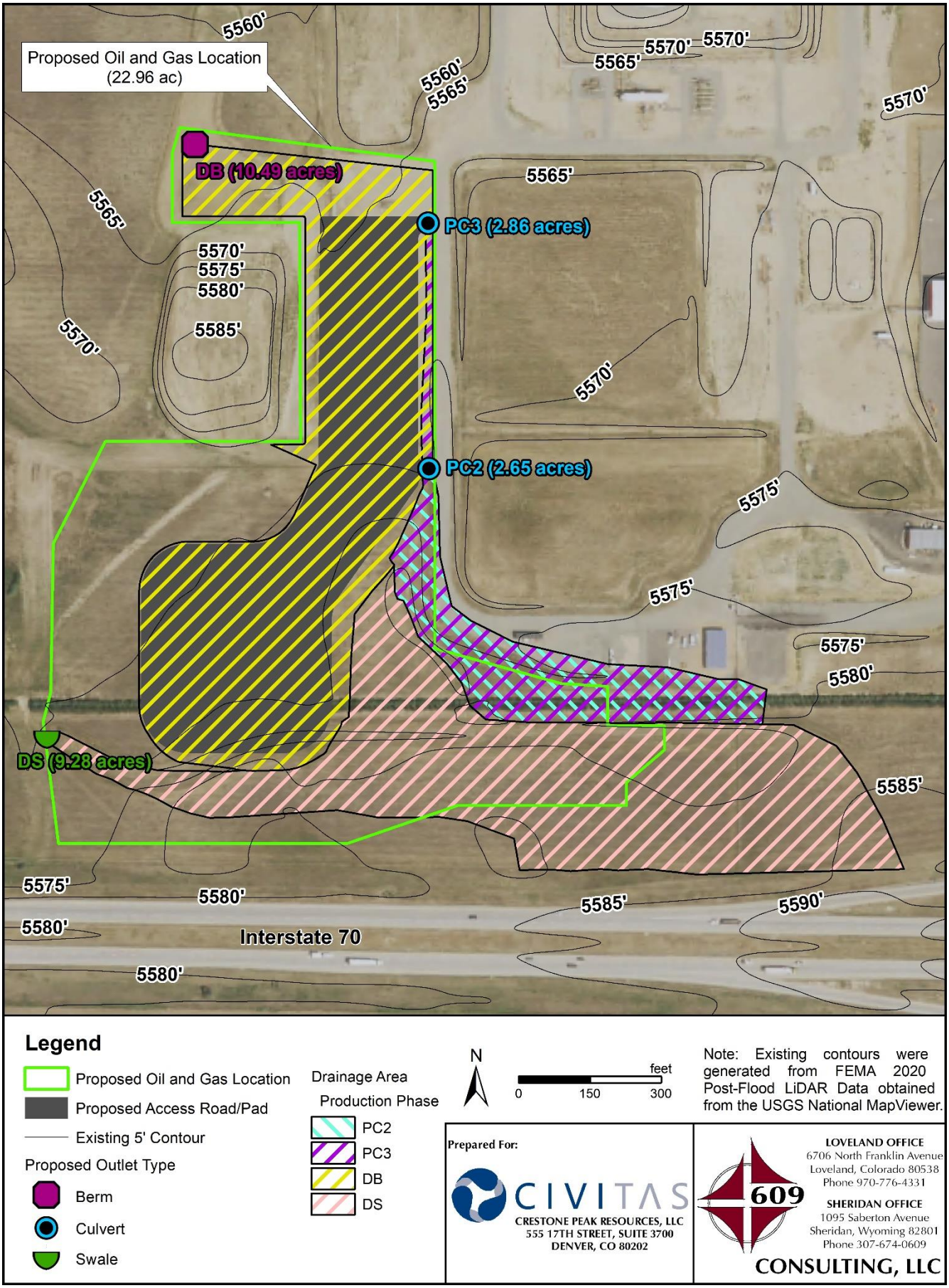

Figure 4. Production Phase Outlets and Drainage Areas

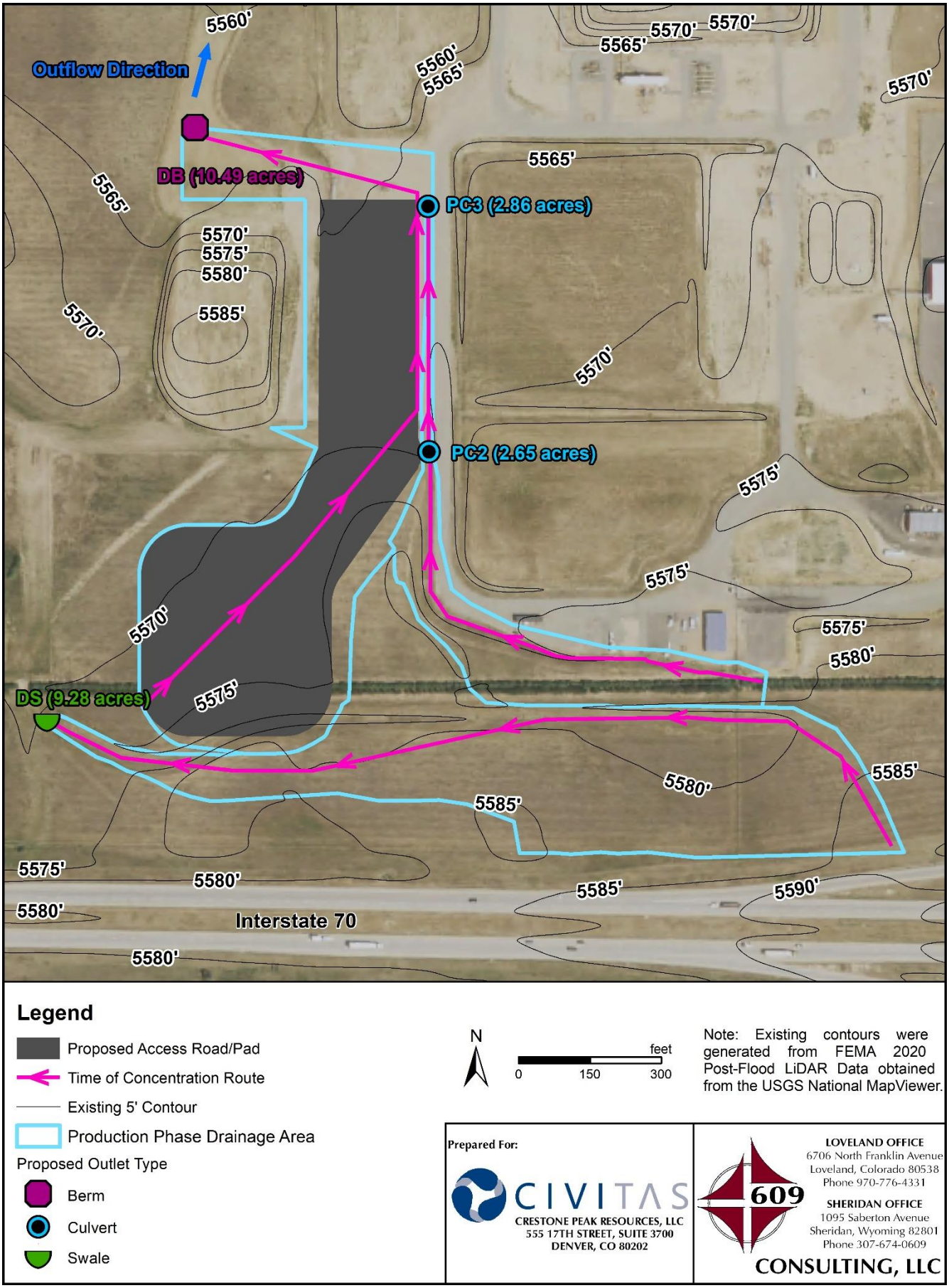

Figure 5. Production Phase Time of Concentration Routes

UD-Rational was used to calculate peak flows using the rational method. Drainages were delineated using the on-site drainage design and grading. Overland flow length, overland flow slope, channelized flow length, and channelized flow slope parameters were estimated using field survey, LiDAR data, and imagery. Computed T_c was used for outlets with imperviousness less than 20 percent. Calculations for area-weighted averages of percent imperviousness are found in Table 4. Peak flow estimates calculated using the rational method are summarized in Table 5. UD-Rational inputs and results can be found in Appendix E.

Table 4. Imperviousness Calculations

Outlet	Phase	Total Area, acre	Open (2% Imperv), acre	Gravel (40% Imperv), acre	Weighted Imperviousness	
					acre	%
ST	Construction	8.62	8.62	0.00	0.17	2.0
PC1	Construction	1.75	1.54	0.21	0.11	6.6
PC2	Construction	2.09	1.77	0.32	0.16	7.8
	Production	2.65	2.35	0.30	0.17	6.3
PC3	Construction	2.30	1.97	0.33	0.17	7.5
	Production	2.86	2.55	0.31	0.18	6.1
DB	Construction	17.84	4.52	13.32	5.42	30.4
	Production	10.49	3.09	7.40	3.02	28.8
DS	Production	9.28	9.28	0.00	0.19	2.0

Table 5. Peak Flow Estimates

Outlet	Phase	Calculated Peak Flow, cfs				
		2-year	5-year	10-year	50-year	100-year
ST	Construction	<0.1	0.1	0.3	2.0	3.9
PC1	Construction	0.1	0.1	0.3	1.2	1.8
PC2	Construction	0.1	0.2	0.4	1.4	2.2
	Production	0.1	0.2	0.4	1.9	2.8
PC3	Construction	0.1	0.2	0.4	1.4	2.2
	Production	0.1	0.2	0.4	1.8	2.8
DB	Construction	4.3	6.8	10.2	23.5	30.8
	Production	2.5	4.0	6.0	14.1	18.6
DS	Production	<0.1	0.1	0.4	3.0	5.0

2.3 Stormwater Volume

In accordance with Adams County Development Standards & Regulations requirements, stormwater falling on the project area will be detained and released at reduced flow rates. The maximum allowable release rates for the 1-hour, 5-year and 100-year storm events were determined by using *Table 9.16—Allowable Release Rates (cfs/acre)*. Using Group B soils as the dominant soil group, a release rate of 0.13 cfs/acre is acceptable during the 5-year storm event and 0.85 cfs/acre is acceptable during the 100-year storm event.

The MHFD spreadsheet model *Detention Basin Design Workbook Version 4.04* (MHFD-Detention) was used to calculate storm runoff volumes. One-hour point rainfall data for the project area (Table 1) were used within MHFD-Detention. Watershed parameters including area, length, and slope as well as imperviousness and soil type were calculated based on the site design and site characteristics. Table 6 shows storm runoff volumes (without accounting for releases) calculated for the stormwater storage area. MHFD-Detention inputs and results can be found in Appendix F.

Table 6. Calculated Storm Runoff Volumes

Outlet	Phase	Storm Runoff Volume, acre-ft						
		WQCV	EURV	2-year	5-year	10-year	50-year	100-year
DB	Construction	0.227	0.557	0.384	0.814	1.129	2.229	2.856
	Production	0.129	0.309	0.212	0.461	0.645	1.292	1.661

3.0 HYDRAULIC ANALYSIS AND DRAINAGE DESIGN

Criteria presented in the MHFD Urban Storm Drainage Criteria Manual outline the capacity, velocity, and slope requirements involved with drainage design and stormwater conveyance. The following sections describe the design recommendations for storage and conveyance during the construction phase and production phase. The recommended drainage design is shown in the Drainage Plan which can be found in Appendix A.

3.1 Stormwater Storage - Construction Phase

During the construction phase, stormwater from the well pad and facility will drain to the detention basin outlet (DB) located on the northwest corner of the detention basin. During the 5-year event, stormwater will pond to a maximum depth of 1.6 feet. During the 100-year event, stormwater will pond to a maximum depth of 3.0 feet creating a total storage of 1.844 acre-feet.

The outlet consists of two 12-inch diameter high-density polyethylene (HDPE) pipes. One pipe will have an orifice cap to control release rates and drain times for smaller events. The orifice cap will have a 1.9-inch diameter orifice at the invert of the outlet pipe, located at the bottom of the detention basin. The second pipe will be located adjacent to the first and positioned 1.0 feet above the bottom of the detention basin. The second pipe will have no orifice cap. Anti-seep collars should be used to prevent seepage through the berm and outlet slopes should be protected using geotextile fabric or riprap in order to prevent erosion along the embankment.

It will take approximately 40 hours to drain 99 percent of the water quality capture volume (WQCV) with outflow controlled by the orifice cap on the first pipe. During the 5-year and 100-year events, outflows will be controlled by the second pipe (no orifice cap). A total peak outflow of 1.3 cfs will occur during the 5-year event, which is less than the acceptable release rate of 0.13 cfs/acre during the 5-year event (0.13 cfs/acre * 17.84 acres = 2.3 cfs). A total peak outflow of 4.8 cfs will occur during the 100-year event, which is less than the acceptable release rate of 0.85 cfs/acre during the 100-year event (0.85 cfs/acre * 17.84 acres = 15.2 cfs).

An emergency spillway will be installed along the northern edge of the detention basin and will be utilized during both the construction and production phases. During the construction phase, detained stormwater will back up to the spillway during the 100-year event. The spillway was designed with a minimum crest width of 16.5 feet, 4:1 side slopes, and a crest invert elevation at 5564.9 feet (3.0 feet above the outlet invert). A berm height of 1.0 feet at the spillway will provide the required freeboard. The spillway is able to convey the developed 100-year peak flow at a depth of 0.5 feet. A concrete cutoff wall will provide scour protection at the spillway.

Stormwater storage volumes, outlet sizing, and spillway design details for the construction phase can be found in Appendix A. Supporting calculations using MHFD-Detention can be found in Appendix F.

3.2 Stormwater Storage - Production Phase

During the production phase, stormwater from the reclaimed well pad and facility will drain to the detention basin outlet (DB) located on the northwest corner of the detention basin. During the 5-year event, stormwater will pond to a maximum depth of 1.2 feet. During the 100-year event, stormwater will pond to a maximum depth of 2.1 feet creating a total storage of 0.915 acre-feet.

The outlet consists of two 12-inch diameter HDPE pipes. One pipe will have an orifice cap to control release rates and drain times for smaller events. The orifice cap will have a 1.6-inch diameter orifice at the invert of the outlet pipe, located at the bottom of the detention basin. The second pipe will be located adjacent to the first and positioned 0.7 feet above the bottom of the detention basin. The second pipe will have no orifice cap. Anti-seep collars should be used to prevent seepage through the berm and outlet slopes should be protected using geotextile fabric or riprap in order to prevent erosion along the embankment.

It will take approximately 40 hours to drain 99 percent of the WQCV with outflow controlled by the orifice cap on the first pipe. During the 5-year and 100-year events, outflows will be controlled by the second pipe (no orifice cap). A total peak outflow of 0.7 cfs will occur during the 5-year event, which is less than the acceptable release rate of 0.13 cfs/acre during the 5-year event (0.13 cfs/acre * 10.49 acres = 1.4 cfs). A total peak outflow of 3.6 cfs will occur during the 100-year event, which is less than the acceptable release rate of 0.85 cfs/acre during the 100-year event (0.85 cfs/acre * 10.49 acres = 8.9 cfs).

An emergency spillway will be installed along the northern edge of the detention basin and will be utilized during both the construction and production phases. During the production phase, detained stormwater will back up towards and nearly reach the spillway during the 100-year event. The spillway was designed with a minimum crest width of 16.5 feet, 4:1 side slopes, and a crest invert elevation at 5564.9 feet (3.0 feet above the outlet invert). A berm height of 1.0 feet at the spillway will provide the required freeboard. The spillway is able to convey the developed 100-year peak flow at a depth of 0.5 feet. A concrete cutoff wall will provide scour protection at the spillway.

Stormwater storage, outlet sizing, and spillway design details for the production phase can be found in Appendix A. Supporting calculations using MHFD-Detention can be found in Appendix F.

3.3 Culverts

Three culvert locations will be required to ensure proper on-site and off-site drainage. The MHFD spreadsheet model *Culvert Hydraulics Workbook Version 4.00* (MHFD-Culvert) was used to calculate conveyance, sizing, and performance characteristics for the recommended culvert designs. Peak flows used for culvert designs are summarized in Table 5. Culvert performance characteristics for the recommended culvert designs are summarized in Table 7. MHFD-Culvert spreadsheet calculations can be found in Appendix G.

Table 7. Culvert Performance Characteristics for Recommended Culvert Designs

Site	Recommended Culvert Design	10-year Peak Flow			Full Barrel Flow			Max Conveyance		
		Q, cfs	Vel, fps	HW/D	Q, cfs	Vel, fps	HW/D	Q, cfs	Vel, fps	HW/D
PC1	12-inch CMP	0.3	3.5	0.3	2.3	2.9	1.0	4.2	5.3	2.0
PC2	12-inch CMP	0.4	2.9	0.2	2.3	2.9	1.0	4.1	5.2	2.0
PC3	12-inch CMP	0.4	0.8	0.2	1.6	2.0	1.0	3.0	3.8	2.0

Proposed Culvert #1 (PC1) will convey off-site runoff from an existing ditch east of the project to the north under the temporary access road during the construction phase. One 12-inch corrugated metal pipe (CMP) culvert is recommended for this location. The maximum design conveyance before overtopping the access road is 4.2 cfs; therefore, the proposed culvert can adequately convey the 100-year peak flow during the construction phase (1.8 cfs).

Proposed Culvert #2 (PC2) will convey off-site runoff from an existing ditch east of the project (through PC1 during the construction phase) to the north under one of the permanent access roads during both the construction and production phases. One 12-inch CMP culvert is recommended for this location. The maximum design conveyance before overtopping the access road is 4.1 cfs; therefore, the proposed culvert can adequately convey the 100-year peak flow during the construction phase (2.2 cfs) and the 100-year peak flow during the production phase (2.8 cfs). Due to the existing site grade and the higher pipe roughness coefficient associated with CMP culverts, the 10-year peak flow velocity is below 3.0 feet per second (fps). Routine maintenance may be required to ensure sedimentation does not occur.

Proposed Culvert #3 (PC3) will convey off-site runoff from an existing diversion ditch east of the project (through PC2 during both phases) and on-site runoff from the external ditch and berm east of the facility under one of the permanent access roads during both the construction and production phases. One 12-inch CMP culvert is recommended for this location. The maximum design conveyance before overtopping the access road is 3.0 cfs; therefore, the proposed culvert can adequately convey the 100-year peak flow during the construction phase (2.2 cfs) and the 100-year peak flow during the production phase (2.8 cfs). Due to the existing site grade and the higher pipe roughness coefficient associated with CMP culverts, the 10-year peak flow velocity is below 3.0 fps. Routine maintenance may be required to ensure sedimentation does not occur.

3.4 Ditches

Diversion ditches and berms will be used to collect and direct on-site stormwater to outlets, deflect and redirect off-site runoff around the disturbance area, and store on-site stormwater. A network of existing and proposed ditches will facilitate the proposed stormwater design. Locations of ditches during the construction and production phase are shown in Figure 6 and Figure 7, respectively.

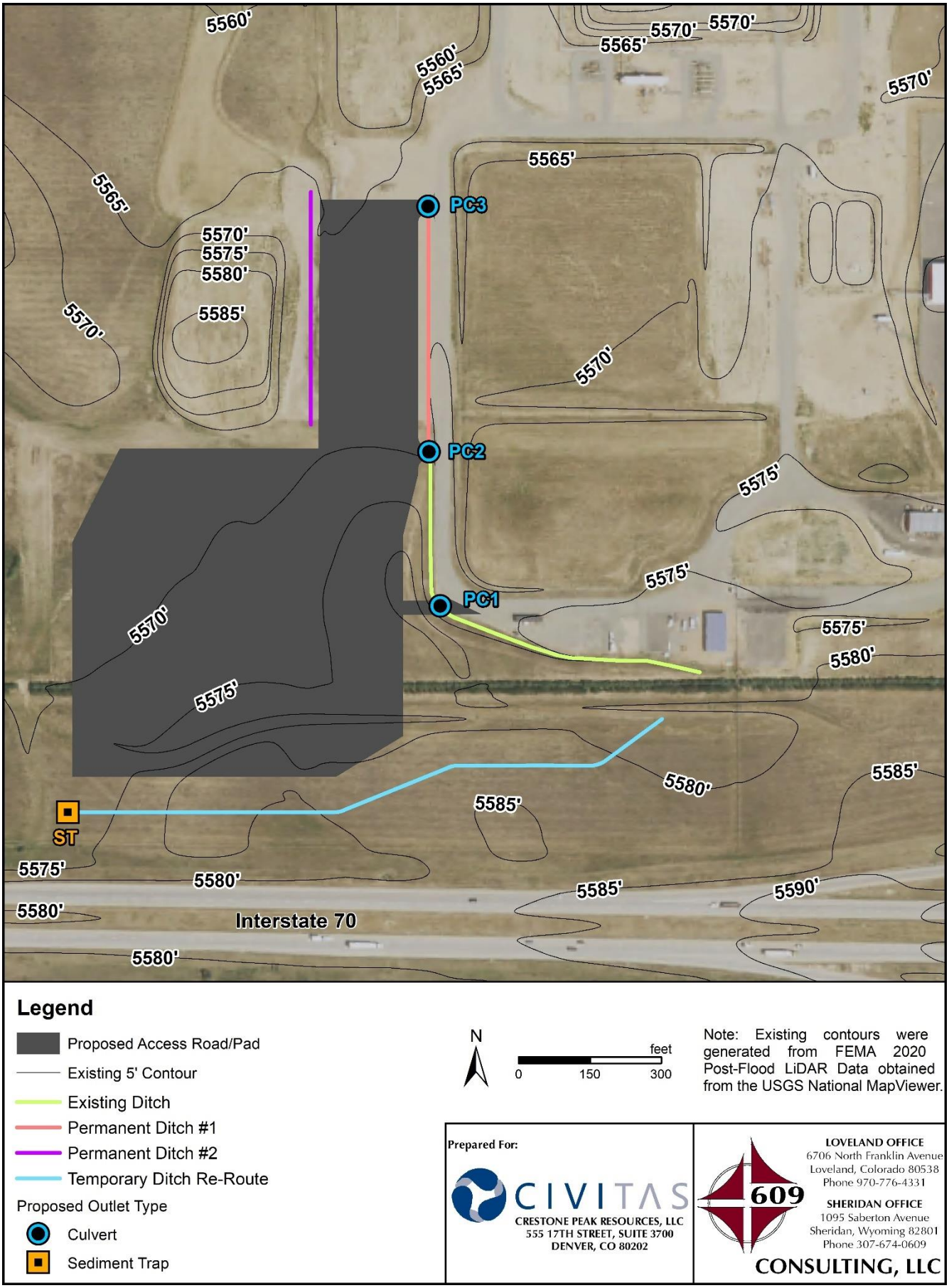

Figure 6. Construction Phase Ditch Locations

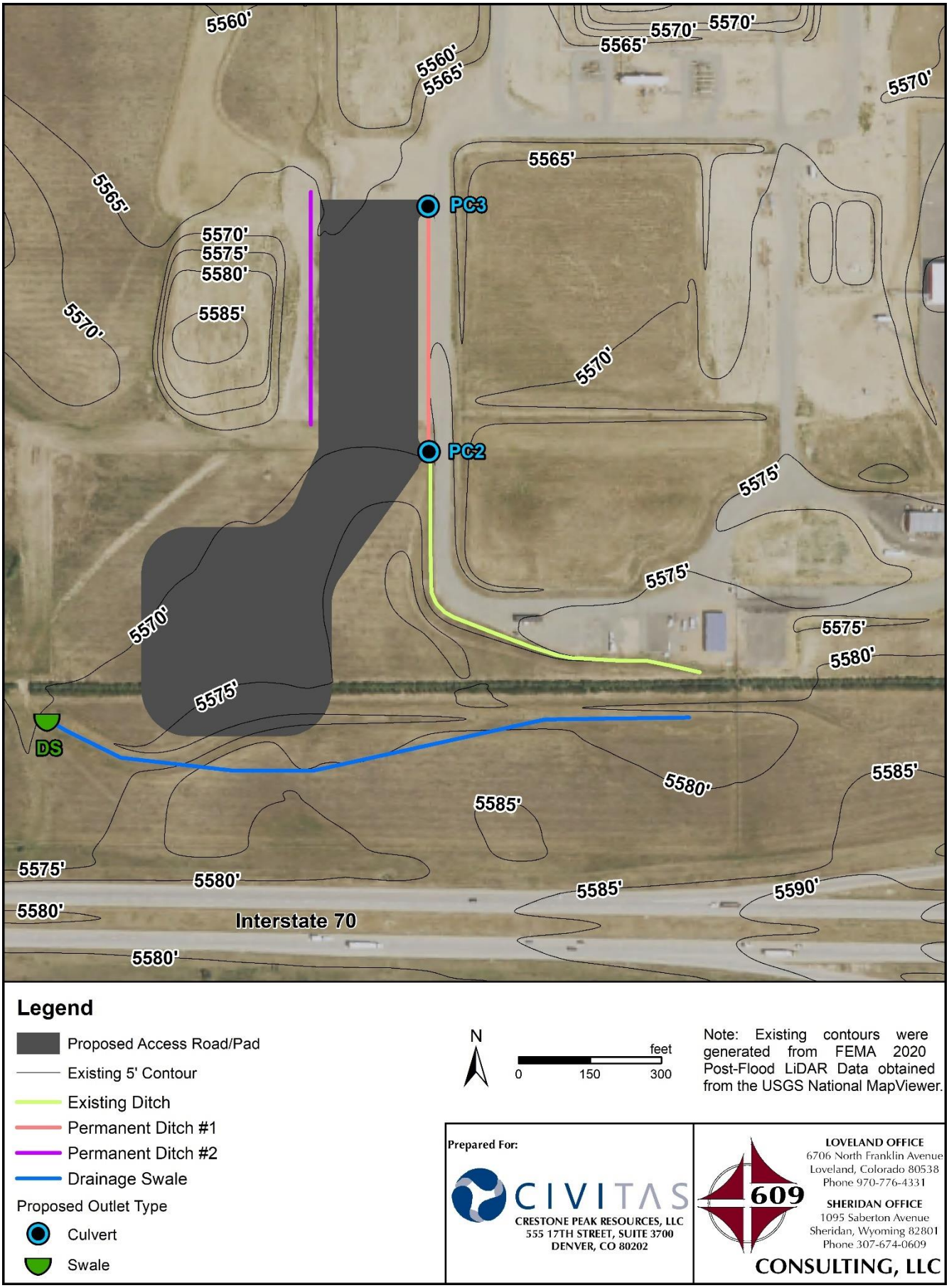

Figure 7. Production Phase Ditch Locations

Existing Ditch

During both the construction and production phases, an existing ditch will convey on-site and off-site runoff north into the proposed permanent ditch. PC1 and PC2 will convey this runoff under the access roads. The existing ditch is approximately 2.0 feet deep with an average slope of 0.7% and 5:1 side slopes. Manning's equation was used to calculate conveyance. The production phase peak flows for PC2 were used for required capacity due to these peak flows being the largest that will be conveyed through the existing ditch. The existing ditch is able to convey the production phase 100-year peak flow of PC2 (2.8 cfs) at a depth of 0.5 feet. This provides 1.5 feet of freeboard.

Permanent Ditch #1

During both the construction and production phases, a permanent ditch will be located on the east side of the facility and will convey on-site and off-site runoff from the existing ditch. This ditch will convey the runoff north under the access road (through PC3) into the detention basin. Permanent Ditch #1 is designed to be approximately 1.0 feet deep with a 1.0 feet tall berm on the outside (eastern) edge with an average slope of 0.7% and 3:1 side slopes. The production phase peak flows for PC3 were used for required capacity due to these peak flows being the largest that will be conveyed through this ditch. Permanent Ditch #1 is able to convey the production phase 100-year peak flow of PC3 (2.8 cfs) at a depth of 0.6 feet. This provides 1.4 feet of freeboard.

Permanent Ditch #2

During both the construction and production phases, a permanent ditch will be located on the west side of the facility. Minimal runoff will be routed through this ditch, and what little runoff enters the diversion ditch will be conveyed to the detention basin. Permanent Ditch #2 is designed to be 1.0 feet deep with a 1.0 feet tall berm on the outside (western) edge with an average slope of 0.7% and 4:1 side slopes. This ditch will be able to convey up to 14.0 cfs at a depth of 1.0 feet. This provides 1.0 feet of freeboard.

Temporary Ditch Re-Route

During the construction phase, an existing ditch running through the south portion of the well pad will be re-routed to flow around the well pad. It will convey off-site runoff from southeast of the project area and on-site flow from the topsoil stockpile to the west into the proposed Sediment Trap (ST). The temporary ditch re-route is designed to be approximately 4.0 feet deep with an average slope of 0.5% and 5:1 side slopes. The peak flows for ST were used for required capacity in the ditch. The ditch will be able to convey the 100-year peak flow of ST (3.9 cfs) at a depth of 0.6 feet. This provides 3.4 feet of freeboard.

Drainage Swale

During the production phase, a Drainage Swale (DS) will convey off-site runoff from southeast of the project area to the west. The swale is designed to be approximately 6.0 feet deep with a 3.0 feet wide bottom, 4:1 side slopes, and an average slope of 0.5%. The swale is able to convey the 100-year peak flow of DS (5.0 cfs) at a depth of 0.7 feet. This provides 5.3 feet of freeboard.

Manning's calculations for ditch conveyances can be found in Appendix H. Ditch cross-sections are included in Appendix A.

3.5 Sediment Trap

One sediment trap and outlet will be installed at the end of the temporary ditch re-route during the construction phase. Runoff from the topsoil stockpile will flow through the ditch and into the sediment trap. Treated stormwater will exit the sediment trap onto undisturbed ground where the natural contours will drain away from the project area. In order to provide additional capture volume and treatment, the sediment trap is designed to be oversized. A 20 feet by 20 feet by 3 feet deep sediment trap is recommended for this project. Typical sediment trap details are included with the Drainage Plan found in Appendix A.

4.0 SITE MAINTENANCE AND UPKEEP

The Crestone Peak Resources Operating LLC site monitoring program ensures site conditions stay in compliance. Sedimentation, culvert and access road condition, vegetation health, and several other safety and maintenance items are routinely monitored and evaluated to ensure the site is in workable and drainable order.

In addition to monitoring during regular operations, a formal monitoring plan has been developed for the project site. During the construction phase, the site will be inspected a minimum of every 14 calendar days as well as following rain or snowmelt events that are able to cause surface erosion. After the construction phase, areas not needed for production operations within the disturbance area will be reclaimed and site inspections will occur at a minimum of every 30 calendar days until the site is fully stabilized. Once the site is stabilized and has achieved interim reclamation standards, inspections will occur annually. More frequent, informal inspections will continue to occur during routine operations.

Routine maintenance and required repairs of access roads, culverts, ditches, berms, and outlet structures will be handled by the operations team. Cleaning and removal of sediment and debris from ditches, culverts, and outlets, as well as vegetation maintenance and specific manufacturer maintenance, will also be handled by the operations team during regular operations and maintenance checks.

5.0 CONCLUSION

The information and analysis presented in this report display the adequacy and effectiveness of the design and planning associated with the Bennett D Pad Drainage Plan. The design protects public health, safety, and general welfare and has no adverse impacts on public rights-of-way or off-site properties. Furthermore, the report demonstrates that the design adheres to Adams County Development Standards & Regulations as well as the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual.

6.0 REFERENCES

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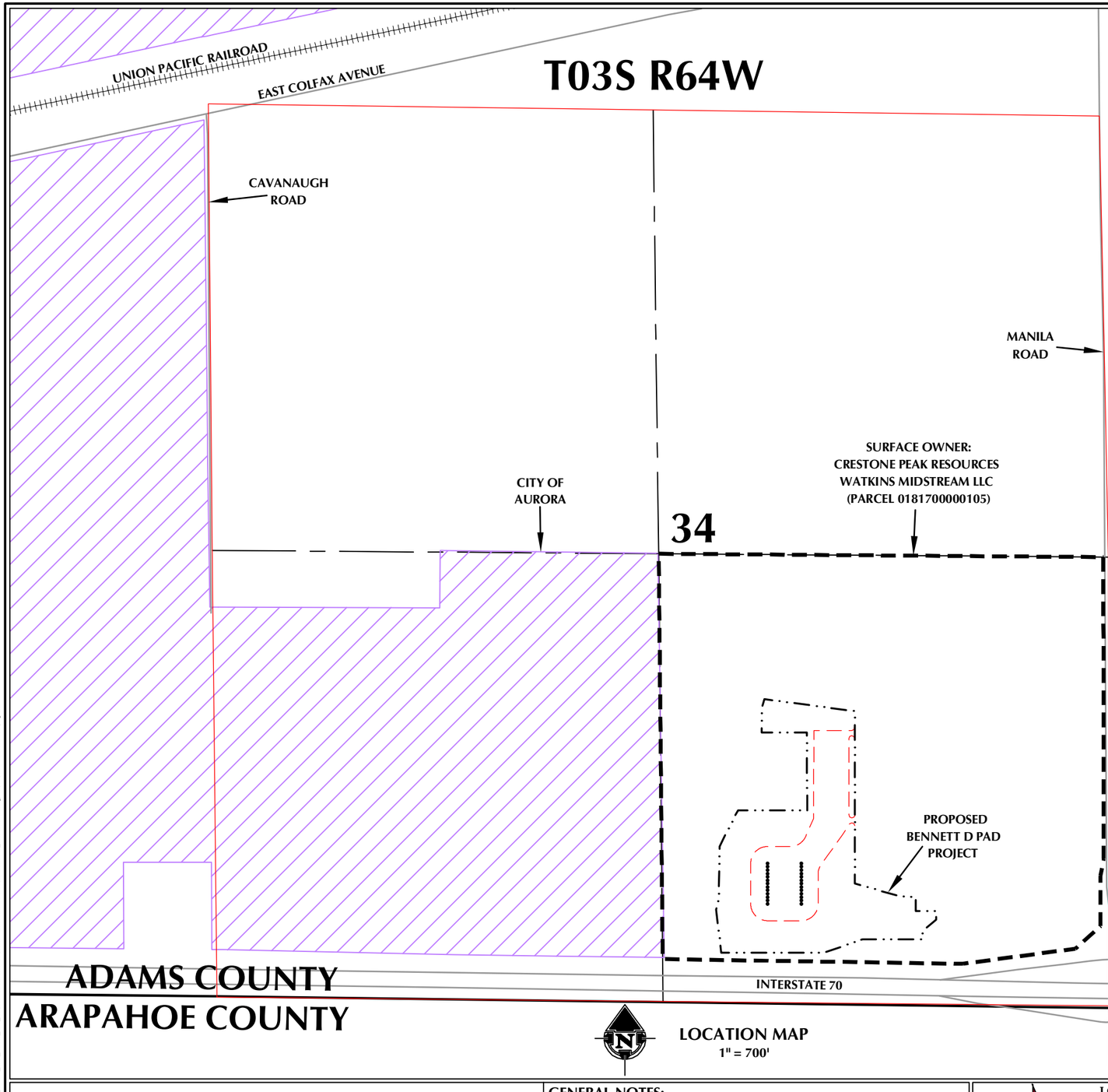
APPENDICES

Appendix A:

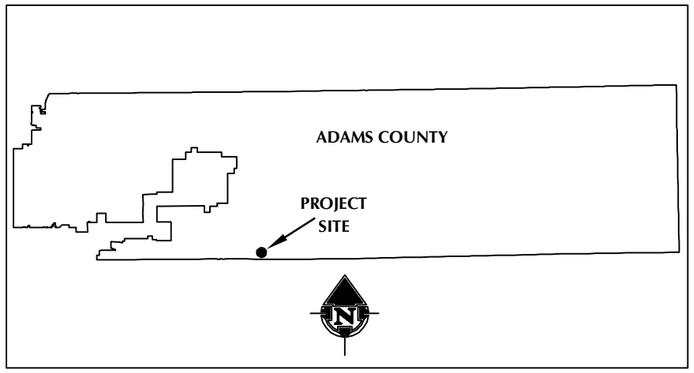
Drainage Plan

BENNETT D PAD
DRAINAGE PLAN

LOCATED IN SECTION 34, T3S, R64W, 6TH P.M.
ADAMS COUNTY, COLORADO



LOCATION MAP
1" = 700'



VICINITY MAP

PAGE INDEX

GENERAL NOTES:

1. THIS DRAINAGE AND EROSION CONTROL PLAN WAS PREPARED FOLLOWING ADAMS COUNTY DEVELOPMENT STANDARDS & REGULATIONS WITH ADDITIONAL DESIGN GUIDANCE PROVIDED BY MILE HIGH FLOOD DISTRICT.
2. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
3. ORIGINAL DOCUMENT SIZE: 11" X 17"

609 CONSULTING, LLC
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6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331
SHERIDAN OFFICE
1095 Saberton Avenue
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Phone 307-674-0609

Prepared For:
CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD
DRAINAGE PLAN
COVER SHEET

SCALE:	VARIES	PAGE:	1 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

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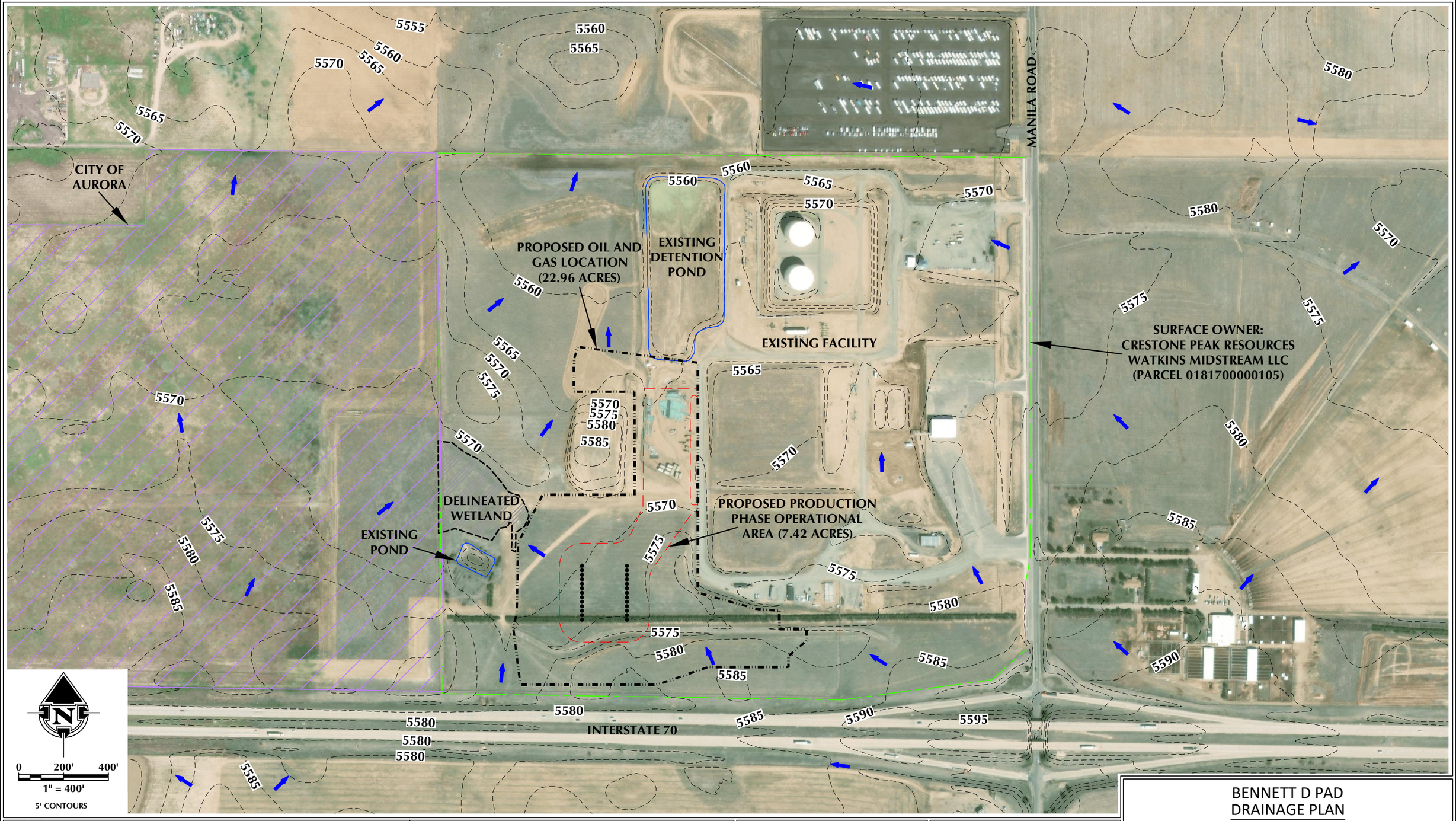

LEGEND

- EXISTING CONTOUR
- EXISTING IRRIGATION DITCH/DRAINAGEWAY
- PROPOSED OIL AND GAS LOCATION
- PROPOSED ACCESS ROAD/PAD
- STORMWATER DRAINAGE
- PROPERTY LINE

GENERAL NOTES:

1. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).

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BENNETT D PAD
DRAINAGE PLAN
SITE OVERVIEW

SCALE:	1" = 400'	PAGE:	2 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

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CULVERT ID	SIZE	LENGTH (FT)	ELEVATION (FT)		GRADE
			INLET INVERT	OUTLET INVERT	
PC1	12" CMP	40	5572.5	5571.1	3.5%
PC2	12" CMP	40	5570.0	5568.8	3.0%
PC3	12" CMP	40	5566.1	5566.0	0.3%

EXISTING CULVERT
EXISTING CULVERT
EXISTING DETENTION POND
400'
EXISTING 400' X 850' MAINTENANCE EASEMENT
SURFACE OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC (PARCEL 0181700000105)
PROPOSED CULVERT #3 (PC3)
PERMANENT ACCESS ROAD
PERMANENT DITCH #1
PERMANENT ACCESS ROAD
EXISTING DITCH
PROPOSED CULVERT #1 (PC1)
PROPOSED CULVERT #2 (PC2)
BENNETT D PAD FACILITY
100-YEAR STORAGE ELEVATION 5564.9'
PERMANENT DITCH #2
DETENTION BASIN
SPILLWAY
DETENTION BASIN (DB) OUTLET
EXISTING TOPSOIL STOCKPILE
TOPSOIL STOCKPILE
TEMPORARY ACCESS ROAD
TEMPORARY DITCH RE-ROUTE
CUT
FILL
BENNETT D PAD WELL PAD
INTERSTATE 70
PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
EXISTING 20' ACCESS EASEMENT
20' X 20' X 3' SEDIMENT TRAP (ST)
DELINEATED WETLAND
EXISTING POND
0.5% SLOPE
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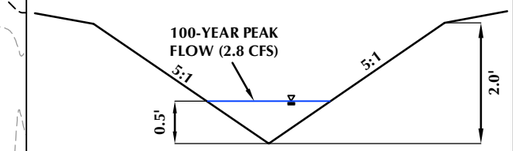
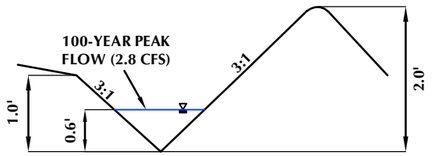
0 100' 200'
1" = 200'
1' CONTOURS

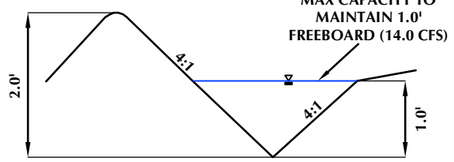
EXISTING DITCH CROSS SECTION



PERMANENT DITCH #1 CROSS SECTION



PERMANENT DITCH #2 CROSS SECTION



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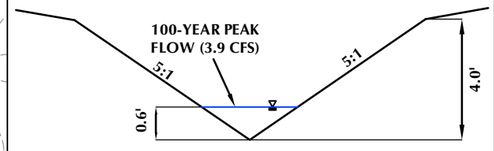

LEGEND

- EXISTING CONTOUR
- EXISTING ROAD
- EXISTING PIPELINE
- EXISTING BURIED POWERLINE
- EXISTING OVERHEAD POWERLINE
- PROPOSED OIL AND GAS LOCATION
- PROPOSED CONTOUR
- PROPOSED ACCESS ROAD/PAD
- PROPOSED WELL
- PROPERTY LINE
- PROPOSED DIVERSION DITCH
- PROPOSED BERM / OFF-SITE FLOW DEFLECTION
- PROPOSED CULVERT PROTECTION / RIPRAP
- PROPOSED SEDIMENT TRAP WITH PROTECTED OUTLET
- PROPOSED SLOPE PROTECTION
- 100-YEAR STORMWATER STORAGE FOOTPRINT
- STORMWATER DRAINAGE
- EASEMENT/ROW
- EXISTING DITCH

GENERAL NOTES:

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2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).
3. SLOPE PROTECTION USED FOR TEMPORARY EROSION CONTROL ON CUT/FILL SLOPES AND SOIL STOCKPILES.

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555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD DRAINAGE PLAN

CONSTRUCTION PHASE SITE PLAN

SCALE:	1" = 200'	PAGE:	3 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

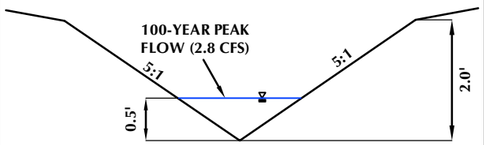
K:\CIVIL\76 RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINED.dwg, 10/22/2024 2:43:35 PM, kgoles

CULVERT ID	SIZE	LENGTH (FT)	ELEVATION (FT)		GRADE
			INLET INVERT	OUTLET INVERT	
PC2	12" CMP	40	5570.0	5568.8	3.0%
PC3	12" CMP	40	5566.1	5566.0	0.3%

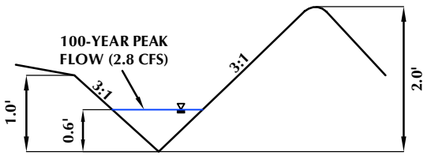
EXISTING CULVERT
EXISTING CULVERT
EXISTING DETENTION POND
400'
EXISTING 400' X 850' MAINTENANCE EASEMENT
SURFACE OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC (PARCEL 0181700000105)
PROPOSED CULVERT #3 (PC3)
PERMANENT ACCESS ROAD
PERMANENT DITCH #1
PERMANENT ACCESS ROAD
PROPOSED CULVERT #2 (PC2)
EXISTING DITCH
BENNETT D PAD FACILITY
100-YEAR STORAGE ELEVATION 5564.0'
0.5% SLOPE
DETENTION BASIN
SPILLWAY
DETENTION BASIN (DB) OUTLET
PERMANENT DITCH #2
EXISTING TOPSOIL STOCKPILE
SEEDED TOPSOIL STOCKPILE (FOR FINAL REC)
BENNETT D PAD WELL PAD
PRODUCTION PHASE OPERATIONAL AREA (7.42 ACRES)
DRAINAGE SWALE (DS)
INTERSTATE 70
PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
EXISTING 20' ACCESS EASEMENT
DELINEATED WETLAND
EXISTING POND

0 100' 200'
1" = 200'
1' CONTOURS

EXISTING DITCH CROSS SECTION



PERMANENT DITCH #1 CROSS SECTION



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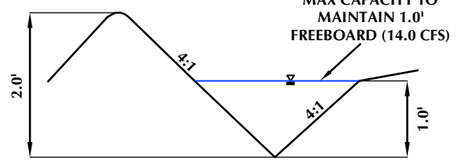
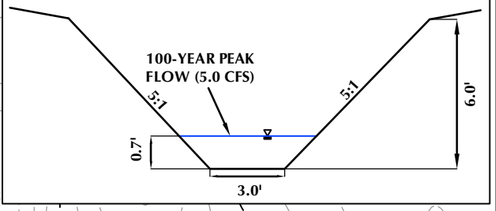


DRAINAGE SWALE CROSS SECTION



LEGEND

- EXISTING CONTOUR
- EXISTING ROAD
- EXISTING PIPELINE
- EXISTING BURIED POWERLINE
- EXISTING OVERHEAD POWERLINE
- PROPOSED OIL AND GAS LOCATION
- PROPOSED CONTOUR
- PROPOSED ACCESS ROAD/PAD
- PROPOSED WELL
- PROPERTY LINE
- PERMANENT DIVERSION DITCH
- PROPOSED BERM / OFF-SITE FLOW DEFLECTION
- PROPOSED CULVERT PROTECTION / RIPRAP
- RECLAMATION BOUNDARY
- PROPOSED PERMANENT SEEDING
- 100-YEAR STORMWATER STORAGE FOOTPRINT
- STORMWATER DRAINAGE
- EASEMENT/ROW
- EXISTING DITCH

GENERAL NOTES:

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2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).
3. RECLAIMED AREA WILL BE RE-SEEDED AND RE-VEGETATED.

