FORM 28 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303) 894-2100 Fax: (303) 894-2109

FOR OGCC USE ONLY

Surety ID: _____

CENTRALIZED E&P WASTE MANAGEMENT FACILITY PERMIT

Submit this Form and accompanying documents for each facility per Rule 908. Financial Assurance in the amount of $50,000 is required to operate each facility.

OGCC Operator Number: 95960
Name of Operator: Wexpro Company
Address: PO Box 458
City: Rock Springs **State:** WY **Zip:** 82902

Contact Name and Telephone:
Tammy Fredrickson
No: 307.352.7514
Fax: 307.352.7575

Surface Owner (if different than above): Dept of Interior, Bureau of Land Management
Address: 455 Emerson Street
City: Craig **State:** CO **Zip:** 81625 **Phone:** 307.826.5000

Facility Name: Powder Wash Evaporation Facility
Address:
City: Powder Wash **State:** CO **Zip:**
Phone: 307.352.7481 **Fax:** 307.352.7942

Location (QtrQtr, Sec, Twp, Rng, Mer): NWNW, 4, 11N, 97W, 6th
Latitude: 40.946683
Longitude: -108.301703

Complete the Attachment Checklist

	Oper	OGCC
Site description (topo, geol, hydro)	✓	
Adjacent land use description	✓	
Topographic map	✓	
Site drainage map with structures	✓	
Scaled drawing and survey map	✓	
Facility design & engineering	✓	
Operating plan	✓	
Water analysis report	✓	
Financial assurance	✓	
Closure plan	✓	
Local gov't zoning compliance	✓	
Local gov't permits and notice	✓	

1. Is the site in a sensitive area? ☐ Y ☑ N

2. What are the average annual precipitation and evaporation rates for the site? Precipitation: 12 inches/year Evaporation: 36 inches/year

3. Has a description of the site's general topography, geology and hydrology been attached? ☑ Y ☐ N

4. Has a description of the adjacent land use been attached? ☑ Y ☐ N

5. Has a 1:24,000 topographic map showing the site location been attached? ☑ Y ☐ N

6. Has a site plan showing drainage patterns, diversion or containment structures, roads, fencing, tanks, pits, buildings and any other pertinent construction details been attached? ☑ Y ☐ N

7. If site is not owned by the operator, is written authorization of the surface owner attached? ☑ Y ☐ N

8. Has a scaled drawing and survey showing the entire section(s) containing the proposed facility been attached? ☑ Y ☐ N

9. What measures have been implemented to limit access to the facilty by wildlife, domestic animals or by members of the public? Briefly explain.

~~Entire perimeter is fenced with a gate at the entrance. Skim pit will be netted and evaporation pond will have a Bird Avert system in place.~~

10. Is there a planned firelane of at least 10 feet in width around the active treatment areas and within the perimeter fence? ☑ Y ☐ N

11. Is there an additional buffer zone of at least 10 feet within the perimeter firelane? ☑ Y ☐ N

12. Have surface water diversion structures been constructed to accommodate a 100-year, 24-hour event? ☑ Y ☐ N

13. Has a waste profile been calculated according to Rule 908.b.6? ☑ Y ☐ N

14. Has facility design and engineering been provided as required by Rule 908.b.7? ☑ Y ☐ N

15. Has an operating plan been completed as required by Rule 908.b.8? ☑ Y ☐ N

16. Has ground water monitoring for the site been provided? ☑ Y ☐ N ***Attach Water Analysis Report, Form 25, for each monitoring well installed.***

17. Has financial assurance been provided as required by Rule 704? ☑ Y ☐ N

18. Has a closure plan been provided? ☑ Y ☐ N

19. Have local government requirements for zoning and construction been complied with? ☑ Y ☐ N

20. Have permits and notifications required by local governments and other agencies been provided? ☑ Y ☐ N

Print Name: Kasey Werkele

Signed: _____ Title: Director of Operations Date: 3/15/18

OGCC Approved: _____ Title: _____ Date: _____

CONDITIONS OF APPROVAL, IF ANY:

Facility Number:

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Dominion Energy

Rule 908.b
Supplemental Narrative

Wexpro Company®

Powder Wash Evaporation Facility

COGCC FORM 28
POWDER WASH PRODUCED WATER EVAPORATION FACILITY
SUPPLEMENTAL INFORMATION

This supplemental to the COGCC Form 28 for Wexpro Company's proposed Powder Wash Evaporation Facility (PWEF) provides additional information required by COGCC Rules 704 and 908.