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BENNETT D PAD
DRAINAGE PLAN
PRODUCTION PHASE SITE PLAN

SCALE:	1" = 200'	PAGE:	4 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

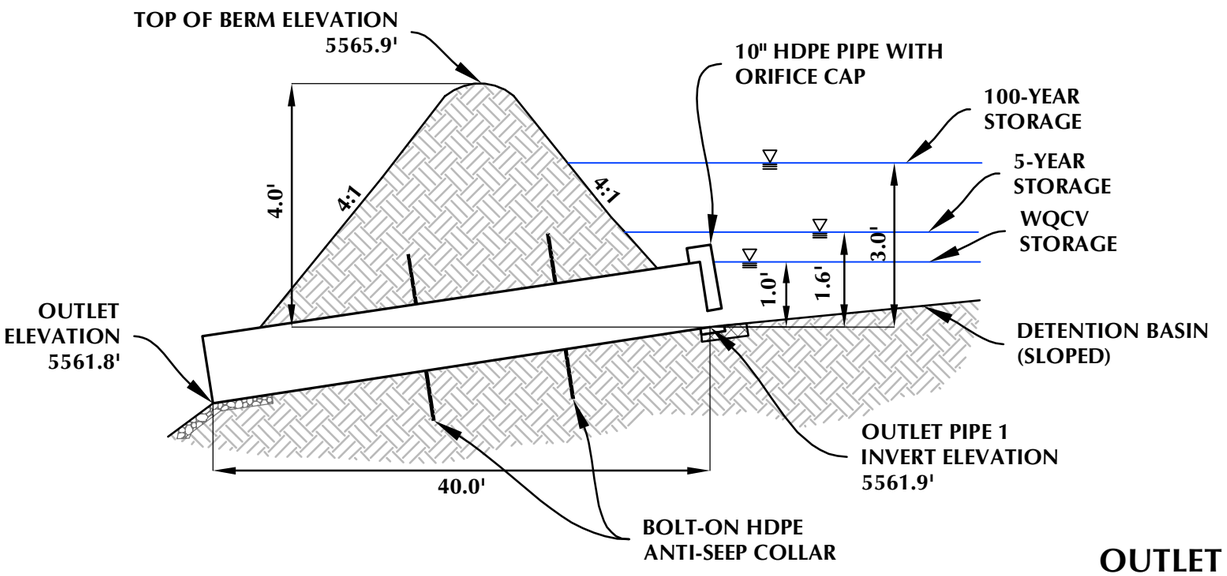
PRELIMINARY

K:\CIVIL\76 RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINE.dwg, 10/22/2024 2:45:34 PM, kgoles

DETENTION BASIN (DB) OUTLET - CONSTRUCTION PHASE

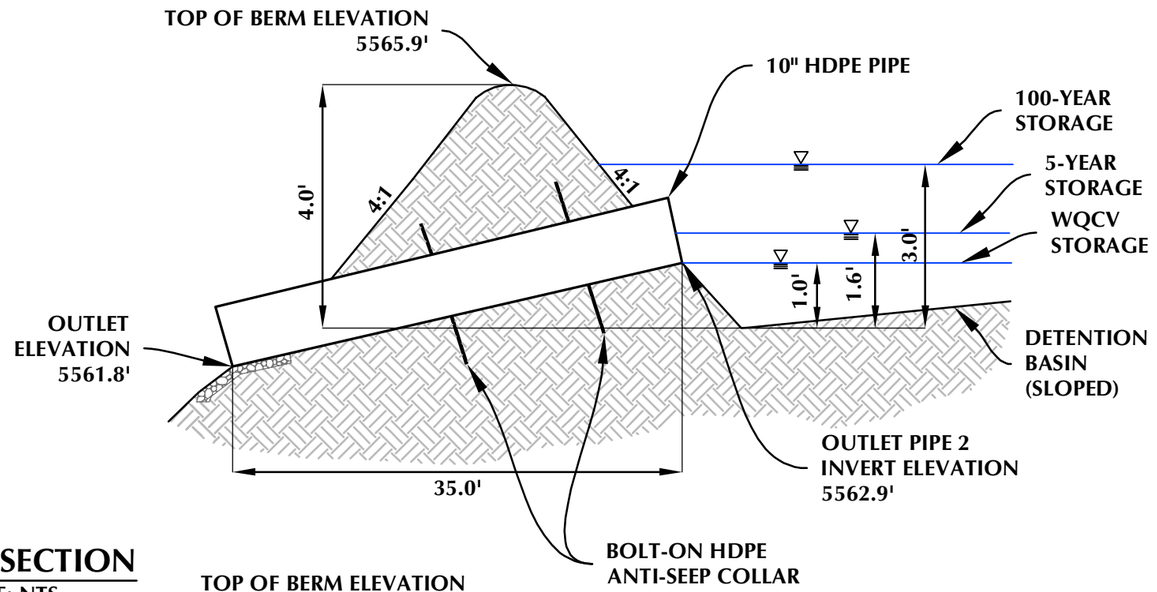
OUTLET PROFILE (PIPE 1)

SCALE: NTS



OUTLET PROFILE (PIPE 2)

SCALE: NTS



OUTLET SECTION

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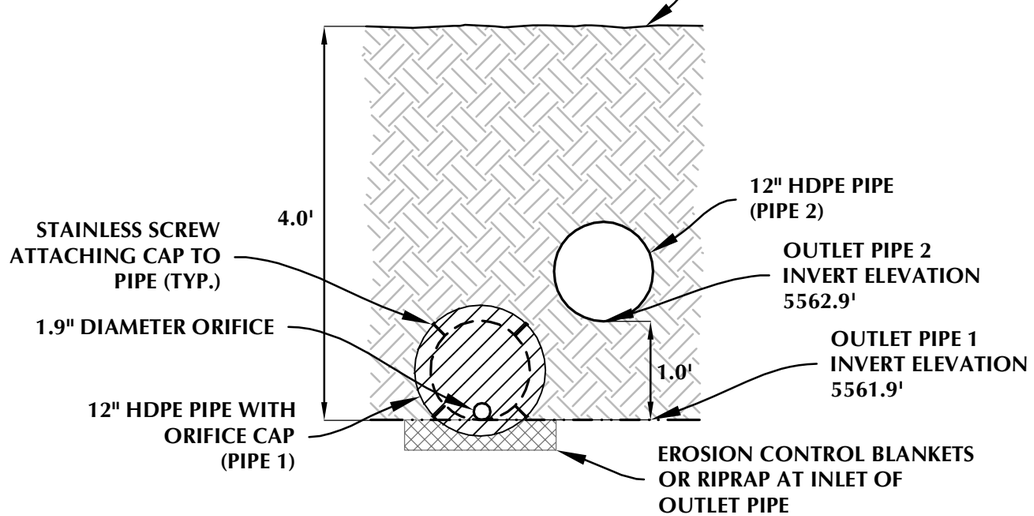

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BENNETT D PAD
DRAINAGE PLAN
DETENTION BASIN OUTLET - CONSTRUCTION

SCALE:	VARIES	PAGE:	5 OF 10
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DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

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DETENTION BASIN (DB) OUTLET - PRODUCTION PHASE

OUTLET PROFILE (PIPE 1)

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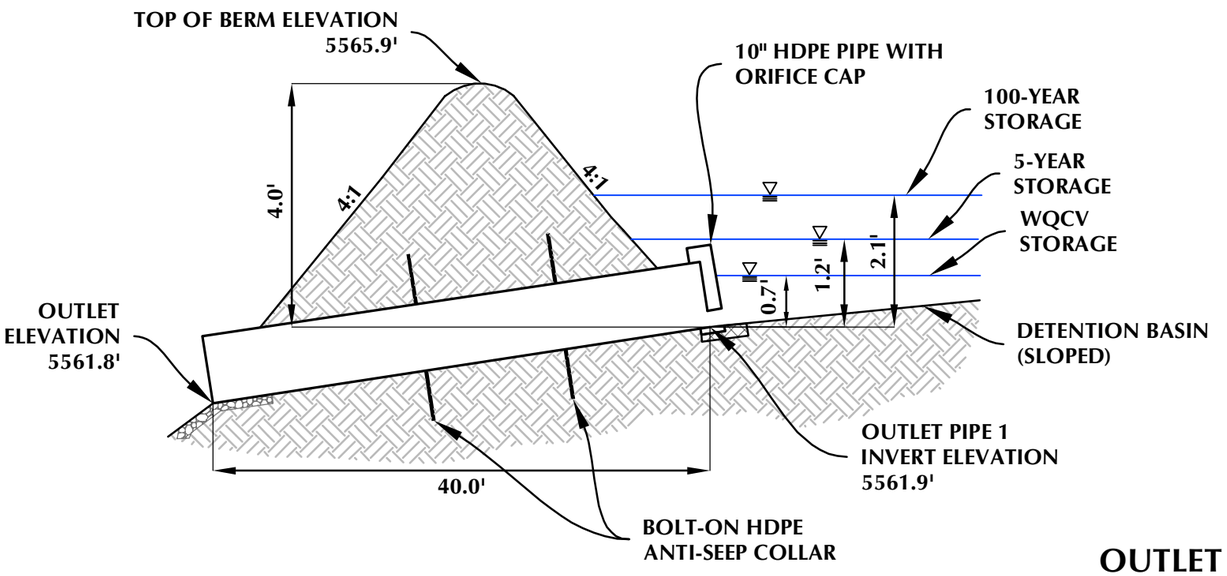

OUTLET PROFILE (PIPE 2)

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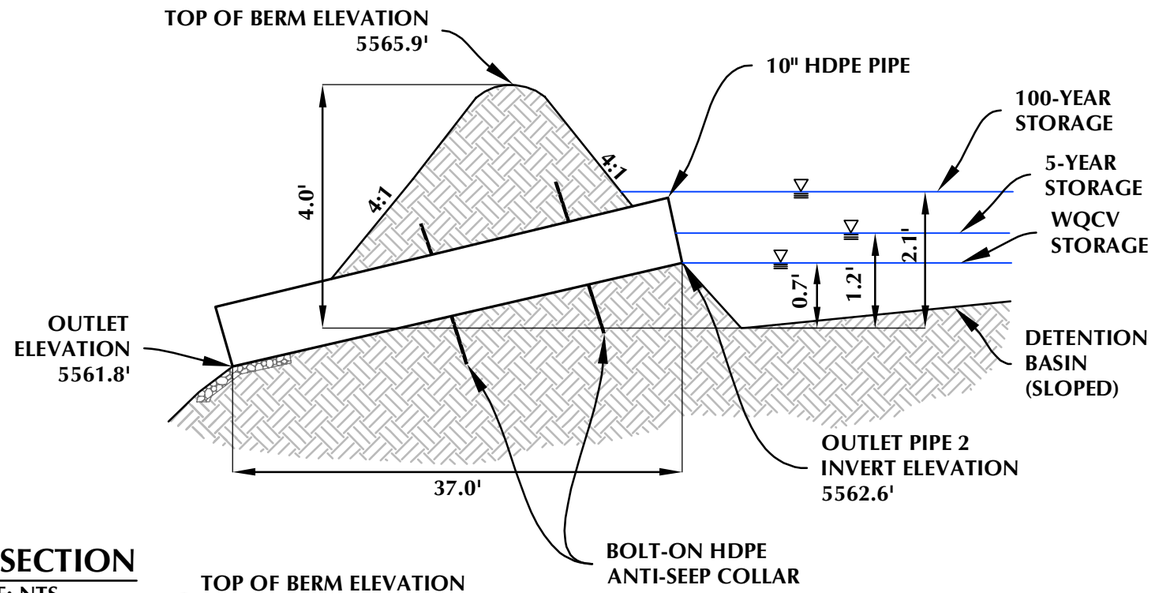

OUTLET SECTION

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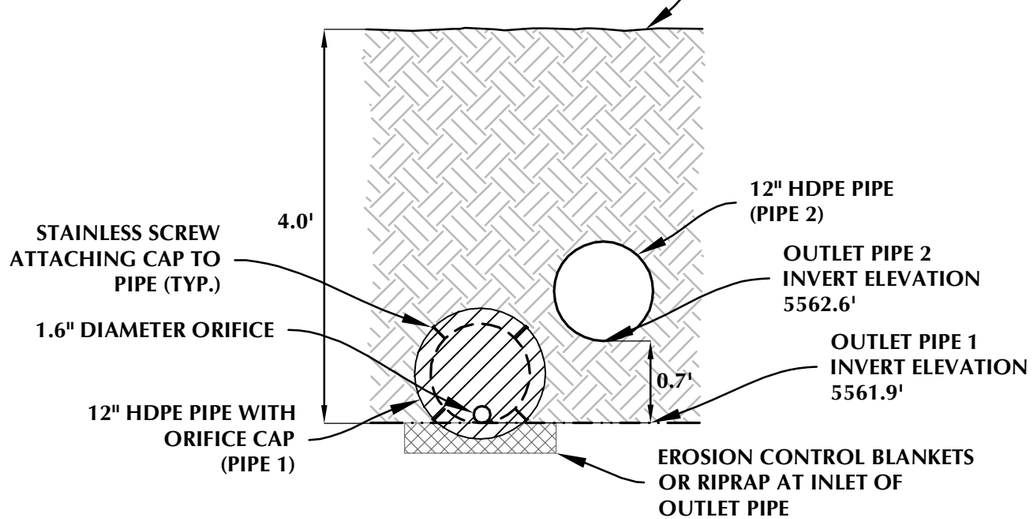

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BENNETT D PAD
DRAINAGE PLAN
DETENTION BASIN OUTLET - PRODUCTION

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DRAFTED BY:	KMG	REVISED:	

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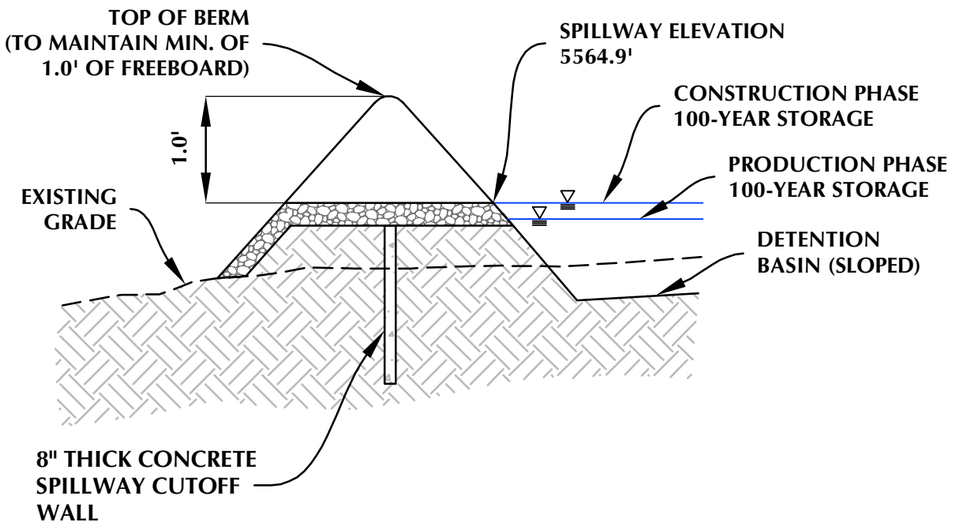
DETENTION BASIN (DB) SPILLWAY - BOTH PHASES

SPILLWAY PROFILE

SCALE: NTS



SPILLWAY SECTION

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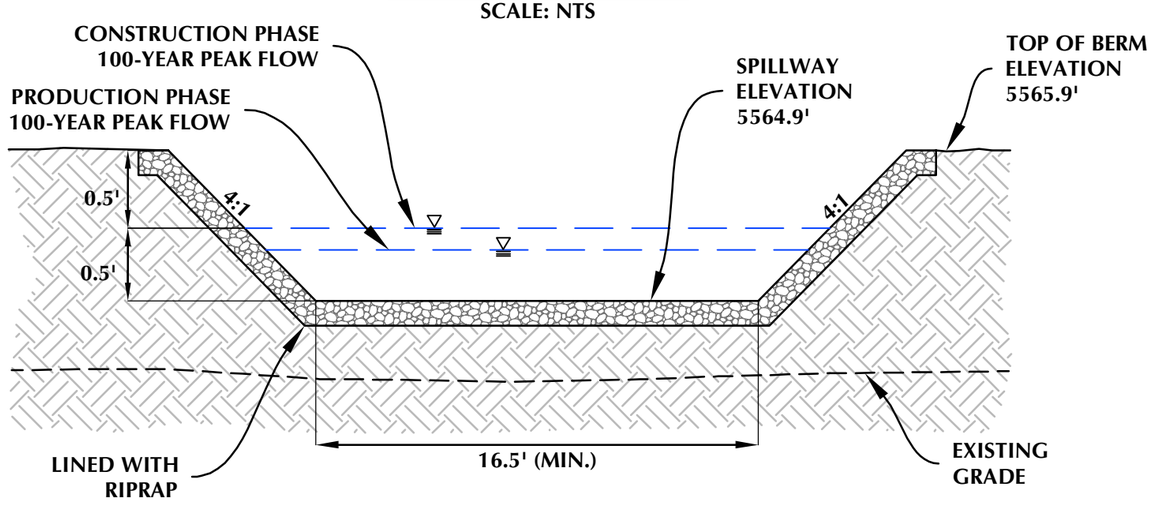
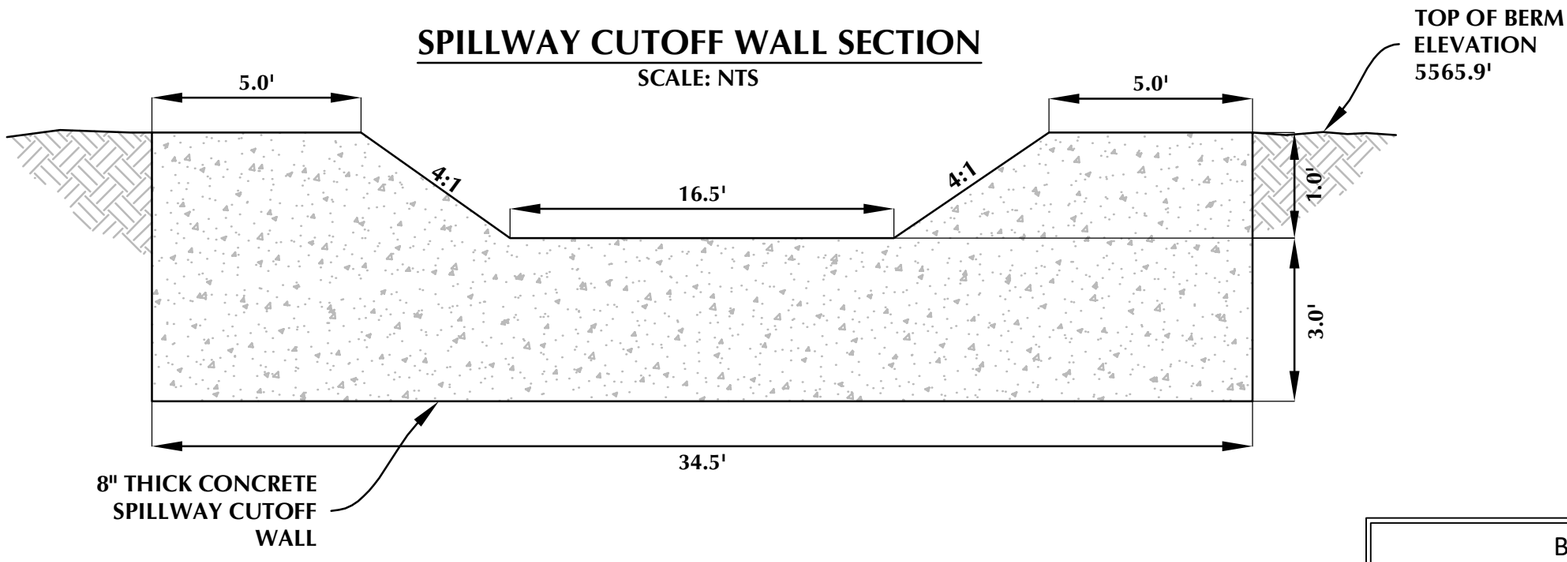


SPILLWAY CUTOFF WALL SECTION

SCALE: NTS



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BENNETT D PAD
DRAINAGE PLAN
DETENTION BASIN SPILLWAY

SCALE:	VARIES	PAGE:	7 OF 10
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DRAFTED BY:	KMG	REVISED:	

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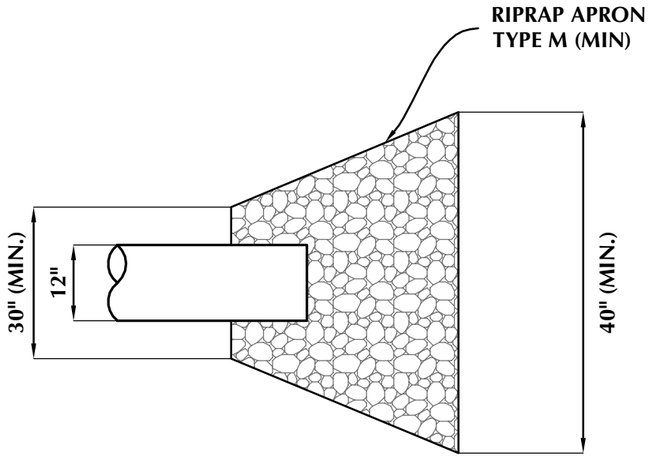
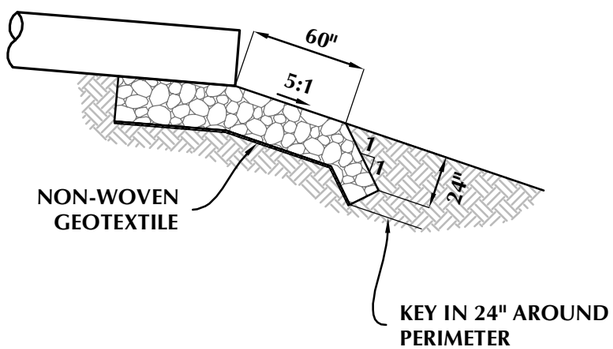
OUTLET PROTECTION

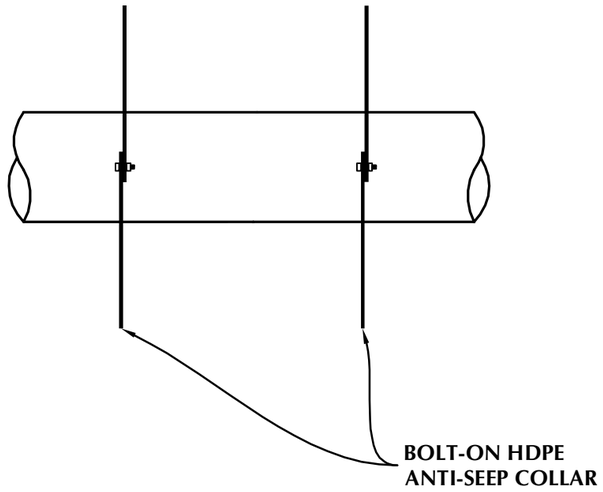
SCALE: NTS

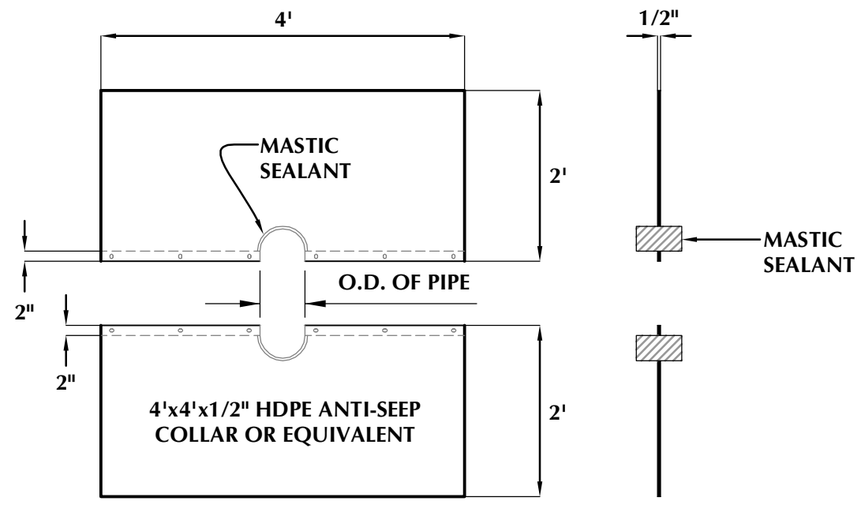




ANTI-SEEP COLLAR

SCALE: NTS





GENERAL NOTES:

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BENNETT D PAD
DRAINAGE PLAN
OUTLET DETAILS

SCALE:	VARIES	PAGE:	8 OF 10
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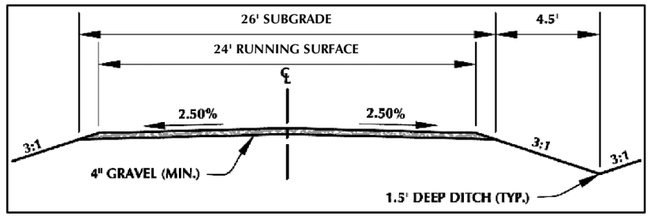


CROSS-SECTION
NTS

Temporary and Permanent Seeding (TS/PS)

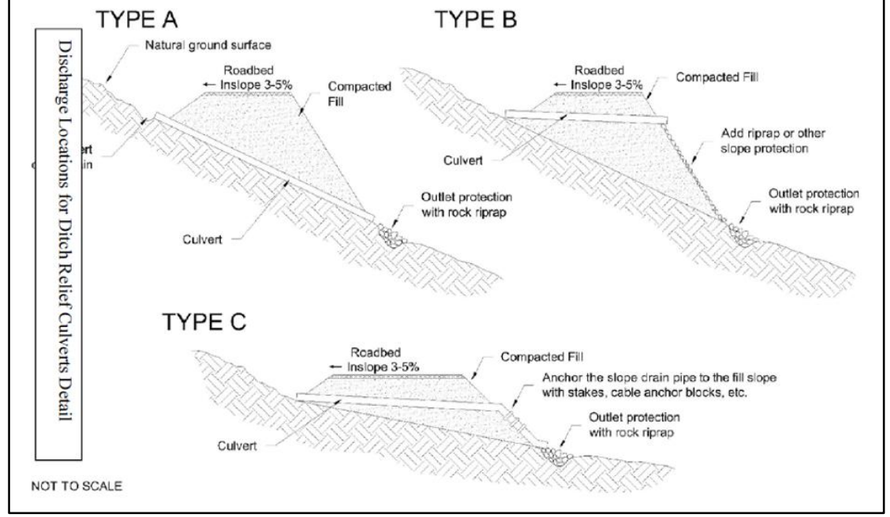
TS/PS

ADAMS COUNTY, COLORADO

SEED MIX	APPLICATION RATE (lbs/acre)
PBSI Dryland Aggressive Mix	25
(20%) Green Needlegrass, Lodorm	
(20%) Slender Wheatgrass, Native	
(20%) Western Wheatgrass, Native	
(20%) Pubescent Wheatgrass, Luna	
(20%) Intermediate Wheatgrass, Oahe/Rush	
PBSI Native Prairie Mix	15
(25%) Blue Grama	
(10%) Buffalograss	
(20%) Green Needlegrass	
(20%) Sideoats Grama	
(25%) Western Wheatgrass	
PBSI Native Sandyland Mix	15
(20%) Yellow Indiangrass	
(10%) Little Bluestem	
(10%) Indian Rice Grass	
(10%) Sideoats Grama	
(10%) Sand Lovegrass	
(10%) Prairie Sandreed	
(20%) Switchgrass	
PBSI Premium Irrig. Pasture Mix #1	25
(75%) Meadow Bromegrass, Paddock/Fleet	
(25%) Orchardgrass, Elsie/Megabite/Paiute	

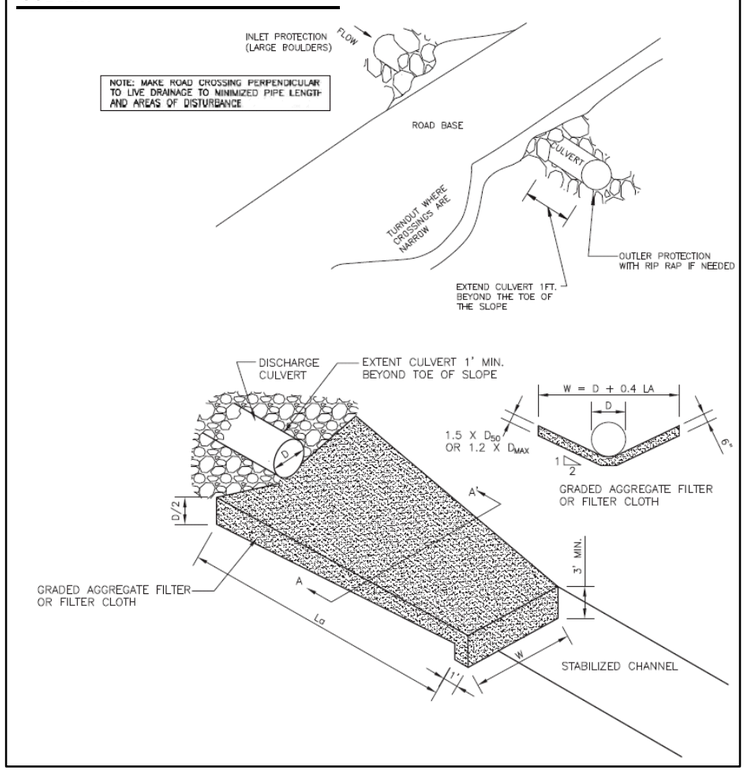
Notes:
lbs/acre = pounds per acre
% = percent

CULVERT



NOT TO SCALE

CULVERT



GENERAL NOTES:

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BENNETT D PAD
DRAINAGE PLAN
BMP TYPICALS (A)

SCALE:	VARIES	PAGE:	9 OF 10
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PRELIMINARY

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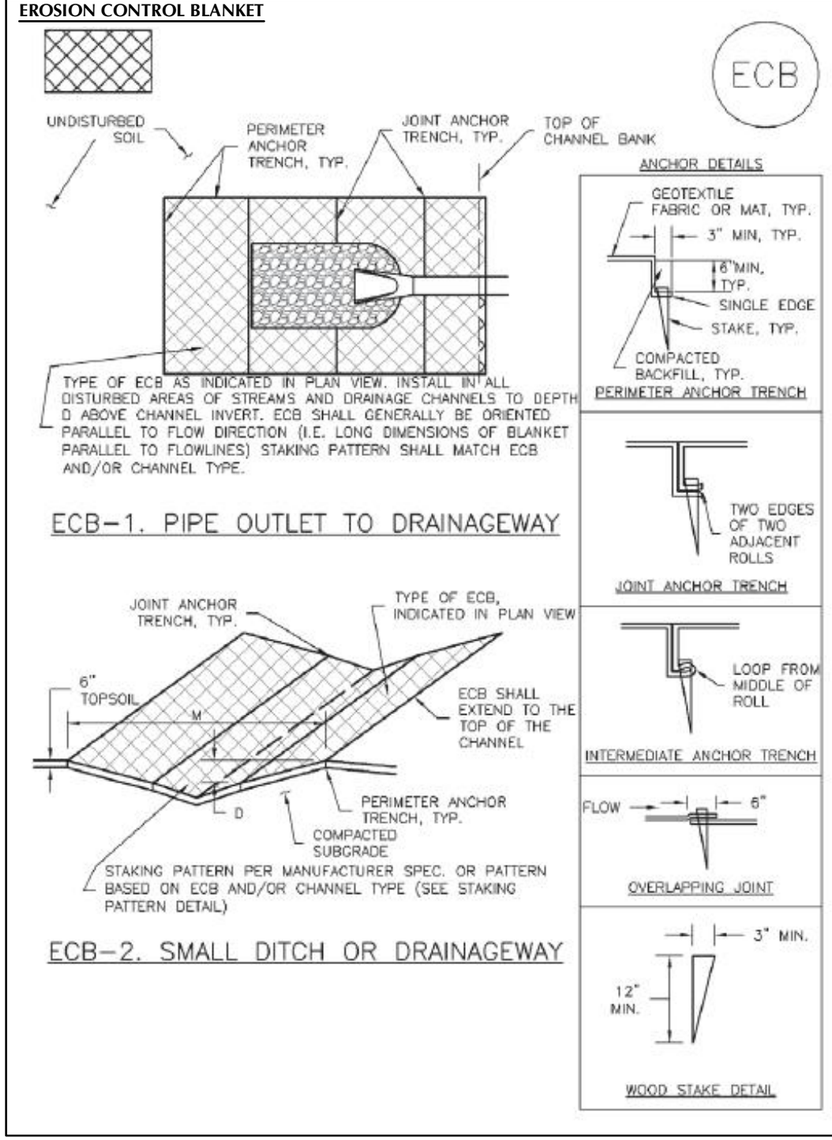
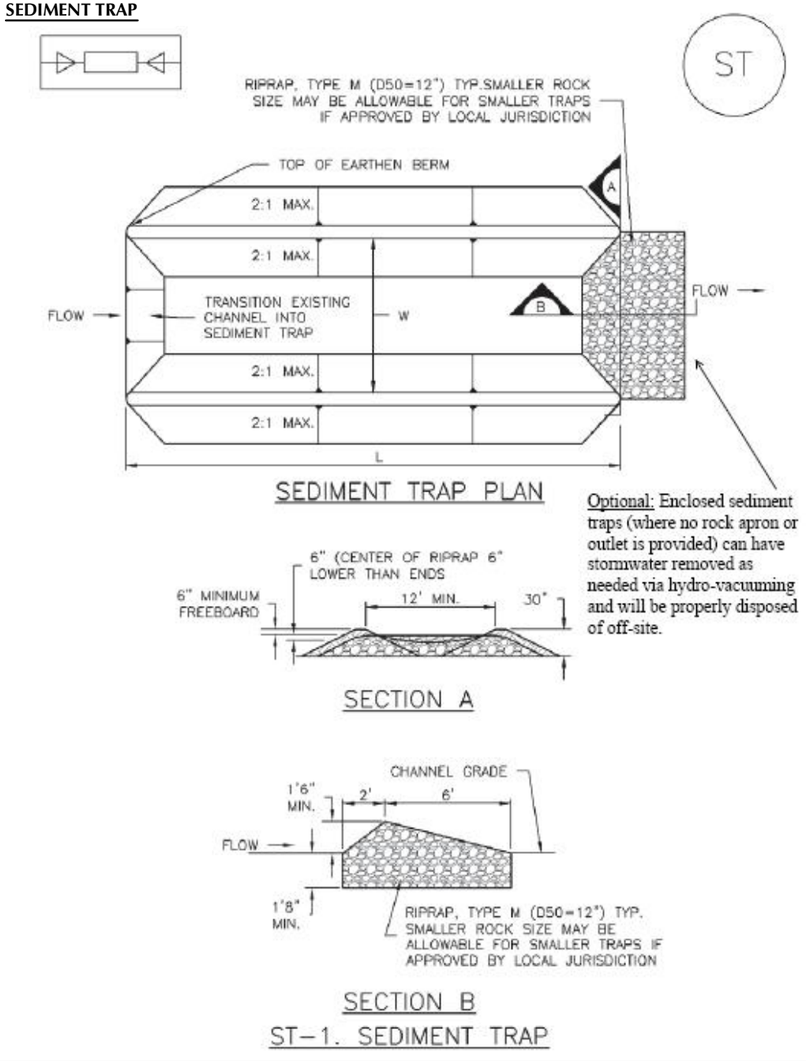
EROSION CONTROL BLANKET



SEDIMENT TRAP



Optional: Enclosed sediment traps (where no rock apron or outlet is provided) can have stormwater removed as needed via hydro-vacuuming and will be properly disposed of off-site.

GENERAL NOTES:

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BENNETT D PAD
DRAINAGE PLAN
BMP TYPICALS (B)

SCALE:	VARIES	PAGE:	10 OF 10
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DRAFTED BY:	KMG	REVISED:	

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Appendix B:

Drainage Report and Drainage Plan Checklist

Level 2 – Storm Drainage Report				
Item No.	Submitted[1]	County Use Only		
		Rejected	N/A	
1.	☐	☐	☐	Signed certification statements of the Engineer and Developer.
2.	☒	☐	☐	Description of project location.
3.	☒	☐	☐	Description of pre-development site conditions.
4.	☒	☐	☐	Description of proposed development, including description of proposed developed site.
5.	☒	☐	☐	Description of proposed stormwater improvements, including conveyance, stormwater quantity control facilities, and stormwater quality control facilities.
6.	☒	☐	☐	Description of the design method utilized, names of any computer software routines utilized in the design process, and reference any design standards utilized (other than Adams County ordinances).
7.	☒	☐	☐	Preliminary hydrological and hydraulic analysis, including pre-development and post-development runoff hydrographs for the project site.
8.	☒	☐	☐	Preliminary sizing of storage facilities proposed for stormwater quantity and/or quality control.
9.	☒	☐	☐	Preliminary report addressing potential erosion and sedimentation impacts during construction, and general proposals for the mitigation of these impacts. Address erosion control during and after construction.
10.	☒	☐	☐	Vicinity Map - including Section, Township, and Range
11.	☒	☐	☐	Professional Engineer's Seal – including signature and date.
12.	☒	☐	☐	Downstream and adjacent property Drainage Impact Analysis and Mitigation Measures.
13.	☒	☐	☐	Pre-development and post-development basin maps, showing boundaries of project, any off-site contributing drainage basins, on-site drainage basins, time of concentration routes, approximate locations of all major drainage structures within the basins, and the course of stormwater originating from the subject property and extending all the way to the nearest receiving body of water (lakes, creeks, etc.). All basin maps shall be legible and at a specified scale.
14.	☒	☐	☐	Other resource material such as soils maps, isopluvial maps, nomographs, charts, figures, tables, etc.
15.	☐	☐	☐	Surface/subsurface soil test results and test locations (when retention/infiltration is proposed).
16.	☒	☐	☐	Identify all easements.
17.	☒	☐	☐	Include runoff summary table at design points.
18.	☒	☐	☐	Indicate proposed drainage improvements.
Developer's Comments (please reference the item number for each comment) 1. Stamp and signature will be added to final report. 15. Retention/infiltration is not being proposed.				
County's Comments				

[1] To be checked by the Developer. If a "submitted" box is not checked, the Applicant must explain (in comment box above) or the application may be rejected for insufficient information.

Level 2 – Storm Drainage Plan

Item No.	Submitted[1]	County Use Only		
		Rejected	N/A	
1.	X	☐	☐	Sheet Size – 24" x 36" or 11" x 17"
2.	X	☐	☐	Project Title Sheet
3.	X	☐	☐	Project Site Plan
4.	X	☐	☐	Title Block – include name and address of proposed project/development.
5.	X	☐	☐	Drawing Information • North arrow indicator • Section-Township-Range • Drawing Scale • Symbol Legend
6.	X	☐	☐	Drawing Scale – plan view must be drawn at a scale legible enough for review. Must use standard engineering scale.
7.	X	☐	☐	Topography – include contour lines at a maximum of 2' intervals with source to datum identified. Extend past the project limits as appropriate to show downstream effects.
8.	X	☐	☐	Utilities - existing and proposed, with easements identified.
9.	X	☐	☐	Site Layout – including property boundaries, dimensions, area (in square feet or acres), adjoining street names and right-of-way widths
10.	X	☐	☐	Drainage Structures - including existing and proposed structures (pipes, catch basins , channels, ponds, irrigation ditches, etc.) and impervious surfaces (parking lots, driveways, patios, buildings, etc.)
11.	X	☐	☐	Natural Features – including drainage channels, wetlands, water bodies, areas of natural vegetation, and flood plains.
12.	X	☐	☐	Proposed Conveyance Structures – including approximate plans for collection and conveyance of stormwater through the project site. As a minimum, show by flow arrows the direction of proposed stormwater flow and indicate the method for conveyance (pipe, ditch, overland flow, etc.)
13.	X	☐	☐	Preliminary Road Layouts – including existing grade and proposed finished grade.
14.	X	☐	☐	Erosion and Sedimentation Control – including location and type of erosion and sedimentation control measure proposal.
15.	X	☐	☐	General Construction Notes – include notes for clarification (see Attachment ___ for County Examples.)
16.	☐	☐	☐	Professional Engineer's Seal – including signature and date.

Developer's Comments (please reference the item number for each comment)

16. Professional Engineer's Seal will be added to final drainage plan.

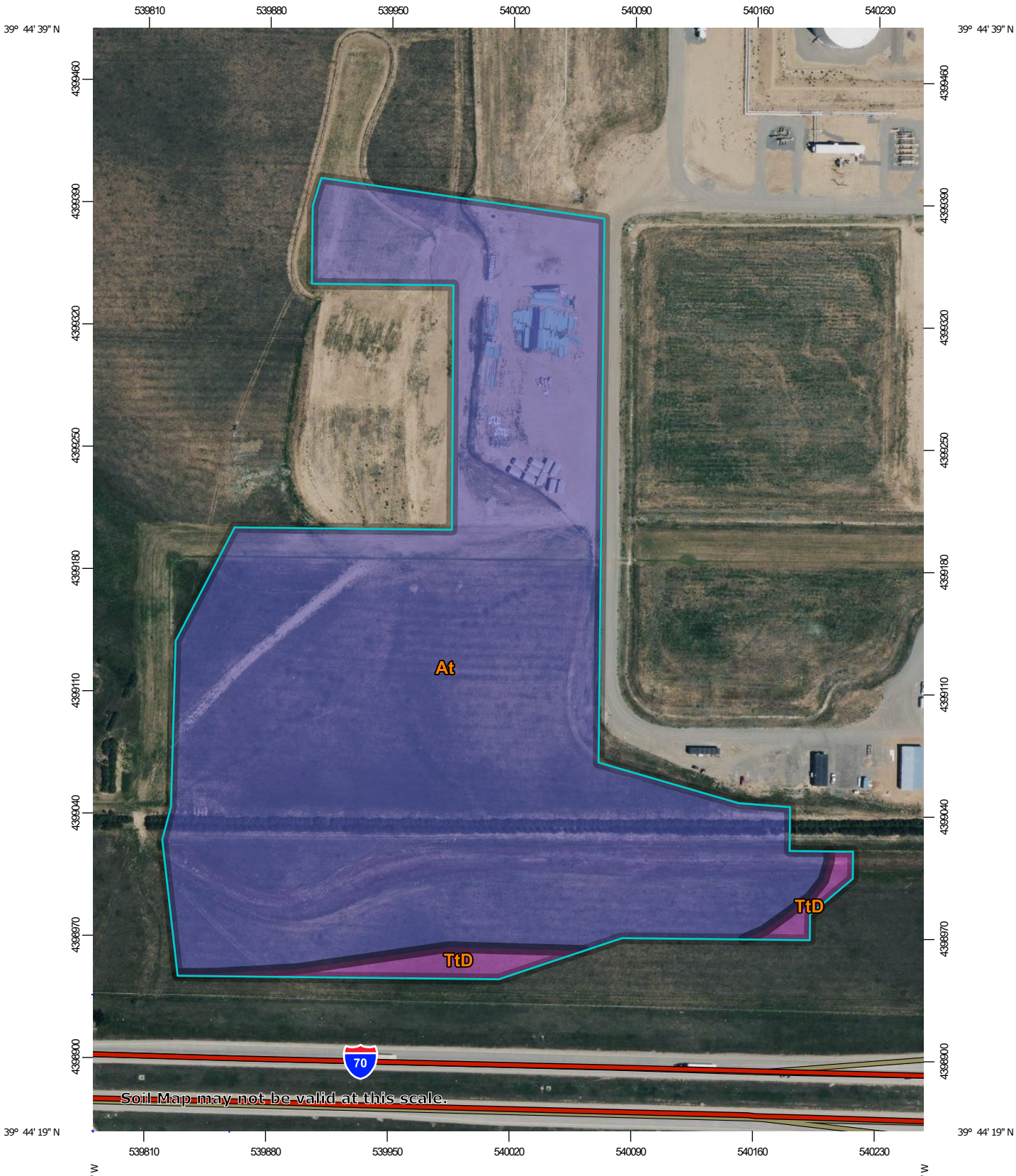
County's Comments

[1] To be checked by the Developer. If a "submitted" box is not checked, the Applicant must explain (in comment box above) or the application may be rejected for insufficient information.

Appendix C:

NRCS Web Soil Survey – Soils Report

Hydrologic Soil Group—Adams County Area, Parts of Adams and Denver Counties, Colorado
(Bennett D Pad)



Map Scale: 1:3,080 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Adams County Area, Parts of Adams and Denver Counties, Colorado
Survey Area Data: Version 20, Aug 24, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
At	Ascalon-Platner association, 0 to 5 percent slopes	B	22.2	96.8%
TtD	Truckton loamy sand, 3 to 9 percent slopes	A	0.7	3.2%
Totals for Area of Interest			**23.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D:

FEMA Flood Insurance Rate Map FIRMette

National Flood Hazard Layer FIRMette

FEMA

104°32'20"W 39°44'41"N

104°31'42"W 39°44'14"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/14/2024 at 6:59 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix E:

UD-Rational Spreadsheet Calculations

Calculation of Peak Runoff using Rational Method

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S^{0.33}}$$

$$t_t = \frac{L_t}{60K_t\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	1.00	1.42	1.68		2.35	2.71	
	a	b	c				
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786				

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

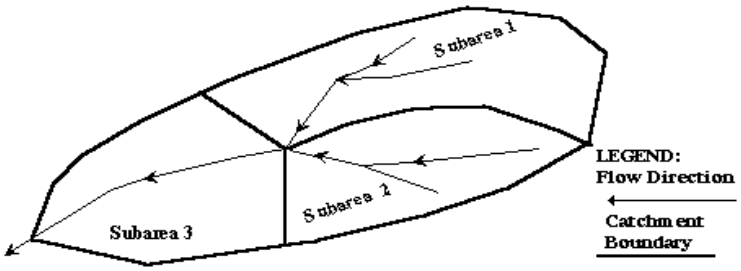
$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Oil and Gas Location - Historic	22.96	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	500			0.019	35.54	490			0.019	7	0.96	8.46	44.00	32.04	32.04	1.5	2.1	2.5		3.5	4.1		0.3	0.6	4.3		27.6	40.9	
				0.01	0.01	0.07	0.25	0.33	0.43	0.53					35.54								44.01		44.01	1.2	1.8	2.1		2.9	3.4		0.2	0.5	3.4		22.0	32.8	
ST - Construction Phase	8.62	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	500			0.005	55.21	1400			0.005	10	0.71	33.00	88.21	61.22	61.22	1.0	1.4	1.7		2.3	2.7		0.1	0.1	1.1		6.8	10.1	
				0.01	0.01	0.03	0.08	0.13	0.22	0.35					55.43								88.43		88.43	0.8	1.1	1.3		1.8	2.1		0.0	0.1	0.3		2.0	3.9	
PC1 - Construction Phase	1.75	B	6.6	0.03	0.04	0.11	0.29	0.36	0.46	0.56	500			0.007	47.93	180			0.007	10	0.84	3.59	51.52	28.49	28.49	1.6	2.3	2.7		3.8	4.4		0.1	0.2	0.5		2.4	3.5	
				0.04	0.05	0.09	0.20	0.26	0.34	0.46					47.88								51.46		51.46	1.1	1.6	1.9		2.6	3.0		0.1	0.1	0.3		1.2	1.8	
PC2 - Construction Phase	2.09	B	7.8	0.04	0.05	0.12	0.30	0.37	0.46	0.56	500			0.007	47.53	520			0.007	10	0.84	10.36	57.89	34.94	34.94	1.4	2.0	2.4		3.4	3.9		0.1	0.2	0.6		2.6	3.7	
				0.05	0.06	0.10	0.22	0.28	0.37	0.48					47.40								57.76		57.76	1.0	1.5	1.7		2.4	2.8		0.1	0.2	0.4		1.4	2.2	
PC2 - Production Phase	2.65	B	6.3	0.03	0.04	0.11	0.29	0.36	0.46	0.56	500			0.007	48.03	520			0.007	10	0.84	10.36	58.39	35.41	35.41	1.4	2.0	2.4		3.3	3.8		0.1	0.2	0.7		3.2	4.6	
				0.04	0.04	0.09	0.23	0.29	0.38	0.49					47.93								58.28		58.28	1.0	1.5	1.7		2.4	2.8		0.1	0.2	0.4		1.9	2.8	
PC3 - Construction Phase	2.30	B	7.5	0.04	0.05	0.12	0.30	0.37	0.46	0.56	500			0.007	47.63	1035			0.007	10	0.84	20.62	68.25	45.24	45.24	1.2	1.7	2.0		2.9	3.3		0.1	0.2	0.6		2.4	3.5	
				0.05	0.05	0.10	0.23	0.29	0.37	0.49					47.52								68.14		68.14	0.9	1.3	1.6		2.2	2.5		0.1	0.2	0.4		1.4	2.2	
PC3 - Production Phase	2.86	B	6.1	0.03	0.04	0.11	0.29	0.36	0.45	0.56	500			0.007	48.10	1035			0.007	10	0.84	20.62	68.72	45.89	45.89	1.2	1.7	2.0		2.8	3.3		0.1	0.2	0.6		2.9	4.2	
				0.04	0.04	0.09	0.23	0.30	0.38	0.50					47.99								68.60		68.60	0.9	1.3	1.6		2.2	2.5		0.1	0.2	0.4		1.8	2.8	
DB - Construction Phase	17.84	B	30.4	0.21	0.23	0.30	0.44	0.50	0.57	0.65	300			0.005	34.02	1700			0.005	10	0.71	40.07	74.09	51.06	51.06	1.1	1.6	1.9		2.6	3.0		4.2	6.7	10.2		23.5	30.9	
				0.22	0.24	0.30	0.44	0.50	0.57	0.65					33.84								73.91		51.06	1.1	1.6	1.9		2.6	3.0		4.3	6.8	10.2		23.5	30.8	
DB - Production Phase	10.49	B	28.8	0.19	0.22	0.29	0.43	0.49	0.56	0.64	300			0.005	34.54	1490			0.005	10	0.71	35.12	69.66	48.05	48.05	1.2	1.7	2.0		2.8	3.2		2.4	3.9	6.0		14.1	18.6	
				0.20	0.23	0.29	0.43	0.49	0.56	0.64					34.33								69.45		48.05	1.2	1.7	2.0		2.8	3.2		2.5	4.0	6.0		14.1	18.6	
DS - Production Phase	9.28	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54	500			0.005	55.21	1440			0.005	7	0.49	48.49	103.69	62.23	62.23	1.0	1.4	1.7		2.3	2.7		0.1	0.2	1.1		7.3	10.8	
				0.01	0.01	0.04	0.14	0.20	0.29	0.41					55.36								103.85		103.85	0.7	1.0	1.2		1.6	1.9		0.0	0.1	0.4		3.0	5.0	

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO



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Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

Subcatchment Name
Oil and Gas Location - Historic

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.74	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
B	22.22	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
Total Area (ac)	**22.96**		**Area-Weighted C**	**0.01**	**0.01**	**0.07**	**0.25**	**0.33**	**0.43**	**0.53**
			Area-Weighted Override C	**0.01**	**0.01**	**0.07**	**0.25**	**0.33**	**0.43**	**0.53**

Area-Weighted Runoff Coefficient Calculations

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Designer: KMG
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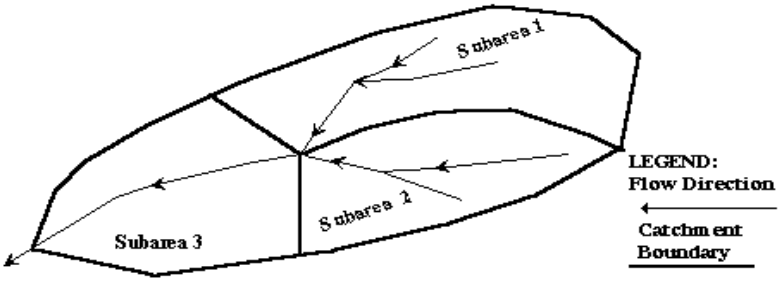

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Subcatchment Name
ST - Construction Phase

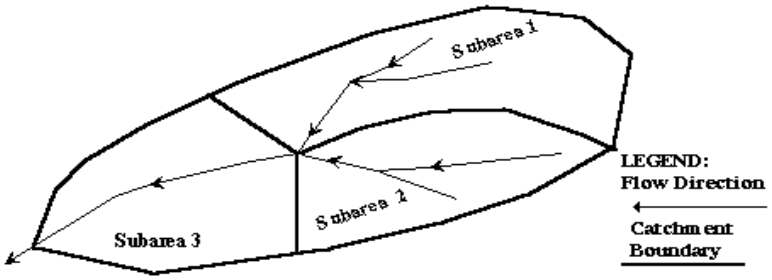
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	6.09	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
B	2.53	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
Total Area (ac)	**8.62**		**Area-Weighted C**	**0.01**	**0.01**	**0.03**	**0.08**	**0.13**	**0.22**	**0.35**
			Area-Weighted Override C	**0.01**	**0.01**	**0.03**	**0.08**	**0.13**	**0.22**	**0.35**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO



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Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

Subcatchment Name
PC1 - Construction Phase

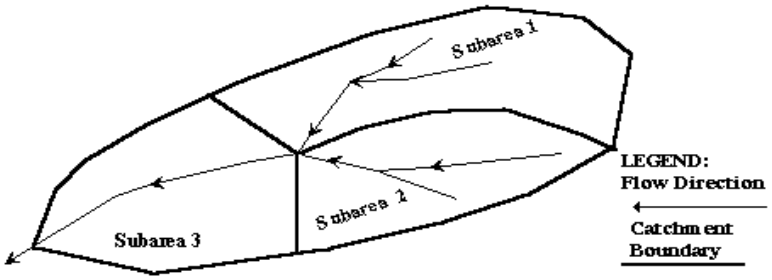
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.63	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
A	0.02	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51
B	0.91	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	0.19	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**1.75**		**Area-Weighted C**	**0.04**	**0.05**	**0.09**	**0.20**	**0.26**	**0.34**	**0.46**
			Area-Weighted Override C	**0.04**	**0.05**	**0.09**	**0.20**	**0.26**	**0.34**	**0.46**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO



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Subcatchment Name
PC2 - Construction Phase

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.63	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
A	0.02	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51
B	1.14	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	0.30	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**2.09**		**Area-Weighted C**	**0.05**	**0.06**	**0.10**	**0.22**	**0.28**	**0.37**	**0.48**
			Area-Weighted Override C	**0.05**	**0.06**	**0.10**	**0.22**	**0.28**	**0.37**	**0.48**

Area-Weighted Runoff Coefficient Calculations

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Designer: KMG
Company: 609 Consulting
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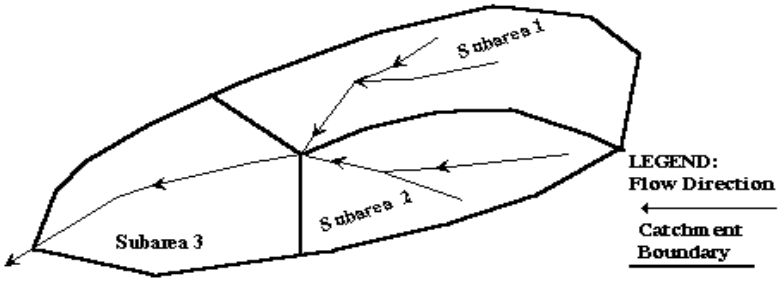
Location: S34 T3S R64W Adams County, CO



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Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

Subcatchment Name
PC2 - Production Phase

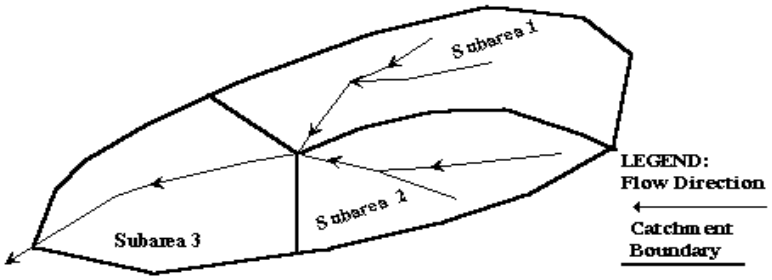
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.63	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
A	0.02	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51
B	1.72	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	0.28	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**2.65**		**Area-Weighted C**	**0.04**	**0.04**	**0.09**	**0.23**	**0.29**	**0.38**	**0.49**
			Area-Weighted Override C	**0.04**	**0.04**	**0.09**	**0.23**	**0.29**	**0.38**	**0.49**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO



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Subcatchment Name
PC3 - Construction Phase

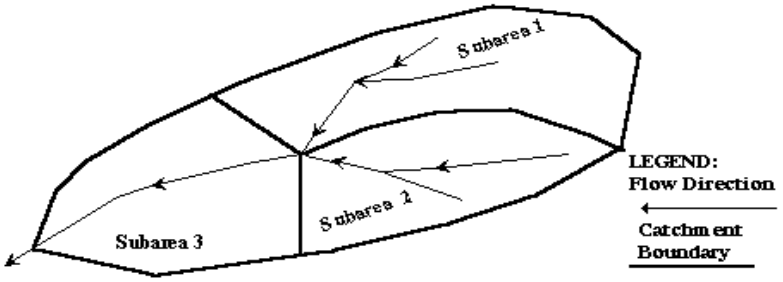
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.63	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
A	0.02	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51
B	1.34	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	0.31	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**2.30**		**Area-Weighted C**	**0.05**	**0.05**	**0.10**	**0.23**	**0.29**	**0.37**	**0.49**
			Area-Weighted Override C	**0.05**	**0.05**	**0.10**	**0.23**	**0.29**	**0.37**	**0.49**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO



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Subcatchment Name
PC3 - Production Phase

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.63	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
A	0.02	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51
B	1.92	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	0.29	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**2.86**		**Area-Weighted C**	**0.04**	**0.04**	**0.09**	**0.23**	**0.30**	**0.38**	**0.50**
			Area-Weighted Override C	**0.04**	**0.04**	**0.09**	**0.23**	**0.30**	**0.38**	**0.50**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
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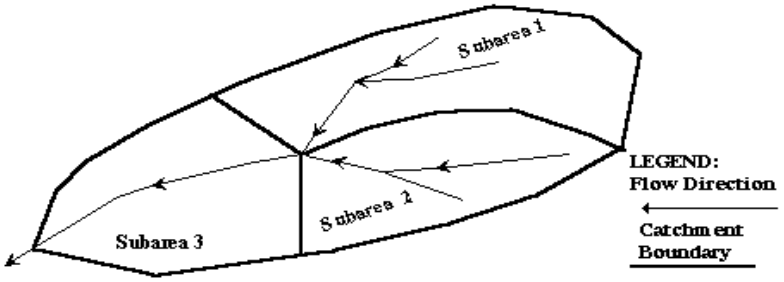

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Subcatchment Name
DB - Construction Phase

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	0.01	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
B	4.51	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	13.32	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**17.84**		**Area-Weighted C**	**0.22**	**0.24**	**0.30**	**0.44**	**0.50**	**0.57**	**0.65**
			Area-Weighted Override C	**0.22**	**0.24**	**0.30**	**0.44**	**0.50**	**0.57**	**0.65**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

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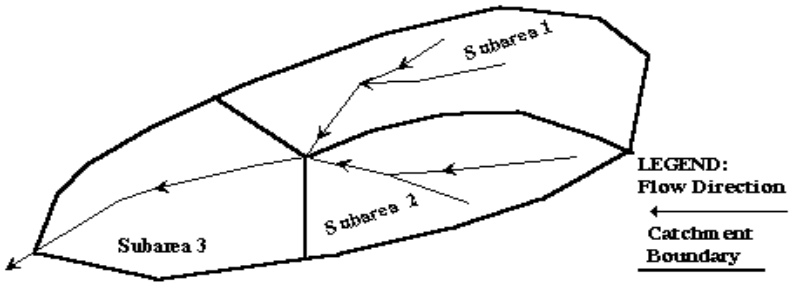

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Subcatchment Name
DB - Production Phase

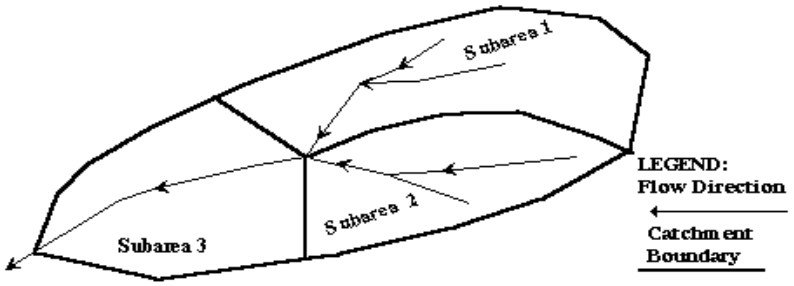
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
B	3.09	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
B	7.40	B	40.0	0.29	0.32	0.38	0.50	0.55	0.61	0.68
Total Area (ac)	**10.49**		**Area-Weighted C**	**0.20**	**0.23**	**0.29**	**0.43**	**0.49**	**0.56**	**0.64**
			Area-Weighted Override C	**0.20**	**0.23**	**0.29**	**0.43**	**0.49**	**0.56**	**0.64**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: KMG
Company: 609 Consulting
Date: 10/16/2024
Project: Bennett D Pad
Location: S34 T3S R64W Adams County, CO



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Subcatchment Name
DS - Production Phase

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A	4.41	A	2.0	0.01	0.01	0.01	0.01	0.04	0.13	0.27
B	4.87	B	2.0	0.01	0.01	0.07	0.26	0.34	0.44	0.54
Total Area (ac)	**9.28**		**Area-Weighted C**	**0.01**	**0.01**	**0.04**	**0.14**	**0.20**	**0.29**	**0.41**
			Area-Weighted Override C	**0.01**	**0.01**	**0.04**	**0.14**	**0.20**	**0.29**	**0.41**

Appendix F:

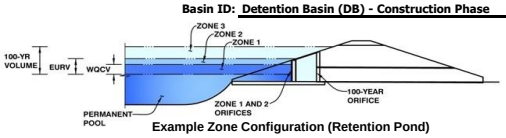
MHFD-Detention Spreadsheet Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Bennett D Pad**

Basin ID: **Detention Basin (DB) - Construction Phase**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	17.84	acres
Watershed Length =	2,000	ft
Watershed Length to Centroid =	1,060	ft
Watershed Slope =	0.005	ft/ft
Watershed Imperviousness =	30.40%	percent
Percentage Hydrologic Soil Group A =	0.06%	percent
Percentage Hydrologic Soil Group B =	99.94%	percent
Percentage Hydrologic Soil Groups C/D =	0.00%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.227	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.557	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1 in.) =	0.384	acre-feet	1.00	inches
5-yr Runoff Volume (P1 = 1.42 in.) =	0.814	acre-feet	1.42	inches
10-yr Runoff Volume (P1 = 1.68 in.) =	1.129	acre-feet	1.68	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	1.273	acre-feet		inches
50-yr Runoff Volume (P1 = 2.35 in.) =	2.229	acre-feet	2.35	inches
100-yr Runoff Volume (P1 = 2.71 in.) =	2.856	acre-feet	2.71	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	3.511	acre-feet		inches
Approximate 2-yr Detention Volume =	0.335	acre-feet		
Approximate 5-yr Detention Volume =	0.540	acre-feet		
Approximate 10-yr Detention Volume =	0.796	acre-feet		
Approximate 25-yr Detention Volume =	0.812	acre-feet		
Approximate 50-yr Detention Volume =	1.057	acre-feet		
Approximate 100-yr Detention Volume =	1.285	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.227	acre-feet
Zone 2 Volume (100-year - Zone 1) =	1.058	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	1.285	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

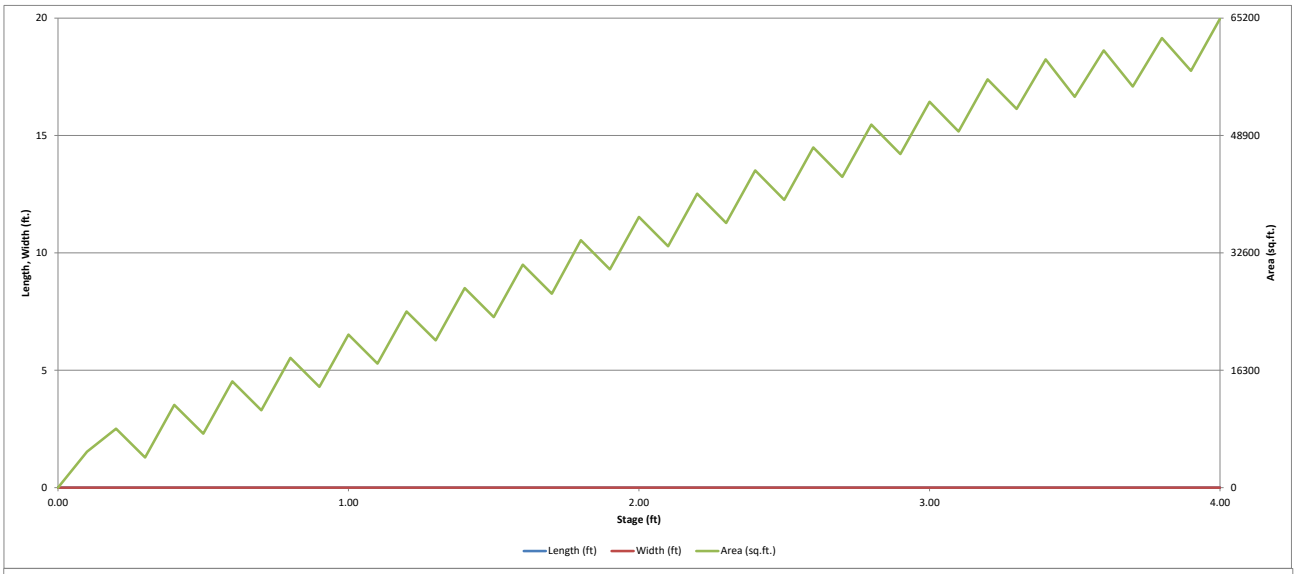
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

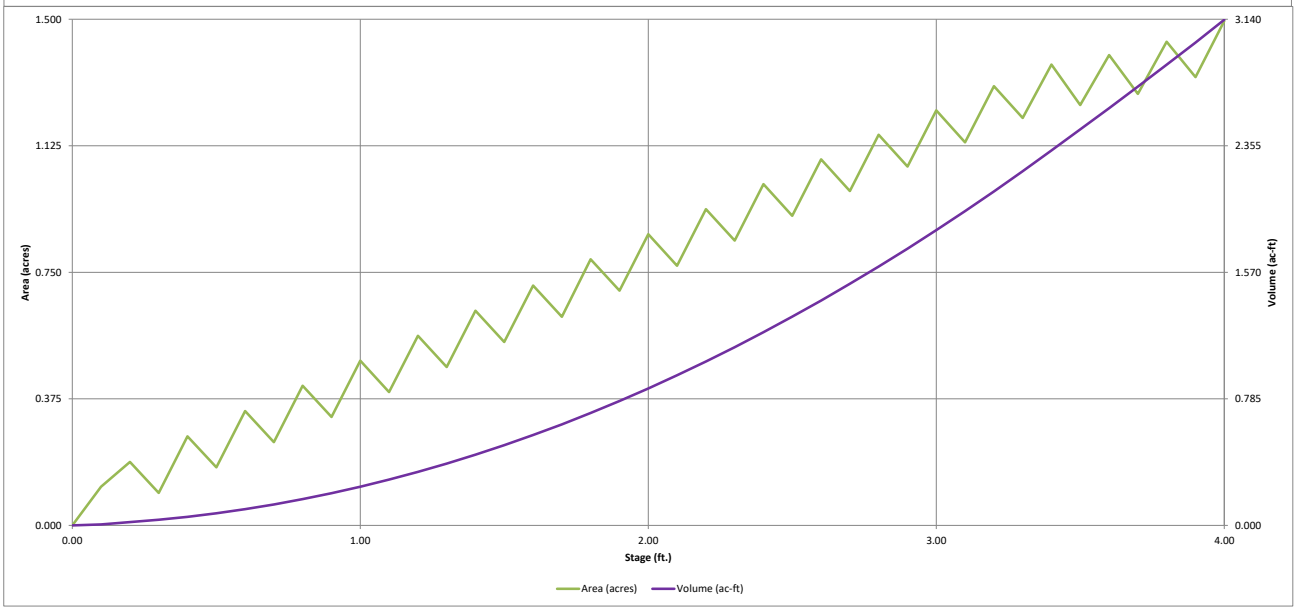
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	0.10	--	--	--	5,000	0.115	249	0.006
	--	0.20	--	--	--	8,188	0.188	908	0.021
	--	0.30	--	--	--	4,200	0.096	1,527	0.035
	--	0.40	--	--	--	11,490	0.264	2,312	0.053
	--	0.50	--	--	--	7,488	0.172	3,260	0.075
	--	0.60	--	--	--	14,764	0.339	4,373	0.100
	--	0.70	--	--	--	10,752	0.247	5,648	0.130
	--	0.80	--	--	--	18,024	0.414	7,087	0.163
	--	0.90	--	--	--	13,996	0.321	8,688	0.199
	--	1.00	--	--	--	21,254	0.488	10,450	0.240
	--	1.10	--	--	--	17,220	0.395	12,374	0.284
	--	1.20	--	--	--	24,474	0.562	14,459	0.332
	--	1.30	--	--	--	20,444	0.469	16,705	0.383
	--	1.40	--	--	--	27,714	0.636	19,112	0.439
	--	1.50	--	--	--	23,684	0.544	21,682	0.498
	--	1.60	--	--	--	30,960	0.711	24,414	0.560
	--	1.70	--	--	--	26,936	0.618	27,309	0.627
	--	1.80	--	--	--	34,362	0.789	30,374	0.697
	--	1.90	--	--	--	30,304	0.696	33,607	0.772
	--	2.00	--	--	--	37,588	0.863	37,002	0.849
	--	2.10	--	--	--	33,526	0.770	40,557	0.931
	--	2.20	--	--	--	40,824	0.937	44,275	1.016
	--	2.30	--	--	--	36,762	0.844	48,154	1.105
	--	2.40	--	--	--	44,048	1.011	52,195	1.198
	--	2.50	--	--	--	39,972	0.918	56,396	1.295
	--	2.60	--	--	--	47,248	1.085	60,757	1.395
	--	2.70	--	--	--	43,158	0.991	65,277	1.499
	--	2.80	--	--	--	50,424	1.158	69,956	1.606
	--	2.90	--	--	--	46,320	1.063	74,793	1.717
	--	3.00	--	--	--	53,578	1.230	79,788	1.832
	--	3.10	--	--	--	49,456	1.135	84,940	1.950
	--	3.20	--	--	--	56,704	1.302	90,248	2.072
	--	3.30	--	--	--	52,592	1.207	95,712	2.197
	--	3.40	--	--	--	59,480	1.365	101,316	2.326
	--	3.50	--	--	--	54,266	1.246	107,003	2.456
	--	3.60	--	--	--	60,706	1.394	112,752	2.588
	--	3.70	--	--	--	55,700	1.279	118,572	2.722
	--	3.80	--	--	--	62,440	1.433	124,479	2.858
	--	3.90	--	--	--	57,878	1.329	130,495	2.996
	--	4.00	--	--	--	65,118	1.495	136,645	3.137

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



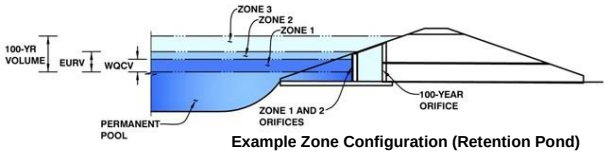


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Bennett D Pad**

Basin ID: **Detention Basin (DB) - Construction Phase**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.98	0.227	Orifice Plate
Zone 2 (100-year)	2.49	1.058	Circular Orifice
Zone 3			
Total (all zones)		1.285	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	1.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.0							
Orifice Area (sq. inches)	2.9							

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.0		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79		ft²
Depth at top of Zone using Vertical Orifice =	3.0		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50		feet
Vertical Orifice Diameter =	12.0		inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.0	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.5	feet
Spillway Crest Length =	16.5	feet	Stage at Top of Freeboard =	4.0	feet
Spillway End Slopes =	4.0	H:V	Basin Area at Top of Freeboard =	1.5	acres
Freeboard above Max Water Surface =	0.5	feet	Basin Volume at Top of Freeboard =	3.1	acre-ft

Calculated Parameters for Spillway

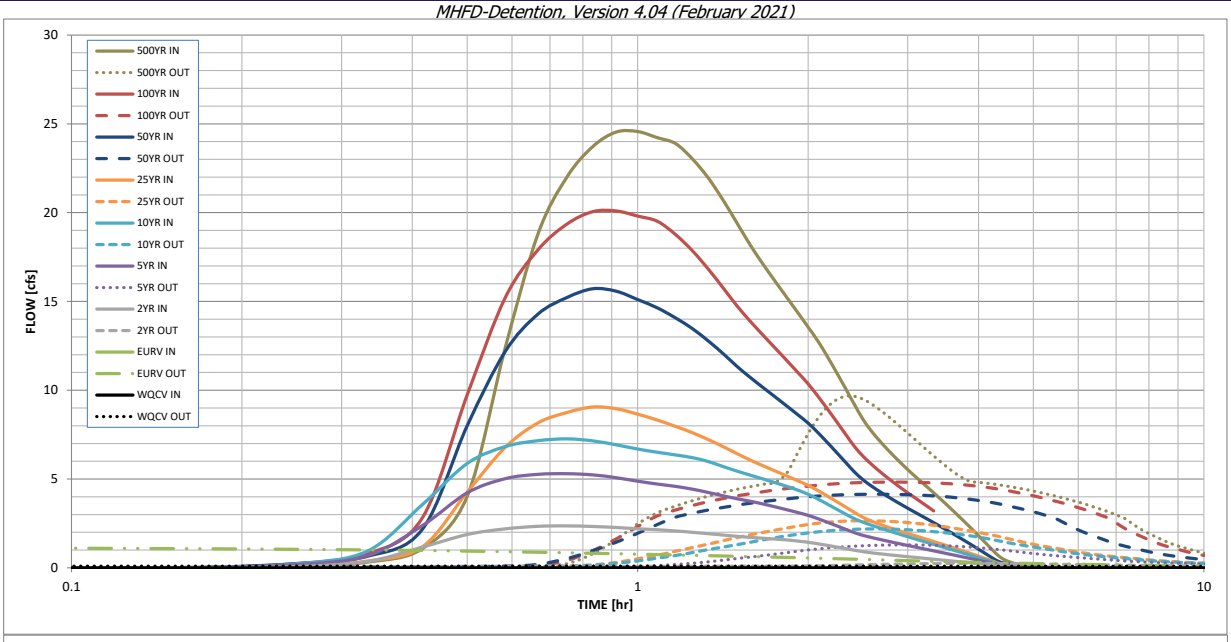
Routed Hydrograph Results

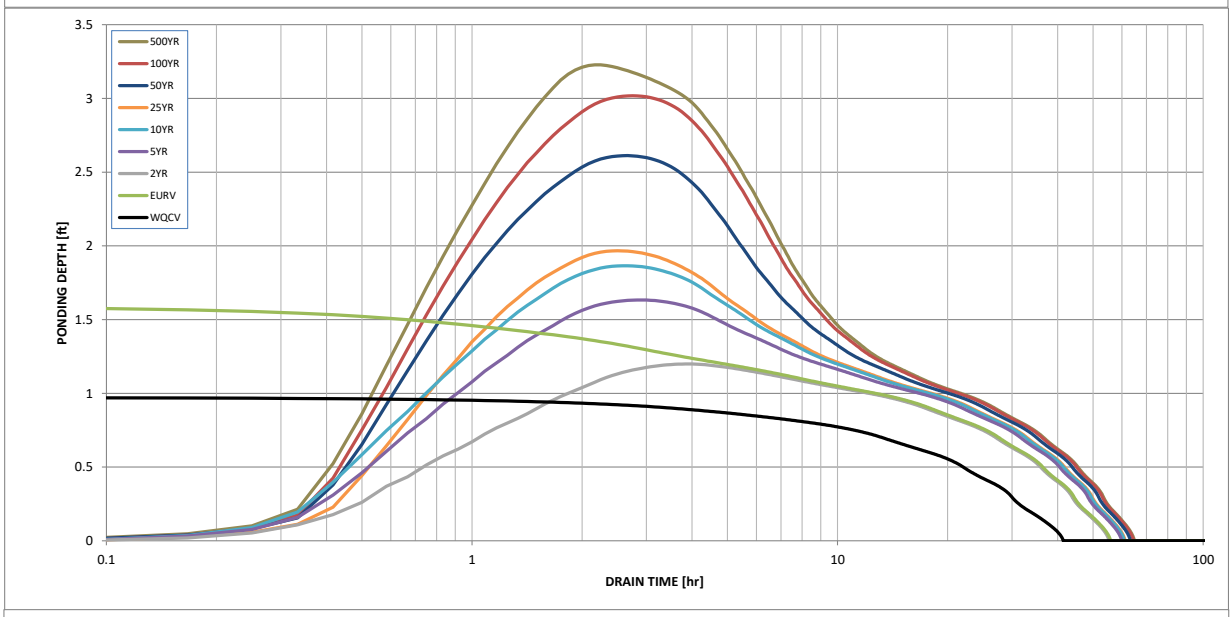
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

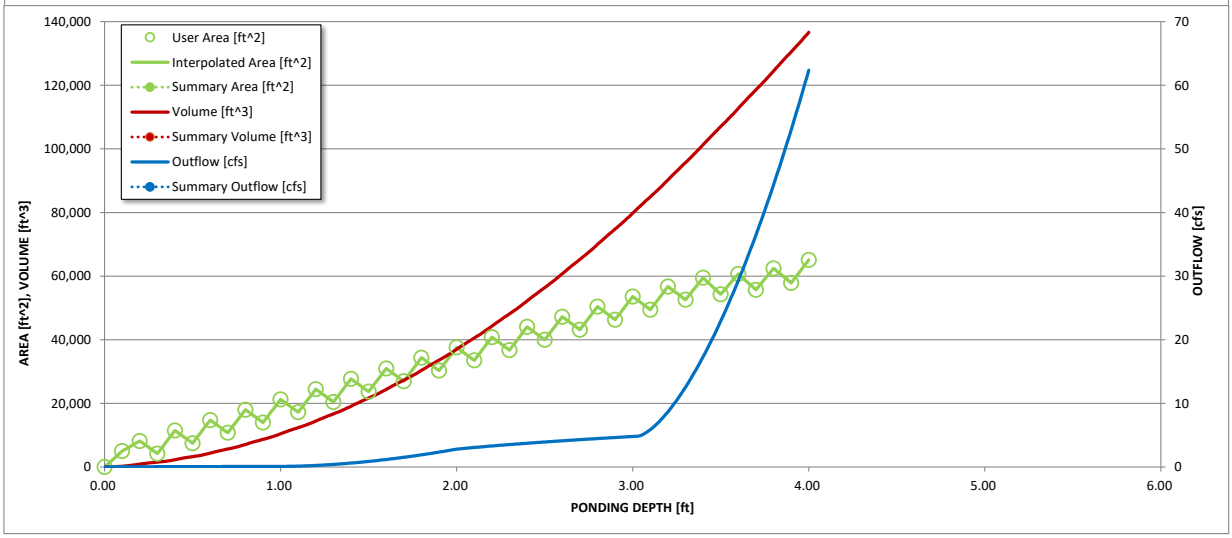
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.00	1.42	1.68	1.69	2.35	2.71	3.14
CUHP Runoff Volume (acre-ft) =	0.227	0.557	0.384	0.814	1.129	1.273	2.229	2.856	3.511
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.384	0.814	1.129	1.273	2.229	2.856	3.511
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	2.1	3.5	5.1	10.3	14.1	17.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		2.3				15.2	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.13	0.20	0.29	0.58	0.85	0.99
Peak Inflow Q (cfs) =	N/A	N/A	2.4	5.3	7.3	9.1	15.7	20.1	24.6
Peak Outflow Q (cfs) =	0.1	1.1	0.3	1.3	2.2	2.7	4.1	4.8	9.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.6	0.5	0.4	0.3	0.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	49	50	51	50	49	45	43	40
Time to Drain 99% of Inflow Volume (hours) =	**40**	53	53	56	56	56	55	55	53
Maximum Ponding Depth (ft) =	1.0	1.6	1.2	1.6	1.9	2.0	2.6	3.0	3.2
Area at Maximum Ponding Depth (acres) =	0.45	0.71	0.55	0.68	0.73	0.80	1.08	1.22	1.28
Maximum Volume Stored (acre-ft) =	0.230	0.560	0.326	0.581	0.743	0.816	1.406	1.844	2.098

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







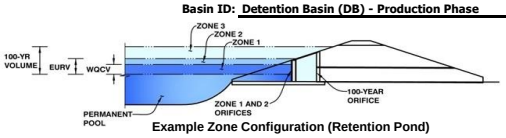
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Bennett D Pad**

Basin ID: **Detention Basin (DB) - Production Phase**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	10.49	acres
Watershed Length =	1,790	ft
Watershed Length to Centroid =	850	ft
Watershed Slope =	0.005	ft/ft
Watershed Imperviousness =	28.80%	percent
Percentage Hydrologic Soil Group A =	0.00%	percent
Percentage Hydrologic Soil Group B =	100.00%	percent
Percentage Hydrologic Soil Groups C/D =	0.00%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.129	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.309	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1 in.) =	0.212	acre-feet	1.00	inches
5-yr Runoff Volume (P1 = 1.42 in.) =	0.461	acre-feet	1.42	inches
10-yr Runoff Volume (P1 = 1.68 in.) =	0.645	acre-feet	1.68	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.731	acre-feet		inches
50-yr Runoff Volume (P1 = 2.35 in.) =	1.292	acre-feet	2.35	inches
100-yr Runoff Volume (P1 = 2.71 in.) =	1.661	acre-feet	2.71	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.045	acre-feet		inches
Approximate 2-yr Detention Volume =	0.185	acre-feet		
Approximate 5-yr Detention Volume =	0.299	acre-feet		
Approximate 10-yr Detention Volume =	0.447	acre-feet		
Approximate 25-yr Detention Volume =	0.459	acre-feet		
Approximate 50-yr Detention Volume =	0.598	acre-feet		
Approximate 100-yr Detention Volume =	0.731	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.129	acre-feet
Zone 2 Volume (100-year - Zone 1) =	0.602	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.731	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

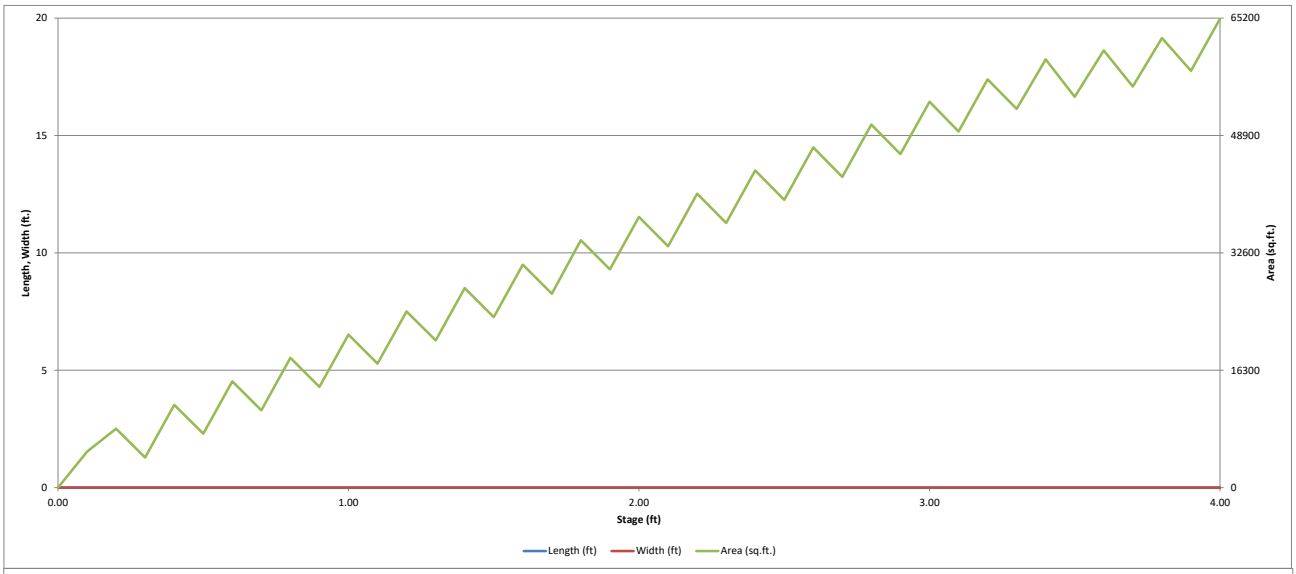
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

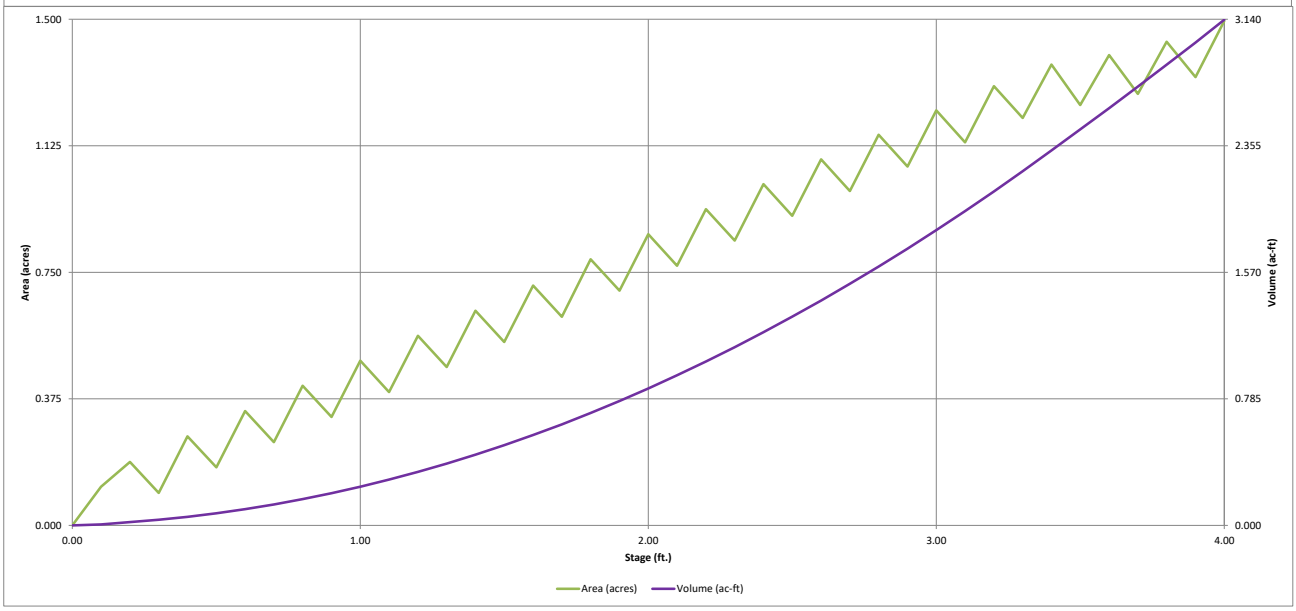
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	0.10	--	--	--	5,000	0.115	249	0.006
	--	0.20	--	--	--	8,188	0.188	908	0.021
	--	0.30	--	--	--	4,200	0.096	1,527	0.035
	--	0.40	--	--	--	11,490	0.264	2,312	0.053
	--	0.50	--	--	--	7,488	0.172	3,260	0.075
	--	0.60	--	--	--	14,764	0.339	4,373	0.100
	--	0.70	--	--	--	10,752	0.247	5,648	0.130
	--	0.80	--	--	--	18,024	0.414	7,087	0.163
	--	0.90	--	--	--	13,996	0.321	8,688	0.199
	--	1.00	--	--	--	21,254	0.488	10,450	0.240
	--	1.10	--	--	--	17,220	0.395	12,374	0.284
	--	1.20	--	--	--	24,474	0.562	14,459	0.332
	--	1.30	--	--	--	20,444	0.469	16,705	0.383
	--	1.40	--	--	--	27,714	0.636	19,112	0.439
	--	1.50	--	--	--	23,684	0.544	21,682	0.498
	--	1.60	--	--	--	30,960	0.711	24,414	0.560
	--	1.70	--	--	--	26,936	0.618	27,309	0.627
	--	1.80	--	--	--	34,362	0.789	30,374	0.697
	--	1.90	--	--	--	30,304	0.696	33,607	0.772
	--	2.00	--	--	--	37,588	0.863	37,002	0.849
	--	2.10	--	--	--	33,526	0.770	40,557	0.931
	--	2.20	--	--	--	40,824	0.937	44,275	1.016
	--	2.30	--	--	--	36,762	0.844	48,154	1.105
	--	2.40	--	--	--	44,048	1.011	52,195	1.198
	--	2.50	--	--	--	39,972	0.918	56,396	1.295
	--	2.60	--	--	--	47,248	1.085	60,757	1.395
	--	2.70	--	--	--	43,158	0.991	65,277	1.499
	--	2.80	--	--	--	50,424	1.158	69,956	1.606
	--	2.90	--	--	--	46,320	1.063	74,793	1.717
	--	3.00	--	--	--	53,578	1.230	79,788	1.832
	--	3.10	--	--	--	49,456	1.135	84,940	1.950
	--	3.20	--	--	--	56,704	1.302	90,248	2.072
	--	3.30	--	--	--	52,592	1.207	95,712	2.197
	--	3.40	--	--	--	59,480	1.365	101,316	2.326
	--	3.50	--	--	--	54,266	1.246	107,003	2.456
	--	3.60	--	--	--	60,706	1.394	112,752	2.588
	--	3.70	--	--	--	55,700	1.279	118,572	2.722
	--	3.80	--	--	--	62,440	1.433	124,479	2.858
	--	3.90	--	--	--	57,878	1.329	130,495	2.996
	--	4.00	--	--	--	65,118	1.495	136,645	3.137

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



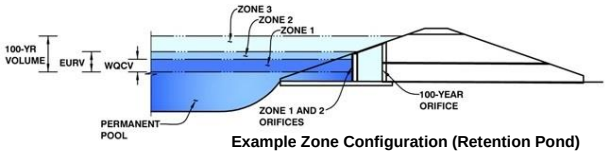


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Bennett D Pad**

Basin ID: **Detention Basin (DB) - Production Phase**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.70	0.129	Orifice Plate
Zone 2 (100-year)	1.85	0.602	Circular Orifice
Zone 3			
Total (all zones)		0.731	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.0	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	0.7	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.0							
Orifice Area (sq. inches)	2.0							

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected		Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	0.7		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79		ft^2
Depth at top of Zone using Vertical Orifice =	2.1		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50		feet
Vertical Orifice Diameter =	12.0		inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft^2
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.0	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.5	feet
Spillway Crest Length =	16.5	feet	Stage at Top of Freeboard =	4.0	feet
Spillway End Slopes =	4.0	H:V	Basin Area at Top of Freeboard =	1.5	acres
Freeboard above Max Water Surface =	0.5	feet	Basin Volume at Top of Freeboard =	3.1	acre-ft

Calculated Parameters for Spillway

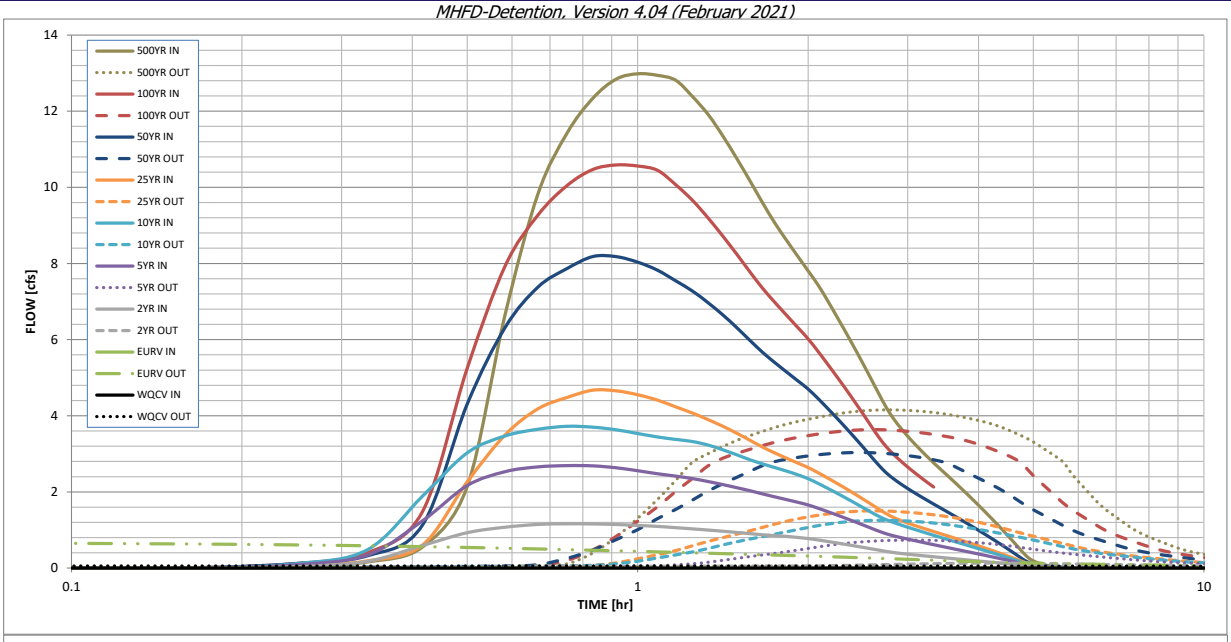
Routed Hydrograph Results

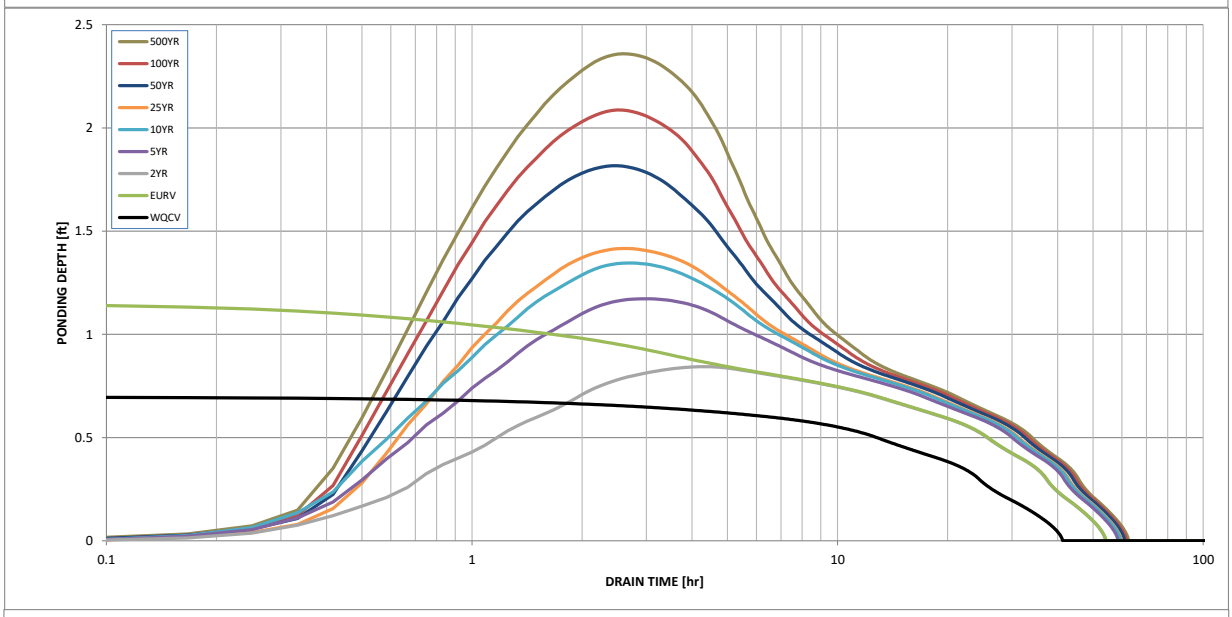
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

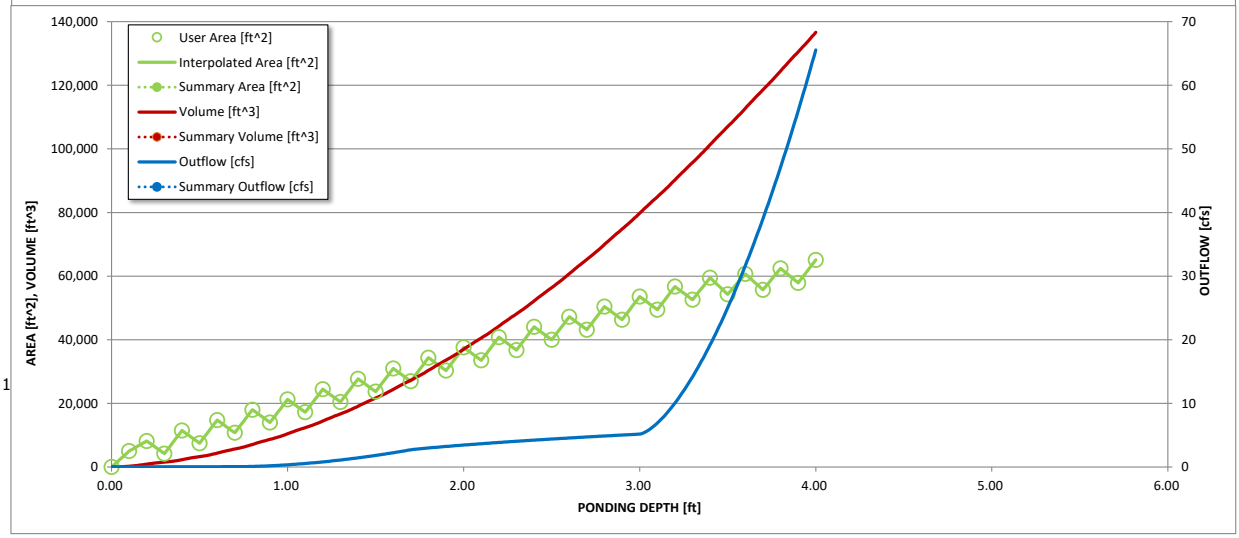
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.00	1.42	1.68	1.69	2.35	2.71	3.14
CUHP Runoff Volume (acre-ft) =	0.129	0.309	0.212	0.461	0.645	0.731	1.292	1.661	2.045
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.211	0.461	0.645	0.731	1.291	1.661	2.045
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	1.1	1.9	2.8	5.6	7.8	9.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		1.4				8.9	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.13	0.18	0.27	0.54	0.85	0.93
Peak Inflow Q (cfs) =	N/A	N/A	1.2	2.7	3.7	4.7	8.2	10.6	13.0
Peak Outflow Q (cfs) =	0.1	0.7	0.1	0.7	1.3	1.5	3.0	3.6	4.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	0.5	0.5	0.4	0.4
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	49	50	49	48	43	40	38
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	52	55	55	55	53	52	51
Maximum Ponding Depth (ft) =	0.7	1.2	0.8	1.2	1.3	1.4	1.8	2.1	2.4
Area at Maximum Ponding Depth (acres) =	0.25	0.50	0.38	0.51	0.54	0.63	0.78	0.79	0.93
Maximum Volume Stored (acre-ft) =	0.130	0.311	0.179	0.316	0.404	0.445	0.705	0.915	1.150

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

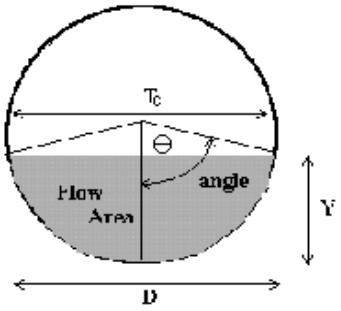
Appendix G:

MHFD-Culvert Spreadsheet Calculations

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Bennett D Pad
Pipe ID: Proposed Culvert #1 (PC1)



Design Information (Input)			
Pipe Invert Slope	So =	0.0350	ft/ft
Pipe Manning's n-value	n =	0.0240	*
Pipe Diameter	D =	12.00	inches
Design discharge	Q =	0.3	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.79	sq ft
Full-flow wetted perimeter	Pf =	3.14	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	3.62	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.13	radians
Flow area	An =	0.19	sq ft
Top width	Tn =	0.90	ft
Wetted perimeter	Pn =	1.13	ft
Flow depth	Yn =	**0.29**	ft
Flow velocity	Vn =	**3.49**	fps
Discharge	Qn =	0.65	cfs
Percent of Full Flow	Flow =	17.9%	of full flow
Normal Depth Froude Number	Fr_n =	1.36	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	0.99	radians
Critical flow area	Ac =	0.13	sq ft
Critical top width	Tc =	0.84	ft
Critical flow depth	Yc =	0.23	ft
Critical flow velocity	Vc =	2.26	fps
Critical Depth Froude Number	Fr_c =	1.00	

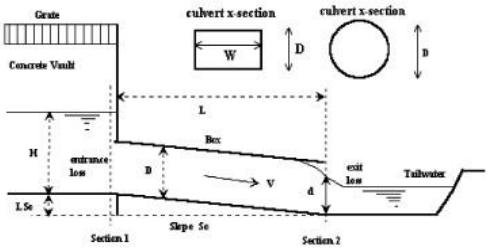
*** Unexpected value for Manning's n**

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Bennett D Pad

ID: Proposed Culvert #1 (PC1)



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	12 inches	**Very Small Culvert**
	Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	**D >= 15 inches expected**
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation at Culvert Invert	Elev IN =	5572.5	ft
	Outlet Elevation **OR** Slope	Elev OUT =	5571.1	ft
	Culvert Length	L =	40	ft
	Manning's Roughness	n =	0.024	**For concrete, typically <= 0.016**
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	4.24
Sum of All Loss Coefficients	K_s =	5.44
Minimum Energy Condition Coefficient	KE_{low} =	-0.1166
Orifice Inlet Condition Coefficient	C_d =	0.60

Calculations of Culvert Capacity (output): **Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise**

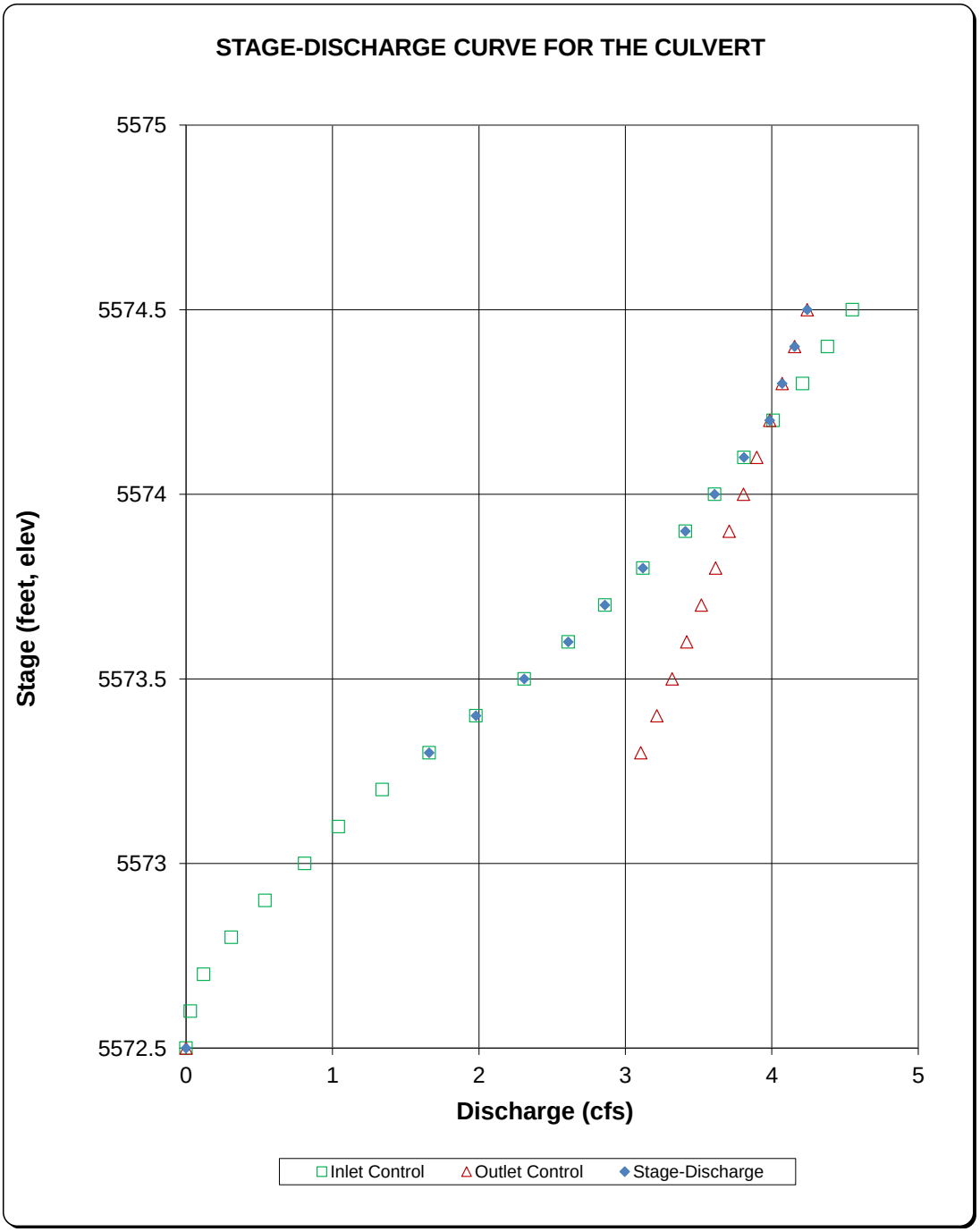
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
5572.50		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
5572.60		Min. Energy. Eqn.	0.03	#N/A	#N/A	#N/A
5572.70		Min. Energy. Eqn.	0.12	#N/A	#N/A	#N/A
5572.80		Min. Energy. Eqn.	0.31	#N/A	#N/A	#N/A
5572.90		Min. Energy. Eqn.	0.54	#N/A	#N/A	#N/A
5573.00		Min. Energy. Eqn.	0.81	#N/A	#N/A	#N/A
5573.10		Regression Eqn.	1.04	#N/A	#N/A	#N/A
5573.20		Regression Eqn.	1.34	#N/A	#N/A	#N/A
5573.30		Regression Eqn.	1.66	3.11	**1.66**	INLET
5573.40		Regression Eqn.	1.98	3.22	**1.98**	INLET
5573.50		Regression Eqn.	2.31	3.32	**2.31**	INLET
5573.60		Regression Eqn.	2.61	3.42	**2.61**	INLET
5573.70		Regression Eqn.	2.86	3.52	**2.86**	INLET
5573.80		Regression Eqn.	3.12	3.62	**3.12**	INLET
5573.90		Regression Eqn.	3.41	3.71	**3.41**	INLET
5574.00		Regression Eqn.	3.61	3.81	**3.61**	INLET
5574.10		Regression Eqn.	3.81	3.90	**3.81**	INLET
5574.20		Regression Eqn.	4.01	3.99	**3.99**	OUTLET
5574.30		Regression Eqn.	4.21	4.07	**4.07**	OUTLET
5574.40		Regression Eqn.	4.38	4.16	**4.16**	OUTLET
5574.50		Regression Eqn.	4.55	4.24	**4.24**	OUTLET

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: **Bennett D Pad**

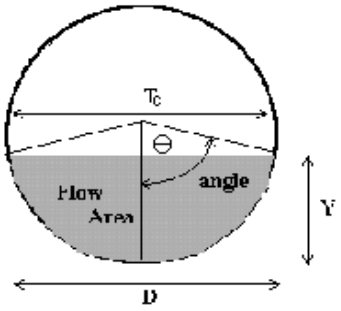
ID: **Proposed Culvert #1 (PC1)**



CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Bennett D Pad
Pipe ID: Proposed Culvert #2 (PC2)



Design Information (Input)			
Pipe Invert Slope	So =	0.0300	ft/ft
Pipe Manning's n-value	n =	0.0240	*
Pipe Diameter	D =	12.00	inches
Design discharge	Q =	0.4	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.79	sq ft
Full-flow wetted perimeter	Pf =	3.14	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	3.35	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.01	radians
Flow area	An =	0.14	sq ft
Top width	Tn =	0.85	ft
Wetted perimeter	Pn =	1.01	ft
Flow depth	Yn =	**0.23**	ft
Flow velocity	Vn =	**2.87**	fps
Discharge	Qn =	0.40	cfs
Percent of Full Flow	Flow =	11.9%	of full flow
Normal Depth Froude Number	Fr_n =	1.25	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.07	radians
Critical flow area	Ac =	0.16	sq ft
Critical top width	Tc =	0.88	ft
Critical flow depth	Yc =	0.26	ft
Critical flow velocity	Vc =	2.45	fps
Critical Depth Froude Number	Fr_c =	1.00	

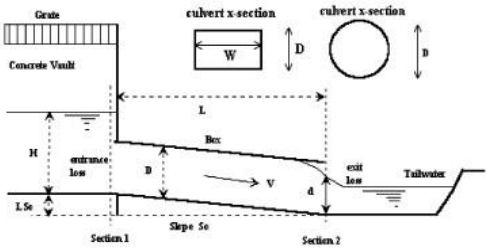
*** Unexpected value for Manning's n**

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Bennett D Pad

ID: Proposed Culvert #2 (PC2)



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	12	inches	**Very Small Culvert**
	Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting		**D >= 15 inches expected**
OR:					
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft	
	Barrel Width (Span) in Feet	W (Span) =		ft	
	Inlet Edge Type (Choose from pull-down list)				
	Number of Barrels	# Barrels =	1		
	Inlet Elevation at Culvert Invert	Elev IN =	5570.0	ft	
	Outlet Elevation **OR** Slope	Elev OUT =	5568.8	ft	
	Culvert Length	L =	40	ft	
	Manning's Roughness	n =	0.024		**For concrete, typically <= 0.016**
	Bend Loss Coefficient	K_b =	0		
	Exit Loss Coefficient	K_x =	1		

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	4.24
Sum of All Loss Coefficients	K_s =	5.44
Minimum Energy Condition Coefficient	KE_{low} =	0.0125
Orifice Inlet Condition Coefficient	C_d =	0.60

Calculations of Culvert Capacity (output): **Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise**

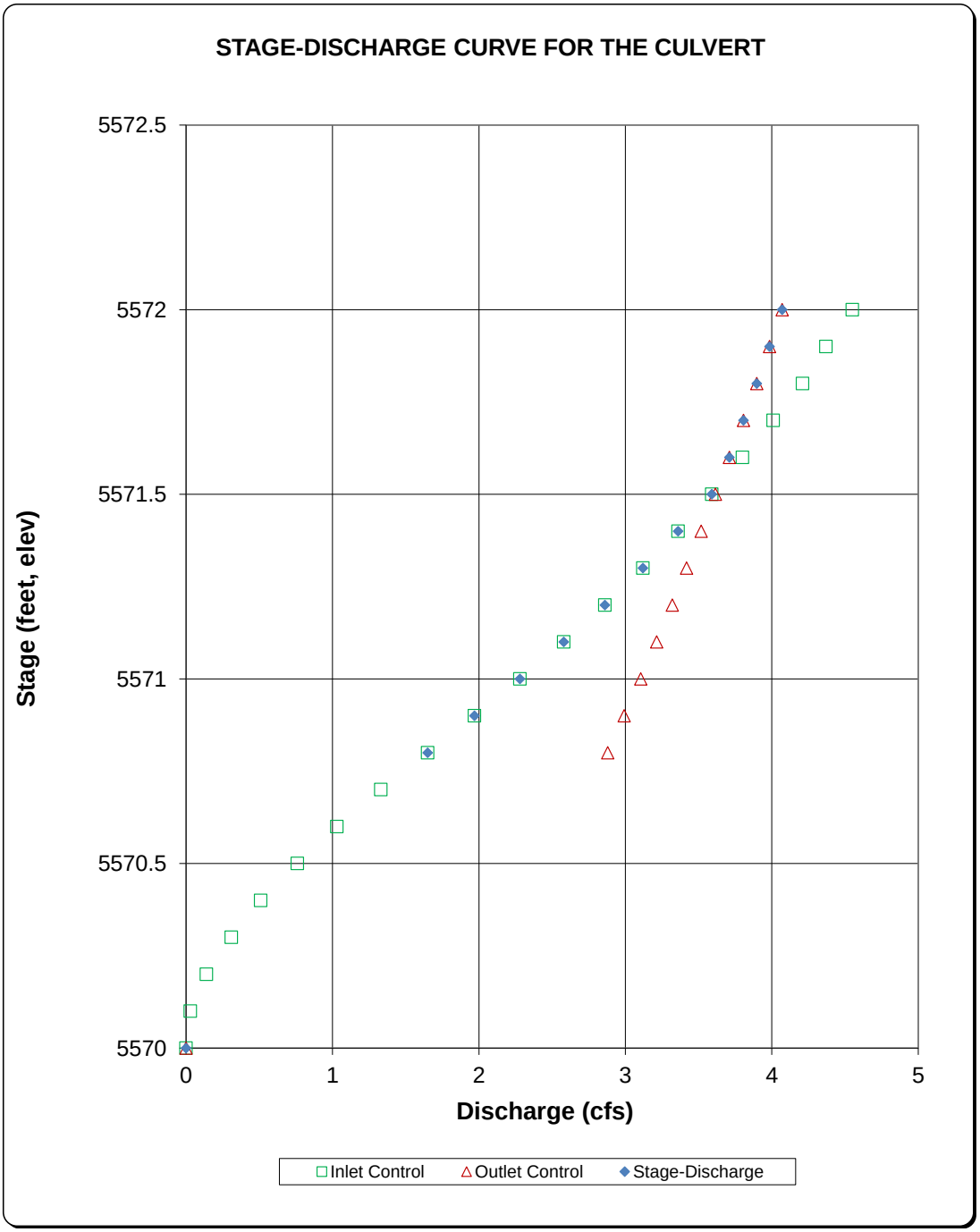
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
5570.00		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
5570.10		Min. Energy. Eqn.	0.03	#N/A	#N/A	#N/A
5570.20		Min. Energy. Eqn.	0.14	#N/A	#N/A	#N/A
5570.30		Min. Energy. Eqn.	0.31	#N/A	#N/A	#N/A
5570.40		Min. Energy. Eqn.	0.51	#N/A	#N/A	#N/A
5570.50		Min. Energy. Eqn.	0.76	#N/A	#N/A	#N/A
5570.60		Regression Eqn.	1.03	#N/A	#N/A	#N/A
5570.70		Regression Eqn.	1.33	#N/A	#N/A	#N/A
5570.80		Regression Eqn.	1.65	2.88	**1.65**	INLET
5570.90		Regression Eqn.	1.97	2.99	**1.97**	INLET
5571.00		Regression Eqn.	2.28	3.11	**2.28**	INLET
5571.10		Regression Eqn.	2.58	3.21	**2.58**	INLET
5571.20		Regression Eqn.	2.86	3.32	**2.86**	INLET
5571.30		Regression Eqn.	3.12	3.42	**3.12**	INLET
5571.40		Regression Eqn.	3.36	3.52	**3.36**	INLET
5571.50		Regression Eqn.	3.59	3.62	**3.59**	INLET
5571.60		Regression Eqn.	3.80	3.71	**3.71**	OUTLET
5571.70		Regression Eqn.	4.01	3.81	**3.81**	OUTLET
5571.80		Regression Eqn.	4.21	3.90	**3.90**	OUTLET
5571.90		Regression Eqn.	4.37	3.98	**3.98**	OUTLET
5572.00		Regression Eqn.	4.55	4.07	**4.07**	OUTLET

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: **Bennett D Pad**

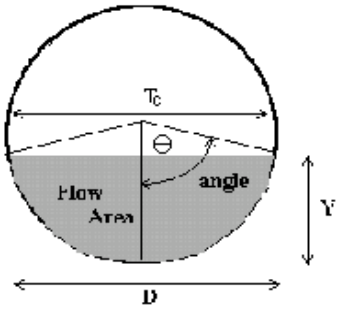
ID: **Proposed Culvert #2 (PC2)**



CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Bennett D Pad
Pipe ID: Proposed Culvert #3 (PC3)



Design Information (Input)			
Pipe Invert Slope	So =	0.0025	ft/ft
Pipe Manning's n-value	n =	0.0240	*
Pipe Diameter	D =	12.00	inches
Design discharge	Q =	0.4	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.79	sq ft
Full-flow wetted perimeter	Pf =	3.14	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	0.97	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.01	radians
Flow area	An =	0.14	sq ft
Top width	Tn =	0.85	ft
Wetted perimeter	Pn =	1.01	ft
Flow depth	Yn =	**0.23**	ft
Flow velocity	Vn =	**0.83**	fps
Discharge	Qn =	0.12	cfs
Percent of Full Flow	Flow =	11.9%	of full flow
Normal Depth Froude Number	Fr_n =	0.36	subcritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.07	radians
Critical flow area	Ac =	0.16	sq ft
Critical top width	Tc =	0.88	ft
Critical flow depth	Yc =	0.26	ft
Critical flow velocity	Vc =	2.45	fps
Critical Depth Froude Number	Fr_c =	1.00	

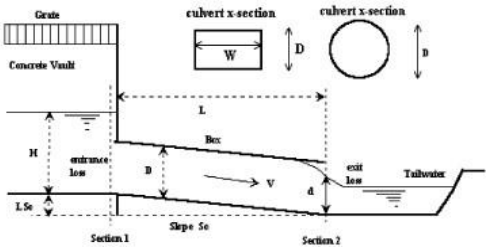
*** Unexpected value for Manning's n**

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Bennett D Pad

ID: Proposed Culvert #3 (PC3)



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	12 inches	**Very Small Culvert**
	Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	**D >= 15 inches expected**
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =		ft
	Barrel Width (Span) in Feet	W (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	# Barrels =	1	
	Inlet Elevation at Culvert Invert	Elev IN =	5566.1	ft
	Outlet Elevation **OR** Slope	Elev OUT =	5566.0	ft
	Culvert Length	L =	40	ft
	Manning's Roughness	n =	0.024	**For concrete, typically <= 0.016**
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	4.24
Sum of All Loss Coefficients	K_s =	5.44
Minimum Energy Condition Coefficient	KE_{low} =	0.1237
Orifice Inlet Condition Coefficient	C_d =	0.60

Calculations of Culvert Capacity (output): **Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Rise**

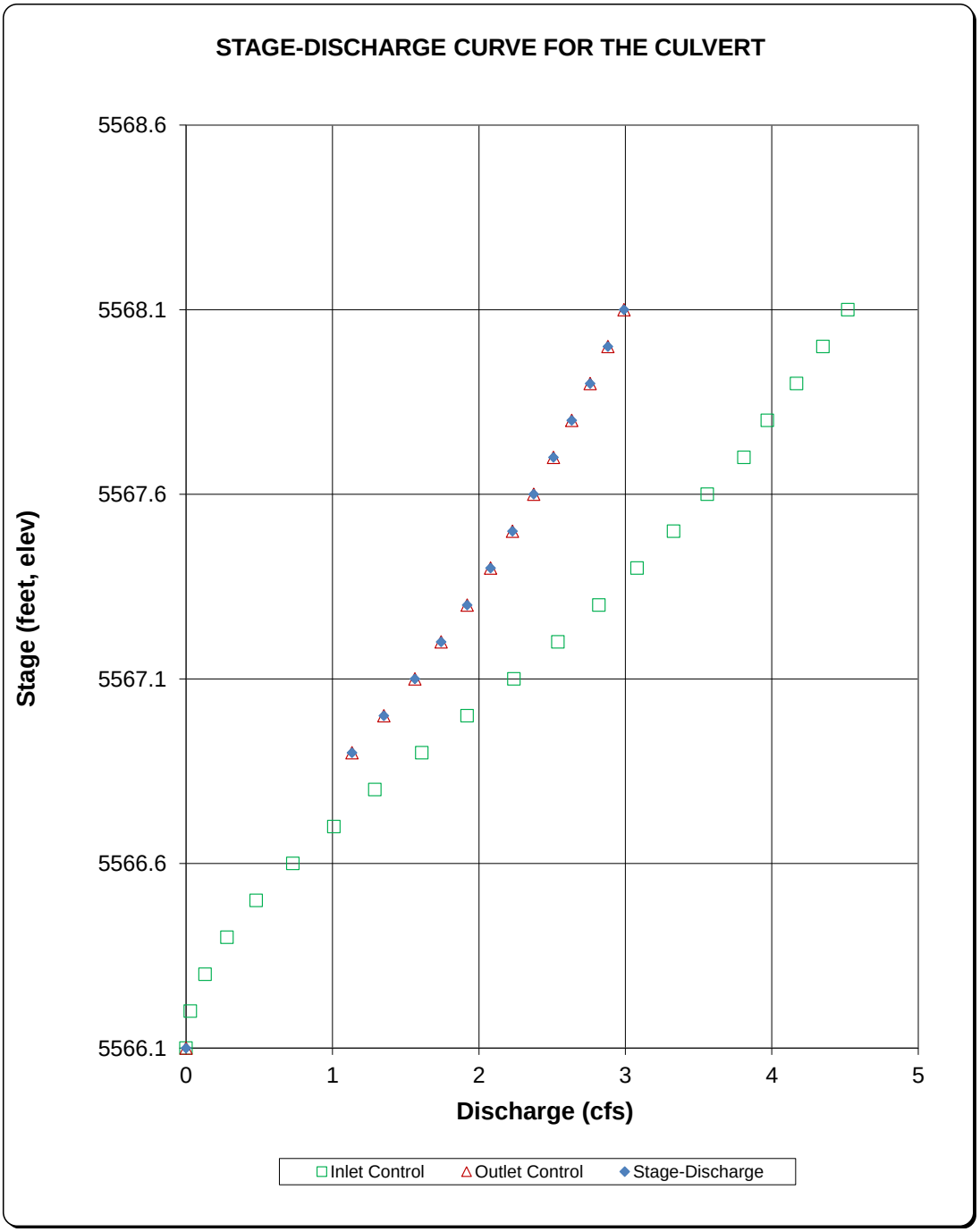
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
5566.10		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
5566.20		Min. Energy. Eqn.	0.03	#N/A	#N/A	#N/A
5566.30		Min. Energy. Eqn.	0.13	#N/A	#N/A	#N/A
5566.40		Min. Energy. Eqn.	0.28	#N/A	#N/A	#N/A
5566.50		Min. Energy. Eqn.	0.48	#N/A	#N/A	#N/A
5566.60		Min. Energy. Eqn.	0.73	#N/A	#N/A	#N/A
5566.70		Regression Eqn.	1.01	#N/A	#N/A	#N/A
5566.80		Regression Eqn.	1.29	#N/A	#N/A	#N/A
5566.90		Regression Eqn.	1.61	1.13	**1.13**	OUTLET
5567.00		Regression Eqn.	1.92	1.35	**1.35**	OUTLET
5567.10		Regression Eqn.	2.24	1.56	**1.56**	OUTLET
5567.20		Regression Eqn.	2.54	1.74	**1.74**	OUTLET
5567.30		Regression Eqn.	2.82	1.92	**1.92**	OUTLET
5567.40		Regression Eqn.	3.08	2.08	**2.08**	OUTLET
5567.50		Regression Eqn.	3.33	2.23	**2.23**	OUTLET
5567.60		Regression Eqn.	3.56	2.37	**2.37**	OUTLET
5567.70		Regression Eqn.	3.81	2.51	**2.51**	OUTLET
5567.80		Regression Eqn.	3.97	2.63	**2.63**	OUTLET
5567.90		Regression Eqn.	4.17	2.76	**2.76**	OUTLET
5568.00		Regression Eqn.	4.35	2.88	**2.88**	OUTLET
5568.10		Regression Eqn.	4.52	2.99	**2.99**	OUTLET

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: **Bennett D Pad**

ID: **Proposed Culvert #3 (PC3)**



Appendix H:

Conveyance Calculations for Diversion Ditch Design

Existing Ditch Design

Estimated Capacity of Existing Ditch

10-year Storm Event			Required Capacity:	0.4 cfs
Depth =	0.2	ft		
Bottom Width=	0.0	ft		
Side Slope (H:V)=	5			
n=	0.022		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	0.29	ft^2		
P=	2.45	ft		
Minimum S=	0.007	ft/ft		
			Calculated Q=	0.4 cfs
			Calculated V=	1.4 fps

100-year Storm Event			Required Capacity:	2.8 cfs
Depth =	0.5	ft		
Bottom Width=	0.0	ft		
Side Slope (H:V)=	5			
n=	0.022		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	1.25	ft^2		
P=	5.10	ft		
Minimum S=	0.007	ft/ft		
			Calculated Q=	2.8 cfs
			Calculated V=	2.2 fps

Permanent Ditch #1 Design

Estimated Capacity of Permanent Ditch #1

10-year Storm Event			Required Capacity:	0.4 cfs
Depth =	0.3	ft		
Bottom Width=	0.0	ft		
Side Slope (H:V)=	3			
n=	0.022		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	0.27	ft^2		
P=	1.90	ft		
Minimum S=	0.007	ft/ft		
			Calculated Q=	0.4 cfs
			Calculated V=	1.5 fps

100-year Storm Event			Required Capacity:	2.8 cfs
Depth =	0.6	ft		
Bottom Width=	0.0	ft		
Side Slope (H:V)=	3			
n=	0.022		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	1.12	ft^2		
P=	3.86	ft		
Minimum S=	0.007	ft/ft		
			Calculated Q=	2.8 cfs
			Calculated V=	2.5 fps

Permanent Ditch #2 Design

Estimated Capacity of Permanent Ditch #2

Depth =	1.0	ft
Bottom Width=	0.0	ft
Side Slope (H:V)=	4	
n=	0.022	
A=	4.00	ft^2
P=	8.25	ft
Minimum S=	0.007	ft/ft

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

Calculated Q=	14.0	cfs
Calculated V=	3.5	fps

Temporary Ditch Re-Route Design

Estimated Capacity of Temporary Ditch Re-Route

10-year Storm Event			Required Capacity:	0.3 cfs
Depth =	0.2	ft		
Bottom Width=	0.0	ft		
Side Slope (H:V)=	5			
n=	0.022		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	0.24	ft^2		
P=	2.24	ft		
Minimum S=	0.005	ft/ft		
			Calculated Q=	0.3 cfs
			Calculated V=	1.1 fps

100-year Storm Event			Required Capacity:	3.9 cfs
Depth =	0.6	ft		
Bottom Width=	0.0	ft		
Side Slope (H:V)=	5			
n=	0.022		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	1.83	ft^2		
P=	6.17	ft		
Minimum S=	0.005	ft/ft		
			Calculated Q=	3.9 cfs
			Calculated V=	2.1 fps

Drainage Swale Design

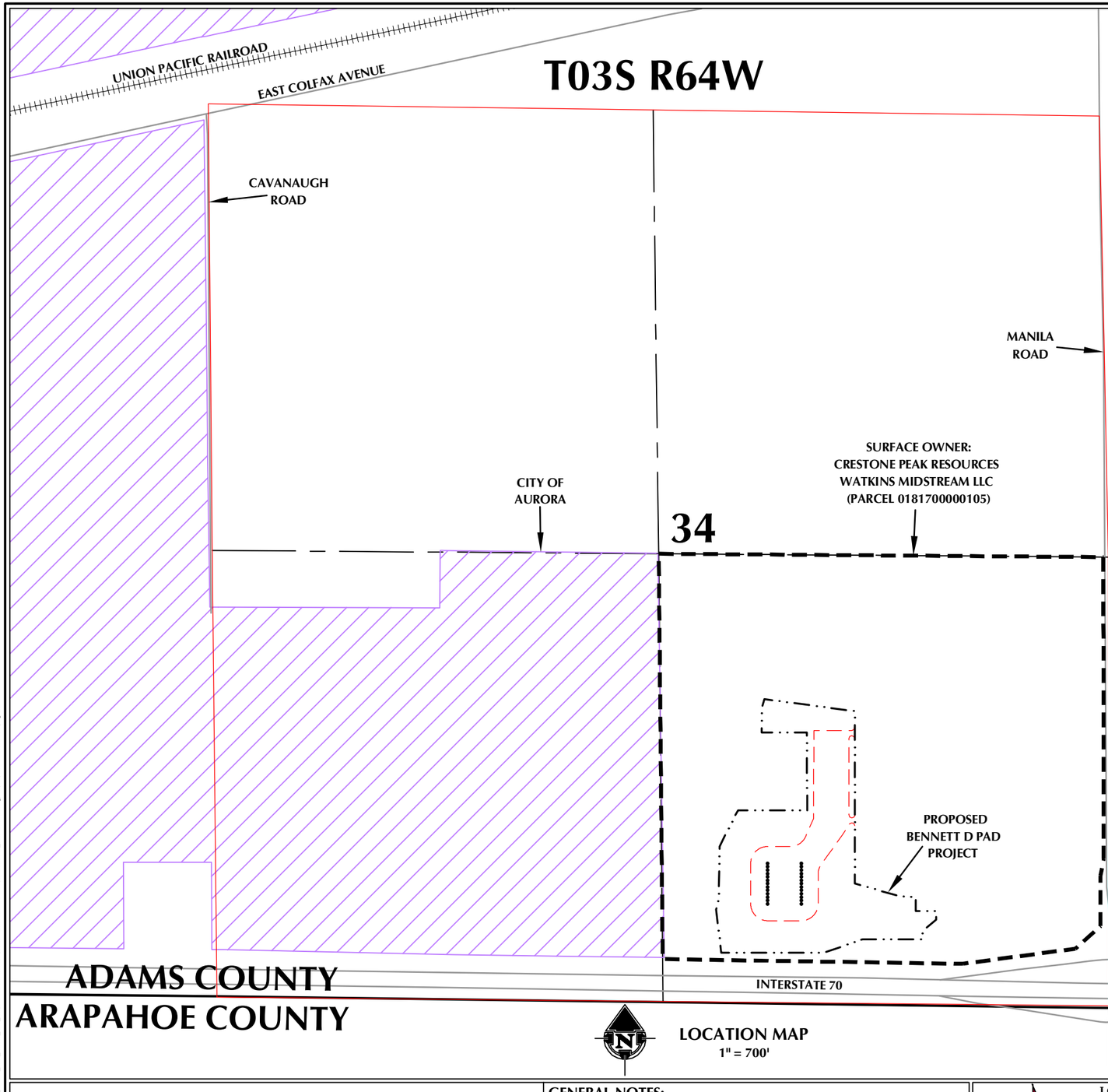
Estimated Capacity of Drainage Swale

10-year Storm Event			Required Capacity:	0.4 cfs
Depth =	0.2	ft		
Bottom Width=	3.0	ft		
Side Slope (H:V)=	4			
n=	0.05		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	0.71	ft^2		
P=	4.57	ft		
Minimum S=	0.005	ft/ft		
			Calculated Q=	0.4 cfs
			Calculated V=	0.6 fps

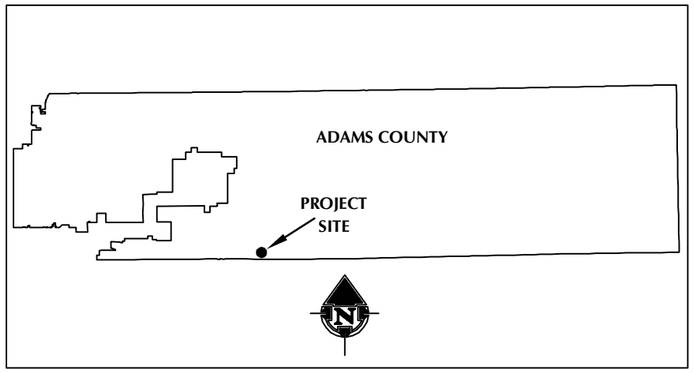
100-year Storm Event			Required Capacity:	5.0 cfs
Depth =	0.7	ft		
Bottom Width=	3.0	ft		
Side Slope (H:V)=	4			
n=	0.05		$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$	
A=	3.97	ft^2		
P=	8.69	ft		
Minimum S=	0.005	ft/ft		
			Calculated Q=	5.0 cfs
			Calculated V=	1.3 fps

BENNETT D PAD
DRAINAGE PLAN

LOCATED IN SECTION 34, T3S, R64W, 6TH P.M.
ADAMS COUNTY, COLORADO



LOCATION MAP
1" = 700'



VICINITY MAP

PAGE INDEX

GENERAL NOTES:

1. THIS DRAINAGE AND EROSION CONTROL PLAN WAS PREPARED FOLLOWING ADAMS COUNTY DEVELOPMENT STANDARDS & REGULATIONS WITH ADDITIONAL DESIGN GUIDANCE PROVIDED BY MILE HIGH FLOOD DISTRICT.
2. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
3. ORIGINAL DOCUMENT SIZE: 11" X 17"

609 CONSULTING, LLC
LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331
SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

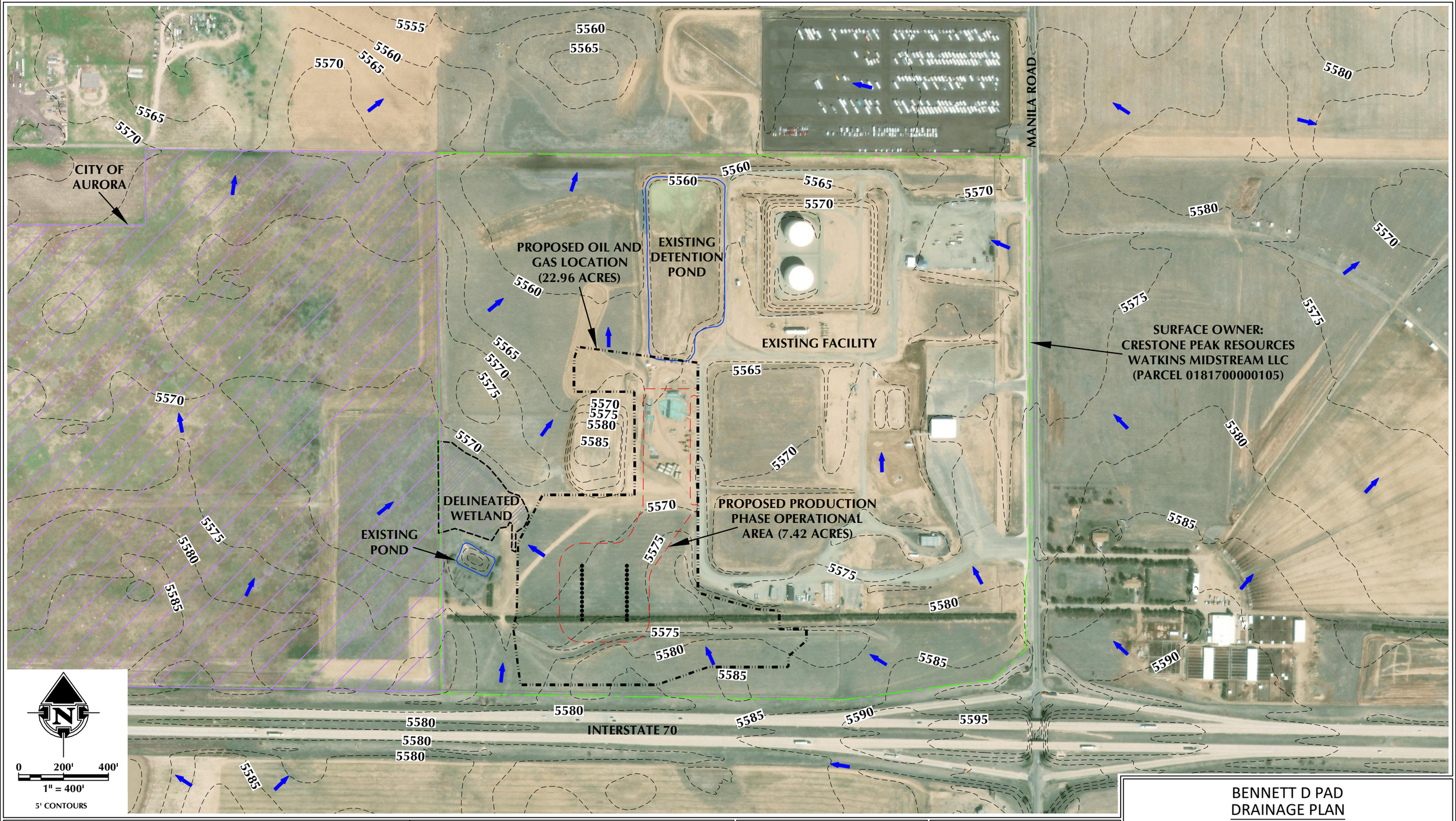
Prepared For:
CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD
DRAINAGE PLAN
COVER SHEET

SCALE:	VARIES	PAGE:	1 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

K:\CIVIT\6 RESOURCES\2023\2023_182_SEC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINED.dwg, 10/22/2024 2:37:14 PM, kgates



LEGEND

- EXISTING CONTOUR
- EXISTING IRRIGATION DITCH/DRAINAGEWAY
- PROPOSED OIL AND GAS LOCATION
- PROPOSED ACCESS ROAD/PAD
- STORMWATER DRAINAGE
- PROPERTY LINE

GENERAL NOTES:

1. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).

609 CONSULTING, LLC
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Phone 307-674-0609

Prepared For:

CIVITAS
CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

BENNETT D PAD
DRAINAGE PLAN
SITE OVERVIEW

SCALE:	1" = 400'	PAGE:	2 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

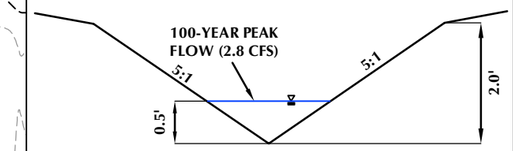
PRELIMINARY

K:\CIVITAS RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINED.dwg, 10/19/2024 3:04:35 PM, kgates

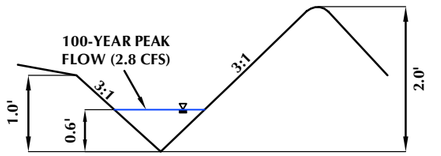
CULVERT ID	SIZE	LENGTH (FT)	ELEVATION (FT)		GRADE
			INLET INVERT	OUTLET INVERT	
PC1	12" CMP	40	5572.5	5571.1	3.5%
PC2	12" CMP	40	5570.0	5568.8	3.0%
PC3	12" CMP	40	5566.1	5566.0	0.3%

EXISTING CULVERT
EXISTING CULVERT
EXISTING DETENTION POND
400'
EXISTING 400' X 850' MAINTENANCE EASEMENT
SURFACE OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC (PARCEL 0181700000105)
PROPOSED CULVERT #3 (PC3)
PERMANENT ACCESS ROAD
PERMANENT DITCH #1
PERMANENT ACCESS ROAD
EXISTING DITCH
PROPOSED CULVERT #1 (PC1)
PROPOSED CULVERT #2 (PC2)
BENNETT D PAD FACILITY
100-YEAR STORAGE ELEVATION 5564.9'
PERMANENT DITCH #2
DETENTION BASIN
SPILLWAY
DETENTION BASIN (DB) OUTLET
EXISTING TOPSOIL STOCKPILE
TOPSOIL STOCKPILE
TEMPORARY ACCESS ROAD
TEMPORARY DITCH RE-ROUTE
CUT
FILL
BENNETT D PAD WELL PAD
INTERSTATE 70
PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
EXISTING 20' ACCESS EASEMENT
20' X 20' X 3' SEDIMENT TRAP (ST)
DELINEATED WETLAND
EXISTING POND
0.5% SLOPE
N
0 100' 200'
1" = 200'
1' CONTOURS

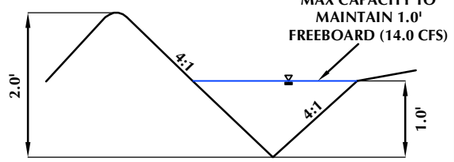
EXISTING DITCH CROSS SECTION



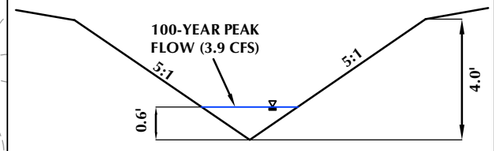
PERMANENT DITCH #1 CROSS SECTION



PERMANENT DITCH #2 CROSS SECTION



TEMPORARY DITCH RE-ROUTE CROSS SECTION



LEGEND

- EXISTING CONTOUR
- EXISTING ROAD
- EXISTING PIPELINE
- EXISTING BURIED POWERLINE
- EXISTING OVERHEAD POWERLINE
- PROPOSED OIL AND GAS LOCATION
- PROPOSED CONTOUR
- PROPOSED ACCESS ROAD/PAD
- PROPOSED WELL
- PROPERTY LINE
- PROPOSED DIVERSION DITCH
- PROPOSED BERM / OFF-SITE FLOW DEFLECTION
- PROPOSED CULVERT PROTECTION / RIPRAP
- PROPOSED SEDIMENT TRAP WITH PROTECTED OUTLET
- PROPOSED SLOPE PROTECTION
- 100-YEAR STORMWATER STORAGE FOOTPRINT
- STORMWATER DRAINAGE
- EASEMENT/ROW
- EXISTING DITCH

GENERAL NOTES:

1. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).
3. SLOPE PROTECTION USED FOR TEMPORARY EROSION CONTROL ON CUT/FILL SLOPES AND SOIL STOCKPILES.

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Phone 307-674-0609

Prepared For:

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DENVER, CO 80202

BENNETT D PAD DRAINAGE PLAN

CONSTRUCTION PHASE SITE PLAN

SCALE:	1" = 200'	PAGE:	3 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

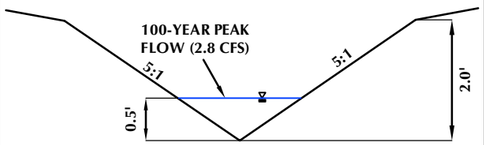
K:\CIVIL\76 RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINED.dwg, 10/22/2024 2:43:35 PM, kgoles

CULVERT ID	SIZE	LENGTH (FT)	ELEVATION (FT)		GRADE
			INLET INVERT	OUTLET INVERT	
PC2	12" CMP	40	5570.0	5568.8	3.0%
PC3	12" CMP	40	5566.1	5566.0	0.3%

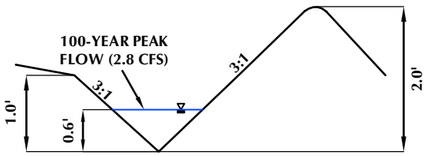
EXISTING CULVERT
EXISTING CULVERT
EXISTING DETENTION POND
400'
EXISTING 400' X 850' MAINTENANCE EASEMENT
SURFACE OWNER: CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC (PARCEL 0181700000105)
PROPOSED CULVERT #3 (PC3)
PERMANENT ACCESS ROAD
PERMANENT DITCH #1
PERMANENT ACCESS ROAD
PROPOSED CULVERT #2 (PC2)
EXISTING DITCH
BENNETT D PAD FACILITY
100-YEAR STORAGE ELEVATION 5564.0'
0.5% SLOPE
DETENTION BASIN
SPILLWAY
DETENTION BASIN (DB) OUTLET
PERMANENT DITCH #2
EXISTING TOPSOIL STOCKPILE
SEEDED TOPSOIL STOCKPILE (FOR FINAL REC)
BENNETT D PAD WELL PAD
PRODUCTION PHASE OPERATIONAL AREA (7.42 ACRES)
DRAINAGE SWALE (DS)
INTERSTATE 70
PROPOSED OIL AND GAS LOCATION (22.96 ACRES)
EXISTING 20' ACCESS EASEMENT
DELINEATED WETLAND
EXISTING POND

0 100' 200'
1" = 200'
1' CONTOURS

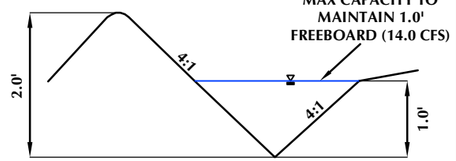
EXISTING DITCH CROSS SECTION



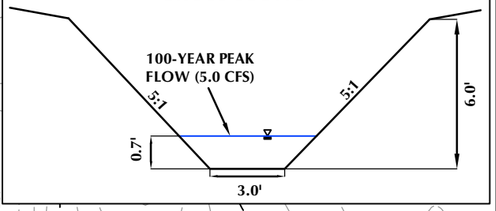
PERMANENT DITCH #1 CROSS SECTION



PERMANENT DITCH #2 CROSS SECTION



DRAINAGE SWALE CROSS SECTION



LEGEND

- EXISTING CONTOUR
- EXISTING ROAD
- EXISTING PIPELINE
- EXISTING BURIED POWERLINE
- EXISTING OVERHEAD POWERLINE
- PROPOSED OIL AND GAS LOCATION
- PROPOSED CONTOUR
- PROPOSED ACCESS ROAD/PAD
- PROPOSED WELL
- PROPERTY LINE
- PERMANENT DIVERSION DITCH
- PROPOSED BERM / OFF-SITE FLOW DEFLECTION
- PROPOSED CULVERT PROTECTION / RIPRAP
- RECLAMATION BOUNDARY
- PROPOSED PERMANENT SEEDING
- 100-YEAR STORMWATER STORAGE FOOTPRINT
- STORMWATER DRAINAGE
- EASEMENT/ROW
- EXISTING DITCH

GENERAL NOTES:

1. DISCLAIMER: THIS PLAN REPRESENTS AN APPROXIMATE LOCATION OF DRAINAGE AND EROSION CONTROL FEATURES; EXACT LOCATION MAY VARY DEPENDING UPON EXISTING EASEMENTS, PIPELINES, FLOWLINES, AND SETBACK REQUIREMENTS.
2. ELEVATIONS ARE BASED ON NAVD88 (GEOID18).
3. RECLAIMED AREA WILL BE RE-SEEDED AND RE-VEGETATED.

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BENNETT D PAD
DRAINAGE PLAN
PRODUCTION PHASE SITE PLAN

SCALE:	1" = 200'	PAGE:	4 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

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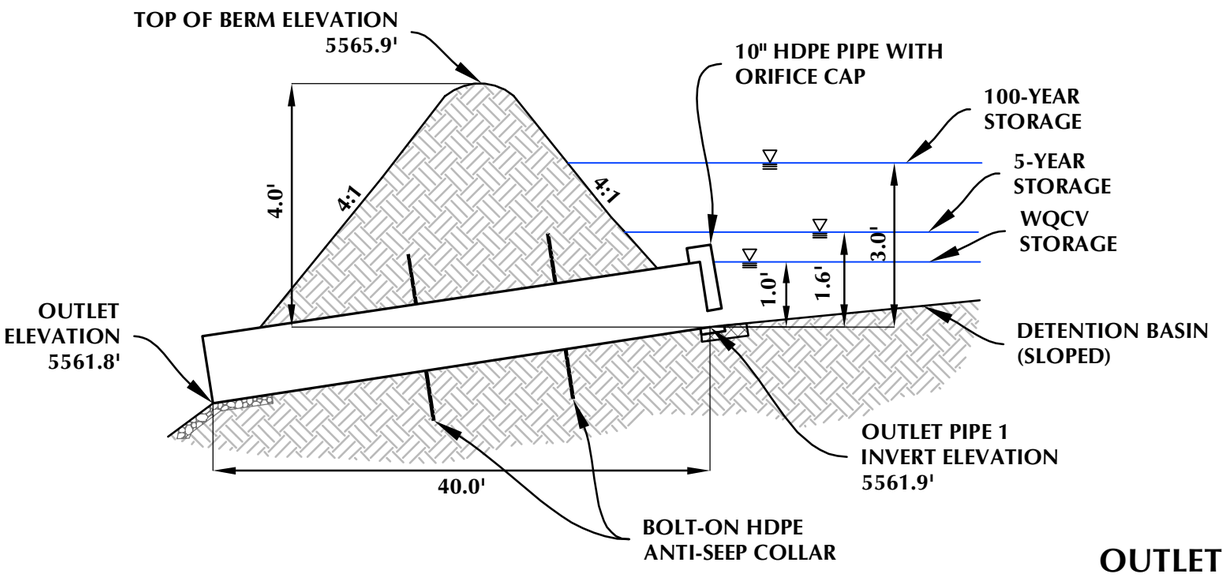
K:\CIVIL\76 RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINE.dwg, 10/22/2024 2:45:34 PM, kgoles

DETENTION BASIN (DB) OUTLET - CONSTRUCTION PHASE

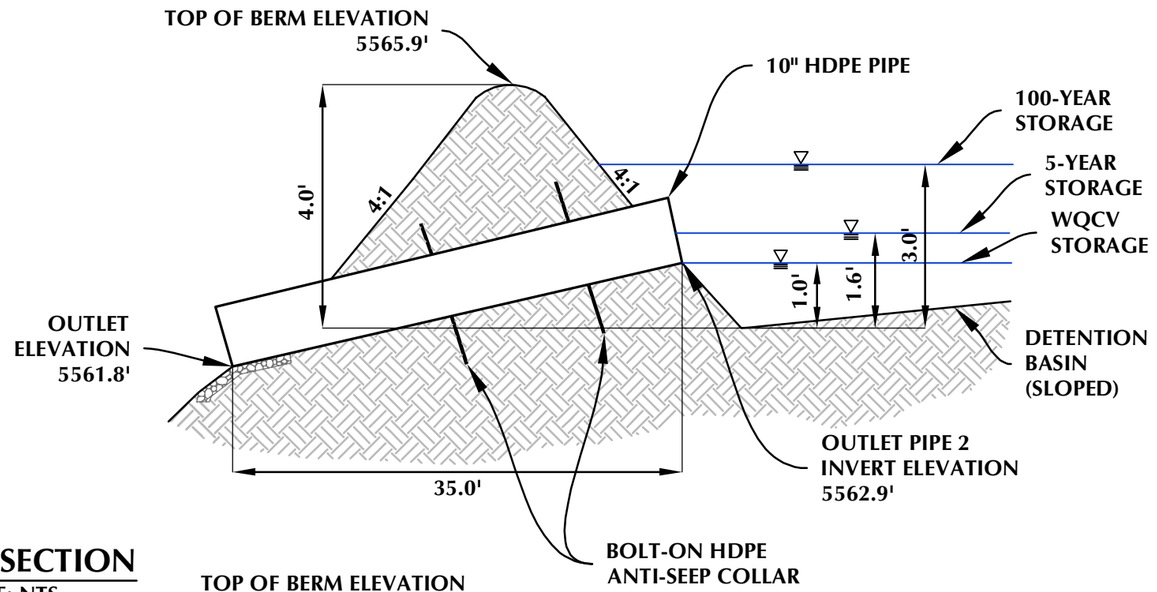
OUTLET PROFILE (PIPE 1)

SCALE: NTS



OUTLET PROFILE (PIPE 2)

SCALE: NTS



OUTLET SECTION

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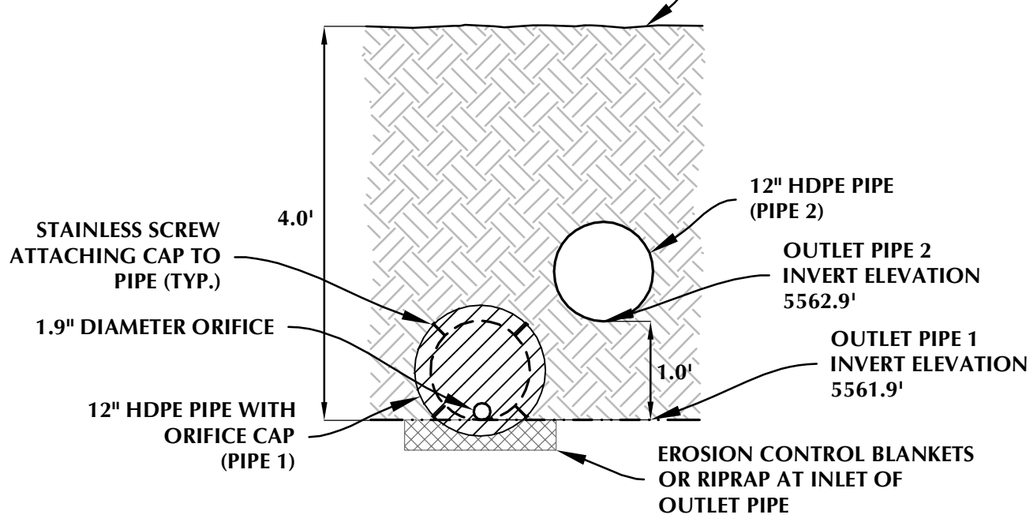

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BENNETT D PAD
DRAINAGE PLAN
DETENTION BASIN OUTLET - CONSTRUCTION

SCALE:	VARIES	PAGE:	5 OF 10
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DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

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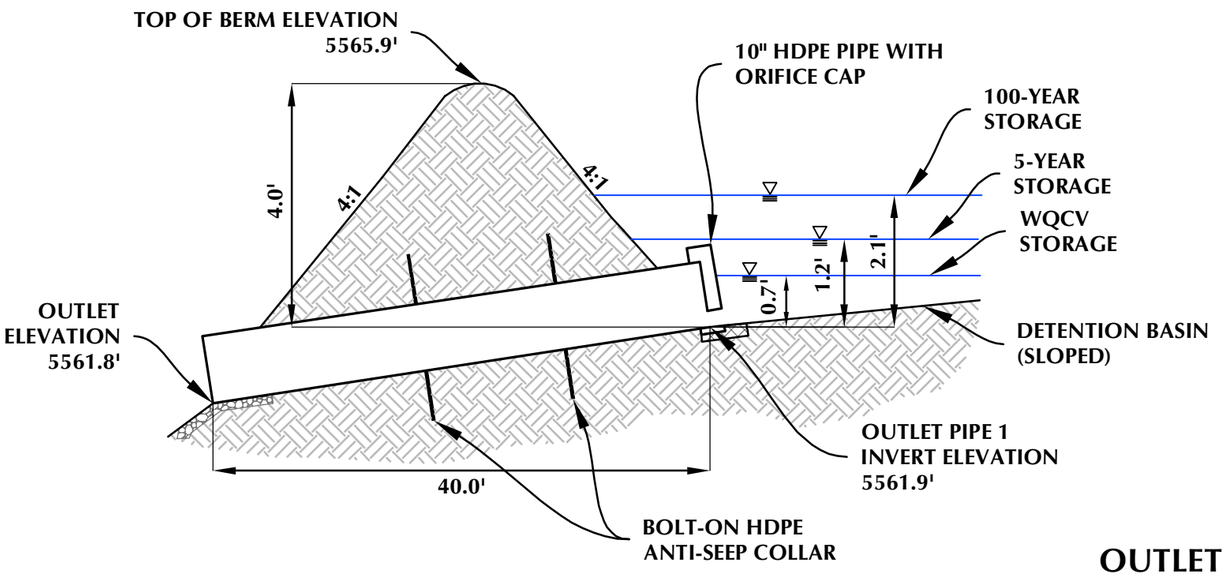
DETENTION BASIN (DB) OUTLET - PRODUCTION PHASE

OUTLET PROFILE (PIPE 1)

SCALE: NTS



OUTLET PROFILE (PIPE 2)

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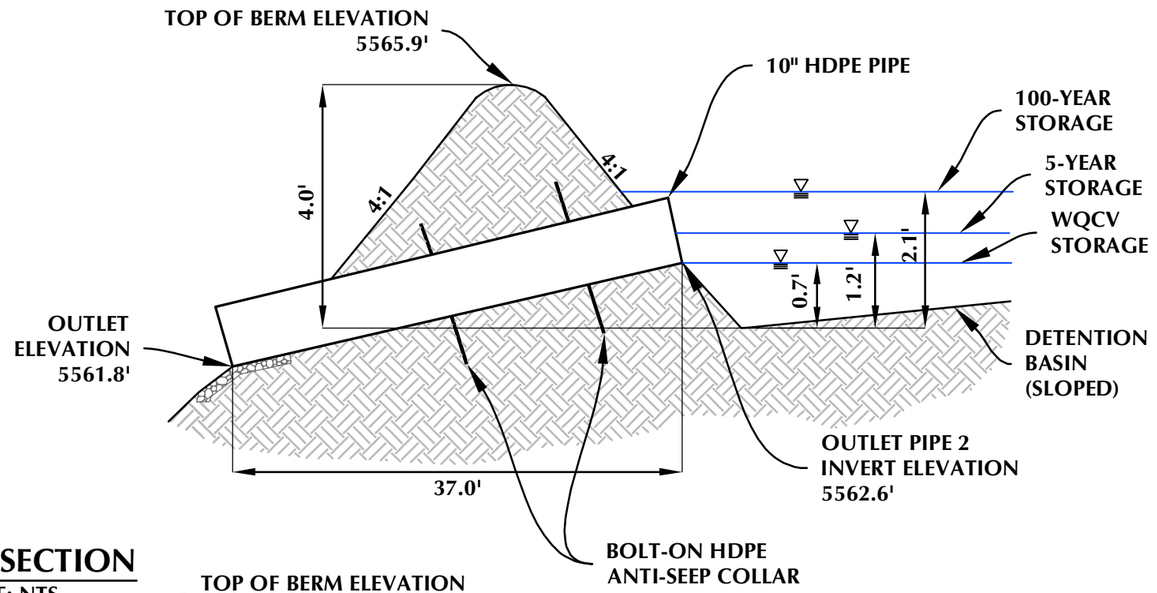

OUTLET SECTION

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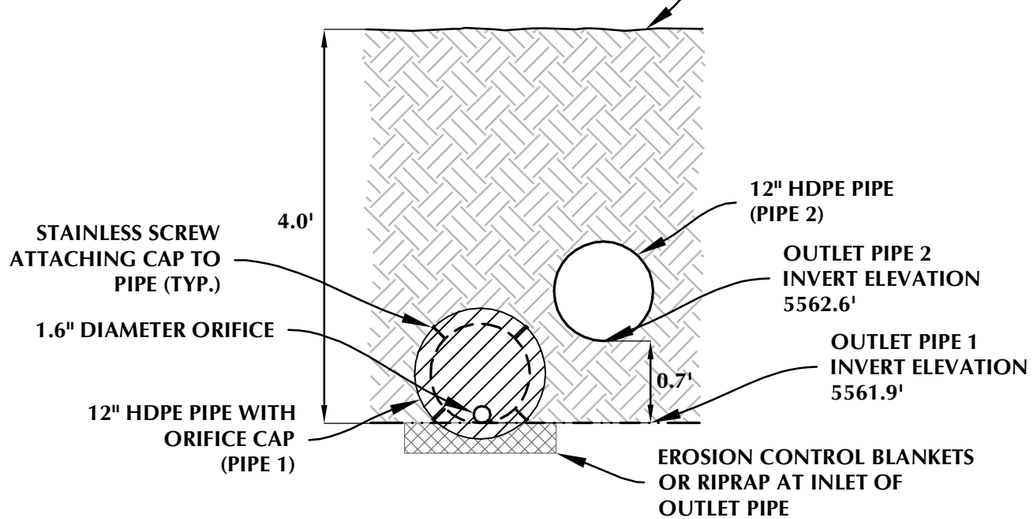

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BENNETT D PAD
DRAINAGE PLAN
DETENTION BASIN OUTLET - PRODUCTION

SCALE:	VARIES	PAGE:	6 OF 10
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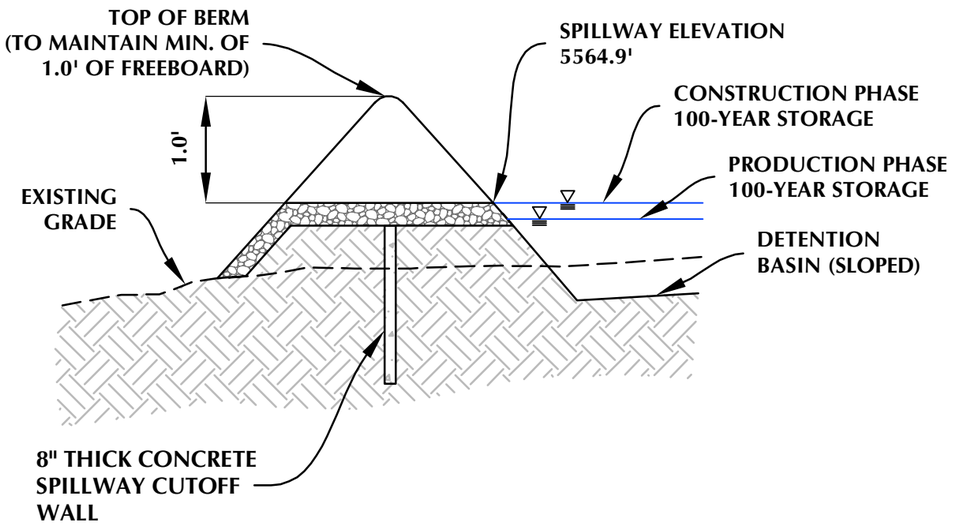
K:\CIVIT\96 RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINED.dwg, 10/19/2024 10:55:02 AM, kgates

DETENTION BASIN (DB) SPILLWAY - BOTH PHASES

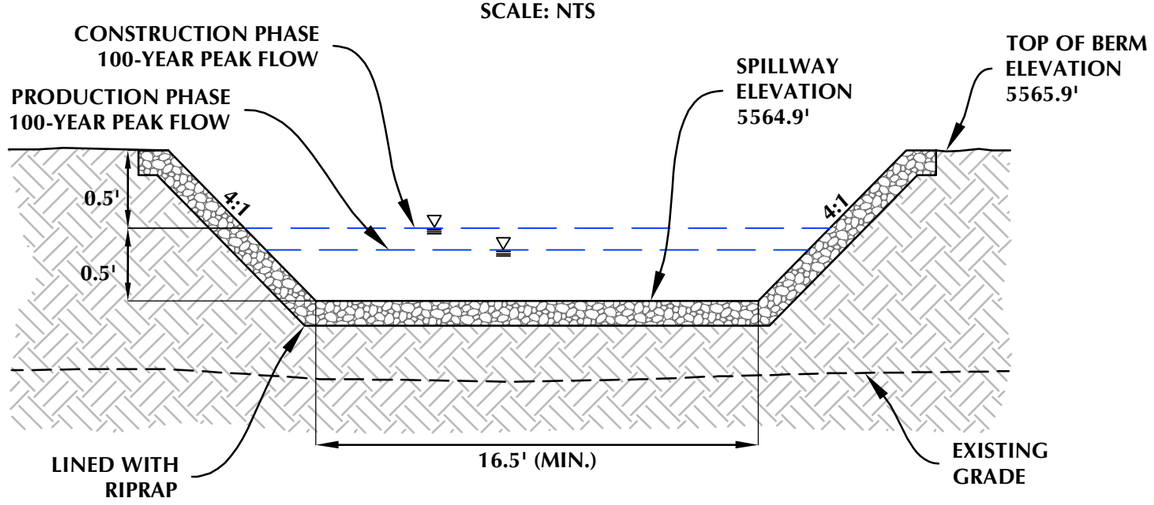
SPILLWAY PROFILE

SCALE: NTS



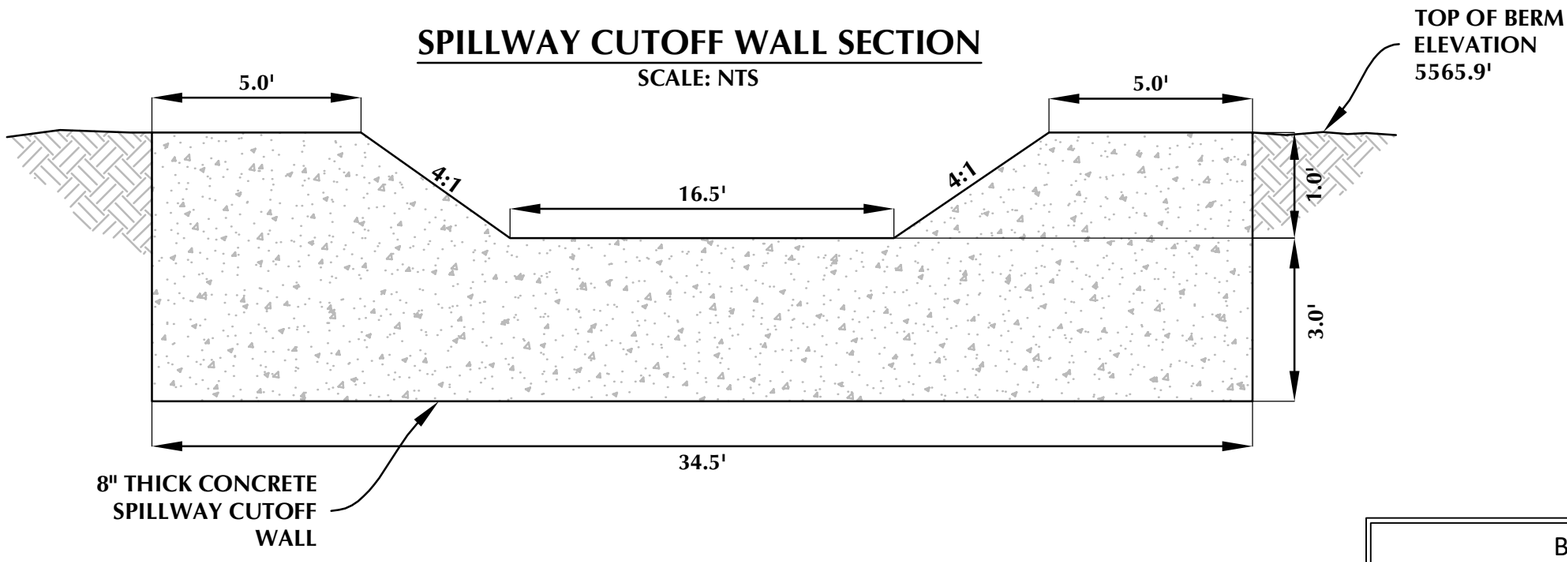
SPILLWAY SECTION

SCALE: NTS



SPILLWAY CUTOFF WALL SECTION

SCALE: NTS



GENERAL NOTES:

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BENNETT D PAD
DRAINAGE PLAN
DETENTION BASIN SPILLWAY

SCALE:	VARIES	PAGE:	7 OF 10
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DRAFTED BY:	KMG	REVISED:	

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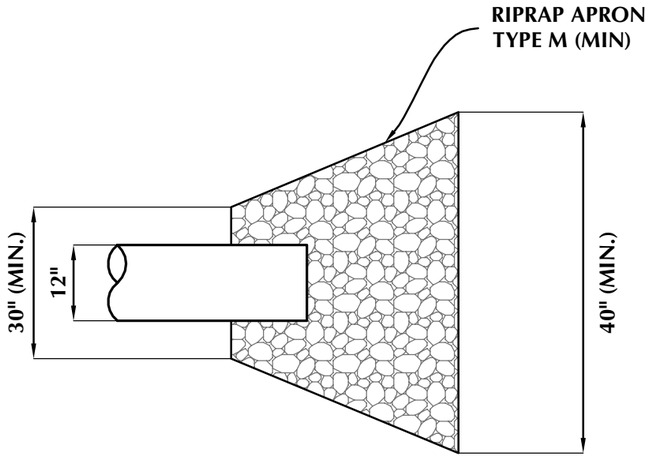
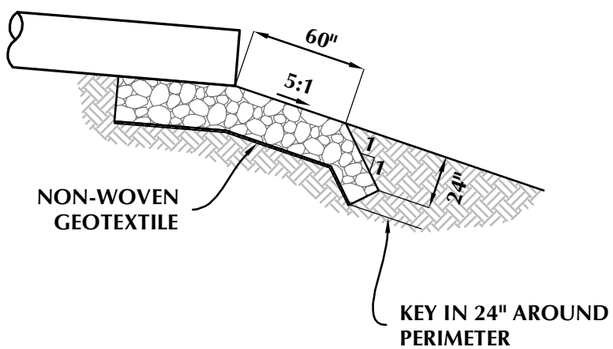
OUTLET PROTECTION

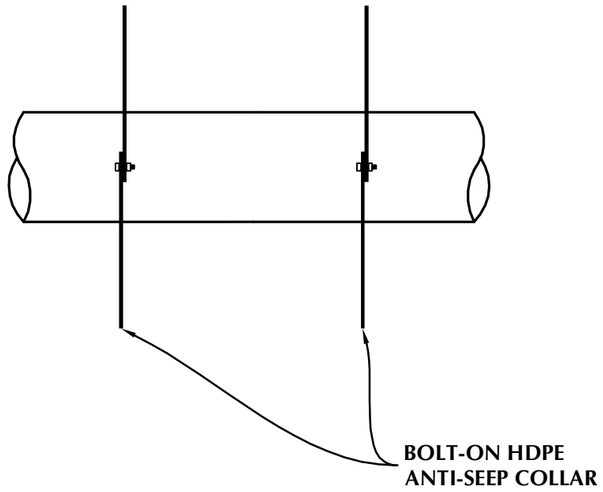
SCALE: NTS

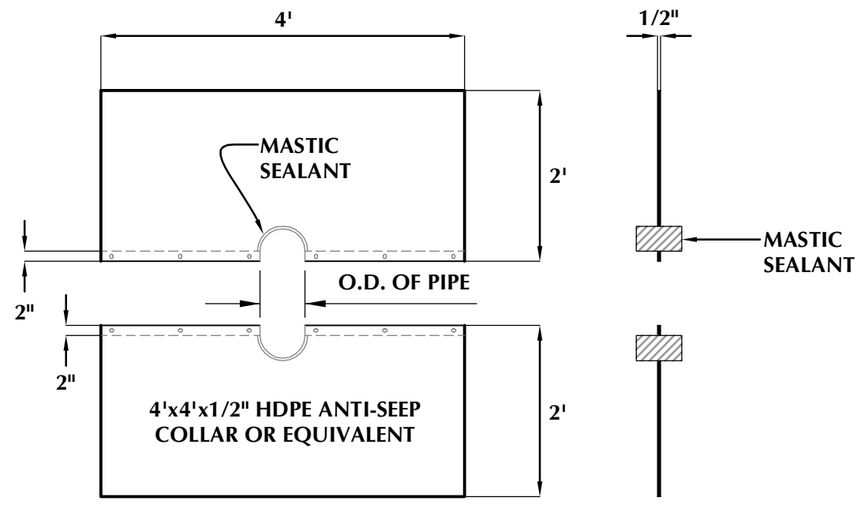




ANTI-SEEP COLLAR

SCALE: NTS





GENERAL NOTES:

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BENNETT D PAD
DRAINAGE PLAN
OUTLET DETAILS

SCALE:	VARIES	PAGE:	8 OF 10
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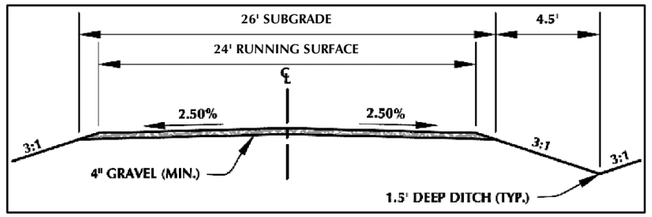
PRELIMINARY

K:\CIVITAS RESOURCES\2023\2023_182_SOC36_T3S_R64W_SEC_36\DRAINAGE STUDY\DWG - DRAINAGE PLAN\BENNETT D_COMBINED.dwg, 10/19/2024 10:56:07 AM, kgates



CROSS-SECTION
NTS

Temporary and Permanent Seeding (TS/PS)

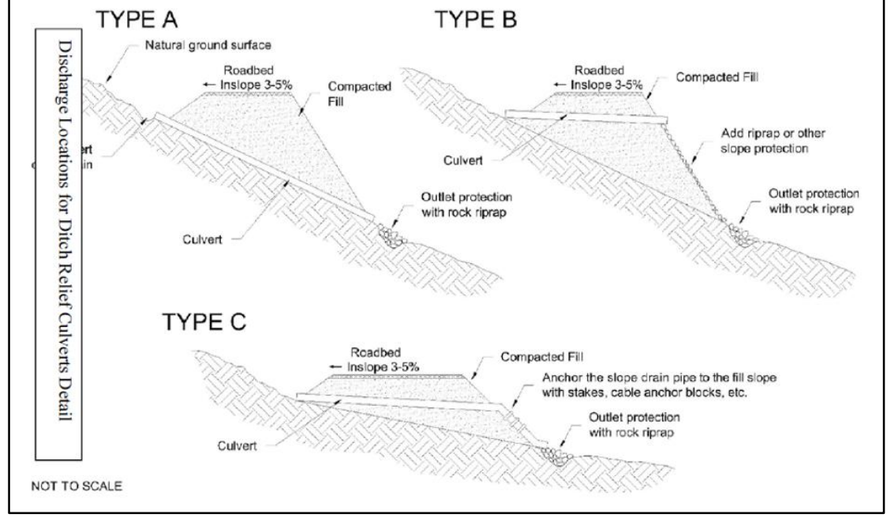
TS/PS

ADAMS COUNTY, COLORADO

SEED MIX	APPLICATION RATE (lbs/acre)
PBSI Dryland Aggressive Mix	25
(20%) Green Needlegrass, Lodorm	
(20%) Slender Wheatgrass, Native	
(20%) Western Wheatgrass, Native	
(20%) Pubescent Wheatgrass, Luna	
(20%) Intermediate Wheatgrass, Oahe/Rush	
PBSI Native Prairie Mix	15
(25%) Blue Grama	
(10%) Buffalograss	
(20%) Green Needlegrass	
(20%) Sideoats Grama	
(25%) Western Wheatgrass	
PBSI Native Sandyland Mix	15
(20%) Yellow Indiangrass	
(10%) Little Bluestem	
(10%) Indian Rice Grass	
(10%) Sideoats Grama	
(10%) Sand Lovegrass	
(10%) Prairie Sandreed	
(20%) Switchgrass	
PBSI Premium Irrig. Pasture Mix #1	25
(75%) Meadow Bromegrass, Paddock/Fleet	
(25%) Orchardgrass, Elsie/Megabite/Paiute	

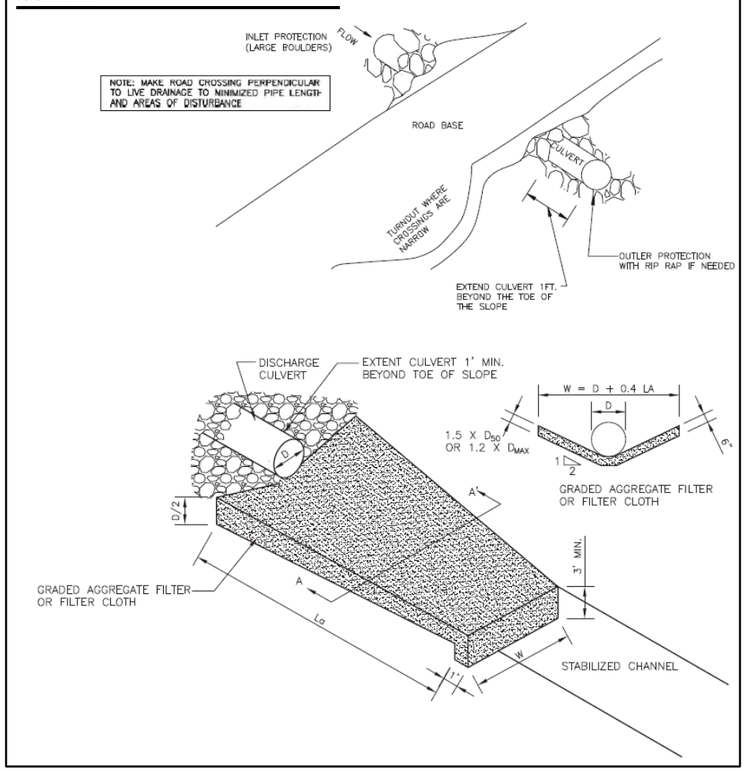
Notes:
lbs/acre = pounds per acre
% = percent

CULVERT



NOT TO SCALE

CULVERT



GENERAL NOTES:

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Prepared For:
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DENVER, CO 80202

BENNETT D PAD
DRAINAGE PLAN
BMP TYPICALS (A)

SCALE:	VARIES	PAGE:	9 OF 10
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DRAFTED BY:	KMG	REVISED:	

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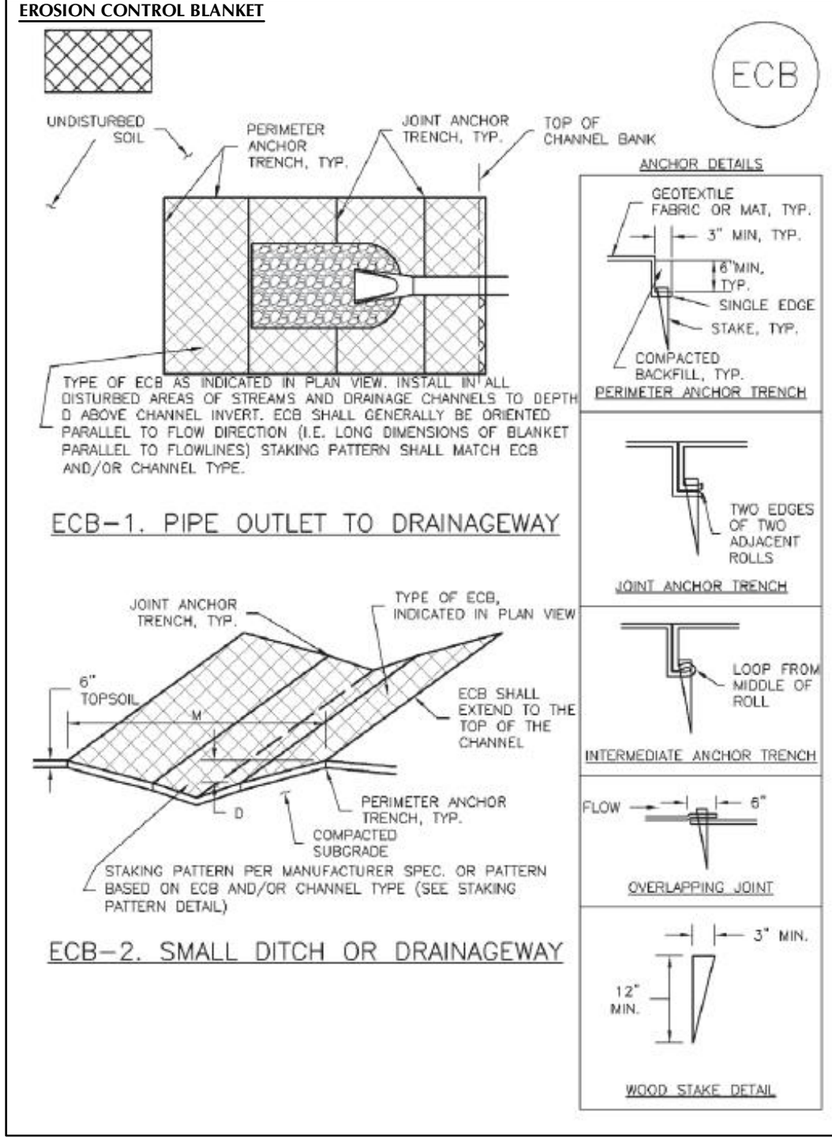
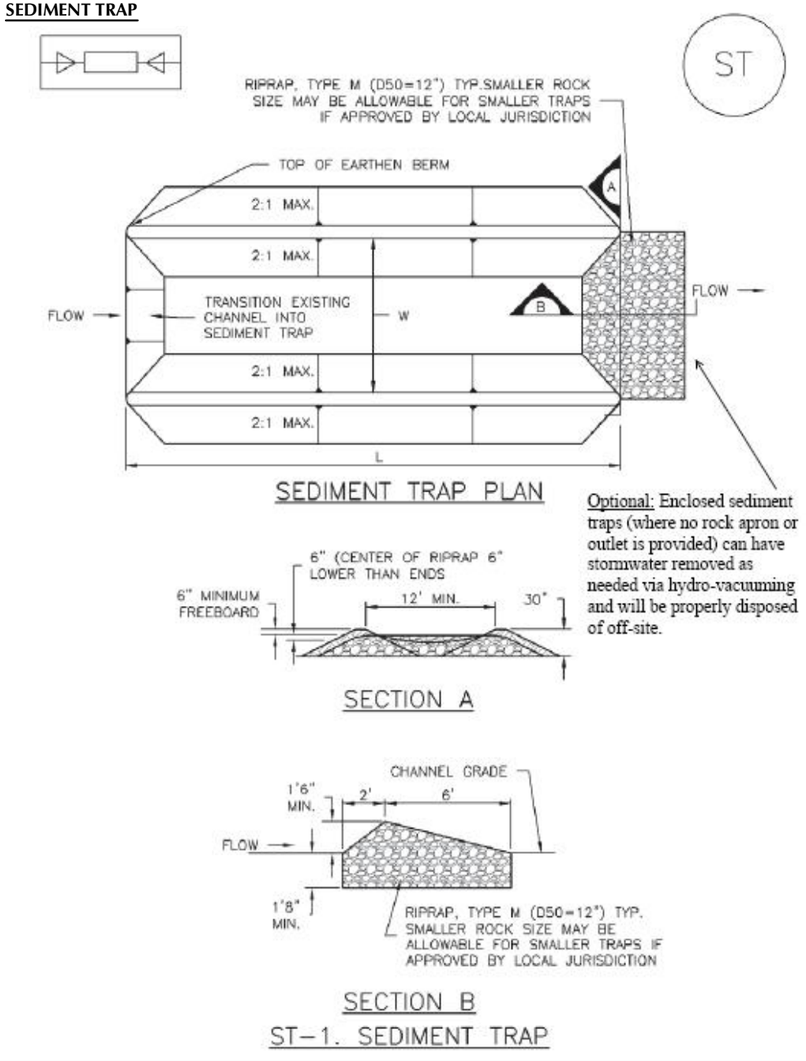
EROSION CONTROL BLANKET



SEDIMENT TRAP



Optional: Enclosed sediment traps (where no rock apron or outlet is provided) can have stormwater removed as needed via hydro-vacuuming and will be properly disposed of off-site.

GENERAL NOTES:

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BENNETT D PAD
DRAINAGE PLAN
BMP TYPICALS (B)

SCALE:	VARIES	PAGE:	10 OF 10
JOB NUMBER:	23-182	DATE:	10/21/24
DRAFTED BY:	KMG	REVISED:	

PRELIMINARY

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Stormwater Management Plan For Bennett D Pad

Prepared for:

Crestone Peak Resources Operating LLC

A Wholly-Owned Subsidiary of Civitas Resources, Inc.

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October 2024

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1.0 INTRODUCTION

This Stormwater Management Plan (SWMP) is being prepared for the Bennett D Pad project on behalf of Crestone Peak Resources Operating LLC, a wholly-owned subsidiary of Civitas Resources, Inc. The project consists of the construction and development of an oil/gas well pad and production facility located in the southeast quarter of Section 34, Township 3 South, Range 64 West in Adams County, Colorado.

The purpose of this report is to develop a site specific SWMP using Stormwater Best Management Practices (BMPs) to control stormwater runoff in a manner that minimizes erosion, transport of sediment offsite, and site degradation. This SWMP shall comply with the Energy & Carbon Management Commission (ECMC) Rule 1002.f and Rule 304.c.(15) and will accompany Form 2A.

This report will discuss the stormwater impacts that may occur during the different development phases (Construction and Production) of the project and will detail the various stormwater BMPs that will be used to minimize erosion, transport of sediment offsite, and site degradation. This SWMP is intended to be a living document which should be updated routinely as site conditions change.

2.0 PROJECT DESCRIPTION AND LOCATION

2.1 Project Description

The proposed project consists of the construction and operation of the Bennett D Pad well pad and production facility containing infrastructure and operations for 26 oil/gas wells. The ECMC Proposed Oil and Gas Location will have a permitted disturbance area of 22.96 acres during the construction phase which includes topsoil stripping and pad earthwork, well drilling and hydraulic fracturing, installation of permanent pipelines and facilities, and setup of temporary equipment and a modular large volume tank (MLVT) area.

Once all wells have been drilled and completed, portions of the Proposed Oil and Gas Location will be reclaimed back to existing grade and re-seeded during interim reclamation. The remaining un-reclaimed area during the production phase will be approximately 7.42 acres.

2.2 Project Location

Bennett D Pad is located on property owned by Crestone Peak Resources Watkins Midstream LLC (Parcel 0181700000105). The project area is approximately 0.1 miles north of Interstate 70 and 0.3 miles west of Manila Road. An existing access road running west from Manila Road will provide access to the project area. Bennett D Pad will be constructed on partially developed industrial land. According to the 2019 National Land Cover Database, the project area is grassland/herbaceous. A map of the proposed Bennett D Pad can be found in Appendix A.

Historically, stormwater from the proposed location drains from the south to the northwest/north. A delineated wetland and existing pond are located to the west of the site while an existing detention pond is located to the north. In order to avoid outflowing towards any of these areas, stormwater will be routed to a detention basin on the north edge of the project area and the outlet will direct flow around the west side of the existing detention pond. The delineated wetland and existing ponds will not be impacted by this project.

Soils data for the project area were taken from NRCS Soil Data Viewer. The project area is comprised of Ascalon-Platner association (0 to 5 percent slopes) soils and Truckton loamy sand (3 to 9 percent slopes). The Ascalon-Platner association has a Hydrologic Soil Group (HSG) classification of Group B with a K soil erosion factor of 0.17, which consists of soils having a moderate infiltration rate and a low runoff potential. The Truckton loamy sand has a HSG classification of Group A soils with a K soil erosion factor of 0.17, which consists of soils having a high infiltration rate and a low runoff potential. The K soil erosion factor is an index ranging from 0.02 to 0.64, which quantifies the relative susceptibility of the soil to sheet and rill erosion. The following table is a summary of K soil erosion factors with typical soil descriptions.

Table 1. Summary of K Soil Erosion Factors with Typical Soil Descriptions

K Factor	Types of Soil	Susceptibility to Erosion
0.02 to 0.25	Sands, Clays, Sandy Clays	Low
0.25 to 0.40	Loams, Sandy Loams, Sandy Silts	Moderate
0.40 to 0.64	Silts	High

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (Panel 08001C0960H, Effective Date: 3/5/2007), the proposed project is in an area of minimal flood hazard (Zone X) and is therefore determined to be outside the 500-year floodplain. The corresponding FIRMette displaying the flood zone classification at the project site can be found in Appendix B.

2.3 Proposed Development

The proposed project consists of the construction of the Bennett D Pad well pad, production facility, and access roads. The project will have two phases: a construction phase and a production phase. The construction phase well pad will have a larger disturbance area to facilitate drilling and completions operations. The production phase well pad will have a smaller disturbance area to facilitate gathering and production operations.

During the construction phase, the Proposed Oil and Gas Location will have a permitted disturbance area of 22.96 acres which includes topsoil stripping and pad earthwork, well drilling and hydraulic fracturing, installation of permanent pipelines and facilities, and setup of temporary equipment and a MLVT area. Once all wells have been drilled and completed, portions of the Proposed Oil and Gas Location will be reclaimed back to existing grade and re-seeded during interim reclamation. The remaining operational area during the production phase will be approximately 7.42 acres.

It is anticipated that heavy construction equipment will construct the access road and working pad surface of this project. Construction of the access road and working pad surface during both phases will consist of:

- Clearing and grubbing of existing vegetation
- Stripping and stockpiling of overlying topsoil
- Grading the working pad area, stormwater diversion ditches, berms, and sediment control structures
- Installing stormwater detention structures
- Installing construction BMPs
- Installing stormwater BMPs

Topsoil piles and excess spoils piles (if any) will be separated and protected from erosion, offsite sediment transport, and degradation. Further site development will consist of:

- Mobilization/demobilization of construction equipment
- Drilling, development, and completion of oil/gas wells
- Installing production facility equipment, utilities, and pipelines

Site development may vary depending on the site-specific conditions.

2.4 Site Specific Construction Requirements

Prior to commencement of any ground disturbance activity, perimeter BMPs will be installed to protect downstream lands from sediment pollution. Once the work area is secure, the access road and well pad will be stripped of topsoil to a depth consistent with the grading plan. Topsoil will be stockpiled separately, then the site will be graded, redistributing material across the site between cut and fill areas to achieve pad finish grade elevations. During this process, fill areas will be properly compacted to ensure working pad surface integrity and proper stabilization. Construction water may be used to assist with compaction as well as minimize dust. All excess material, if any, will be separated and stockpiled. The contractor will place gravel road base on both the pad surface and access road to a compacted depth as shown on the grading plan to provide additional stabilization. All disturbed soil stockpiles and cut/fill slopes will receive slope protection as temporary erosion control during the construction phase. Once all wells have been drilled and completed, portions of the Proposed Oil and Gas Location will be reclaimed back to existing grade and stabilized with drill seed and mulch and any additional stormwater BMPs will be installed.

3.0 DISTURBANCE REDUCTION & RECLAMATION

3.1 Disturbance Reduction and Interim Reclamation

Once all drilling and completion activities are complete, the working pad surface size will be reduced to minimize the site disturbance during the production phase. A sufficient amount of working pad surface must remain to ensure a safe working environment for continued oil and gas production operations. All areas needed for ongoing operations will be stabilized for the long-term life of the well pad. All unused portions of the project area will be reclaimed as described below, and in accordance with the interim reclamation plan.

3.2 Reclamation

Developed areas to be reclaimed will be stripped of topsoil, cross-ripped to 18" (compaction alleviation), and graded to pre-disturbed conditions. Surface treatment will consist of reapplying the topsoil, seeding, and mulching. Reclaimed areas will be restored to as nearly as practicable to the site's original condition. The reclaimed areas will be monitored until final stabilization is achieved. All reclamation shall be completed within three (3) months on crop land and twelve (12) months on non-crop land.

The operator will seed using a seed mix specified by the surface owner. Seeding will be applied at the optimum seeding methodology. A typical seed mix and application rates can be found in Appendix C.

Successful reclamation of the well site and access road will be considered completed when:

1. All construction activities are complete.
2. All working pad surface areas are stabilized from compaction and erosion for the remainder of the project.
3. All seeded and mulched areas have achieved a desirable vegetation density when:
    i. On Crop Land: Reclamation has been performed as per Rules 1003 & 1004 and observation by the Director over two (2) growing seasons has indicated no significant unrestored subsidence.
    ii. On Non-Crop Land: Reclamation has been performed as per Rules 1003 & 1004 and disturbed areas have been either built on, compacted, paced, or otherwise stabilized in such a way as to minimize erosion to the extent practicable, or a uniform vegetative cover has been established that reflects the pre-development or reference area forbs, shrubs, and grasses with a total plant cover of at least eighty percent (80%) of pre-development or reference area levels, excluding noxious weeks, as determined by the Director through visual appraisal.
4. Disturbances resulting from flow line installations shall be deemed adequately reclaimed when the disturbed area is reasonably capable of supporting the pre-development land use.
5. A final reclamation inspection has been completed by the Director, or a representative appointed by the Director, there are no outstanding compliance issues relating to commission rules, regulations, orders, permit conditions or the act, and the Director has notified the operator that final reclamation has been approved. A Sundry Notice Form 4 will be submitted by the operator when final stabilization has been achieved when. The sundry notice will describe the final reclamation procedures and mitigation measures and any changes in the landowner's designated final land use (if applicable).

3.3 Abandonment

Once the operator has made the decision to no longer operate production operations on a well, it will be plugged and abandoned (P&A). All equipment associated with the well will be removed from the location. If the well pad and access road is no longer needed, it will be reclaimed and recontoured to its pre-disturbed conditions and/or in accordance with the surface owner's requirements.

4.0 SWMP REQUIREMENTS

Crestone Peak Resources Operating LLC has a field-wide master SWMP that covers their construction activities within this area. Also, construction activities within this area are covered under and governed by the CDPS General Permit for Discharges Associated with Construction Activity (Permit No. COR401104). The CDPS General Permit can be found in Appendix D.

Stormwater BMPs will be employed in accordance with good engineering, hydrologic, and pollution control practices in order to prevent pollution in stormwater discharges associated with the development of the Bennett D Pad project. All personnel, including applicable contractors, shall comply with the contents of this SWMP.

All information and conditions represented this SWMP are estimated and intended as a preliminary plan. As stated previously, this SWMP is intended to be a living document which should be updated routinely as site conditions change. Actual placement of BMP's may vary based on actual conditions encountered at the site.

4.1 Qualified Stormwater Management Plan Manager

The Qualified SWMP Manager (QSM) has the authority to dedicate the financial and human resources needed to install & implement SWMP control measures, conduct inspections, keep records, report incidents, and make repairs and/or changes in design. The following person has been assigned as the QSM.

Mr. Bryan Mickiewicz, Director EHS
650 Southgate Drive
Windsor, CO 80550
Office: (303) 294-7814
Cell: (720) 539-9978

4.2 State-wide SWMP Requirements

Site inspections must be conducted in accordance with the following requirements. The required inspection schedules are a minimum frequency and do not affect the permittee's responsibility to implement control measures in effective operating condition as prescribed in the SWMP. Proper maintenance of control measures may require more frequent inspections. Site inspections shall start within 7 calendar days of the commencement of construction activities on site.

The person(s) inspecting the site may be on the permittee's staff or a third-party contractor hired to conduct stormwater inspections under the direction of the permittee(s). The permittee is responsible for ensuring that the inspector is a qualified stormwater manager.

4.2.1 Site Inspections Frequency

Permittees must conduct site inspections at least once every seven (7) calendar days for sites that discharge to a water body designated as an "Outstanding Water" by the Water Quality Control Commission. Otherwise, permittees must conduct site inspections in accordance with the following minimum frequencies:

a. At least one inspection every seven (7) calendar days; or
b. At least one inspection every fourteen (14) calendar days, if post-storm event inspections are conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion. Post-storm inspections may be used to fulfill the 14-day routine inspection requirement.
c. When site conditions make the schedule required in this section impractical, the permittee may petition the Division to grant an alternate inspection schedule. The alternative inspection schedule may not be implemented prior to written approval by the Division and incorporation into the SWMP.

4.2.2 Reduced Inspection Frequency

The permittee may perform site inspections at the following reduced frequencies when one of the following conditions exist:

1. Post-Storm Inspections at Temporarily Idle Sites
   For permittees choosing to combine 14-day inspections and post-storm-event-inspections, if no construction activities will occur following a storm event, post-storm event inspections must be conducted prior to recommencing construction activities, but no later than 72 hours following the storm event. The delay of any post-storm event inspection must be documented in the inspection record. Routine inspections must still be conducted at least every 14 calendar days.

2. Inspections at Completed Sites/Areas
   When the site, or portions of a site, are awaiting establishment of a vegetative ground cover and final stabilization, the permittee must conduct a thorough inspection of the stormwater management system at least once every 30 days. Post-storm event inspections are not required under this schedule. This reduced inspection schedule is allowed if all of the following criteria are met:

   a. All construction activities resulting in ground disturbance are complete
   b. All activities required for final stabilization, in accordance with the SWMP, have been completed, with the exception of the application of seed that has not occurred due to seasonal conditions or the necessity for additional seed application to augment previous efforts
   c. The SWMP has been amended to locate those areas to be inspected in accordance with the reduced schedule allowed for in this paragraph

4.2.3 Inspections Exclusions

Inspections are not required for sites that meet the following conditions:

1. Construction activities are temporarily halted; or,
2. Snow cover exists over the entire site for an extended period of time and there is no snowmelt (only applies to the routine 7-day, 14-day and monthly inspections, as well as the post-storm-event inspections)

When the permittee has an inspection exclusion, the following information must be documented in accordance with permit requirements:

1. Dates when construction activities began & ended; or,
2. Dates when snow cover existed and date when snow melt began

4.3 SWMP Inspection Scope

When conducting a SWMP site inspection:

1. Visually verify whether all implemented control measures are in effective operational condition and are working as designed in their specifications to minimize pollutant discharges
2. Determine if there are new potential sources of pollutants
3. Assess the adequacy of control measures at the site to identify areas requiring new or modified control measures to minimize pollutant discharges
4. Identify all areas of non–compliance with the permit requirements and, if necessary, implement corrective action(s)

The following areas, if applicable, must be inspected for evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system or discharging to state waters:

1. All disturbed areas
2. Ditches, berms, and any areas with stormwater mitigation
3. Site perimeter
4. Spill containment areas
5. Topsoil & material stockpiles
6. All locations where stormwater has the potential to discharge offsite
7. Locations where vehicles enter/exit the working pad surface

The permittee must keep a record of all SWMP inspections conducted for each permitted site. Inspection reports must identify any incidents of non-compliance with the terms and conditions of this permit. Inspection records must be retained and signed in accordance with the SWMP. At a minimum, the inspection report must include:

1. Facility Name
2. Inspector's name, title, and company
3. Date of inspection
4. Weather conditions at the time of inspection
5. Phase of construction at the time of inspection
6. Estimated acreage of disturbance at the time of inspection
7. Location(s) and identification of discharges of sediment or other pollutants from the site
8. Location(s) and identification of control measures needing maintenance
9. Location(s) and identification of inadequate control measures
10. Location(s) and identification of additional control measures needed that were not in place at the time of inspection
11. Location of discharges of sediment or other pollutants from the site
12. Description of inspection frequency and any deviations from the minimum inspection schedule

This would include documentation of division approval for an alternate inspection schedule. Location and description of corrective action(s) that have been taken, or where a report does not identify any incidents requiring corrective action, the report shall contain a statement.

5.0 SITE-SPECIFIC SWMP REQUIREMENTS

The following are the site-specific SWMP BMPs. Included with each BMP is its description, applicability, limitations, and location. More information on each site-specific stormwater BMP can be found in Appendix E.

5.1 Berm

Description

A berm is a mound of compacted soil. The top is at a specified width and the side slopes are at a specified slope. Berms may be constructed from either excavated topsoil or subsoil. Berms may be used to collect and direct on-site stormwater to sediment traps and outlets, store on-site stormwater, and deflect/redirect off-site runoff around the disturbance area.

Applicability

Berms help contain and divert runoff. Berms may be used for the upslope of cut or fill slopes to contain or divert surface water. Usually, berms will surround the perimeter of the working pad surface or spill containment area.

Limitations

Berms must be regularly maintained sometimes several times a year depending on site conditions. Berms will erode if they not properly maintained, compacted, and/or stabilized with vegetation or road base. Berms will fail if it is constructed with hydro-sensitive material. Berms which are downstream to surface drainage will require a ditch or additional protection to prevent erosion. Drive-over berms installed through a pad entrance will require a larger width and increased maintenance to remain effective. Depending on the berm material, stabilization such as erosion control blankets, road base, or liners may be needed.

Location

Two ditches and berms will be constructed along part of the perimeter of the Bennett D Pad project site to ensure that runoff remains on-site and is diverted to the sediment trap and detention basin area.

5.2 Ditch

Description

A ditch consists of a sub-grade drainage channel. The bottom is at a specified width and the side slopes are at a specified slope. Ditches will have a specified channel slope and discharge to the sediment trap or the detention basin area. Typically, ditches are constructed with an earthen channel. The purpose of a ditch is to collect and divert surface water. Typically, ditches will collect and divert off-site surface water around the perimeter of the well site, and, collect and divert on-site surface water from the bottom of cut and fill slopes to sediment control devices.

Applicability

Ditches help to collect and divert runoff. On-site ditches will be placed around the perimeter of the pad and soil stockpiles to divert on-site and off-site surface water to the sediment trap or detention basin area. Diversion ditches and berms will be used to collect and direct on-site stormwater to outlets, deflect and redirect off-site runoff around the disturbance area, and store on-site stormwater.

Limitations

Ditches must be regularly maintained sometimes several times a year depending on site conditions. Ditches may erode and fill in if they not properly maintained, compacted, and/or stabilized with vegetation or road base. Ditches will fail if they are not properly sloped or not deep enough to contain the diverted runoff. Ditches that cross roads must have a stabilized low water crossing or culvert. Ditches concentrate flows and increase runoff velocities. Ditches must be released into an appropriate outlet structure or they can become a source of erosion. Ditch outlet structures must release into downstream historical drainages. Ditches with steep slopes and increased velocities will require check dams and stabilization such as erosion control blankets, road base, or liners.

Location

Two permanent ditches will be constructed on the west and east sides of the facility to ensure that runoff remains on-site and is diverted to the detention basin area. A temporary ditch re-route will direct off-site runoff and on-site runoff from the topsoil stockpile to the sediment trap and outlet. Treated stormwater will exit the sediment trap onto undisturbed ground where the natural contours will drain away from the project area. Ditches shall have a minimum slope of 0.5%, 12" depth minimum, and 2:1 slope.

5.3 Culvert

Description

A culvert is a structure that channels water through an obstacle, with a sole purpose to allow water to drain. It allows normal drainage to flow under a travel way and to drain inside road ditches.

Applicability

Culverts are installed to periodically relieve the ditch line flow by piping water to the opposite side of the obstacle where the flow can be dispersed away from the roadway.

Limitations

Culverts must be regularly inspected and maintained, especially during construction activities. Without proper maintenance, culverts with high water velocities may result in soil erosion. Culverts with the minimum diameter will help with drainage and ditch relief to prevent failure from debris and blockages.

Location

Three culvert locations will be required to ensure proper on-site and off-site drainage. Three 12-inch corrugated metal pipe (CMP) culverts will convey on-site and off-site runoff from east of the project site to the north under the temporary access road and each of the permanent access roads during both the construction and production phases.

5.4 Sediment Trap

Description

A sediment trap consists of a sub-grade excavation that captures and detains runoff, storing sediment and releasing runoff. Sediment traps are designed to capture drainage from disturbed areas and allow sediment to settle prior to being discharged. In order to provide additional capture volume and treatment, sediment traps are designed to be oversized when possible.

Applicability

Sediment traps help prevent the transport of sediment offsite during construction activities and slope stabilization periods. Sediment traps are used as outlet structures for on-site drainage ditches.

Limitations

Sediment traps must be regularly inspected and maintained, especially during construction activities. Sediment traps may fail by being filled in if they not properly maintained. Sediment traps could also erode if they are not properly compacted and the outlet is not properly stabilized.

Location

One 20 feet by 20 feet by 3 feet deep sediment trap will be installed at the end of the temporary ditch re-route during the construction phase. The sediment trap will be reclaimed during the production phase.

5.5 Stormwater Detention Basin

Description

Stormwater detention basins capture runoff in a large area allowing sediment to settle prior to flows being released. By detaining on-site stormwater, flows are released more slowly than without the control structure. During both the construction and production phase, an engineered stormwater detention basin area will hold stormwater from the required 100-year storm event and control release rates through an outlet pipe and emergency spillway. As an additional erosion and sediment control measure, the outlet pipe will discharge to a riprap pad surrounded with straw wattles to slow the velocity and minimize sediment before outflows are released off site.

Applicability

The stormwater detention area is designed to be site-specific and are appropriate for detaining stormwater from the project area.

Limitations

Stormwater detention basins only provide peak flow reduction and do little to control stormwater volume. Stormwater detention basins have limited water quality treatment capacity.

Location

During the construction phase, stormwater from the well pad and production facility will drain to the stormwater detention basin located north of the facility. The outlet, utilized during both the construction and production phase, will consist of two 12-inch diameter high-density polyethylene (HDPE) pipes. One will have an orifice cap to control release rates and one will have no orifice cap. Anti-seep collars should be used to prevent seepage through the berm and outlet slopes should be protected using geotextile fabric or riprap in order to prevent erosion along the embankment.

5.6 Riprap Apron

Description

Riprap aprons are runoff energy dissipation devices usually constructed from rip-rap at the end of culverts and pipe outlets. Riprap aprons are specified by rip-rap gradations, length, and width. The purpose of riprap aprons is to reduce the stormwater runoff velocities from ditches and culverts and spread out the runoff as it is released.

Applicability
Riprap aprons are used at the end of ditches and culverts. Riprap aprons help to reduce areas susceptible to erosion.

Limitations
Riprap aprons must be regularly maintained especially during construction activities. Riprap aprons are not sediment traps and if allowed to silt in they may become a source of erosion. Riprap aprons may fail if they are undersized or not property placed.

Location
This site will have riprap aprons located at the inlet and outlet of each culvert and the pipe outlet for the stormwater detention basin.

5.7 Sediment Control Logs

Description
Sediment control logs are a manufactured tubular sediment collection device sometimes referred as "straw wattles." Sediment control logs are at a specified diameter and must be installed according to the manufacturer's recommendations and specifications. The purpose of the sediment control logs is to capture sediment preventing it from leaving the site while releasing the stormwater runoff.

Applicability
Sediment control logs help prevent the transport of sediment offsite during the slope stabilization and revegetation periods. Sediment control logs are often placed along contour lines in short repeating intervals perpendicular to cut/fill slopes. Sediment control logs are also commonly used at the bottom of material stockpiles. Sediment control logs cannot be used as runoff diversion devices. Sediment control logs may be used as ditch check dams and storm drain inlet control devices.

Limitations
Sediment control logs must be regularly maintained especially during construction activities and slope stabilization periods. Sediment control logs have a limited sediment capture zone area and multiple lines will be needed for longer slopes. Sediment control logs must be placed in a trench which could cause slope damage while doing maintenance using heavy machinery. Sediment control logs may be difficult to install on rocky slopes.

Location
Straw wattles may be placed around the perimeter of stockpiles during both the construction and production phase to further control erosion and minimize sediment transport.

5.8 Seeding and Mulching

Description

Seeding and mulching assumes the preparation of a seedbed with topsoil, selection of an appropriate native seed mixture, proper planting techniques, and protection mulching of the seeded area. The purpose of seeding and mulching is to stabilize slopes and prevent erosion control and sediment transport from the site. Seeding also absorbs the impact of raindrops, reduces the velocity of runoff, reduces runoff volumes by increasing water permeation into the soil, binds soil with roots, protects soil from wind, improves wildlife habitat, and enhances natural beauty.

Applicability

Seeding and mulching is used for slope stabilization and erosion control on all disturbed slopes, berms, ditches, and material stockpiles during construction following interim reclamation efforts. Operator will seed with a mix specified by the surface owner. Seeding will be applied at the optimum seeding methodology. Typical seed mix and application rates can be found in Appendix C.

Limitations

Without proper seedbed preparation and seed mix, seeding and mulching will fail. Seeding and mulching takes time to develop and slopes will need to be protected and regularly maintained. Noxious weeds transported onsite may become a site nuisance and a hazard to private property and may try to establish themselves in seedbed areas.

Location

Permanent seeding will be applied to all topsoil stockpiles and reclaimed areas during the production phase.

6.0 SITE MAINTENANCE AND UPKEEP

The Crestone Peak Resources Operating LLC site monitoring program ensures site conditions stay in compliance. Sedimentation, culvert and access road condition, vegetation health, and several other safety and maintenance items are routinely monitored and evaluated to ensure the site is in workable and drainable order.

Routine maintenance and required repairs of access roads, culverts, ditches, berms, and outlet structures will be handled by the operations team. Cleaning and removal of sediment and debris from ditches, culverts, and outlets, as well as vegetation maintenance and specific manufacturer maintenance, will also be handled by the operations team during regular operations and maintenance checks.

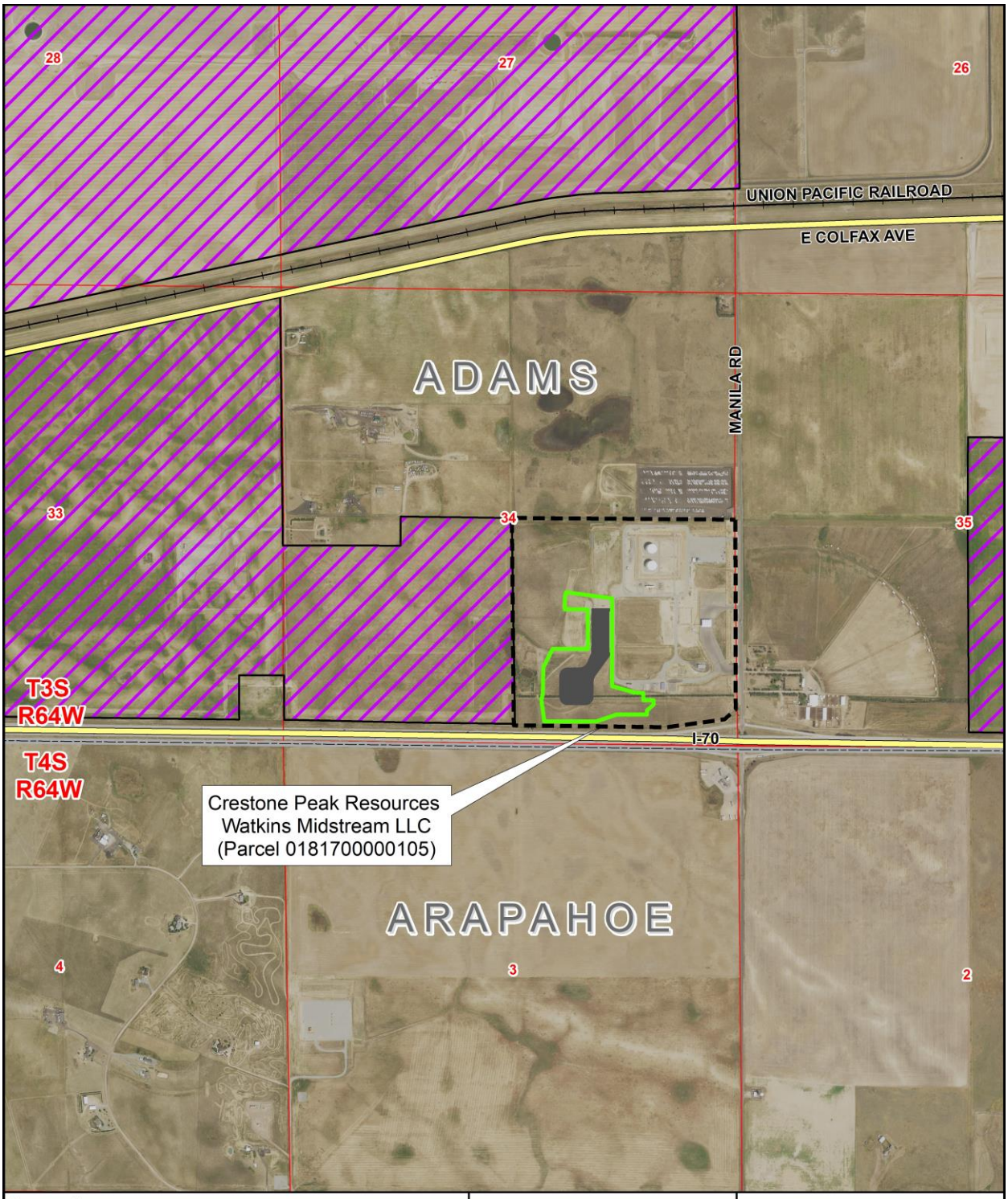
7.0 CONCLUSION

The information and analysis presented in this SWMP display the adequacy and effectiveness of the design and planning associated with the Bennett D Pad. The design protects public health, safety, and general welfare and has no adverse impacts on public rights-of-way or off-site properties.

APPENDICES

Appendix A:

Project Location



Legend

- Proposed Oil and Gas Location
- Bennett D Pad Operational Area
- City of Aurora
- County Boundary
- Railroad

N
W E
S

0 0.25 miles

Prepared For:

CIVITAS

CRESTONE PEAK RESOURCES, LLC
555 17TH STREET, SUITE 3700
DENVER, CO 80202

609 CONSULTING, LLC

LOVELAND OFFICE
6706 North Franklin Avenue
Loveland, Colorado 80538
Phone 970-776-4331

SHERIDAN OFFICE
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609

Appendix B:

FEMA Flood Insurance Rate Map FIRMette

National Flood Hazard Layer FIRMette

FEMA

104°32'20"W 39°44'41"N

104°31'42"W 39°44'14"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/14/2024 at 6:59 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix C:

Seed Mix

Table 4
Seed Mix and Application Rates

ADAMS COUNTY, COLORADO

SEED MIX	APPLICATION RATE (lbs/acre)
PBSI Dryland Aggressive Mix	**25**
(20%) Green Needlegrass, Lodorm	
(20%) Slender Wheatgrass, Native	
(20%) Western Wheatgrass, Native	
(20%) Pubescent Wheatgrass, Luna	
(20%) Intermediate Wheatgrass, Oahe/Rush	
PBSI Native Prairie Mix	**15**
(25%) Blue Grama	
(10%) Buffalograss	
(20%) Green Needlegrass	
(20%) Sideoats Grama	
(25%) Western Wheatgrass	
PBSI Native Sandyland Mix	**15**
(20%) Yellow Indiangrass	
(10%) Little Bluestem	
(10%) Indian Rice Grass	
(10%) Sideoats Grama	
(10%) Sand Lovegrass	
(10%) Prairie Sandreed	
(20%) Switchgrass	
PBSI Premium Irrig. Pasture Mix #1	**25**
(75%) Meadow Bromegrass, Paddock/Fleet	
(25%) Orchardgrass, Elsie/Megabite/Paiute	

Notes:
lbs/acre = pounds per acre
% = percent

Appendix D:

CDPS General Permit Certification

COLORADO
Department of Public Health & Environment

CERTIFICATION TO DISCHARGE
UNDER
CDPS GENERAL PERMIT COR400000
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

Certification Number: **COR401104**

This Certification to Discharge specifically authorizes:

Owner Civitas Resources
Operator Civitas Resources
to discharge stormwater from the facility identified as

COP Field Permit Arapahoe County West of Watkins

To the waters of the State of Colorado, including, but not limited to:

Box Elder Creek, Coal Creek, South Platte River

Facility Activity :	OilGas
Disturbed Acres:	2000 acres
Facility Located at:	County Line Rd and Watkins Rd Watkins 80137 Arapahoe County Latitude 39.662067 Longitude -104.624440
Specific Information (if applicable):	

Certification is issued: 5/15/2024
Certification is effective: 4/1/2024
Expiration date of general permit: 3/31/2029

This certification under the general permit requires that specific actions be performed at designated times. The certification holder is legally obligated to comply with all terms and conditions of the COR400000 permit.

This certification was approved by:
Andrew Sayers-Fay Permits Section Manager
Clean Water Program
Water Quality Control Division

Appendix E:

Site-Specific Stormwater BMPs

Berm (B)

Description

A berm is a ridge of compacted soil located at the top or base of a sloping disturbed area to contain or divert surface water runoff. Berms may be constructed from compactable soils sufficiently impermeable to retain water. Typically berms will be constructed using subsoils.

The purpose of a berm is to control runoff velocity, divert on-site surface runoff into a sediment trapping device, divert clean water away from disturbed areas, provide secondary containment, and to provide a safe slope barrier for vehicle traffic.

Applicability

Berms are usually appropriate for drainage basins smaller than five acres, but with modifications they can be capable of servicing areas as large as ten acres. With regular maintenance, the life span of earthen berms can last throughout the life of a project. Berms can used at, but are not limited to, the following applications:

- Along the outside shoulder of an in-sloped road to ensure runoff from the roadway drains inward and to protect the fill slope from continual disturbance during road blading and maintaining;
- Up slope of cut or fill slopes to divert flows away from disturbed areas;
- Down slope of cut or fill slopes to divert on-site runoff into a stabilized outlet or sediment trapping device;
- Along the outside shoulder of a road to provide vehicle safety or;
- Secondary containment around pollutant sources.

Limitations

- Berms may erode if not properly maintained, compacted, and or stabilized with vegetation. Berms which are adjacent to concentrated flows may require other means of stabilization.
- If a berm crosses a vehicle roadway or entrance, it needs to be compacted and widened to create a drive over that ensures simultaneous function of the berm and road. Wherever possible, berms should be designed to avoid crossing vehicle pathways.

Design Criteria

See figure B-1 for design criteria.

Construction Specifications

- Prior to berm construction, remove all trees, brush, stumps, and other objects in the path of the berm. Fill will typically consist of subsoil excavated during the construction of nearby roads or well pads.
- All berms shall have positive drainage to a stabilized outlet so runoff does not collect in ponds on the up-slope side of the berm, but instead flows along the berm until it reaches a stabilized outlet. Field location should be adjusted as needed. The stabilized outlet may be a well-vegetated area, a well pad detention pond, or a sediment control such as a silt fence or sediment trap where sediment can settle out of the runoff before being discharged.
- Berms should be constructed prior to commencement of major up-slope land disturbance. This will maximize the effectiveness of the structure as a stormwater control device.
- Berms used as secondary containment must be compacted and sufficiently impervious to retain liquids until the next routine inspection.

Maintenance Considerations

The frequency of inspections shall be in accordance with the Stormwater Management Plan (SWMP). Berms should be inspected for evidence of erosion or deterioration. Berms should also be maintained at or above the minimum required height. Any decrease in height due to settling or erosion, which impacts the effectiveness of the BMP, shall be repaired.

Removal

Berms should remain in place and in good condition until all up-slope disturbed areas are permanently stabilized. There is no need to remove a berm upon stabilization, provided the berm is stabilized and functioning properly.

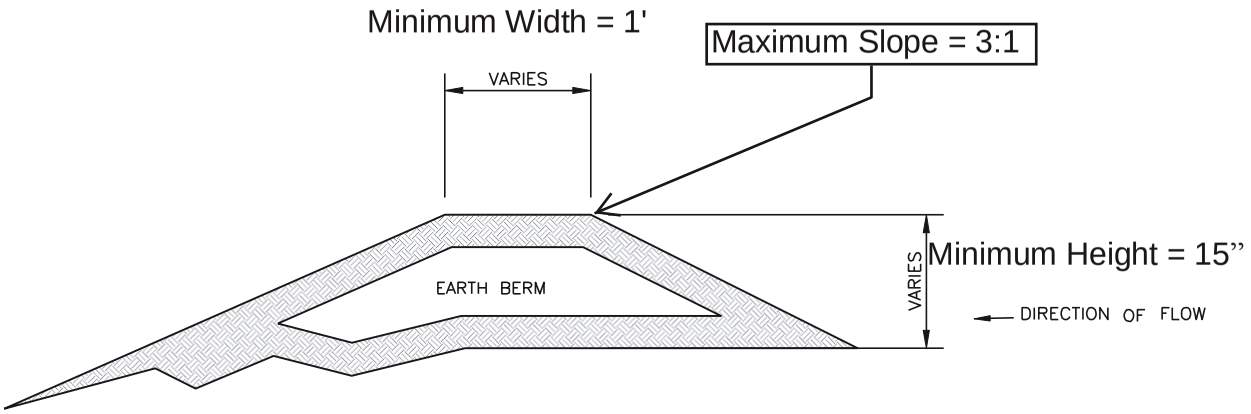
References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Storm Water Runoff Control.* Washington, D.C., February, 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

New York State Department of Environmental Conservation, *New York Guidelines for Erosion and Sediment Control*. New York. August 2005.http://www.dec.ny.gov/chemical/29066.html

Urban Drainage and Flood Control District, *Volume 3 Stormwater Quality*. Denver, CO, November 2015. http://udfcd.org/volume-three

FIGURE B-1
Earth Berm



Notes:
1. Soil must be compactable and sufficiently impervious to retain/deflect stormwater.
2. Earthen Berms must be compacted to be effective.

SCALE: NOT TO SCALE

Culvert (C)

Description

Culverts are typically constructed of concrete, steel, aluminum, or plastic pipe and are used to direct stream flow or ditch water under a road or construction area.

Applicability

Culverts are ideal on roads with grades of less than 15%. For grades over 15%, it is difficult to slow down the water or remove it from road surface rapidly. On such steep grades, it is best to use frequently spaced relief culverts and drainage crossing culverts, with armored ditches (see RIPRAP [R]). Culverts may be used:

- As drainage crossing culverts in streams and gullies to allow normal drainage to flow under pathways and roads;
- As ditch relief culverts to periodically relieve the inside ditch line flow by piping water to the opposite side of the road where the flow can be dispersed away from the roadway;
- Culverts placed in natural drainages may be utilized for ditch relief.

Limitations

- Undersized culverts are susceptible to plugging and will require cleaning;
- Culverts will not filter sediment;
- Culverts are easily crushed if not properly designed/protected.

Design Criteria

Pipe size can be determined using general design criteria, such as in Table C-1, but it is ideally based upon site-specific hydrologic analysis.

Depth

The depth of culvert burial must be sufficient to ensure protection of the culvert barrel for the design life of the culvert. This requires anticipating the amount of material that may be lost to road use and erosion.

Headwalls

Use headwalls on culvert pipes as often as possible (see RETAINING WALL [RW]). The advantages of headwalls include preventing large pipes from floating out of the ground when plugged;

reducing the length of the pipe capacity; allowing debris to funnel through the pipe; retaining the backfill material; and reducing the chances of culvert failure if it is overtopped.

Construction Specifications

Drainage Crossing Culverts

- Make road crossings of natural drainages perpendicular to the drainage to minimize pipe length and area of disturbance (Figure C-1).
- Use single large pipes versus multiple smaller diameter pipes to minimize plugging potential in most channels (unless roadway elevation is critical). In very broad channels, multiple pipes are desirable to maintain the natural flow spread across the channel. All culverts should be concrete-lined corrugated metal pipe made of steel or aluminum, or properly bedded and backfilled corrugated metal or plastic pipe.
- Align culverts in the bottom and middle of the natural channel flowline so the installation causes no change in the stream alignment or stream bottom elevation. Culverts should not cause damming or pooling or increase stream velocities significantly.
- Extend the outlet of the culvert at least one foot beyond the toe of the slope to prevent erosion of the fill material. Alternatively, use retaining walls (headwalls) to hold back the fill slope when applicable.
- It may be necessary to install rip rap, erosion control blanketing, or a combination of both or other energy-dissipater device at the outlet end of the culvert to reduce soil erosion or to trap sediment (see CULVERT PROTECTION [CP]).
- It may be desirable to construct pull offs/turnouts for vehicles on one or both sides of narrow culvert crossings. This will help avoid culvert crushing as well as disturbance to roadside ditches and berms.

Ditch Relief Culverts (See Figure C-2 for installation details).

- Ditch relief culverts can provide better flow when skewed 0 to 30 degrees perpendicular to the road.
- The culvert gradient should be at least 2% greater than the approach ditch gradient. This improves the flow hydraulics and reduces siltation and debris from plugging the culvert inlet.
- Discharge the culvert at the natural ground level where possible (see Figure C-3, type A), on firm, non-erosive soil or in rocky or bushy areas. If discharging on fill slopes, and armor outlets with riprap or logging slash (see Figure C-3, type B), or use down-drain structures (see Figure C-3, type C and SLOPE DRAIN [SD]).
- Extend the inlet of the culvert at least one foot beyond the flowline of the roadside ditch.
- Extend the outlet of the culvert at least one foot beyond the toe slopes to prevent erosion of the fill material.
- It may be necessary to install riprap or other energy-dissipater devices at the outlet end of the culvert to prevent soil erosion or to trap sediment (see CULVERT PROTECTION [CP]).
- Spacing of culverts is dependent on the road gradient, soil types, and runoff characteristics according to the table below.
- It may be desirable to construct pull offs/turnouts for vehicle on one or both sides of narrow culvert crossings. This will help avoid culvert crushing as well as disturbance to roadside ditches and berms.

Soil Type	Road Grade		
	3-4%	5-8%	9-12%
Highly Corrosive Granitic or Sandy	240'	180'	140'
Intermediate Erosive Clay or Load	310'	260'	200'
Low Erosive Shale or Gravel	400'	325'	250'

Backfill and Compaction

- Firmly compact well-graded fill material (soil or road base) around culverts, particularly around the bottom half, using placement in layers to achieve a uniform density. Use slightly plastic sandy gravel with fines. Avoid the use of fine sand and silt rich soils for bedding material because of their susceptibility to piping. Pay particular attention to culvert bedding and compaction around the haunches of the pipe. Do not allow the compaction to move or raise the pipe. In large fills, allow for settlement.
- Cover the top of the metal and plastic culvert pipes with fill to a depth of at least one foot to prevent crushing by heavy trucks. Use a minimum cover of 2 feet of fill over concrete pipe. For maximum allowable fill height, **follow the manufacturer's recommendations.**
- Mound fill materials over the top of culvert pipes so the road is slightly raised at the culvert locations to help prevent erosion and water from ponding over culvert crossings. This practice, as well as placing large boulders around the culvert outlets, will also help to prevent culverts from being crushed.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). If any damage to culvert or inlet/outlet protection is noted or if there is any evidence of scour, repairs should be made immediately. Any debris that may be blocking the culvert inlet or outlet should be removed.

References

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004.

Keller, Gordon and James Sherar, *Low-Volume Roads Engineering, Best Management Practices Field Guide.* United States Department of Agriculture (USDA), Forest Service, US Agency of International Development (USAID), 2003. http://www.blm.gov/bmp/field%20guide.htm

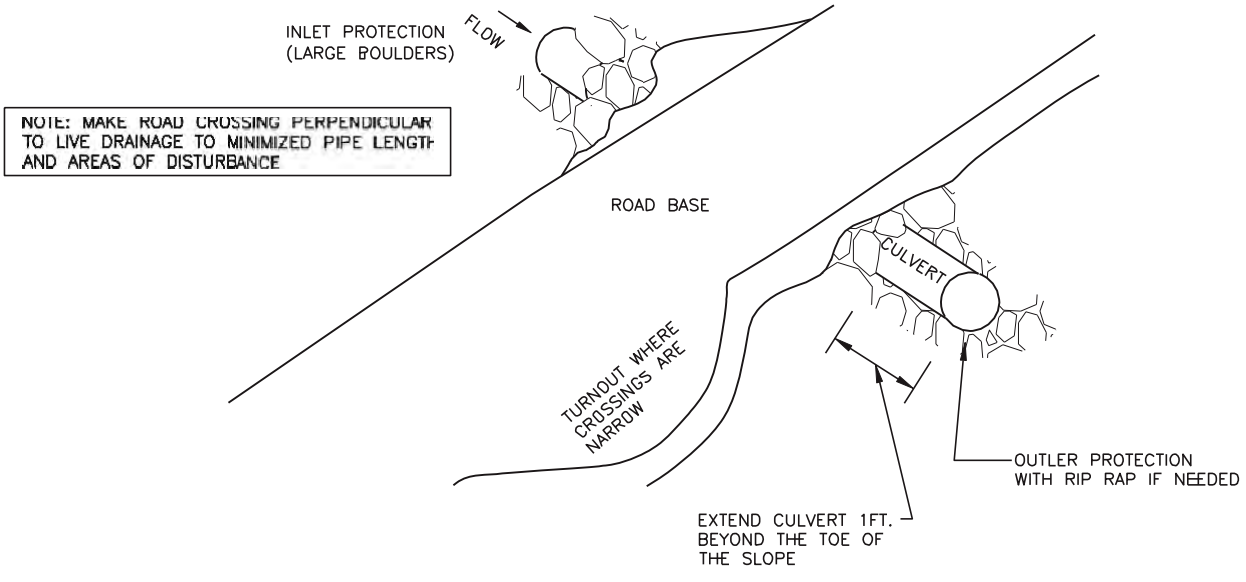
United States Department of the Interior, Bureau of Land Management (BLM), *Surface Operating Standards for Oil and Gas Exploration and Development "Gold Book"*. Fourth Edition, 2007. http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.h tml

TABLE C-1
Culvert Sizing

Drainage Area (acres)	Size of Drainage Structure (diameter and area)			
	Steep Slopes (Light Vegetation) C=0.7		Gentle Slopes (Heavy Vegetation) C=0.2	
	Round Pipe (in)	Area (sq. ft)	Round Pipe (in)	Area (sq. ft)
0-10	30"	4.9	18"	1.8
10-20	42"	9.6	24"	3.1
20-35	48"	12.6	30"	4.9
35-75	72"	28.3	42"	9.6
75-125	84"	38.5	48"	12.6
125-200	96"	50.3	60"	19.6

Note: Minimum culvert sizes are general construction practices. Engineered designs may provide other sized culverts as applicable to site-specific installation. Details will be noted in the SWMP diagram and site-specific documentation.

FIGURE C-1
Drainage Crossing Culvert Alignment & Overflow Dip



SCALE: NOT TO SCALE

FIGURE C-2

Ditch Relief Culvert Installation

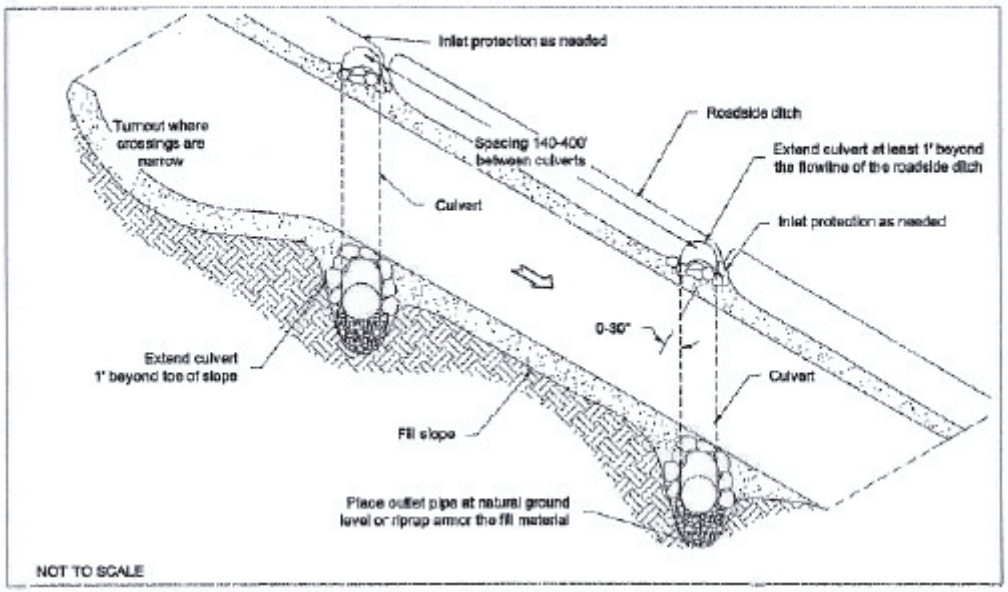
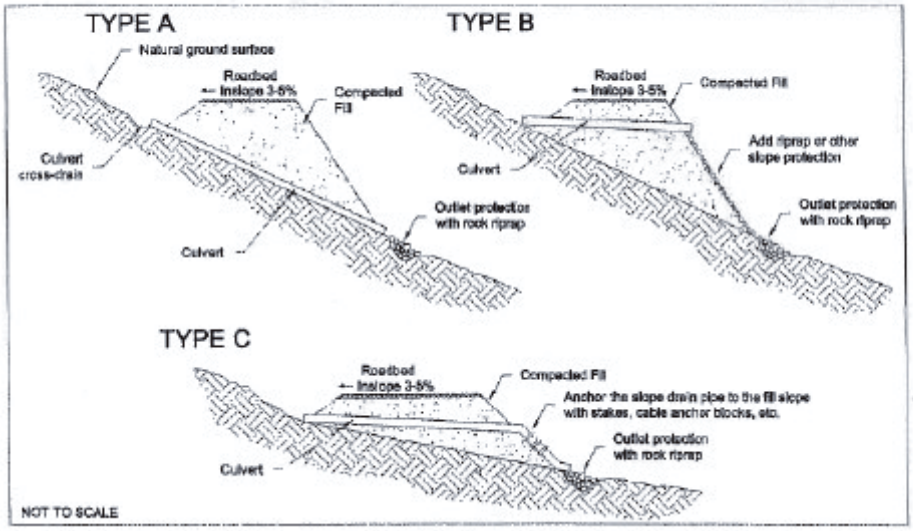


FIGURE C-3

Culvert Installation Options



Culvert Protection (CP)

Description

Culvert protection may be required at the inlet (upstream side) of the culvert and/or the outlet (downstream side) of the culvert. Protection helps to reduce erosion from culverts with concentrated, high velocity flows.

Culvert inlet protection involves placing boulders, riprap, gabions, rock retaining walls, slash, and/or any other protection at the inlet pipes. Riprap, or other energy-dissipating devices, will reduce the velocity of stormwater flows and thereby prevent erosion and help protect the inlet structure.

Culvert outlet protection involves placing structurally lined aprons or other appropriate energy-dissipating devices, such as large boulders or plunge pools, at the outlets of the pipes. Lined aprons or other appropriate energy-dissipating devices will reduce the velocity of stormwater flows and thereby prevent scour at stormwater outlets, protect the outlet structure, and minimize potential for erosion downstream.

Applicability

Riprap inlet protection should be used where velocities and energies at the inlets of culverts are sufficient to erode the inlet structure. Riprap may also be used to help channel the stormwater into the inlet of the culvert.

Culvert outlet protection should be used where discharge velocities and energies at the outlets of the culverts or channels are sufficient to erode the next downstream reach.

Limitations

Rock aprons at the culvert outlets should not be placed on slopes steeper than 10 %. Runoff from pipe outlets at the top of cut/fills or on slopes steeper than 10% should be routed using slope drains or riprap chutes to a rock apron at the toe of the slope. Otherwise, the flow will re- concentrate and gain velocity as the flow leaves the apron.

Design Criteria

See Figure CP-2 and Table CP-1 for design criteria.

Culvert Inlet Protection

Riprap, gabions, or rock retaining walls at culvert inlets shall be designed according to RIPRAP (R) or RETAINING WALL (RW).

Culvert Outlet Protection

Gabions or rock retaining walls at culvert outlets shall be designed according to RETAINING WALL (RW). Riprap aprons at culvert outlets shall be designed as follows:

Tail-water depth: The depth of tail-water immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tail-water depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a minimum tail-water condition. If the tail-water depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a maximum tail-water condition. Pipes out-letting onto flat areas with no defined channel may be assumed to have a minimum tail-water condition.

Riprap apron size and D50 size: The apron length (LA) and the D50 size of the riprap will be determined using Table CP-1 according to the design flow and weather there is a minimum or maximum tail-water condition. The apron width (W) shall then be determined as (W=d+0.4LA) where d is the diameter of the culvert. If the pipe discharges directly into a well-defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tail-water depth or to the top of the bank, whichever is less. The upstream end of the apron, adjacent to the pipe, shall have a width of two times the diameter of the outlet pipe.

Riprap materials: The outlet protection may be done using rock riprap or grouted riprap. Riprap shall be composed of a well-graded mixture of stone size such that 50% of the pieces, by weight, shall be larger than the D50 size determined from Table CP-1. A well-graded mixture, as used herein, is defined as a mixture composed primarily of larger stone sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the D50 size. All grout for grouted riprap must be 1-part Portland cement for every 3-parts sand, mixed thoroughly with water.

Filter: If a filter cloth or gravel is used, it should be designed according to RIPRAP (R).

Apron thickness: The minimum thickness of the riprap layer shall be 1.5 times the maximum stone diameter for a D50 of 15 inches or less and 1.2 times the maximum stone size for a D50 greater than 15 inches.

Riprap stone quality: Stone for riprap shall consist of field stone or rough un-hewn angular stone. The stone shall be hard and angular and of a quality that will not disintegrate with exposure to water or weathering. The specific gravity of the individual stone shall be at least 2.5. Site rock or site boulders may be used providing it has a density of at least 150 pounds per cubic foot and does not have any exposed steel or reinforcing bars

Construction Specifications

Culvert Inlet Protection

- Riprap, gabions, or rock retaining walls at culvert inlets shall be constructed in accordance to RIPRAP (R) or RETAINING WALL (RW).
- After installation of a culvert, examine the stream channel for the amount of debris, logs, and brushy vegetation present. In channels with large amounts of debris, consider using oversized pipes.
- Boulders should be dry-stacked around the culvert inlet and up the slope to the edge of the road.

Culvert Outlet Protection

Gabions or rock retaining walls at culvert outlets shall be designed according to RETAINING WALL (RW). Riprap aprons at culvert outlets shall be constructed according to CP-2 and the following:

- Prepare the sub-grade for the riprap to the required lines and grades. Any fill required in the sub-grade shall be compacted to a density of approximately that of the surrounding undisturbed material.
- If a pipe discharges into a well-defined channel, the channel's side slopes may not be steeper than 2:1.
- Construct the apron to the design length and width with no slope (Figure CP-2). The invert elevations must be equal at the receiving channel and the apron's downstream end. No over-fall at the end of the apron is allowed. The elevation of the downstream culvert outlet and of the apron shall be equal to the elevation of the receiving channel or adjacent ground. The outlet protection apron shall be located so there are no bends in the horizontal alignment.
- Line the apron with riprap, grouted riprap, or concrete. Riprap should be the appropriate size thickness and design. See RIPRAP (R) for the placement of riprap.
- If a culvert outlet discharges at the top of cut/fills or on slopes steeper than 10%, one of the following options is suggested:
    1. Transition the culvert to a slope drain according to SLOPE DRAIN (SD). The slope drain shall convey stormwater to the bottom of the slope where the riprap apron, as designed above, shall prevent erosion at the slope drain outlet.
    2. Line the slope below the culvert outlet with a riprap channel to convey stormwater to the bottom of the slope where a riprap apron, as designed above, shall prevent erosion at the bottom of the slope. The riprap channel shall be designed according to the table in the RIPRAP (R) construction specification based on depth of flow and slope. The riprap channel shall dip into the slope such that all water is contained within the channel, flows to the riprap outlet apron at the base of the slope, and does not spill over the sides onto unprotected soil.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Inspect for debris at the entrance to culverts and within culverts. Inspect riprap at culvert inlets for damage and dislodged stones. The maintenance needs are usually very low for properly installed riprap aprons at culvert outlets. However, inspect for evidence of scour beneath riprap at outlet aprons or for dislodged stones. Anything found to reduce the effectiveness of the culvert or culvert outlet protection should be repaired immediately.

References

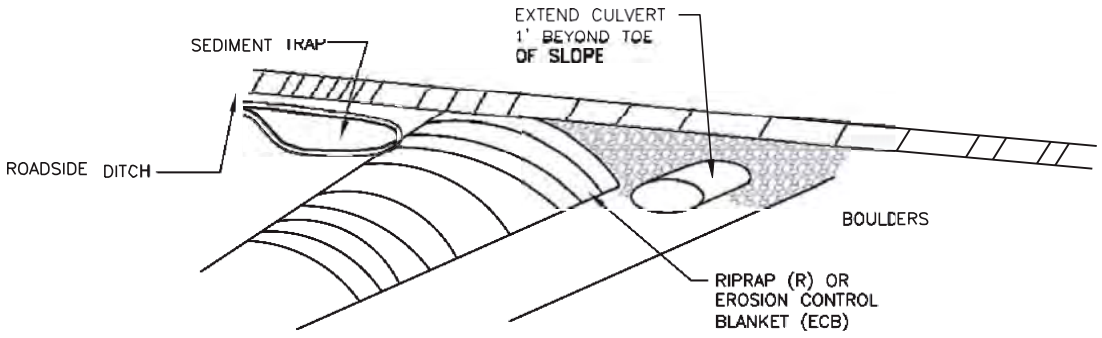
Keller, Gordon and James Sherar, *Low-Volume Roads Engineering, Best Management Practices Field Guide.* United States Department of Agriculture (USDA), Forest Service, US Agency of International Development (USAID), 2003. http://www.blm.gov/bmp/field%20guide.htm

New York State Department of Environmental Conservation, *New York Guidelines for Erosion and Sediment Control*. New York. August 2005. http://www.dec.ny.gov/chemical/29066.html

TABLE CP-1
Outlet Protection Design

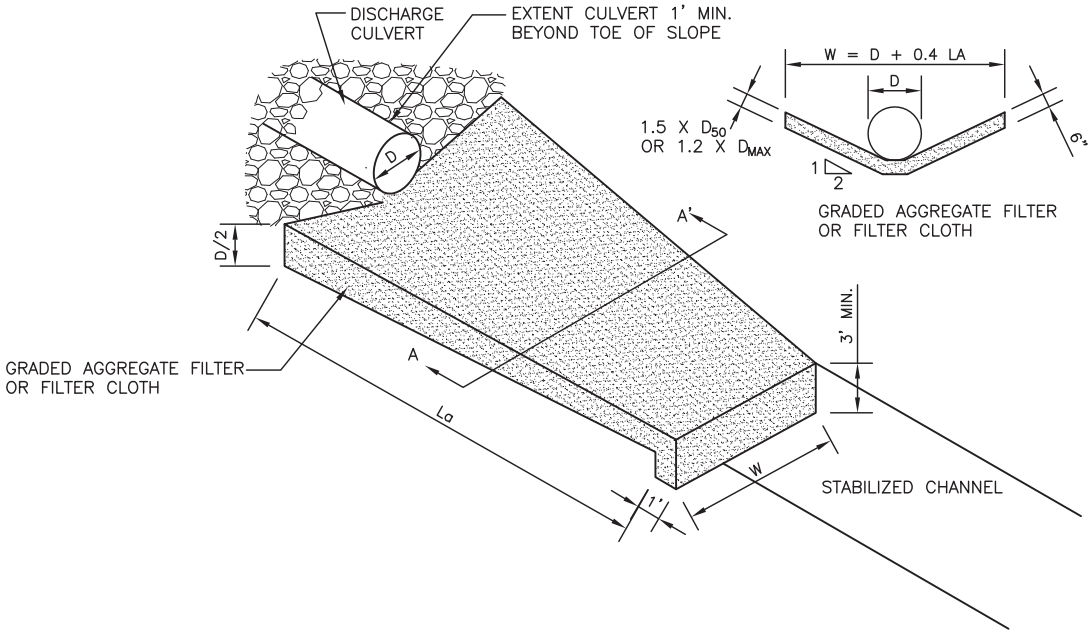
Riprap Aprons for Low Tailwater (downstream flow depth <0.5 X pipe diameter)															
Culvert Diameter	Lowest Value			Intermediate values to interpolate from									Highest value		
	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}
	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In
12"	4	7	2.5	6	10	3.5	9	131	6	12	16	7	14	17	8.5
15"	6.5	8	3	10	12	5	15	16	7	20	18	10	25	20	12
18"	10	9	3.5	15	14	5.5	20	17	7	30	22	11	40	25	14
21"	15	11	4	25	18	7	35	22	10	45	26	13	60	29	18
24"	21	13	5	35	20	8.5	50	26	12	65	30	16	80	33	19
27"	27	14	5.5	50	24	9.5	70	29	14	90	34	18	110	37	22
30"	36	16	6	60	25	9.5	90	33	15.5	120	38	20	140	41	24
36"	56	20	7	100	32	13	140	40	18	180	45	23	220	50	28
42"	82	22	8.5	120	32	12	160	39	17	200	45	20	260	52	26
48"	120	26	10	170	37	14	220	46	19	270	54	23	320	64	37
Riprap Aprons for High Tailwater (downstream flow depth <0.5 X pipe diameter)															
Culvert Diameter	Lowest Value			Intermediate values to interpolate from									Highest value		
	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}
	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In
12"	4	8	2	6	18	2.5	9	28	4.5	12	36	7	14	40	8
15"	7	8	2	10	20	2.5	15	34	5	20	42	7.5	25	50	10
18"	10	8	2	15	22	3	20	34	5	30	50	9	40	60	11
21"	15	8	2	25	32	4.5	35	48	7	45	58	11	60	72	14
24"	20	8	2	35	36	5	50	55	8.5	65	68	12	80	80	15
27"	27	10	2	50	41	6	70	58	10	90	70	14	110	82	17
30"	36	11	2	60	42	6	90	64	11	120	80	15	140	90	18
36"	56	18	2.5	100	60	7	140	85	13	180	104	18	220	120	23
42"	82	15	2.5	120	50	60	160	75	10	200	96	14	260	120	19
48"	120	20	2.5	170	58	7	220	85	12	270	105	16	320	120	20

FIGURE CP-1
Typical Inlet Protection



SCALE: NOT TO SCALE

FIGURE CP-2
Typical Outlet Protection



Ditch and Berm (DB)

Description

A ditch and berm (also known as Earthen Dike and Drainage Swale) is a drainage with a parabolic or V-shaped cross-section and a supporting ridge on the lower side that is constructed across the slope. The purpose of a ditch and berm is to prevent off-site stormwater runoff (runon) from entering a disturbed area, to prevent sediment laden storm runoff from leaving the construction site or disturbed area, to prevent flows from eroding slopes, and to direct sediment laden flows to a trapping device.

Applicability

Ditch and berms can be designed for temporary or permanent use. Regardless of timeframe, a ditch and berm should be sufficiently constructed throughout to minimize the potential for failure. Ditch and berms may be used for, but are not limited to:

- The up slope of cut or fill slopes to convey or divert flows away from disturbed areas;
- The down slope of cut or fill slopes to divert on-site runoff to a stabilized outlet or sediment trapping device;
- At the outer edge of a location to ensure that runoff remains on the pad and is diverted to a designated water collection system, such as a sediment trap, pond, etc. (if applicable);
- Where runoff from higher areas has potential for causing erosions, or interfering with, or preventing the establishment of vegetation on lower areas;
- Where the length of slopes need to be reduced so soil loss will be kept to a minimum;
- At the perimeter of a site or disturbed area.

Limitations

- The area around the ditch and berm that is disturbed by its construction must be stabilized (with vegetation or other erosion control) so it is not subject to similar erosion as the steep slope the channel is built to protect. Overburden needs to be sufficiently compacted upon initial ditch construction.
- To alleviate erosion capability, ditch and berms must be directed into a stabilized outlet or well-vegetated area or to sediment trapping devices, where erosion sediment can be settled out of the runoff before being discharged into surface waters.
- Temporary ditch and berms should be designed to avoid crossing vehicle pathways. If a ditch needs to cross a vehicle pathway a culvert and or similar BMPs must be utilized.
- Ditch and berms should be used with caution on soils subject to slippage.

Design Criteria

See Figures ED-1, DS-1, DS-2, DS-3, DS-4 and/or DS-5 for design criteria and installation details.

Construction Specifications

- All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the ditch and berm. Ideally the ditch will be cut in a location that avoids obstructions and or objects as to avoid additional disturbance.
- All ditch and berms shall have uninterrupted positive grade to an outlet.
- All ditch and berms shall be parabolic or V-shaped if possible.
- The ditch and berm shall be excavated or shaped to line, grade, and cross section as required to meet the specific criteria, depending on ditch design (see ED/DS Diagram).
- All ditch and berms must be cut to a minimum depth of 15 inches from the top of the ditch to the bottom center.
- The side slopes must be 3:1 to ensure ease of maintenance, minimize erosion, and allow the ditch to adequately disperse flow.
- All ditch and berms must have a minimum width of 7.5 feet from ridge to ridge.
- In the event of an excavated ditch and berm, all overburden needs to be sufficiently compacted along the ditch edge.
- Rills shall be compacted as needed to prevent unusual settlement that would interfere with the proper functioning of the ditch and berm.
- All earth that is removed and not needed in the construction process shall be spread or disposed of on the well pad side so it will not interfere with the functioning of the ditch and berm.
- Stabilization BMPs shall be incorporated into all ditch and berms immediately after the ridge and channel are constructed in order to minimize erosion, degradation, and sediment deposition from the ditch. Permanent ditch and berms must be seeded or hydro seeded and mulched or covered with erosion control blanketing according to SEEDING (S) and MULCHING (M) or EROSION CONTROL BLANKET (ECB) along with any disturbed areas that drain into the ditch and berm.
- Diverted runoff from a disturbed area shall be conveyed to a sediment trapping device.
- Diverted runoff from an undisturbed area shall outlet to a sediment trapping device or into an undisturbed stabilized area at non-erosive velocities. Vegetative outlets shall be installed before ditch and berm construction, if needed, to ensure establishment of vegetative cover in the outlet channel.

Location

Ditch and berms are usually located above or below cut or fill slopes. Exact ditch and berm location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, and the development layout. Where possible on shallow slopes, a vegetative buffer strip should be left between the edge of the cut or fill slope and the ditch and berm. See VEGETATIVE BUFFER (VB).

For clay vegetated channels. Ditch and berms are usually not applicable below high sediment producing areas unless structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the ditch and berm.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Channels should be cleared of sediment and repairs made when necessary. Maintain ditch and berm capacity, ridge height, especially if high-sediment yielding areas are in the drainage area above the ditch and berm. Redistribute the sediment as necessary to maintain the capacity of the ditch and berm.

Removal

Temporary ditch and berms shall remain in place only until the disturbed areas are re-graded and prepared for permanent stabilization. Permanent ditch and berms shall remain in place until final reclamation (abandonment).

References

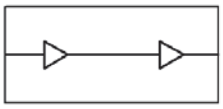
United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control.* Washington, D.C., February, 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

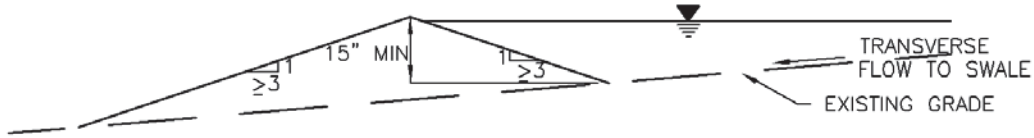
New York State Department of Environmental Conservation, *New York Guidelines for Erosion and Sediment Control*. New York. August 2005. http://www.dec.ny.gov/chemical/29066.html

United States Department of Agriculture (USDA), Natural Resources Conservation Services (NRCS), *Field Office Technical Guide.* 2002. http://www.nrcs.usda.gov/technical/efotg/

Urban Drainage and Flood Control District, *Volume 3 Stormwater Quality*. Denver, CO, November 2015. http://udfcd.org/volume-three

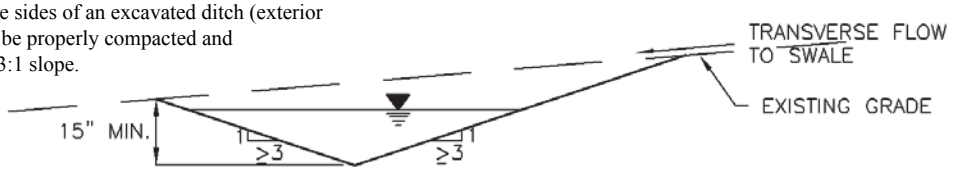
Earth Dikes and Drainage Swales (ED/DS)



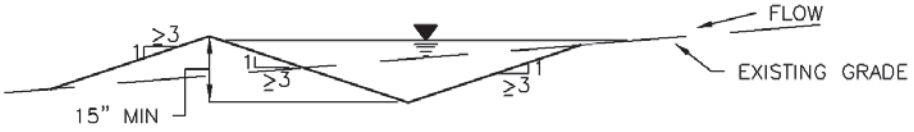


ED–1. COMPACTED UNLINED EARTH DIKE FORMED BY BERM

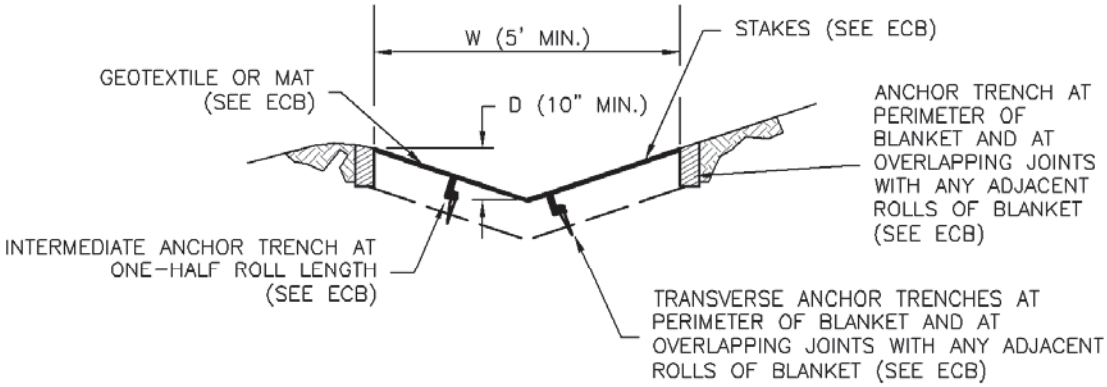
Optional: An interior berm is optional if all overburden generated during the constuction phase is removed and properly stored on location. All overburden that remains along the sides of an excavated ditch (exterior & interior) must be properly compacted and constructed at a 3:1 slope.



DS–1. COMPACTED UNLINED EXCAVATED SWALE



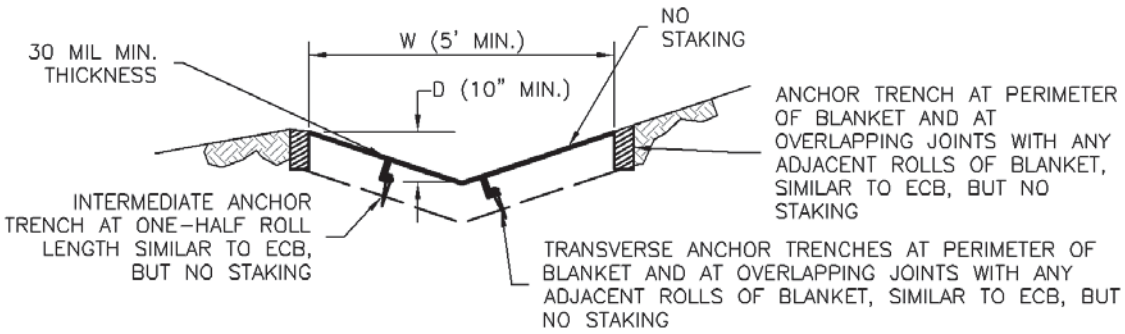
DS–2. COMPACTED UNLINED SWALE FORMED BY CUT AND FILL



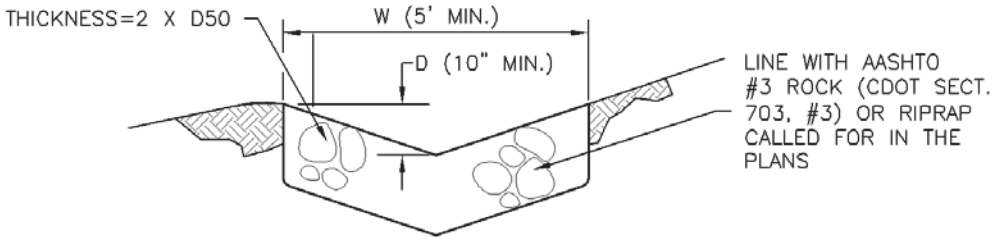
DS–3. ECB LINED SWALE (CUT AND FILL OR BERM)

Note: Excavated or fill material used to create a ditch and berm must be compacted.
Note: Locations with site-specific engineered ditch and berm desgins will be followed in lieu of this standard design and will be documented in the site-specific SWMP diagram and/or applicable documentation.

Earth Dikes and Drainage Swales (ED/DS)



DS-4. SYNTHETIC LINED SWALE



DS-5. RIPRAP LINED SWALE

EARTH DIKE AND DRAINAGE SWALE INSTALLATION NOTES

1. SEE SITE PLAN FOR:
   - LOCATION OF DIVERSION SWALE
   - TYPE OF SWALE (UNLINED, COMPACTED AND/OR LINED).
   - LENGTH OF EACH SWALE.
   - DEPTH, D, AND WIDTH, W DIMENSIONS.
   - FOR ECB/TRM LINED DITCH, SEE ECB DETAIL.
   - FOR RIPRAP LINED DITCH, SIZE OF RIPRAP, D50.

2. SEE DRAINAGE PLANS FOR DETAILS OF PERMANENT CONVEYANCE FACILITIES AND/OR DIVERSION SWALES EXCEEDING 2-YEAR FLOW RATE OR 10 CFS.

3. EARTH DIKES AND SWALES INDICATED ON SWMP PLAN SHALL BE INSTALLED PRIOR TO LAND-DISTURBING ACTIVITIES IN PROXIMITY.

4. EMBANKMENT IS TO BE COMPACTED TO 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D698.

5. SWALES ARE TO DRAIN TO A SEDIMENT CONTROL BMP.

6. FOR LINED DITCHES, INSTALLATION OF ECB/TRM SHALL CONFORM TO THE REQUIREMENTS OF THE ECB DETAIL.

7. WHEN CONSTRUCTION TRAFFIC MUST CROSS A DIVERSION SWALE, INSTALL A TEMPORARY CULVERT WITH A MINIMUM DIAMETER OF 12 INCHES.

Note: Excavated or fill material used to create a ditch and berm (dike/swale) must be compacted.

Earth Dikes and Drainage Swales (ED/DS)

EARTH DIKE AND DRAINAGE SWALE MAINTENANCE NOTES

1. INSPECT BMPs ACCORDING TO THE APPLICABLE SWMP SCHEDULE AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SWALES SHALL REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION; IF APPROVED BY LOCAL JURISDICTION, SWALES MAY BE LEFT IN PLACE.

5. WHEN A SWALE IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

(DETAIL ADAPTED FROIIA DOUGLAS COUNTY, COLORADO ANO THE CITY OF COLORADO SPRINGS, COLORADO, NOT AVAILABLE IN AUTOCAD)

Land Grading (LG)

Description

Grading involves reshaping the ground surface to planned grades. Grading provides more suitable topography for well pads and pipelines and helps to control runoff, soil erosion, and sediment during and after construction in these areas. Land grading includes the following.

- Proper cut and fill techniques to ensure roads and well pads remain stable over time.
- Road crowning or sloping to properly route stormwater off of the roadway.
- Surfacing of roads or well pads with gravel to avoid mud, rutting, and large quantities of sediment that will wash away during storms.

Applicability

- The construction and maintenance of any road or well pad, but particularly those located on steep topography or easily erodible soils.
- Surface gravel areas with "soft" soils sections, steep grades, highly erosive soils, or where all-weather access is needed. Gravel may be used as "fill" material in ruts or as a full structural section over the entire road or well pad.

Limitations

- Improper cut and fill slopes that disrupt natural stormwater patterns might lead to poor drainage, high runoff velocities, and increased peak flows during storm events.
- Rutting and wash boarding may develop if surface gravel is not designed properly or if road or well pad is not sloped properly.
- Flat-blading to maintain the roadway must be done properly to avoid changes in gravel thickness, road slope, and road grade.

Design Criteria

Land grading should be based upon well pad and pipeline layouts that fit and utilize existing topography and desirable natural surroundings to avoid extreme grade modifications. Clearing and grading should only occur at those areas necessary for well pad activity and equipment traffic. Maintaining undisturbed temporary or permanent buffer zones in the grading operation

provides a low cost sediment control measure that will help reduce runoff and off-site sedimentation.

Slope Failures

Landslides and failed cuts and fills can be a major source of sediment. Slope failures can close the roads or require major repairs and can greatly increase maintenance costs. Slope failures or landslides typically occur where a slope is overly steep, where fill material is not compacted, or where cuts in natural soils encounter groundwater or zones of weak material. Good road location can often avoid landslide areas and reduce slope failures. When failure does occur, the slide area should be stabilized by removing the slide material, flattening the slope, adding drainage, or using structures as discussed below. Designs are typically site specific and may require input from geotechnical engineers and engineering geologists. Failures that occur typically impact operations and can be costly to repair. Failures near streams and channel crossings have an added risk of impact to water quality.

Road Slope (See Figure LG-1 for details).

All roads should be designed with one of the following three slope types:

1. Out-sloped roads minimize the concentration of water and minimize road width by avoiding the need for an inside ditch, but may require roadway surface and fill slope stabilization. Out-sloped roads with clay rich, slippery road surface materials often require surface stabilization with gravel or limited use during rainy periods to assure traffic safety. Roads with over 10% to 12% grades and on steep hill slope areas, out- sloped roads are difficult to drain and can feel unsafe.
2. In-sloped roads are the best method to control surface water. However, in-sloped roads also concentrate water and require a system of ditches and turnouts or cross draining culverts.
3. Crowned roads are appropriate for higher standard, two lane roads on gentle grades. They may or may not require roadside ditches, turnouts, and/or cross drains. It is difficult to create and maintain a crown on a narrow road, so generally in-sloped or out-sloped road drainage is more effective.

Construction Specifications

Cut and Fill Slopes

- All areas to be disturbed (both cut and fill) shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.
- Fill material shall be free of brush, logs, stumps, roots, or other objectionable material that would interfere with, or prevent construction or satisfactory fills. This material can be set aside and later used at the toe of fill slopes as filter berms.
- Table LG-1 presents a range of commonly used cut and fill slope ratios appropriate for the soil and rock types described. Vertical cut slopes should not be used unless the cut is in rock or very well-cemented soil. Ideally, both cut and fill slopes should be constructed with a 2:1 or flatter slope to promote growth of vegetation, but cut slopes in dense, sterile soils or rocky material are often difficult to vegetate. All cut & fill slopes will be constructed according to the engineered diagrams when applicable.

- All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems.
- Topsoil required for the establishment of vegetation shall be stockpiled in the amount necessary to complete finished grading of all exposed areas.

Road Slope (See Figure LG-1).

- Compact soil or road base material to direct runoff.
- If crowning a road, runoff is directed to both sides of the road requiring two roadside ditches, unless runoff will drain directly to well-stabilized areas.
- If using an in-slope design, runoff will be directed toward the hillside and requires a roadside ditch with periodic turnouts or cross drain culvert installation.
- If using an out-slope design, ensure a moderate road slope with dense vegetative cover.

Surface Gravel

- Ideally, aggregate surfacing material is (1) hard, durable, and crushed or screened to a minus 2-inch size; (2) well graded to achieve maximum density; (3) contains 5-15% clayey binder to prevent raveling; and (4) has a plasticity index of 2 to 10.
- Gravel thickness should be at least twice the diameter of the largest stone with a minimum thickness of 4 inches. Gravel thickness can be reduced with the use of geotextile or geo-grid sub-grade reinforcement when gravel is placed over very weak soils. Also, geotextile layers are useful over soft soils to separate the gravel from the soil, keep it uncontaminated, and extend the useful life of the gravel.
- Compact the aggregate during construction and maintenance to achieve a dense, smooth surface and thus reduce the amount of water that can soak into the road or well pad.
- "Spot" stabilize local wet areas and soft areas with 4 to 6 inches of coarse rocky material, add more as needed.
- Blend coarse aggregate and fine clay-rich soil (when available) with 5% to 15% fines for binder to produce a desirable composite roadway material that is coarse yet well graded.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Inspect cut and fill slopes for rills or other indications of erosion. Maintain all crowns, out slopes, in slopes, and surface gravel.

References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control.* Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004.

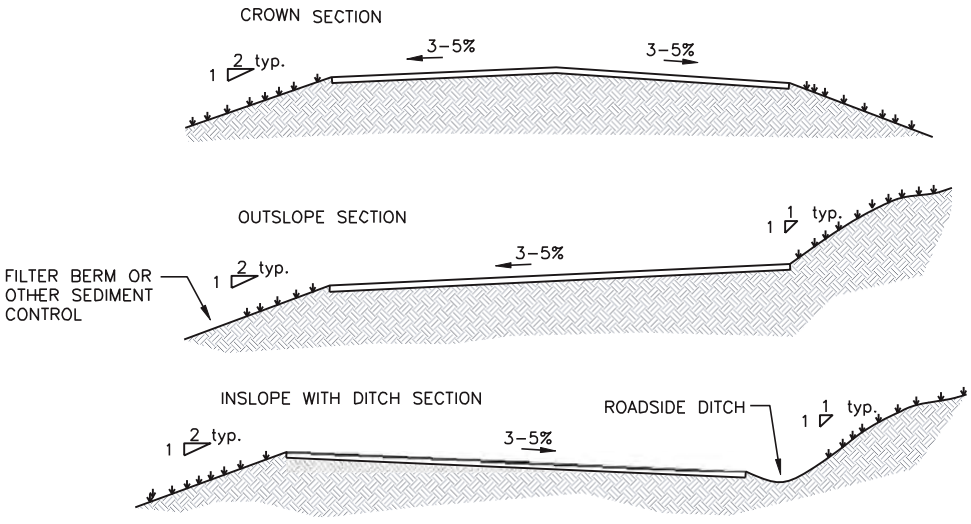
Keller, Gordon and James Sherar, *Low-Volume Roads Engineering, Best Management Practices Field Guide.* United States Department of Agriculture (USDA), Forest Service, US Agency of International Development (USAID), 2003. http://www.blm.gov/bmp/field%20guide.htm

New York State Department of Environmental Conservation, *New York Guidelines for Erosion and Sediment Control*. New York. August 2005. http://www.dec.ny.gov/chemical/29066.html

TABLE LG-1
Stable Slope Ratios for Various Conditions

Soil/Rock Condition	Slope Ratio (Hor:Vert)
Most rock	1/4: 1 to 1/2: 1
Very well cemented soils	1/4: 1 to 1/2: 1
Most in-place soils	3/4: 1 to 1: 1
Very fractured rock	1: 1 to 1 1/2: 1
Loose coarse granular soils	1 1/2: 1
Heavy clay soils	2: 1 to 3: 1
Soft clay rich zones or wet seepage areas	2: 1 to 3: 1
Fills of most soils	1 1/2: 1 to 2: 1
Fills of hard, angular rock	1 1/3: 1
Low cuts and fills (<10 ft high)	2: 1 or flatter (for revegetation)

FIGURE LG-1
Typical Road Surface Drainage Options



SCALE: NOT TO SCALE

Mulching (M)

Description

Mulching is a temporary erosion control practice in which materials such as grass, hay, wood chips, wood fibers, straw, or gravel are placed on exposed or recently planted soil surfaces. Mulching stabilizes soils by minimizing rainfall impact and reduces stormwater runoff velocity. When used in combination with seeding or planting, mulching can aid plant growth by holding seeds, fertilizers, and topsoil in place, preventing birds from eating seeds, retaining moisture, and insulating plant roots against extreme temperatures.

Mulch matting is materials such as jute or other wood fibers that are formed into sheets and are more stable than loose mulch. Jute and other wood fibers, plastic, paper, or cotton can be used individually or combined into mats to hold mulch to the ground. Netting can be used to stabilize soils while plants are growing, although netting does not retain moisture or insulate against extreme temperatures. Mulch binders consist of asphalt or synthetic materials that are sometimes used instead of netting to bind loose mulch.

Applicability

Mulching is often used after (or in combination with) seeding to help aid in the establishment of vegetation. Hydraulic application of mulch is often used in steep areas (up to 1:1) where regular mulching is difficult because of environmental constraints. Mulch matting, with net or anchoring to hold it in place, can also be used on steep slopes or in critical areas such as waterways. Mulch can last for one to two years and is most effective when used on an area less than two acres in size.

Limitations

- Mulching, matting, and netting might delay seed germination because the cover changes soil surface temperatures.
- The mulches are subject to erosion and may be washed away in a large storm.
- Maintenance is necessary to ensure that mulches provide effective erosion control.

Design Criteria

See Table M-1 and M-2 for mulch materials and application rate details.

Construction Specifications

Site Preparation

- Prior to mulching, install the necessary temporary or permanent erosion control practices and drainage system within or adjacent to the area to be mulched.
- Slope, grade, and smooth the side to fit the needs of the selected mulch products.
- Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Mulching and Anchoring

- Select the appropriate mulch and application rate that will best meet the need and availability of material. When possible, organic mulches should be used for erosion control and plant establishment. See Table M-1 for suggested materials and application rates. Other materials include hydraulic mulch products with 100% post-consumer paper content and yard trimming composts. All materials should be free of seed.
- Apply mulch after soil amendments and planting is accomplished or simultaneously if hydro-seeding is used. See Table M-1 for installation guidelines.
- Use a mulch crimper to apply and anchor mulch. A crimper should have approximately 6-inch cleats with perpendicular, dull, disc blades. If a crimper is unavailable the Contractor shall apply the mulch and anchor it to the soil using one of the methods described in Table M-2. The mulch should be anchored the same day as the mulch application. Materials that are heavy enough to stay in place (for example, bark or wood chips on flat slopes) do not need anchoring. Mulches may or may not require a binder, netting, or tacking. Mulch binders should be applied at rates recommended by the manufacturer. Effective use of netting and matting material requires firm, continuous contact between the materials and the soil.

Hydraulic Mulching

- For steep slopes or other areas where hydraulic application of mulch is desired, a high-quality type of hydraulic matrix known as a Bonded Fiber Matrix (BFM) may be used. A BFM refers to a continuous layer of elongated wood fiber strands that are held together by a water-resistant bonding agent to form a water-absorbing crust.
- A typical construction specification for wood fiber mulch (hydro-mulch) is as follows: Biodegradable green-dyed wood-cellulose-fiber mulch, which is nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15% and a pH range of 4.5 to 6.5.
- A typical construction specification for weed-free-straw non-asphaltic tackifier is as follows: Organic derivative vegetative gum tackifier recommended by fiber-mulch manufacturer for a slurry application, which is nontoxic and free of plant growth-or germination-inhibitor.

- Hydraulic application of BFM must be done when no rainfall is expected, preferably within a 24-hour time period. Mix BFM in a hydraulic application machine (such as a hydro-seeder or a mulch blower) and then apply to the slope as a liquid slurry. The slurry must be constantly agitated to keep the proper application rate and achieve uniform effective coverage. The minimum application rate shall be 2,000 pounds per acre with a typical application rate between 3,000 and 4,000 pounds per acre.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Areas should be identified where mulch has loosened or been removed. Such areas should be re-seeded (if necessary) and the mulch cover replaced. If washout, breakage, or erosion occurs, surfaces should be repaired, re-seeded, and re-mulched, and new netting should be installed. Inspections should be continued until vegetation is firmly established.

Removal

Anchor netting and any other artificial mulch material should be removed when protection is no longer needed and then disposed of in a landfill.

References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control*. Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004

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United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), *Field Office Technical Guide.* 2002. http://www.nrcs.usda.gov/technical/efotg/

Table M-1
Typical Mulching Materials and Application Rates

Material	Rate per Acre	Requirements	Notes
Organic Mulches			
Straw	1-2 tons	Dry, unchopped, unweathered; certified weed free	Spread by hand or machine; must be tacked or tied down
Wood fiber or wood cellulose	1/2 - 1 ton		Use with hydroseeder, may be used to tack straw. Do not use in hot dry weather.
Wood Chips	5 - 6 tons	Air dry. Add fertilizer N. 12 lb/ton	Apply with blower, chip handler, or by hand. Not for fine turf areas.
Bark	35 yd^3	Air dry, shredded, or hammermilled, or chips.	Apply with mulch blower, chip handler, or by hand. Do not use asphalt tack.
Nets and Mats			
Jute net	Cover area	Heavy, uniform; woven of single jute yarn. Used with organic mulch	Withstands water flow
Excelsior (wood fiber) mat	Cover area		

Table M-2
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manuracturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
2. Wood cellulose fiber	Hay or straw	Apply hydroseeder immediately after mulching. Use 500 lbs. Wood fiber per acre. Some products contain an adheisive material, possibly advantageous.
3. Mulch anchoring tool/Crimper	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
4. Chemical	Hay or straw	Apply Terra Tack AR 120lbs./ac. In 480 gal. of water (#156/sec.) or Aerospray 70 (60gal./ac.) according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperatire higher than 45 deg. Ferhenheit are required.

Riprap (R)

Description

Riprap is a permanent, erosion resistant layer made of stones or boulders. It is intended to stabilize areas subject to erosion and protect against scour of the soil caused by concentrated, high velocity flows.

Applicability

Riprap can be used for areas subject to erosion or weathering, particularly where conditions prohibit the establishment of re-vegetation or where flow velocities exceed 5 feet per second.

Riprap can be used in, but is not limited to:

- Cut and fill slopes;
- Channel side slopes and/or bottoms;
- Inlets and outlets to culverts, slope drains, and sediment traps; and
- Roadside ditches.

Limitations

Riprap is limited by steepness of slope, because slopes that are greater than 1.5:1 have potential riprap loss due to erosion and sliding. When working within flowing streams, measures should be taken to prevent excessive turbidity and erosion during construction. Bypassing base flows or temporarily blocking base flows are two possible methods.

Design Criteria

Gradation

A well-graded mixture of rock sizes should be used instead of one uniform size (with the exception of dry stacking boulders). Fifty percent by weight should be larger than the specified design size. The diameter of the largest stone size in such a mixture should be 1.5 times the D50 size with smaller sizes graded down to one inch. When dry stacking up a slope, boulders may be uniform in size or may get gradually smaller as the boulders are placed up the slope.

Quality

Riprap must be durable so freeze/thaw cycles do not decompose it in a short time. They should be angular and not subject to breaking down when exposed to water or weathering.

Size

The sizes of stones used for riprap protection are determined by the purpose and specific site conditions:

- **Slope Stabilization:** Riprap stone for slope stabilization not subject to flowing water should be sized for the proposed grade. The gradient of the slope to be stabilized should be less than the natural angle of the repose of the stone selected. Angles of the repose of riprap stones may be estimated using Figure R-1. Riprap used for surface stabilization of slopes does not add significant resistance to sliding or slope failure and should not be considered a retaining wall. Slopes approaching 1.5:1 may require special stability analysis. The inherent ability of the soil must be satisfactory before riprap is used for surface stabilization.
- **Outlet Protection.** Design criteria for sizing stone and determining dimensions of riprap aprons are presented in CULVERT PROTECTION (CP).
- **Stream Bank Protection.** If the shear stress is estimated, riprap stone for stream bank protection can be selected from the gradations in Table R-1, below. The shear stress can be estimated from the depth of flow and the channel slope (see note for Table R-1). The riprap should extend 2 feet below the channel bottom and be keyed into the bank both at the upstream end and downstream end of the proposed work or reach.

Filter Material

Filter material is sometimes used between riprap and the underlying soil surface to prevent soil from moving through the riprap. Filter cloth material or a layer of sand and/or gravel is usually used for the filter.

The design of a sand/gravel filter blanket is based on the ratio of particle size in the overlying filter material to that of the base material in accordance with the criteria below. Multiple layers (each a minimum of 6-inches thick) may be designed to affect a proper filter if necessary. A sand/gravel filter blanket should have the following relationship for a stable design.

The design of a synthetic filter fabric, which may be used with or in place of gravel filters, is as follows:

- Filter fabric covering a base containing 50 percent or less by weight of fine particles (#200 sieve size).
- Total open area of filter fabric should not exceed 36%.
- Filter fabric covering other soils.
- Equivalent opening size (EOS) is no larger than 0.21 mm (#70 sieve size).
- Total open area of filter fabric should not exceed 10%.
- *EOS- Equivalent opening size compared to a U.S. standard sieve size.

No filter fabric should have less than 4% open area or an EOS less than U.S. Standard Sieve #100 (0.15 mm). The permeability of the fabric must be greater than that of the soil. The fabric may be

made of woven or non-woven monofilament yarns and should meet the following minimum requirements:

- Thickness 20-60 mils
- Grab strength 90-120 lbs
- Conform to ASTM D-1682 or ASTM D-177

Construction Specifications

See Figure R-2 for riprap slope stabilization and stream bank protection. See Figure R-3 for dry stacking boulders. See SEDIMENT TRAP (ST) for a detail of a riprap lined channel leading into a sediment trap. For culvert outlet protection, construct according to CULVERT PROTECTION (CP).

Sub-Grade Preparation

Prepare the sub-grade for riprap to the required lines and grades. Compact any fill required in the sub-grade to a density approximating that of the undisturbed material or overfill depressions with riprap. Remove brush, trees, stumps, and other objectionable material. Cut the sub-grade sufficiently deep so the finished grade of the riprap will be at the elevation of the surrounding area. Channels should be excavated sufficiently to allow placement of the riprap in a manner such that the finished inside dimensions and grade of the riprap meet design specifications.

Sand/Gravel Filter Basket

If using a granular filter, spread filter stone in a uniform layer to the specified depth. Where more than one layer of filter material is used, spread the layers with minimal mixing.

Synthetic Filter Fabric

If using a filter fabric, place the cloth directly on the prepared foundation. Where large stones are to be placed, a 4-inch layer of fine sand or gravel is recommended to protect the filter cloth. Filter fabric is not recommended as a filter on slopes steeper than 2:1.

Stone Placement

Place riprap so it forms a dense, well-graded mass of stone with a minimum of voids. The desired distribution of stones throughout the mass may be obtained by selective loading at the quarry and controlled dumping during the final placement. Place riprap through chutes or other methods that cause segregation of stone sizes. If a filter is used, be careful not to lodge the underlying base filter or damage the filter cloth when placing the stones. If damage occurs, remove the riprap and repair the filter.

The toe of the riprap should be keyed into a stable foundation at its base as shown in Figure R-2 if required for slope stabilization and stream bank protection. The finished slope should be free of pockets of small stones or clusters of large stones. Hand placing may be necessary to achieve proper distribution of stone sizes to produce a relatively smooth, uniform surface. The finished grade of the riprap should blend with the surrounding area.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). If riprap has been damaged or dislodged, repairs should be made to prevent a progressive failure. If repairs are needed repeatedly at one location, the site should be evaluated to determine if the original design conditions have changed. Channel obstructions such as trees and sediment bars can change flow patterns and cause erosive forces that may damage riprap. Control of weed and brush growth may be needed in some locations.

Removal

Riprap is generally not removed. If it is anticipated that riprap shall be removed from a location, removal generally occurs during pullback/reduction methods.

References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control*. Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

New York State Department of Environmental Conservation, *New York Guidelines for Erosion and Sediment Control*. New York. August 2005. http://www.dec.ny.gov/chemical/29066.html

TABLE R-1
Riprap Gradations

Unit shear stress (lb/ft^2)	D_{50}	d_{max}	Minimum blanket thickness (inches)
0.67	2	4	6
2	6	9	14
3	9	14	20
4	12	18	27
5	15	22	32
6	18	27	32
7.8	21	32	38
8	24	36	43

Unit shear stress calculated as T=y*d*s where:

T=shear stress in lb/ft^2

y=unit weight of water, 62.4 lb/ft^2

d=flow depth in ft

s=channel gradient in ft/ft

FIGURE R-1
Angles of Repose of Riprap Stones

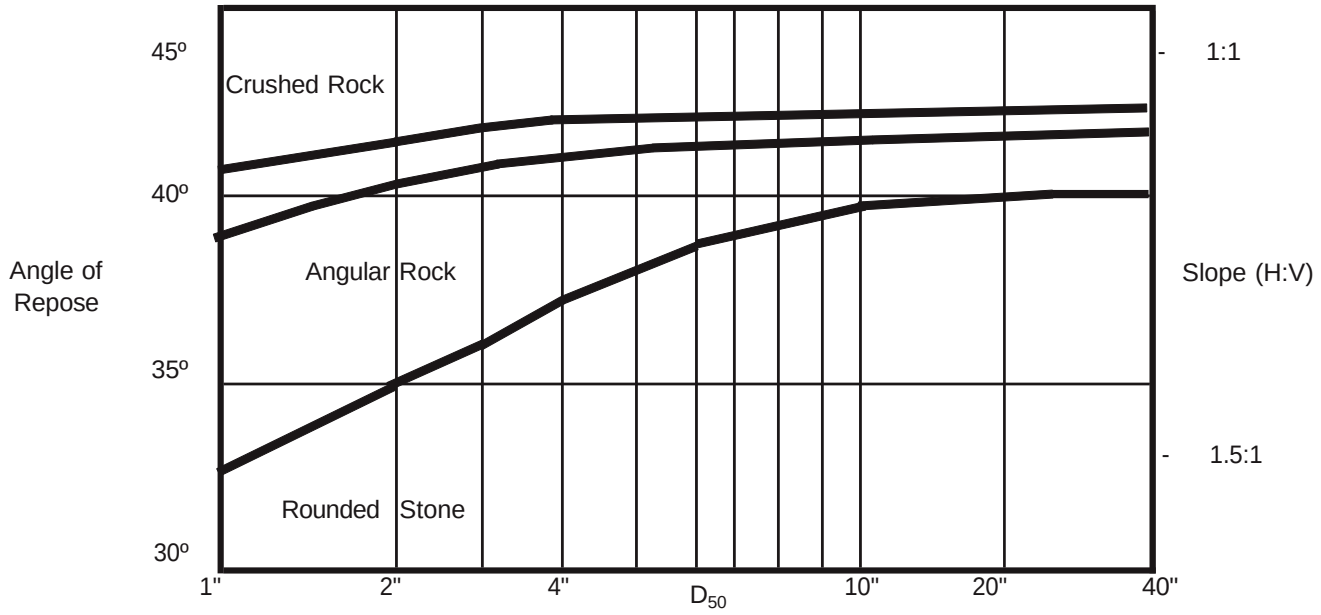


Figure R-2
Typical Riprap Slope Protection
Detail

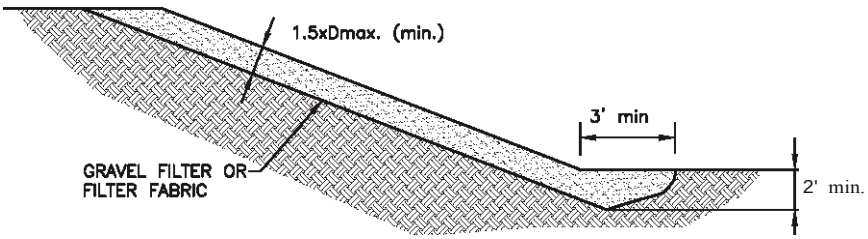
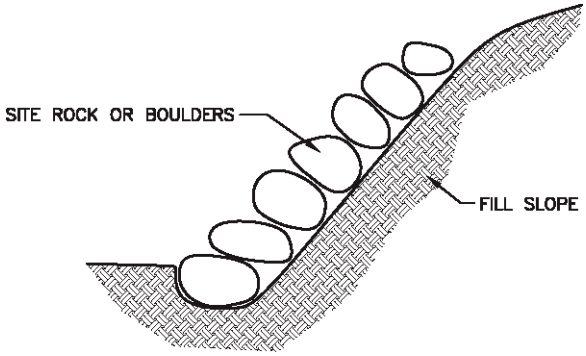


Figure R-3
Typical Boulder Drystack
Detail



SCALE: NOT TO SCALE

Sediment Basin (SB)

Description

Sediment basins can be used to temporarily pond and capture eroded or disturbed soil transported in stormwater runoff. Sediment basins are designed to capture runoff in a large pool or pond and allow sediment to settle from runoff prior to discharge from a location. The pool is dewatered through a single riser and drainage hole leading to a suitable outlet on the downstream side of the embankment or through the gravel of a rock dam. The water is released more slowly than it would be without the control structure. Many sediment basins are constructed in a location where it will remain after post-construction to serve as a permanent means of sediment settling.

Applicability

Sediment ponds are usually used for drainage areas greater than 2 acres. They can be temporary or permanent. Sediment ponds designed to be used for up to 3 years are usually described as temporary. Those designed for longer service are considered permanent. Temporary sediment basins can be converted into permanent stormwater runoff management ponds, but they must meet all regulatory requirements for wet ponds.

Limitations

Do not use a sediment pond with an earthen embankment or a rock dam in an area of continuously running water (live streams). Do not use a sediment pond in an area where failure of the earthen or rock dam will result in loss of life or damage to homes or other buildings. Do not use sediment basins in areas where failure will prevent the use of public roads or utilities.

Design Criteria

Investigate potential sites for sediment ponds during the initial site evaluation. Construct the ponds before any grading takes place in the drainage area. Ponds should take into account basin storage volume, geometry, dam embankment, and inflow structure (See Table SB-1). For permanent structures, a qualified professional engineer experienced in designing dams should complete the basin design.

Construction Specification

A sediment pond is constructed by excavation or by erecting an earthen embankment across a low area or drainage swale. Some sediment ponds are designed to drain completely during dry periods. Others are constructed so a shallow pool of water remains between storm events. See Diagram SD and Table SB for installation details.

Maintenance Considerations

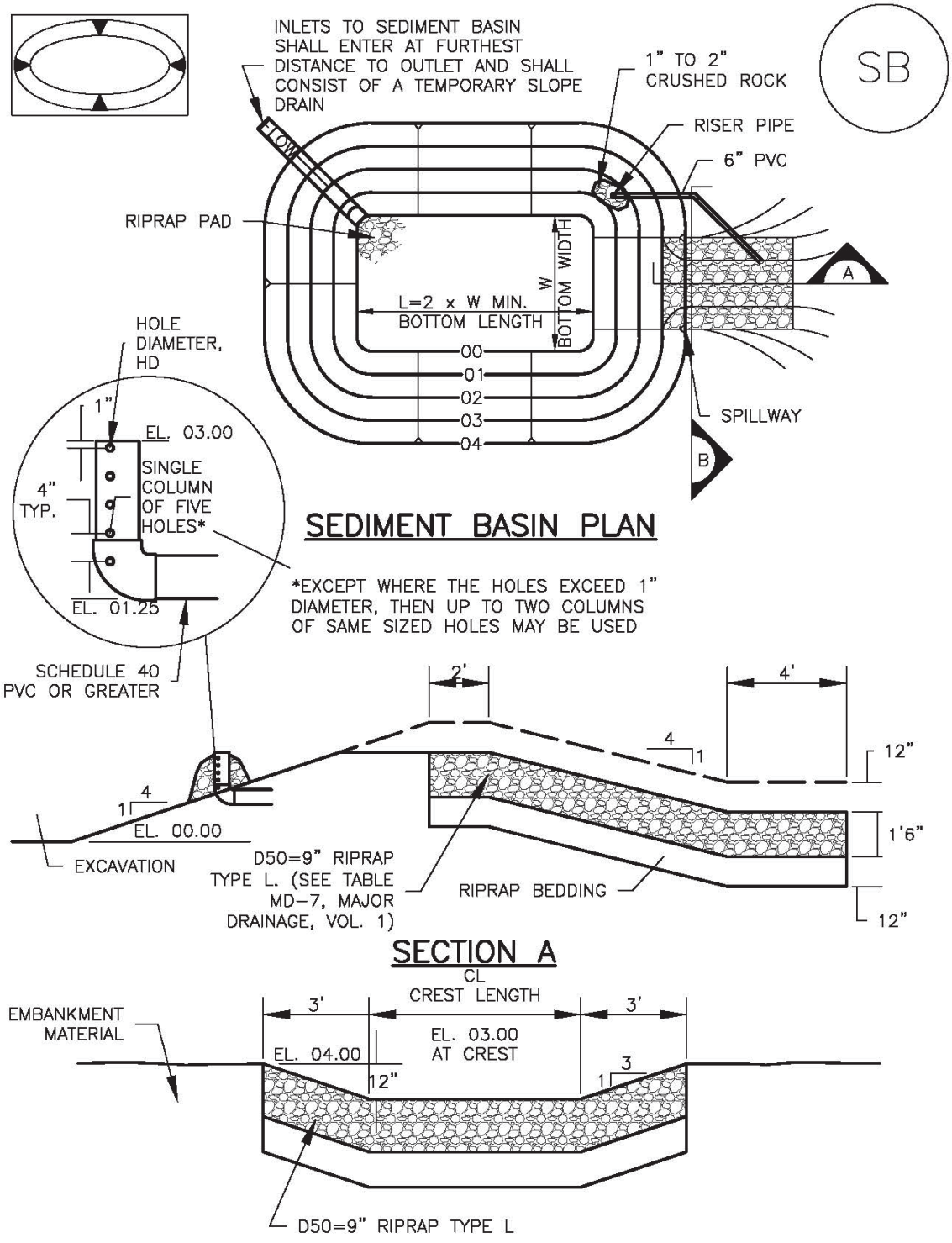
The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP) to ensure proper drainage from the collection pool and determine the need for structural repairs. Replace material eroded from earthen embankments or stones moved from rock dams immediately. Locate sediment basins in an area that is easily accessible to maintenance crews for removal of accumulated sediment. Remove sediment from the basin when the storage capacity has reached approximately 50%. Remove trash and debris from around dewatering devices promptly after rainfall events.

References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control*. Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Urban Drainage and Flood Control District, *Volume 3 Stormwater Quality*. Denver, CO, November 2015. http://udfcd.org/volume-three

Sediment Basin (SB)



Note: Excavated or fill material used to create a sediment basin must be compacted.

Sediment Basin (SB)

TABLE SB–1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN			
Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 ½	2	9/32
2	21	3	13/16
3	28	5	½
4	33 ½	6	9/16
5	38 ½	8	21/32
6	43	9	21/32
7	47 ¼	11	25/32
8	51	12	27/32
9	55	13	7/8
10	58 ¼	15	15/16
11	61	16	31/32
12	64	18	1
13	67 ½	19	1 1/16
14	70 ½	21	1 1/8
15	73 ¼	22	1 3/16

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - –LOCATION OF SEDIMENT BASIN.
   - –TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
   - –FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
   - –FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.

2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.

3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND–DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.

4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.

5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

6. PIPE SCH 40 OR GREATER SHALL BE USED.

7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

Sediment Basin (SB)

SEDIMENT BASIN MAINTENANCE NOTES

1. INSPECT BMPs IN ACCORDANCE WITH THE APPLICABLE SWMP FREQUENCY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E.. TWO FEET BELOW THE SPILLWAY CREST).

5. SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS ACCEPTED BY THE LOCAL JURISDICTION.

6. WHEN SEDIMENT BASINS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Sediment Trap (ST)

Description

Sediment traps are traps formed by excavation of an area or by placing an earthen embankment across a low area or drainage swale. Sediment traps are designed to capture drainage from disturbed areas and allow settling of sediment prior to discharge from a location.

Applicability

Sediment traps are generally temporary control measures used at the outlets of stormwater diversion structures, channels, slope drains, construction site entrance wash racks, or any other runoff conveyance that discharges waters containing erosion sediment and debris. Sediment traps should be used for drainage areas of five acres or less. Sediment traps shall remain in place until the upstream disturbed area is stabilized. Traps may be located in a series to accommodate larger drainage areas and allow for backup control in case one trap fails.

Limitations

- Regular maintenance is needed to remove sediment. Traps should be located near roads or where accessible to remove sediment.
- Although sediment traps allow eroded soils to settle, due to the short detention periods for stormwater, traps typically do not remove fine particles such as silts and clays.
- Water may remain in sediment traps for extended periods causing mosquitoes and other insects to gather. Locate the trap in a sunny spot if possible.
- Never construct a sediment trap on a live flow stream or in wetlands.

Design Criteria

Traps should be located at points of discharge from disturbed areas. The location will be determined by the natural terrain, drainage pattern of the runoff, and the accessibility for maintenance. Sediment traps should not be located in areas where their failure due to stormwater runoff excess can lead to further erosive damage of the landscape. Alternative diversion pathways should be designed to accommodate these potential overflows. Sediment trap locations should also allow for easy maintenance access for the periodic removal of accumulated sediment.

Construction Specifications

See Figure ST for installation details.

- Sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.
- Traps should be located above the floodplain, where possible. If there are space constraints, several small sediment traps may be constructed in series.
- Area under embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. The pool area shall be cleared.
- The fill material for the embankment shall be free of roots and other woody vegetation as well as over-sized stones, rocks, organic material, or other objectionable material.
- The sediment trap must have a minimum depth of 2.5 feet from the bottom of the trap to the top of the earthen berm. The sediment trap must also have a minimum width of 12 feet measured from berm-to-berm. Sizes vary on a site-specific basis.
- The sides of the sediment trap must be 2:1 to minimize erosion and ensure sufficient pooling of stormwater runoff.
- The berm of the sediment trap must be compacted or similar BMPs implemented.
- Stabilization of the embankment should be performed as soon as possible after construction of the sediment trap. This includes sufficient compaction, slope grade, or similar stabilization BMPs.
- The top of the earthen berm shall be, at minimum, 6 inches higher than the center of the outlet. The spillway must consist of Type M riprap (D50) 12 inches in size, at minimum, and extend 8 feet beyond the outlet. Smaller rock may be allowable for smaller traps if approved by local jurisdiction. Alternatives to a Type M riprap spill way include, but are not limited to, the combination of an erosion control blanket and wattles, a series of wattles, and/or Silt Soxx on properly compacted spillways.
- Sediment traps may be used in conjunction with the perimeter ditch in order to slow down the velocity of the water moving through the ditch and provide the sediment an intermediate location whereby it can fall/settle out of the water. In this instance, the trap(s) is/are placed in-line with the perimeter ditch with an outlet/spillway directing water either offsite (perpendicular to the ditch), or to continue on into the ditch downgradient of the sediment trap.
- In the event that an outlet is not constructed (enclosed design), sediment traps may be cleaned via hydro-vacuuming as needed and stortmwater will be properly disposed of off-site as described in the SWMP.
- Seeding of sediment trap embankments can be conducted if the life expectancy of a trap exceeds 12 months (1 year).

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). The primary maintenance consideration for temporary sediment traps is the removal of accumulated sediment from the basin to ensure the continued effectiveness of the sediment trap. Sediments should be removed when the trap reaches approximately 50% sediment capacity. Inspectors should also ensure that the trap is draining properly (if applicable) and check the structure for damage from erosion.

Removal

The structure shall be removed and the area stabilized when the drainage area has been properly stabilized.

References

Colorado Department of Transportation (CDOT), *Erosion Control and Stormwater Quality Guide.* 2002. http://www.coloradodot.info/programs/environmental/water-quality/documents/erosion-storm-quality

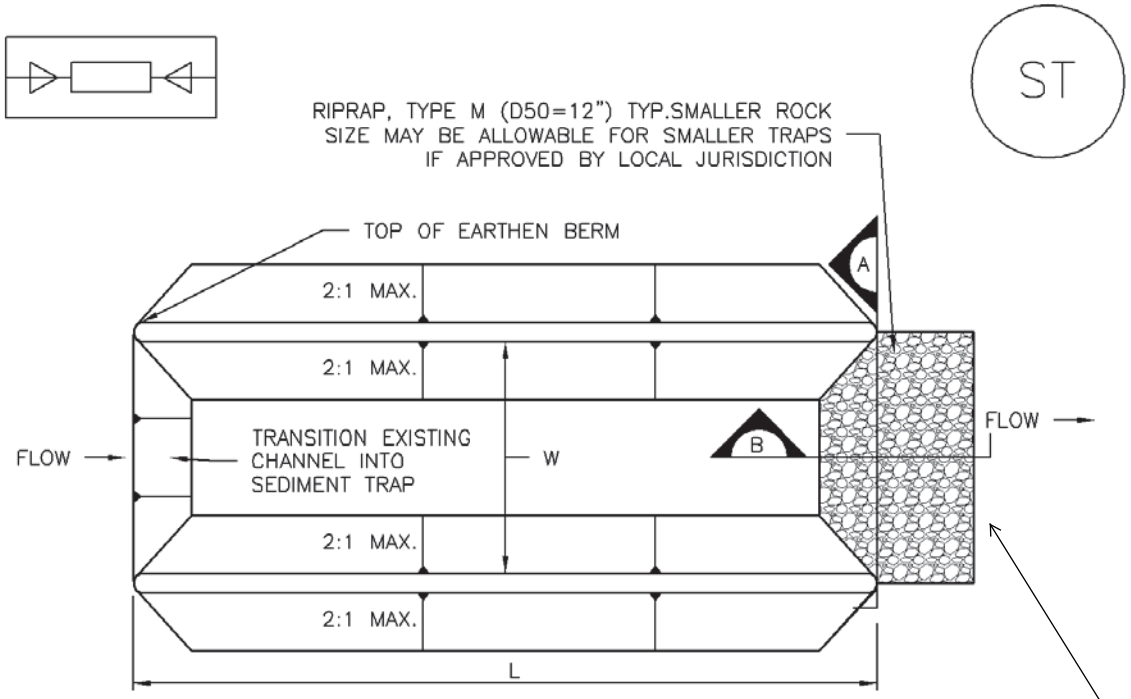
Colorado Department of Transportation (CDOT), *Erosion Control and Stormwater Quality Field Guide.* 2011. https://www.codot.gov/programs/environmental/water-quality/documents/CDOT%20Pocket%20Guide%20122211.pdf

Fank and Pat Pfister. *Stormwater - Sediment Trap.* 2011. http://forum.sws.org/eve/forums/a/tpc/f/2756008642/m/6897034506

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004

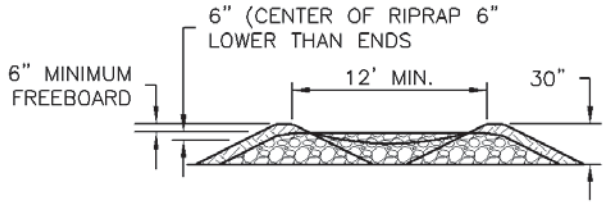
Urban Drainage and Flood Control District, *Volume 3 Stormwater Quality*. Denver, CO, November 2015. http://udfcd.org/volume-three

Sediment Trap (ST)

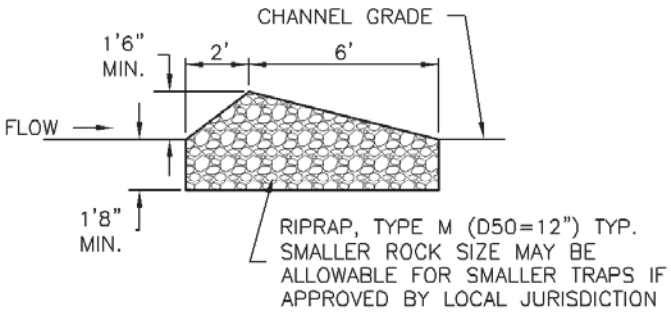


SEDIMENT TRAP PLAN

Optional: Enclosed sediment traps (where no rock apron or outlet is provided) can have stormwater removed as needed via hydro-vacuuming and will be properly disposed of off-site.



SECTION A

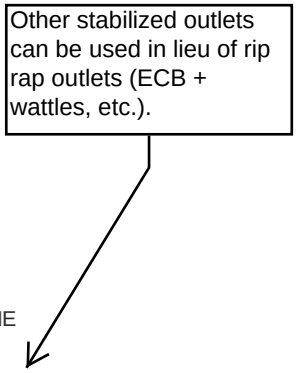


SECTION B

ST–1. SEDIMENT TRAP

Note: Excavated or fill material used to create a sediment trap must be compacted.
Note: Locations with site-specific engineeried sediment trap desgins will be followed in lieu of this standard design and will be documented in the site-specific SWMP diagram and/or applicable documentation.

Sediment Trap (ST)



SEDIMENT TRAP INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   -LOCATION, LENGTH AND WIDTH OF SEDIMENT TRAP.

2. ONLY USE FOR DRAINAGE AREAS LESS THAN 5 ACRES.

3. SEDIMENT TRAPS SHALL BE INSTALLED PRIOR *TO* ANY UPGRADIENI LAND-DISTURBING ACTIVITIES.

4. SEDIMENT TRAP BERM SHALL BE CONSTRUCTED FROM MATERIAL FROM EXCAVATION. THE BERM SHALL BE COMPACTED.

5. SEDIMENT TRAP OUTLET *TO* BE CONSTRUCTED OF RIPRAP, TYPE M (050=12") TYP.SMALLER ROCK SIZE MAY BE ALLOWABLE FOR SMALLER TRAPS IF APPROVED BY LOCAL JURISDICTION.

6. THE TOP OF THE EARTHEN BERM SHALL BE A MINIMUM OF 6" HIGHER THAN THE TOP OF THE RIPRAP OUTLET STRUCTURE.

7. THE ENDS OF THE RIPRAP OUTLET STRUCTURE SHALL BE A MINIMUM OF 6" HIGHER THAN THE CENTER OF THE OUTLET STRUCTURE.

SEDIMENT TRAP MAINTENANCE NOTES

1. INSPECT BMPs IN ACCORDANCE WITH THE APPLICABLE SWMP FREQUENCY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE FOLLOWING A STORM THA CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

J. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITPTEO UPON DISCOVERY OF THE FAILURE.

4. REMOVE SEDIMENT ACCUMULATED IN TRAP AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN THE SEDIMENT DEPTH REACHES)2 THE HEIGHT OF THE RIPRAP OUTLET.

5. SEDIMENT TRAPS SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED.

6. WHEN SEDIMENT TRAPS ARE REMOVED. THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED.

(DETAILS ADAPTED FRDM DOUGLAS COUNTY, COLORIIDO, NOT AVAILABLE N AUTOCAO)

Seeding (S)

Description

Seeding involves planting seed to establish a vegetative cover in disturbed areas that will be inactive for an extended period. Seeding establishes vegetation that reduces erosion and sediment displacement by stabilizing disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant material.

Seeding also:

- Absorbs the impact of raindrops;
- Reduces the velocity of runoff;
- Reduces runoff volumes by increasing water permeation into the soil;
- Binds soil with roots;
- Protects soil from wind;
- Improves wildlife habitat; and
- Enhances natural beauty.

Applicability

Seeding is most effective on slopes no steeper than 2:1. Seeding may be used as a permanent control or a temporary control in areas where exposed soil surfaces are not to be re-graded for periods longer than 30 days. Such areas include denuded areas, soil stockpiles, berms, temporary road banks, etc.

Limitations

The effectiveness of seeding can be limited by:

- High erosion potential during establishment.
- The need for stable soil temperature and soil moisture content during germination and early growth.
- The need to re-seed areas that fail to establish.
- Limited seeding times depending on the season.

Proper seedbed preparation and the use of quality seed are important in this practice. Failure to carefully follow sound agronomic recommendations will often result in an inadequate stand of vegetation that provides little or no erosion control.

Seeding does not immediately stabilize soils. Prior to seeding, install necessary erosion and sediment control practices such as diversions, straw bales, and basins until vegetation is established.

Design Criteria

Successful plant establishment can be maximized with proper planning; consideration of soil characteristics; selection of plant materials that are suitable for the site; adequate seedbed preparation, liming, and fertilization; timely planting; and regular maintenance.

When to Seed

Areas to be stabilized with vegetation must be seeded or planted one to four months after grading is completed unless temporary stabilization measures are in place. Temporary stabilization measures should be installed through "no growth" periods during winter months until the weather can support seed growth.

Seed Mix

Climate, soils, and topography are major factors that dictate the suitability of plants for a particular site. Vegetation that has adapted to the site, has strong roots, and provides good ground cover should be used. Although a native seed mix is best, some grasses such as Vetiver have been used extensively worldwide because of their strong deep roots, adaptability, and non- invasive properties.

Construction Specifications

- Seeding does not immediately stabilize soils. Temporary erosion and sediment control measures should be in place to prevent off-site transport of sediments from disturbed areas until vegetation is established.
- Vegetation should not be established on slopes that are unsuitable due to inappropriate soil texture, poor internal structure or internal drainage, volume of overland flow, or excessive steepness, until measures have been taken to correct these problems.
- If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted, or hardened, the soil surface shall be loosened by disking, raking, harrowing, or other acceptable means to ensure good water infiltration and root penetration (see SOIL ROUGHENING [SR]).
- The soil on a disturbed site may need to be modified to provide an optimum environment for seed germination and seedling growth. To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. If any of the below criteria cannot be met then topsoil shall be applied. The existing soil must have these characteristics:
    1. Enough fine-grained material to maintain adequate moisture and nutrient supply.

2. Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hard-pans shall be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
3. A favorable pH range for plant growth. If the soil is so acidic that a pH range of 6.0 to 7.0 cannot be attained by addition of pH-modifying materials, then the soil is considered an unsuitable environment for plant roots and further soil modification would be required.
4. Freedom from toxic amounts of materials harmful to plant growth.
5. Freedom from excessive quantities of roots, branches, large stones and clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they do not significantly impede good seed-soil contact.

- Add fertilizer and/or lime, if necessary. Lime and fertilizer may be incorporated into the top 2 to 4 inches of the soil if possible. The addition of lime is equally as important as applying fertilizer. Lime will modify the pH and supply calcium and magnesium. Its effect on pH makes other nutrients more available to the plant.
- The appropriate seed shall be evenly applied with a broadcast seeder, drill, cultipacker or hydro-seeder. Seeding depth should be \1 to Yz inch.
- If necessary, apply mulch according to MULCHING (M). The mulch will hold moisture and modify temperature extremes and prevent erosion while seedlings are growing.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Vegetation is considered established when a density of at least 70% of pre-disturbance levels has been reached throughout the area. Seeded areas should be inspected for failure and any necessary repairs and re-seeding should be made prior to the next growing season.

References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control*. Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004.

Keller, Gordon and James Sherar, *Low-Volume Roads Engineering, Best Management Practices Field Guide.* United States Department of Agriculture (USDA), Forest Service, US Agency of International Development (USAID), 2003. http://www.blm.gov/bmp/field%20guide.html

Soil Roughening (SR)

Description

Soil (surface) roughening is an erosion control practice that involves tracking, scarifying, imprinting, or tilling a disturbed area to provide temporary stabilization of disturbed areas. Surface roughening creates variations in the soil surface that help to minimize wind and water erosion. Depending on the technique used, surface roughening may also help establish conditions favorable to establishment of vegetation.

Applicability

Soil roughening is most effective for areas of one acre or less, or in conjunction with other sediment controls on larger locations, and works well for the following applications:

- Any slope, but particularly fill slopes greater than 3:1;
- Areas with highly erodible soils; and
- Soils that are frequently disturbed

Limitations

- Soil roughening is not appropriate for rocky slopes.
- Soil compaction might occur when roughening with tracked machinery.
- Soil roughening is of limited effectiveness in anything more than a gentle or shallow depth rain.
- If roughening is washed away in a heavy storm, the surface will have to be re-roughened.

Design Criteria

The selection for the appropriate method of soil roughening depends on the type of slope. Steepness, mowing requirements, and/or a cut or fill slope operation are all factors considered in choosing a roughening method. See Figure SR-1 and Figure SR-2 for design criteria and installation details.

Construction Specifications

- To slow erosion, roughening should be done as soon as possible after grading activities have ceased (temporarily or permanently) in an area.
- All cut and fill slopes should be roughened whenever possible.

- Do not blade or scrape the final fill slope face.
- Excessive compacting of the soil surface should be avoided during roughening, and areas should be seeded as soon as possible after roughening is completed.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Roughening might need to be repeated after storm events.

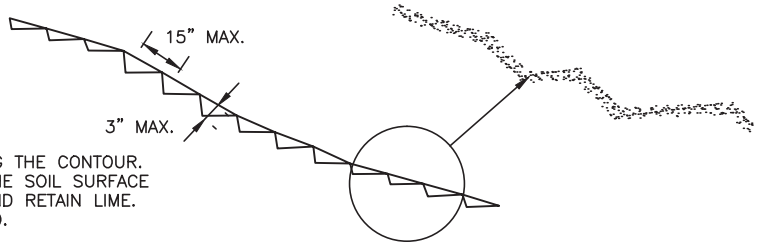
References

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control*. Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004.

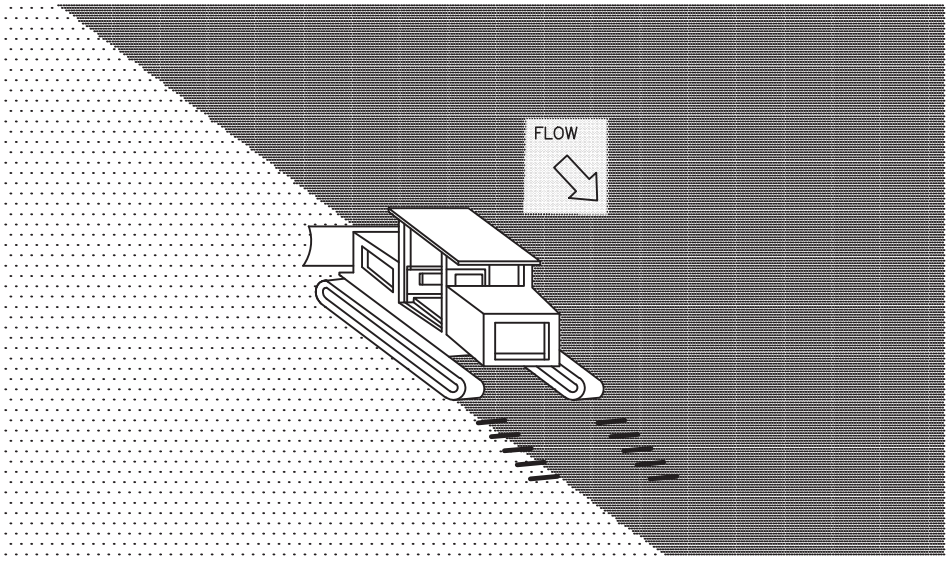
New York State Department of Environmental Conservation, *New York Guidelines for Erosion and Sediment Control*. New York. August 2005. http://www.dec.ny.gov/chemical/29066.html

FIGURE SR-1
Corrugation/Grooving



CUT FURROWS ALONG THE CONTOUR.
IRREGULARITIES IN THE SOIL SURFACE
CATCH RAINWATER AND RETAIN LIME.
FERTILIZER AND SEED.

FIGURE SR-2
Tracking



SCALE: NOT TO SCALE

Tracking Pad (TP)

Description

A stabilized construction entrance (i.e., tracking pad) is a pad of gravel where construction traffic leaves a site. The purpose of a stabilized access to a site is to minimize the amount of tracked mud that leaves a site. As a vehicle drives over the gravel tracking pad, mud and sediment are removed from the vehicle's wheels and off-site transport of soil is reduced. The gravel tracking pad also reduces erosion and rutting in the soil beneath the stabilized structure. The filter fabric separates the gravel from the soil below, preventing the gravel from being ground into the soil. The fabric also reduces the amount of rutting caused by vehicle tires by spreading the vehicle's weight over a larger soil area than just the width of the tire. Tracking pads are generally used in conjunction with stabilization material such as surface armor, road base, etc.

Applicability

Typically, stabilized construction accesses are installed at locations where construction traffic leaves or enters an existing paved road. However, the applicability of the site access stabilization should be extended to any roadway or entrance where vehicles will enter or leave the site.

Limitations

- Although stabilizing construction access is a good way to help reduce the amount of sediment leaving a site, some soil may still be deposited from vehicle tires onto paved surfaces. To further reduce the chance of these sediments polluting stormwater runoff, sweeping of the paved area adjacent to the stabilized site access is recommended.
- Site traps or other secondary sediment controls may be needed to capture sediment that accumulates at the pad and may run off during storm events.

Design Criteria

Construct all tracking pads on a level surface. Where feasible, grade the tracking control towards the construction site in order to reduce off-site runoff. There are several different types of stabilized tracking pads including:

1. **Aggregate Vehicle Tracking Control:** This type of tracking pad consists of a coarse-aggregate surfaced pad underlain by a geotextile to minimize compaction of tracking material. This tracking pad can be effective at removing sediment from vehicle tires when properly maintained and refreshed.

2. **Aggregate Vehicle Tracking Control with Was Rock:** This type of tracking pad may consists of a coarse-aggregate surface similar to VTC-1, with the addition of a sediment trapping device, and the optional installation of a geotextile. A concrete or steel rack is utilized for shaking and washing purposes and to dispose of sediment and/or sediment laden water in a designated location (if applicable). This is the most common vehicle tracking control and when properly maintained can be effective at removing sediment from vehicle tires.
3. **Vehicle Tracking Control with Construction Mat:** This type of tracking pad may be appropriate for locations with a small access and low traffic volume over vegetated areas. Although this application does not typically remove sediment from vehicles, it helps protect existing vegetation and provides a stabilized entrance.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Stabilization of site accesses should be maintained until the remainder of the construction site has been fully stabilized. Stone and gravel might need to be periodically added to each stabilized construction site access to keep the access effective. Soil that is tracked off site should be swept up immediately and properly disposed of.

References

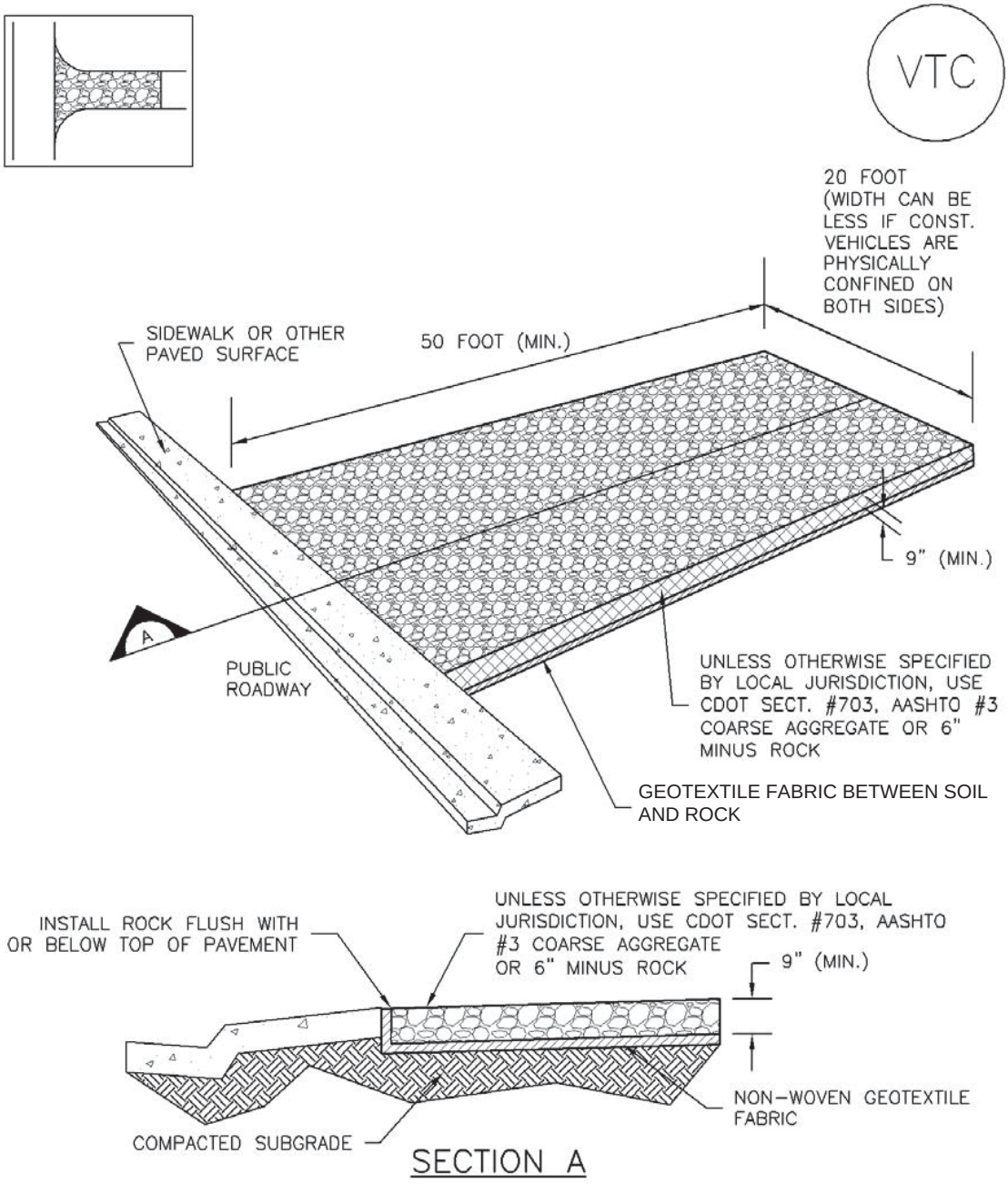
Colorado Department of Transportation (CDOT), *Erosion Control and Stormwater Quality Guide*. 2002. http://www.coloradodot.info/programs/environmental/water- quality/documents/erosion-storm-quality

United States Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Stormwater Runoff Control*. Washington, D.C., February 2003. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites.* April 2004.

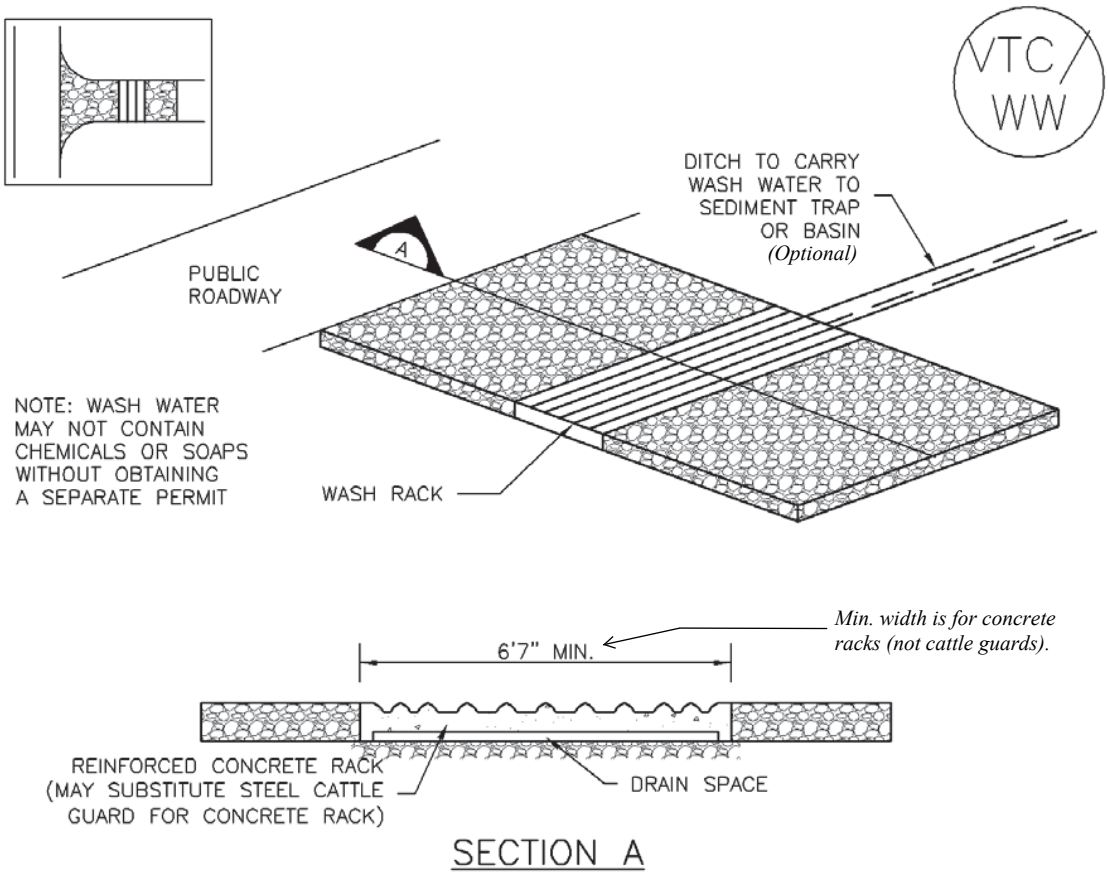
Urban Drainage and Flood Control District, *Volume 3 Stormwater Quality*. Denver, CO, November 2015. http://udfcd.org/volume-three

Vehicle Tracking Control (VTC)



VTC-1. AGGREGATE VEHICLE TRACKING CONTROL

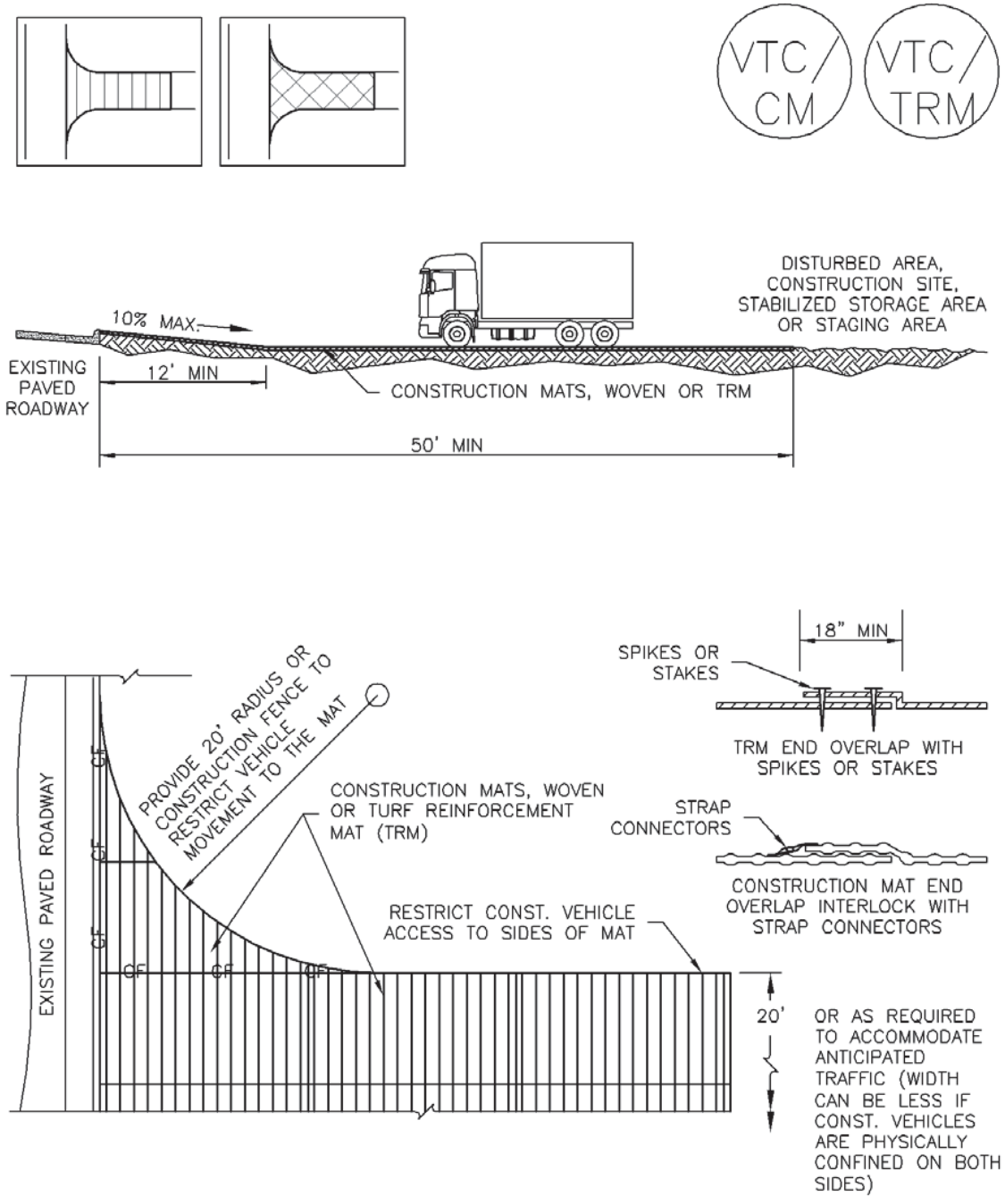
Vehicle Tracking Control (VTC)



VTC–2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK

Note: Locations which use a steel cattle guard for tracking control purposes do no require the use of a ditch and sediment trap combination to control sediment and/or stormwater. All cattle guards will be inspected in accordance with the SWMP and cleaned out once 50% capacity is reached.
Note: Cattle guards may be used in series if additional tracking control is required.

Vehicle Tracking Control (VTC)



VTC–3. VEHICLE TRACKING CONTROL W/ CONSTRUCTION MAT OR TURF REINFORCEMENT MAT (TRM)

Vehicle Tracking Control (VTC)

STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   -LOCATION OF CONSTRUCTION ENTRANCE(S)/EXIT(S).
   -TYPE OF CONSTRUCTION ENTRANCE(S)/EXITS(S) (WITH/WITHOUT WHEEL WASH, CONSTRUCTION MAT OR TRM).

2. CONSTRUCTION MAT OR TRM STABILIZED CONSTRUCTION ENTRANCES ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.

3. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT-OF-WAYS.

4. STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

5. A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.

6. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

1. INSPECT BMPs IN ACCORDANCE WITH THE APPLICABLE SWMP FREQUENCY, AND MAINTEN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.

5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM CITY OF BROOMFIELD, COLORADO, NOT AVAILABLE IN AUTOCAD)

Wattles (W)

Description

A wattle (also called a Sediment Control Log) consists of straw, flax, or other similar synthetic materials bound into a tight tubular roll. When wattles are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, wattles can also reduce erosion.

Applicability

Wattles may be a suitable BMP choice:

- Along the top, face, and at the grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow;
- At the end of a downward slope where it transitions to a steeper slope;
- Along the perimeter of a project;
- At the overflow location of sediment traps;
- As check dams in unlined ditches; and/or
- Around temporary stockpiles.

Limitations

- Wattles are not effective unless trenched and staked properly.
- The maximum allowable drainage area per 100 lineal feet of wattles installed along the contour is approximately 0.25 acres with a disturbed slope length of up to 150 feet and a slope gradient no steeper than 3:1. Longer and steeper slopes require additional measures (i.e. larger diameter wattles, stacked wattles, etc.).
- Difficult to move once saturated.
- If not properly staked and trenched in, wattles could be transported in high flows.
- Wattles have a very limited sediment capture zone.
- Wattles should not be used on slopes subject to creep, slumping, or landslide.
- Wattles should not be used where periodic road or surface maintenance activities are expected.

- If wattles are installed in an area that experiences concentrated flow, "J-hook" installation may be appropriate to force runoff to pond and evaporate or infiltrate multiple areas rather than concentrate and cause erosive conditions parallel to the BMP.

Design Criteria

See Figures SCL-1, SCL-2, and SCL-3 for design criteria.

Construction Specifications

Wattles should be either prefabricated rolls or rolled tubes of erosion control blankets. A minimum diameter of 9" is required for prefabricated rolls. If using erosion control blankets, roll the length of erosion control blanket into a tube with a minimum of 8 inches in diameter and bind the roll at each end and every 4 feet along the length of the roll with jute-type twine.

Locate wattles on a level contour and spaced as follows:

- Slope inclination of 4:1 or flatter: Fiber rolls should be placed at a maximum interval of 20 feet.
- Slope inclination between 4:1 and 2:1: Fiber rolls should be placed at a maximum of 15 feet.
- Slope inclination 2:1 or greater: Fiber rolls should be placed at a maximum interval of 10 feet.
- Turn the ends of the wattles upslope to prevent runoff from going around the roll.
- Stake the wattles into a trench with a depth of 1/3 the wattle diameter and a trench width equal to the diameter of the wattle.
- Drive stakes at the end of each wattle and space 4 feet maximum on center.
- If more than one wattle is placed in a row, the rolls should be overlapped, not abutted.
- Cross stake the ends of the wattles and throughout as necessary to minimize the potential of a wattle to be lifted and/or removed from location.

Maintenance Considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Repair or replace split, torn, unraveling, or slumping rolls. If the wattle is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates must be periodically removed in order to maintain wattle effectiveness. Sediment should be removed when sediment accumulation reaches half the distance between the top of the wattle and the adjacent ground surface.

Removal

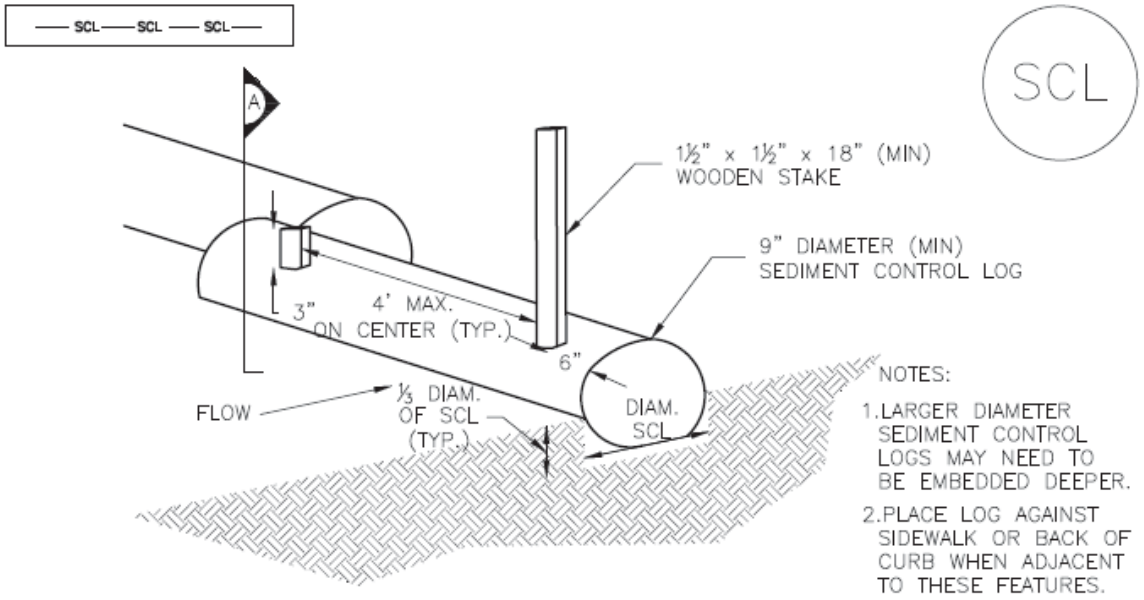
Wattles are typically left in place until final stabilization. If wattles are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions, or any other ground disturbance to blend with adjacent ground.

References

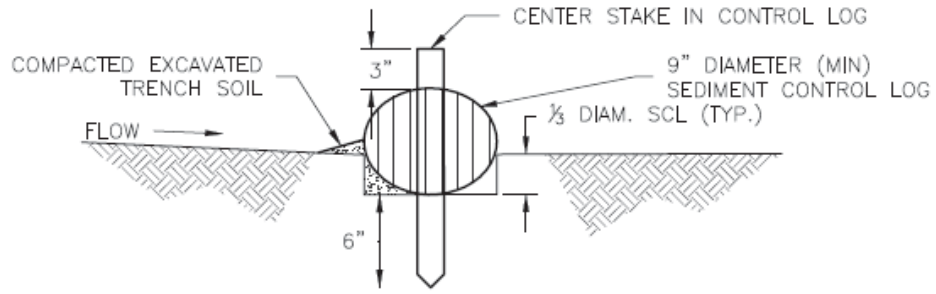
California Stormwater Quality Association (CASQA). 2003. Stormwater Best Management *Practice Handbook: Construction.* https://www.casqa.org/store/products/tabid/154/p-167-construction-handbookportal-initial-subscription.aspx

Urban Drainage and Flood Control District, *Volume 3 Stormwater Quality*. Denver, CO, November 2015. http://udfcd.org/volume-three

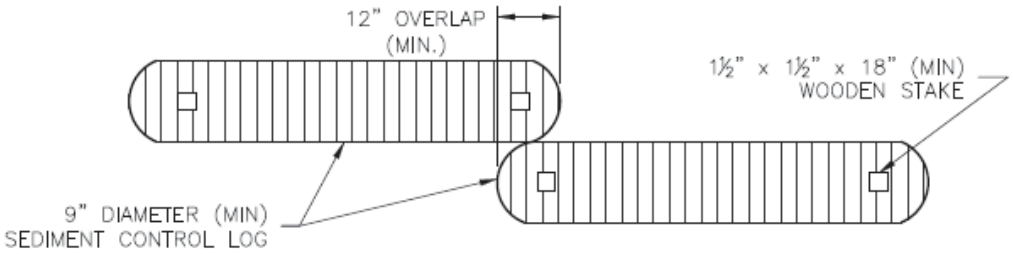
Sediment Control Log (SCL)



TRENCHED SEDIMENT CONTROL LOG



SECTION Ⓐ
TRENCHED SEDIMENT CONTROL LOG

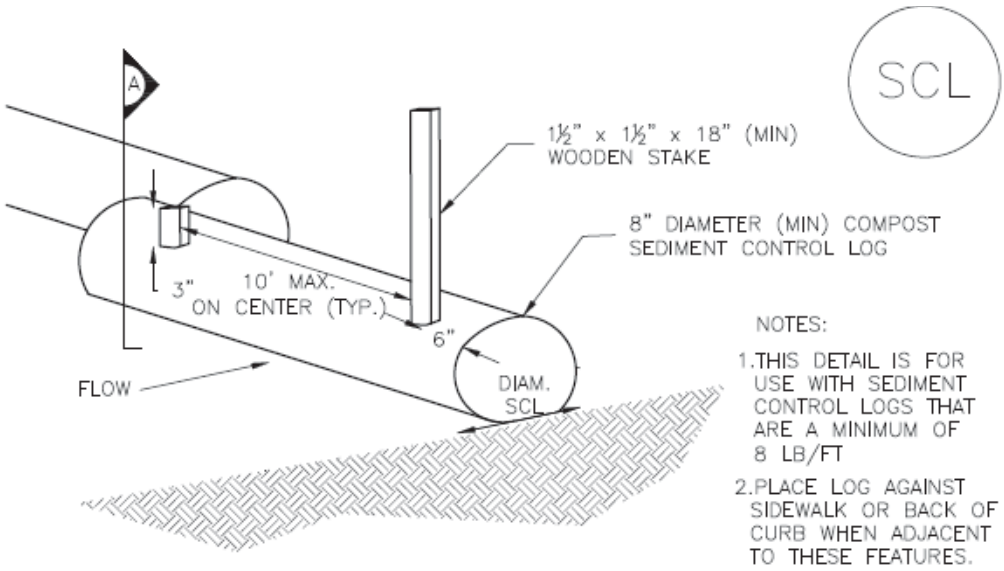


LOG JOINTS

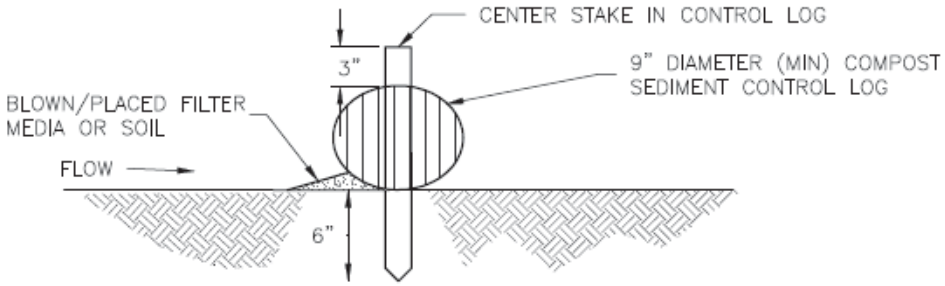
SCL–1. TRENCHED SEDIMENT CONTROL LOG

Note: Wattles may be cross-staked at the ends and throughout to prevent lifting of wattles off stakes.

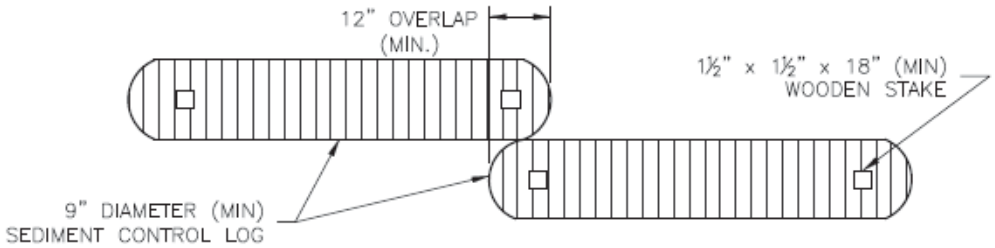
Sediment Control Log (SCL)



COMPOST SEDIMENT CONTROL LOG (WEIGHTED)



SECTION (A)
COMPOST SEDIMENT CONTROL LOG

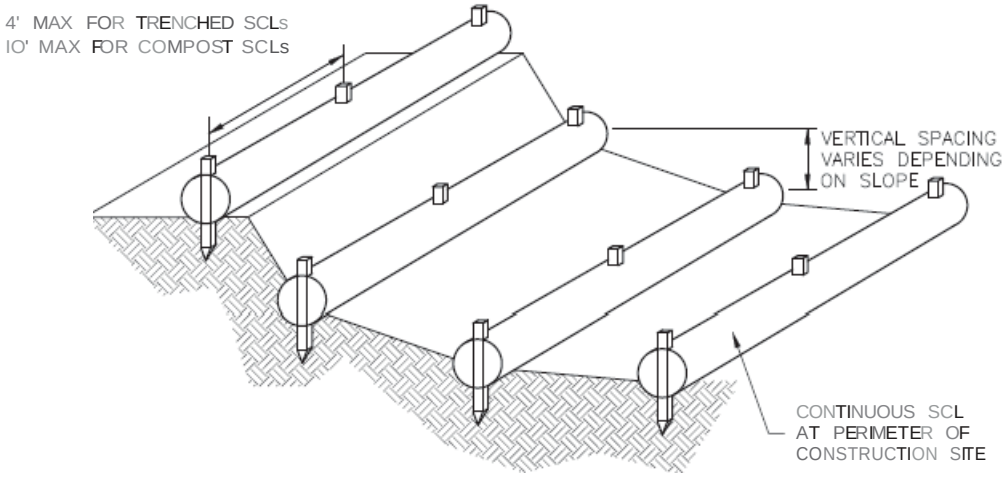


LOG JOINTS

SCL–2. COMPOST SEDIMENT CONTROL LOG (WEIGHTED)

Note: Wattles may be cross-staked at the ends and throughout to prevent lifting of wattles off stakes.

Sediment Control Log (SCL)



SCL-3. SEDIMENT CONTROL LOGS TO CONTROL SLOPE LENGTH

Sediment Control Log (SCL)

SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.

2. SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADIENT LAND-DISTURBING ACTIVITIES.

3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.

4. SEDIMENT CONTROL LOGS MAY BE USED AS SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS.

5. IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A DEPTH OF APPROXIMATELY Y.i OF THE DIAMETER OF THE LOG. IF TRENCHING TO THIS DEPTH IS NOT FEASIBLE AND/OR DESIRABLE (SHORT TERM INSTALLATION WITH DESIRE NOT TO DAMAGE LANDSCAPE) A LESSER TRENCHING DEPTH MAY BE ACCEPTABLE WITH MORE ROBUST STAKING. COMPOST LOGS THAT ARE 8 LB/FT *DO* NOT NEED TO BE TRENCHED.

6. THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL OR FILTER MATERIAL THAT IS FREE OF ROCKS AND DEBRIS. THE SOIL SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER OR BLOWN IN PLACE.

7. FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. STAKES THAT ARE BROKEN PRIOR TO INSTALLATION SHALL BE REPLACED. COMPOST LOGS SHOULD BE STAKED 1O' ON CENTER.

SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. INSPECT BMPs ACCORDINGTOTHEAPPLICABLESWMPFREQUENCY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION.MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOG SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.

5. SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION.COMPOST FROM COMPOST LOGS MAY BE LEFT IN PLACE AS LONG AS BAGS ARE REMOVED AND THE AREA SEEDED. IF DISTURBED AREAS EXIST AFTER REMOVAL, THEY SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BYTHE LOCAL JURISDICTION.

(DETALS ADAPTED FROM *TOWN* OF PARKER, COLORADO, JEFFERSON COUNTY, COLORADO, DOUGLAS COUNTY, COLORADO, AND CITY Of AURORA. COLORADO, NOT AVALABLE IN AVTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

COLORADO
Department of Public Health & Environment

CERTIFICATION TO DISCHARGE
UNDER
CDPS GENERAL PERMIT COR400000
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

Certification Number: **COR401104**

This Certification to Discharge specifically authorizes:

Owner Civitas Resources
Operator Civitas Resources
to discharge stormwater from the facility identified as

COP Field Permit Arapahoe County West of Watkins

To the waters of the State of Colorado, including, but not limited to:

Box Elder Creek, Coal Creek, South Platte River

Facility Activity :	OilGas
Disturbed Acres:	2000 acres
Facility Located at:	County Line Rd and Watkins Rd Watkins 80137 Arapahoe County Latitude 39.662067 Longitude -104.624440
Specific Information (if applicable):	

Certification is issued: 5/15/2024
Certification is effective: 4/1/2024
Expiration date of general permit: 3/31/2029

This certification under the general permit requires that specific actions be performed at designated times. The certification holder is legally obligated to comply with all terms and conditions of the COR400000 permit.

This certification was approved by:
Andrew Sayers-Fay Permits Section Manager
Clean Water Program
Water Quality Control Division

Surface Owner Documentation

Applicant is surface owner – deed enclosed

Electronically Recorded RECEPTION#: 2022000032417,
4/12/2022 at 10:13 AM, 1 OF 8,
REC: $48.00 DocStamp: $0.00
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

SPECIAL WARRANTY DEED

This Special Warranty Deed (this "***Deed***"), effective as of March 1, 2022, at 12:01 a.m., Mountain Standard Time (the "***Effective Time***"), is from DJ South Infield Gathering, LLC, a Colorado limited liability company (the "***Grantor***"), to Crestone Peak Resources Watkins Midstream LLC, a Delaware limited liability company ("***Grantee***"). Capitalized terms used but not defined in the body of this Assignment shall have the meanings set forth in that certain Asset Purchase Agreement, dated March 29, 2022, by and between Grantor and Grantee (the "***APA***").

For $10.00 and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged by Grantor, Grantor hereby conveys to Grantee, and its successors and assigns, all of Grantor's right, title and interest in and to all of the real property being in the County of Adams, State of Colorado, further described on Exhibit A hereto, together with all and singular the hereditaments and appurtenances thereto belonging, or in anywise appertaining thereto, (the "***Land***").

TO HAVE AND TO HOLD unto Grantee and its successors and assigns forever, but excepting and reserving to Grantor, however, all other assets and properties of Grantor not specifically described as Land, and further excepting and reserving unto Grantor and its successors and assigns the Excluded Assets, as definited in the APA.

Grantor hereby warrants title to the land, free and clear of all Encumbrances except Permitted Encumbrances, against claims by, through and under Grantor, but not otherwise.

Except as explicitly set forth herein, this Deed is made without warranty of any kind, whether express, implied or statutory; however, Grantor gives and grants to Grantee, its successors and assigns, to the extent so transferable, full power and right of substitution and subrogation in and to all covenants and warranties by others heretofore given or made with respect to the Land or any part thereof.

THE PARTIES AGREE THAT, TO THE EXTENT REQUIRED BY APPLICABLE LAW TO BE OPERATIVE, THE FOLLOWING DISCLAIMERS ARE "CONSPICUOUS" DISCLAIMERS FOR THE PURPOSES OF ANY APPLICABLE LAW, RULE OR ORDER.

(a) NO REPRESENTATIONS AND WARRANTIES. ***EXCEPT AS EXPLICITLY SET FORTH HEREIN,*** GRANTOR EXPRESSLY DISCLAIMS ANY AND ALL REPRESENTATIONS AND WARRANTIES, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OR REPRESENTATIONS, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, RELATING TO: (I) TITLE TO THE LAND; (II) THE CONDITION, QUANTITY, QUALITY, CONFORMITY TO MODELS OR SAMPLES, FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR NON-INFRINGEMENT OF THE LAND; (III) THE ACCURACY OR COMPLETENESS OF ANY DATA, REPORTS, RECORDS, PROJECTIONS, INFORMATION OR MATERIALS FURNISHED OR MADE AVAILABLE TO OR OTHERWISE OBTAINED BY GRANTEE; (IV) THE ENVIRONMENTAL CONDITION OF THE LAND, BOTH SURFACE AND SUBSURFACE; OR (V) ANY OTHER MATTERS CONTAINED IN ANY MATERIALS FURNISHED OR MADE AVAILABLE TO OR OTHERWISE OBTAINED BY GRANTEE OR ITS AGENTS AND REPRESENTATIVES.

(b) INSPECTION. GRANTEE HAS INSPECTED, OR WAIVED ITS RIGHT TO INSPECT, THE LAND FOR ALL PURPOSES, AND SATISFIED ITSELF AS TO ITS PHYSICAL AND ENVIRONMENTAL CONDITION, BOTH SURFACE AND SUBSURFACE, INCLUDING CONDITIONS SPECIFICALLY RELATING TO THE PRESENCE, RELEASE OR DISPOSAL OF HAZARDOUS MATERIALS, SOLID WASTES, ASBESTOS, OTHER MAN-MADE FIBERS, AND NATURALLY OCCURRING RADIOACTIVE MATERIALS. GRANTEE IS RELYING SOLELY UPON ITS OWN INSPECTION OF THE LAND.

(c) "AS IS, WHERE IS". GRANTEE IS ACQUIRING THE LAND IN AN "AS IS, WHERE IS" CONDITION, AND SHALL ASSUME ALL RISKS AND LIABILITIES THAT THE LAND MAY CONTAIN HAZARDOUS MATERIALS OR OTHER WASTE, TOXIC, HAZARDOUS, EXTREMELY HAZARDOUS OR OTHER MATERIALS OR SUBSTANCES, OR OTHER ADVERSE PHYSICAL CONDITIONS, INCLUDING WITHOUT LIMITATION, THE PRESENCE OF UNKNOWN ABANDONED OIL AND GAS WELLS, WATER WELLS, SUMPS, PITS, PIPELINES OR OTHER WASTE OR SPILL. ALL RESPONSIBILITY AND LIABILITY RELATING TO ALL SUCH CONDITIONS, WHETHER KNOWN OR UNKNOWN, FIXED OR CONTINGENT, ARE ASSUMED BY GRANTEE, REGARDLESS OF WHEN THE LIABILITY OR RESPONSIBILITY AROSE.

1. Exhibits. Exhibit A attached to this Deed are incorporated herein and made a part hereof for all purposes, provided, that such incorporation shall not be deemed to ratify or create any rights in favor of any third party.

2. Successors and Assigns. This Deed shall inure to the benefit of and be binding upon the parties hereto, and their respective successors, legal representatives and assigns.

3. Headings. The headings in this Deed are inserted for convenience only and shall not control or affect the meaning or construction of any of the provisions hereof.

4. Further Actions. Grantee and Grantor covenant and agree to take all such further actions and to execute, acknowledge and deliver all such further documents that are necessary or useful in carrying out the purposes of this Deed.

5. Invalidity. If any term, provision, covenant or restriction of this Deed is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the terms, provisions, covenants and restrictions of this Deed shall continue in full force and effect and shall in no way be affected, impaired or invalidated unless such an interpretation would materially alter the rights and privileges of any party hereto or materially alter the terms of the transactions contemplated hereby.

6. Governing Law; Venue; Jury Trial Waiver.

(a) THIS DEED AND THE LEGAL RELATIONS BETWEEN THE PARTIES SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF COLORADO, EXCLUDING ANY CHOICE OF LAW RULES WHICH MAY DIRECT THE APPLICATION OF THE LAWS OF ANOTHER JURISDICTION.

(b) Each of the Parties hereby irrevocably and unconditionally submits to the exclusive jurisdiction of the State and Federal courts sitting in Denver County, in the State of Colorado and any appellate court from any thereof, with respect to any proceeding relating to this

Deed. Further, each of the Parties hereby irrevocably and unconditionally waives any objection or defense that it may have based on improper venue or forum non conveniens to the conduct of any such proceeding in any such courts. The Parties agree that either or both of them may file a copy of this paragraph with any court as written evidence of the knowing, voluntary and bargained agreement between the Parties to waive irrevocably any objections to jurisdiction, venue or to convenience of forum. Each of the Parties (on behalf of itself and its Affiliates) agrees that a final judgment in any such action or proceeding shall be conclusive and may be enforced in other jurisdictions by suit on the judgment or in any other manner provided by Law or in equity.

(c) WITH RESPECT TO ANY ACTION ARISING OUT OF OR RELATING TO THIS DEED OR THE TRANSACTIONS CONTEMPLATED HEREBY, EACH PARTY HEREBY WAIVES, TO THE FULLEST EXTENT PERMITTED BY LAW, ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY.

7. Miscellaneous. This Deed together with the Exhibits and the APA contains the entire understanding and agreement of Grantor and Grantee with respect to the subject matter hereof. This Deed may be executed in any number of original counterparts, all of which constitute one and the same instrument. Whenever possible, each provision or part thereof of this Deed shall be interpreted in such manner as to be valid and effective under applicable Laws, but if any provision or part thereof of this Deed or the application of any such provision or part thereof to any Person or circumstance shall be held invalid, illegal, or unenforceable in any respect by a court of competent jurisdiction, such invalidity, illegality, or unenforceability shall not affect any other provision or part thereof.

8. APA. This Deed is subject to and delivered under the terms and conditions of the APA. If any provision of this Deed is construed to conflict with any provision of the APA, the provisions of the APA shall be deemed controlling to the extent of that conflict. The execution and delivery of this Deed by Grantor, and the execution and acceptance of this Deed by Grantee, shall not operate to release or impair any surviving rights or obligations of any Party under the APA.

[*Signature pages follow*]

Electronically Recorded RECEPTION#: 2022000032417,
4/12/2022 at 10:13 AM, 4 OF 8,
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

Dated this 28th day of March 2022, but effective as of the Effective Time.

GRANTOR

DJ SOUTH INFIELD GATHERING, LLC,
a Colorado limited liability company

By: _____
Name: Daniel C. Campbell
Title: Chief Executive Officer

ACKNOWLEDGEMENT

STATE OF COLORADO)
) ss.
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 28 day of March 2022 by Daniel C. Campbell, Chief Executive Officer of DJ South Infield Gathering, LLC, a Colorado limited liability company, on behalf of such company.

WITNESS my hand and official seal.

My commission expires: April 17, 2023

LALENA BISHOP
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154015513
MY COMMISSION EXPIRES APRIL 17, 2023

_____
Notary Public

By: _____
Name: Rogan McGillis
Title: Chief Financial Officer

ACKNOWLEDGEMENT

STATE OF COLORADO)
) ss.
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 28 day of March 2022 by Rogan McGillis, Chief Financial Officer of DJ South Infield Gathering, LLC, a Colorado limited liability company, on behalf of such company.

WITNESS my hand and official seal.

My commission expires: April 17, 2023

LALENA BISHOP
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154015513
MY COMMISSION EXPIRES APRIL 17, 2023

_____
Notary Public

Electronically Recorded RECEPTION#: 2022000032417,
4/12/2022 at 10:13 AM, 5 OF 8,
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

GRANTEE

CRESTONE PEAK RESOURCES WATKINS MIDSTREAM LLC

By: _____
Name: Cyrus Marter
Title: General Counsel

ACKNOWLEDGEMENT

STATE OF COLORADO)
) ss.
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 28th day of February 2022, by Cyrus Marter, General Counsel of Crestone Peak Resources Watkins Midstream LLC, a Delaware limited liability company, on behalf of such company.

WITNESS my hand and official seal.

My commission expires: 9-21-2024

PAULA L. GREER
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 19934011880
MY COMMISSION EXPIRES SEPTEMBER 21, 2024

_____
Notary Public, State of Colorado

Electronically Recorded RECEPTION#: 2022000032417,
4/12/2022 at 10:13 AM, 6 OF 8,
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

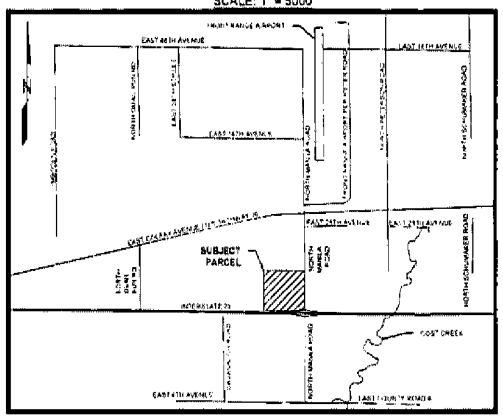
Exhibit A

[See attached]

LAND SURVEY PLAT

PART OF THE SE ¼ OF SECTION 34,TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M., COUNTY OF ADAMS, STATE OF COLORADO

VICINITY MAP
SCALE: 1" = 5000'



RECORD LEGAL DESCRIPTION:

(FROM ADAMS COUNTY WARRANTY DEED REC NO 2019000004213)

TO BE A PART OF THAT PART OF THE SOUTHEAST ¼ OF SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF ADAMS, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID SECTION 34; THENCE WEST ALONG THE SOUTH LINE OF SAID SOUTHEAST ¼ OF SECTION 34, A DISTANCE OF 2648.81 FEET TO THE SOUTHWEST CORNER OF SAID SOUTHEAST ¼ OF SECTION 34; THENCE ON A DEFLECTION ANGLE TO THE RIGHT OF 88°57'08" ALONG THE WEST LINE OF SAID SOUTHEAST ¼ OF SECTION 34, A DISTANCE OF 252.99 FEET TO THE POINT OF BEGINNING; THENCE NORTH ALONG THE LAST DESCRIBED COURSE A DISTANCE OF 2401.98 FEET TO THE NORTHWEST CORNER OF SAID SOUTHEAST ¼ OF SECTION 34; THENCE ON A DEFLECTION ANGLE TO THE RIGHT OF 90°53'26" ALONG THE NORTH LINE OF THE SAID SOUTHEAST ¼ OF SECTION 34, A DISTANCE OF 2637.00 FEET TO A POINT ON THE WEST RIGHT-OF-WAY LINE OF MANILA ROAD; THENCE ON A DEFLECTION ANGLE TO THE RIGHT OF 88°30'10" ALONG THE SAID WEST RIGHT-OF-WAY LINE OF MANILA ROAD, A DISTANCE OF 1706.24 FEET; THENCE ON A DEFLECTION ANGLE TO THE RIGHT 11°16'30" ALONG THE NORTH RIGHT-OF-WAY LINE INTERSTATE 70, A DISTANCE OF 300.00 FEET; THENCE ON A DEFECTION ANGLE TO THE RIGHT OF 45°13'30" ALONG SAID NORTH RIGHT OF WAY LINE OF INTERSTATE 70, A DISTANCE OF 201.30 FEET; THENCE ON A DEFECTION ANGLE TO THE RIGHT OF 34°03'30" ALONG SAID NORTH RIGHT OF WAY LINE OF INTERSTATE 70, A DISTANCE OF 672.50 FEET; THENCE ON A DEFLECTION ANGLE TO THE RIGHT OF 98°55'58" ALONG SAID NORTH RIGHT-OF-WAY LINE OF INTERSTATE 70, A DISTANCE OF 1784.31 FEET TO THE POINT OF BEGINNING, COUNTY OF ADAMS, STATE OF COLORADO

ALSO DESCRIBED AS
(FROM ADAMS COUNTY WARRANTY DEED REC NO 2019000004213)

THAT PART OF THE SOUTHEAST QUARTER OF SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, ADAMS COUNTY, STATE OF COLORADO BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SOUTHEAST CORNER OF SAID SECTION 34; THENCE N89°39'30"W AND ALONG THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 34, A DISTANCE OF 2565.02 FEET TO THE SOUTH QUARTER CORNER OF SAID SECTION 34; THENCE N00°11'41"W, A DISTANCE OF 2413.18 FEET TO A POINT ON THE NORTH LINE OF SAID SOUTHEAST QUARTER; THENCE S89°34'18"E AND ALONG SAID NORTH LINE, A DISTANCE OF 2639.78 FEET TO A POINT ON THE WEST RIGHT OF WAY LINE OF MANILLA ROAD; THENCE S00°05'43"E ALONG SAID WEST RIGHT-OF-WAY LINE, A DISTANCE OF 1790.35 FEET TO A POINT ON THE NORTH RIGHT-OF-WAY LINE OF INTERSTATE 70; THENCE ALONG SAID NORTH RIGHT-OF-WAY LINE FOR THE FOLLOWING FIVE COURSES: 1) S11°12'47"W, 102.00 FEET; 2) S00°05'43"E, 300.00 FEET; 3) S45°04'47"W, 201.30 FEET; 4) S82°08'17"W, 672.50 FEET; 5) N88°55'28"W, 1756.74 FEET TO THE POINT OF BEGINNING.

SURVEYED LEGAL DESCRIPTION:

BEING A PORTION OF THE SOUTHEAST SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, ADAMS COUNTY, STATE OF COLORADO BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS

COMMENCING AT THE SOUTH ¼ CORNER OF SAID SECTION 34 (AS MONUMENTED BY A FOUND 3-1/4" ALUMINUM CAP "PLS 28285/ 2014"), FROM WHICH THE SOUTHEAST CORNER OF SAID SECTION 34 (AS MONUMENTED BY A 3-1/4" ALUMINUM CAP "AZTEC CONSULTANTS INC / 2004/ PLS 38550") BEARS S89°38'36"E, A DISTANCE OF 2,662.28 FEET, FORMING THE BASIS OF BEARINGS USED IN THIS DESCRIPTION;

THENCE N00°14'47"W COINCIDENT WITH THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 34, A DISTANCE OF 250.20 FEET TO A POINT ON THE NORTH RIGHT-OF-WAY LINE OF INTERSTATE 70 AS DESCRIBED IN BOOK 746 ON PAGE 79 (REC. NO. 553054) AS RECORDED IN THE OFFICIAL ADAMS COUNTY RECORDS, SAID POINT ALSO BEING THE POINT OF BEGINNING;

THENCE N00° 14' 47"W COINCIDENT WITH THE WEST LINE OF THE SOUTHEAST QUARTER OF SAID SECTION, A DISTANCE OF 2416.51 FEET TO THE CENTER ¼ CORNER OF SAID SECTION; THENCE S89° 32' 39" E COINCIDENT WITH THE NORTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION, A DISTANCE OF 2,639.91' FEET TO A POINT ON THE WEST RIGHT-OF-WAY LINE OF MANILA ROAD; THENCE S00° 05' 01"E COINCIDENT WITH SAID WEST RIGHT-OF-WAY LINE OF MANILA ROAD, A DISTANCE OF 1790.41 FEET TO A POINT ON THE NORTH RIGHT-OF-WAY LINE OF INTERSTATE 70; THENCE ALONG SAID NORTHERLY RIGHT-OF-WAY LINE OF INTERSTATE 70 THE FOLLOWING FIVE (5) COURSES:

1. S11° 13' 31"W, A DISTANCE OF 102.00 FEET.
2. S00° 04' 59"E, A DISTANCE OF 300.00 FEET.
3. THENCE S45° 05' 31"W, A DISTANCE OF 201.30 FEET.
4. THENCE S82° 09' 01"W, A DISTANCE OF 672.50 FEET
5. THENCE N89° 15' 26"W, A DISTANCE OF 1756.74 FEET TO THE POINT OF BEGINNING

PARCEL CONTAINS 6,314,024 SQUARE FEET OR 144.95 ACRES, MORE OR LESS

GENERAL NOTES:

1. NOTICE: ACCORDING TO COLORADO LAW, YOU MUST COMMENCE LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON. (C.R.S. 13-80-105)
2. THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY ENCOMPASS SERVICES, LLC TO DETERMINE OWNERSHIP OR EASEMENTS OF RECORD. FOR ALL INFORMATION REGARDING EASEMENTS, RIGHTS-OF-WAY, AND TITLE OF RECORD, ENCOMPASS SERVICES, LLC RELIED UPON A PUBLIC RECORDS SEARCH ONLY USING THE ADAMS COUNTY CLERK AND RECORDER ONLINE DATABASE. ENCOMPASS SERVICES, LLC HAS NOT RESEARCHED OR SHOWN ANY OTHER EASEMENTS, RIGHTS-OF-WAY, VARIANCES, AND OR AGREEMENTS OF RECORD EXCEPT AS SHOWN HEREON. ALL REFERENCES HEREON TO BOOKS, PAGES, MAPS, AND RECEPTION NUMBERS ARE PUBLIC DOCUMENTS FILED IN THE RECORDS OF ADAMS COUNTY, COLORADO.
3. THE BASIS OF BEARINGS FOR THIS SURVEY, MONUMENTED AND DESCRIBED AS SHOWN HEREON, ARE GRID BEARINGS OF NAD83(11) COLORADO STATE PLANE CENTRAL ZONE (0502) WITH ALL BEARINGS REFERENCED HEREIN RELATIVE THERETO.
4. ALL DISTANCES SHOWN HEREON ARE GROUND DISTANCES RELATIVE TO NAD83(11) COLORADO STATE PLANE CENTRAL ZONE (0502). THE COMBINED ELEVATION/ SCALE FACTOR (CSF) USED TO MODIFY DISTANCES TO GROUND IS 0.99971230.
5. THE LINEAR UNITS FOR THIS SURVEY ARE U.S. SURVEY FEET (1200/3937 METERS).
6. THE FIELDWORK FOR THIS SURVEY WAS PERFORMED AND COMPLETED IN FEBRUARY 2022.
7. THIS LAND SURVEY PLAT WAS PREPARED IN ACCORDANCE WITH C.R.S. 38-51-106.

SURVEYORS CERTIFICATE:

I, AARON J. HANDL, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO DO HEREBY STATE THAT THIS LAND SURVEY PLAT AND THE SURVEY FROM WHICH IT IS BASED WAS PREPARED UNDER MY DIRECT SUPERVISION AND THAT THE INFORMATION SHOWN HEREON IS CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF AND THAT THIS SURVEY WAS COMPLETED IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE. THIS IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

DATE OF LAND SURVEY PLAT: 03-03-2022

AARON J. HANDL, PLS 38328
FOR AND ON BEHALF OF
ENCOMPASS SERVICES, LLC
10901 W. 120TH AVE., STE. 400
BROOMFIELD, CO 80021

COLORADO LICENSED
AARON J. HANDL
38328
03-03-22
PROFESSIONAL LAND SURVEYOR

INDEXING STATEMENT:

DEPOSITED THIS _____ DAY OF _____, 20_____, AT _____, M., IN BOOK_____
OF THE COUNTY SURVEYOR'S LAND SURVEY/ RIGHT-OF-WAY SURVEYS AT
PAGE(S)_____, RECEPTION NUMBER_____

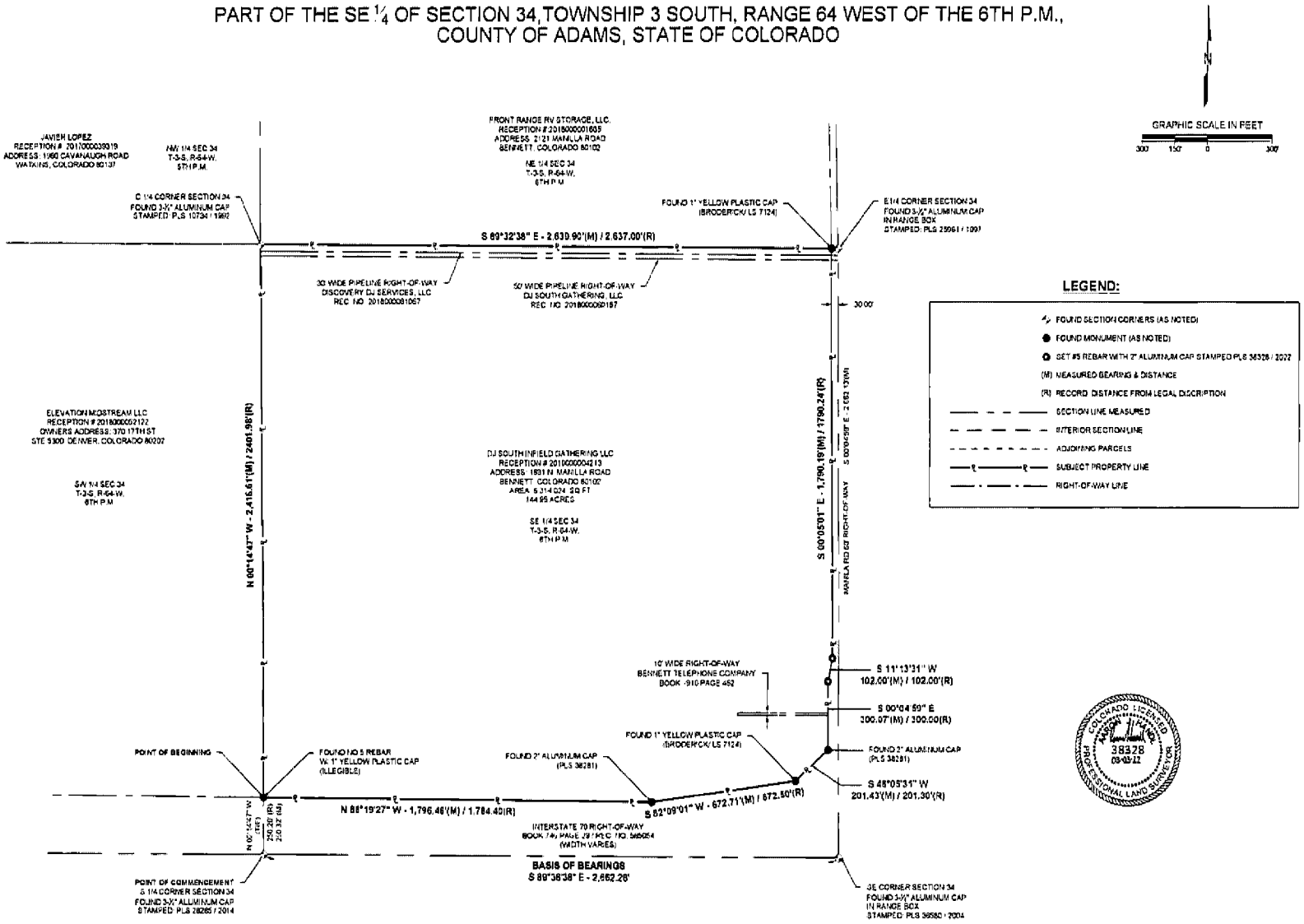
_____
COUNTY SURVEYOR/ DEPUTY COUNTY SURVEYOR

eneompass ENCOMPASS SERVICES, LLC 10901 W. 120TH AVE., STE. 400 BROOMFIELD, CO 80021	LAND SURVEY PLAT PART OF THE SE ¼ OF SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M., COUNTY OF ADAMS, STATE OF COLORADO	ISSUE DATE: 02/28/2022	PROJECT NO.: 61763	REV. NO.: 1
		DATE:	REVISION COMMENTS:	DRWN / CHKD
		03/03/2022	UPDATED MONUMENT REFERENCES	RD / AH
				SHEET NO. 1
				1 OF 2

Electronically Recorded RECEPTION#: 2022000032417,
4/12/2022 at 10:13 AM, 7 OF 8,
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

LAND SURVEY PLAT

PART OF THE SE ¼ OF SECTION 34, TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M.,
COUNTY OF ADAMS, STATE OF COLORADO



encompass

ENCOMPASS SERVICES, LLC
10901 W. 120TH AVE., STE. 400
BROOMFIELD, CO 80021

LAND SURVEY PLAT
PART OF THE SE ¼ OF SECTION 34,
TOWNSHIP 3 SOUTH, RANGE 64 WEST OF THE 6TH P.M.,
COUNTY OF ADAMS, STATE OF COLORADO

ISSUE DATE: 02/28/2022	PROJECT NO.: 61763	REV. NO.: 1	SHEET NO.
DATE:	REVISION COMMENTS:	DRWN	CHKD
03/03/2022	UPDATED MONUMENT REFERENCES	RD	AH
			2
			2 OF 2

Electronically Recorded RECEPTION#: 2022000032417,
4/12/2022 at 10:13 AM, 8 OF 8,
TD Pgs: 0 Josh Zygielbaum, Adams County, CO.

Transportation Plan & Traffic Summary

Adams County Development Standards and Regulations Section 4-11-02-03-03-03-22

To:	John Piekara, Civitas Resources
From:	Lily Vagelatos, PE, Tetra Tech Bill Zahniser, PE, Tetra Tech
Date:	January 27, 2025
Subject:	Bennett Pad D – Narrative Traffic Memorandum

Crestone Peak Resources Operating, LLC (Crestone, operating as part of Civitas Resources, Inc.) is planning development of the Bennett D Pad located north of Interstate 70 (I-70) and west of Manila Road, in the Southeast ¼ of Section 34, Township 3 South, Range 64 West (**Figure 1**). Crestone has contracted services from Tetra Tech Inc. (Tetra Tech) to provide a narrative description of the local traffic impacts anticipated for the proposed oil and gas development. Impacts are based on a desktop review of the area, and information provided to Tetra Tech by Crestone for their development plans. A field traffic survey was not performed in support of this evaluation. A traffic count was previously performed for the oil terminal that first developed the existing access and Adams County confirmed with Crestone that a second one was not needed.

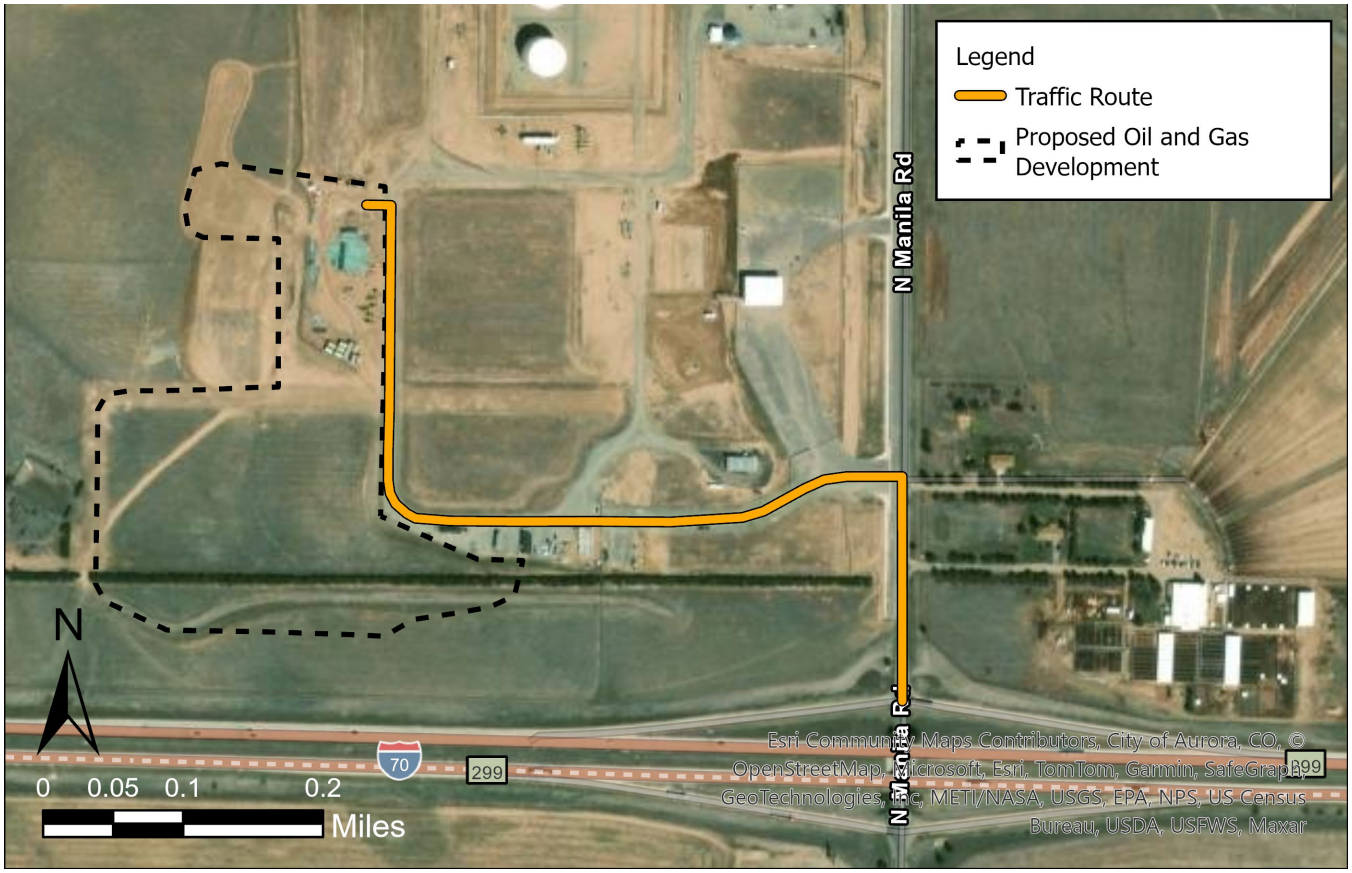


Figure 1. Site location and traffic route.

Current Conditions

The proposed location for the development is a mostly vacant portion of a privately owned land parcel in Adams County that has existing oil and gas development on the eastern portion of the property, between the proposed project and Manila Road. The main access is off Manila Road approximately 0.1 miles north of I-70 and is an industrial site access permitted by Adams County. No additional public road construction or improvements to county roads is planned as part of this development as the existing access is of sufficient quality and dimensions for the trucks and heavy equipment that will be used.

Bennett D Pad Development Plan

Crestone is in the process of permitting the drilling and completion of up twenty-six horizontal wells and the installation of related surface production equipment on one well pad that will be serviced by the existing access road. They are also planning the construction of water and product pipelines at this location to reduce the number of produced water and product trucks accessing the site. The installation of these pipelines are projected to eliminate as many as 160,000 tanker truck and facility service rig trips over the projected 30 year life of the facility. Construction, drilling and completion phases of the project are considered to be a temporary use, and do not factor into long term changes to the site access. Once completed, it is anticipated that one to two operators will access the site daily in light duty trucks to check equipment.

Crestone has provided traffic estimates and durations for each phase of the project. The duration of each phase is dependent on the number of wells drilled. The traffic data provided in **Table 1** conservatively assumes all twenty-six proposed wells are drilled and completed. All traffic for the project will access the site from I-70.

Table 1. Estimated Traffic Volumes and Durations

Phase	Duration (Days)	Truck[(1)] Trips (Total)	Average Truck Trips per Day	Light Duty Crew Traffic (Trips/Day)	PCE Trips/Day	Peak Hour PCE
Pad Construction	60	1,418	24	10	82	15
Drilling	194	4,268	24	23	95	9
Completions: • Completions • Facility Construction • Mill Out/Tubing	 • 105[(2)] • 92[(2)] • 164[(2)]	20,672	77	61	292	26
Flowback	60	40	1	5	8	4
Interim Reclamation	60	566	9	10	37	11
Production	15 – 30 years	40 (per month)	1	2	5	0

Notes:

- PCE – Passenger car equivalent, CDOT – Colorado Department of Transportation, SHAC – State Highway Access Code.

1. Crestone indicated that the majority of the truck traffic for the project will be Class 8 through 13 combo units (3 PCE), but that there may be some Class 4 through single unit trucks (2 PCE). To be conservative, all PCE calculations assume combo units for the total volumes.
2. Completion activities may be performed in parallel, and durations are not necessarily additive for this phase of the project.

Sight Distance Evaluations

Sight distance is an important measure to determine the safety of a vehicle entering a roadway. Stopping sight distance (SSD) is the minimum distance a vehicle driver needs to be able to see to have room to stop before colliding with an object in the roadway. Insufficient sight distance can adversely affect the safety or operations of a roadway or intersection. A desktop evaluation of sight distance measurements was made using Google Earth at the existing access from Manila Road. The posted traffic speed limit along Manila Road is 45 miles per hour (mph). Using the Colorado Department of Transportation (CDOT) State Highway Access Code (Colorado Department of Transportation, 2002), the design stopping distance for a 45-mph road is 400 feet. The stretch of Manila Road with the existing site access, is straight, relatively flat and there are no trees or obstructing structures. Using street view in Google Earth, the SSD of 400 feet is clear both north and south bound toward the access (**Figure 2**).

Figure 2. Sight stopping distance. Left picture 400 feet south of the existing access facing north. Right picture 400 feet north of the existing access facing south.

Another important measure of sight distance is the entering sight distance. Guidelines for measuring these distances can also be found in the State Highway Access Code. Entering sight distance is the sight distance a vehicle entering a roadway needs to safely make the movement. Section 4.3 of the State Highway Access Code provides a list of required entering sight distance values for varying types of entering vehicles. An entering sight distance of 765 feet is required for multi-unit trucks for a two-lane roadway at 45 mph, such as Manila

Road. Again, using street view in Google Earth, the entering sight distance of 765 feet is clear both east and west bound looking out from the access (**Figure 3**).

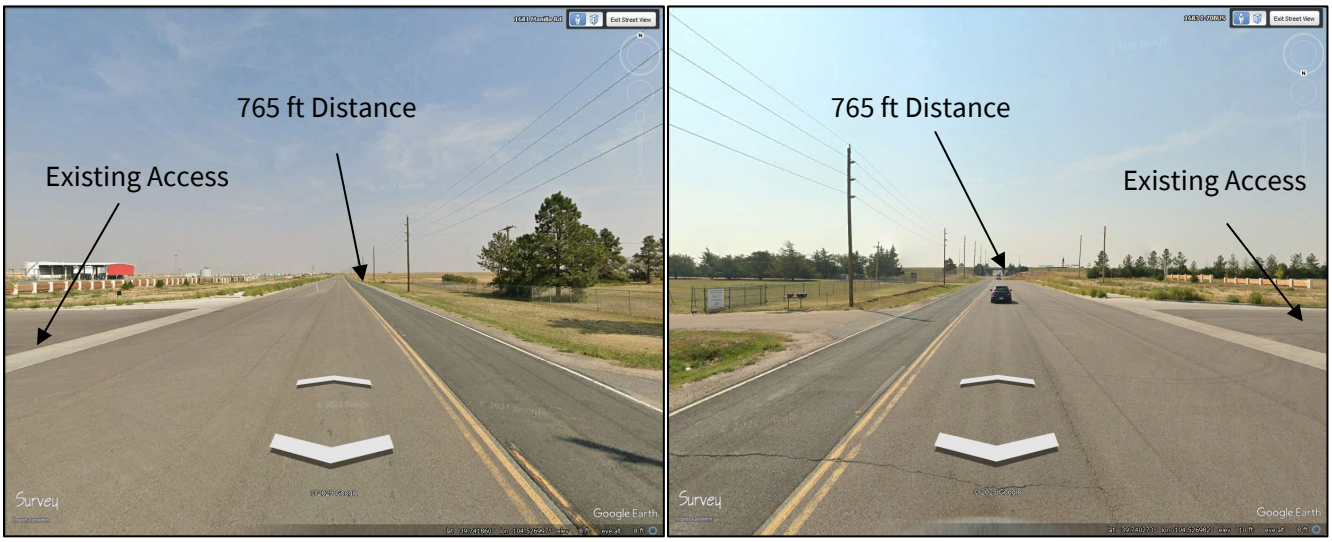


Figure 3. Entering sight distance. Left picture from the existing access facing north. Right from the existing access facing south.

Conclusions

Based on the details above, Tetra Tech anticipates that the Bennett D Pad will have a minor impact on traffic volume during the construction and development period of the project. After completion of the construction build-out phase, there should be minimal impacts to traffic along Manila Road related to the Bennett D Pad project site.

The existing access meets safety requirements for both the driving public and the development traffic. There is adequate visibility for inbound and outbound project traffic to negotiate the access and make full turn movements. Traffic throughout the construction and development phase of the project is anticipated to exceed the CDOT warrant for a left turn auxiliary deceleration lane (10 PCE per hour during the peak hour); however, due to the temporary nature of the impact (less than a year) construction of an auxiliary lane would be potentially be more disruptive to the driving public. Tetra Tech recommends a traffic control plan with additional signage during the peak periods of traffic.

Tetra Tech understands that the County may require a road maintenance agreement to help manage potential damages from the project traffic. Crestone has indicated they are amenable to such an agreement if warranted. Tetra Tech would recommend that the term of any such road maintenance agreement be focused on potential damage that may be incurred during the construction of the facility.

References

Colorado Department of Transportation. (2002). State Highway Access Code. Transportation Commission and Office of Transportation Safety.