Wexpro Company is proposing to construct and operate a non-commercial produced water evaporation pond. The evaporation pond will reduce and eliminate trucking water to a commercial disposal site. The pond will not be covered or netted. Construction of the facility will be completed in one phase with an anticipated start date of August 1, 2018.

Wexpro Company has applied for a Conditional Use Permit (CUP) with Moffat County Colorado. A copy will be submitted to the COGCC upon approval. In addition a COGCC Form 2A has been applied for.

Applications for permits for air emissions from the facility have been submitted to the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD).

This facility is not within a Sensitive Wildlife Area as defined by the COGCC.

Rule 704:

An estimate of the cost for reclamation, closure, and abandonment of the proposed facility has been included with this submittal. Prior to the commencement of construction, Wexpro Company will provide the required financial assurance to COGCC. Financial assurance will also be required by the surface owner in the form of a reclamation bond.

Rule 908.a.:

The proposed facility is a non-commercial, centralized E&P waste management facility for the disposal and evaporation of produced water and will only serve Wexpro Company operations in the Powder Wash, Ace, and Jacks Draw fields of Moffat County, Colorado.
Wexpro Company (Operator Number 95960)
Powder Wash Produced Water Evaporation Facility (Document Number 401520294[02A])

Rule 908.b.(1):

This facility will be operated by Wexpro Company. The information required by this rule is as follows:

Operator Name:	Wexpro Company
Address:	P.O. Box 458, Rock Springs, WY 82902
Phone:	(307) 352-7481
Fax:	(307) 352-7942
Contact Person:	Jon Lison, Field Foreman

Rule 908.b.(2):

The Department of the Interior, Bureau of Land Management, Little Snake Field Office is the surface owner of this location. Surface construction is authorized by Lease Serial Number COC038749A. (Attachment A-9) Additional authorization for trucking and bringing in off lease water will be granted under a BLM Rights-of-Way Grant which has been applied for and is pending approval. A copy of the final approval will be submitted to the COGCC via Sundry Notice. Archaeological and Paleontology surveys have been completed and are included in this submittal as Attachment A-15.

Landowner Name:	Bureau of Land Management
Address:	Little Snake F.O., 455 Emerson Street, Craig, CO 81625
Phone:	970-826-5000
Fax:	970-826-5002
Contact Person:	Bruce Sillitoe, Field Manager

Rule 908.b.(3):

The project is located in Moffat County, Colorado. The legal description of the site is as follows:

NW1/4 of Section 4, Township 11 North, Range 97 West, 6th P.M., Moffat County, Colorado

General directions to the Powder Wash Field from Craig, Colorado are as follows: From Craig, proceed North on Highway 13 approximately 30 miles. Turn left onto Moffat County Road 4 and proceed west approximately 30 miles.

Rule 908.b.(4):

A topographic map of the location is provided in Topo B (Attachment A-10). The geology and hydrology of the site are described in greater detail below. The average annual precipitation in the area of the facility is approximately 11-12 inches (Western Regional Climate Center records from Dixon, WY, station number 482610 and Baggs, WY, station number 480484). The average annual evaporation rate in the area of the facility is approximately 36 inches (National Weather Service Evaporation Map of the United States).

Evaporation is a major component of the facility. The intent of the facility is to maximize evaporation with the use of Land Shark evaporators. Adjacent uses include rural livestock grazing and oil and gas operations.

Rule 908.b.(5).A.:

The site plan identifies all of the facility features, including all proposed equipment. Construction, drainage, and storm water details are provided in the engineered grading plans. Drainage details have been prepared by a licensed professional engineer and are in accordance with COGCC requirements. The site has potential for a small amount of runoff which should be adequately handled by utilizing diversion ditches. Wexpro Company will also utilize waddles and sediment traps as needed.

Refer to Topo A and Topo B (Attachment A-10) for access road information. The proposed access road is approximately 432' feet in length. Approximately 117 feet will be new

construction and 315 feet is existing road. The entire access road will be authorized under rights-of-way with the Bureau of Land Management, Little Snake Field Office. Water turnouts are utilized to divert runoff water from the road ditch in such a manner as to not cause erosion. Surface disturbance and vehicular travel will be limited to the approved access route.

As shown on Figure 5, one 18 inch culvert will be placed on the channel bottom, on a firm uniform bed, which has been shaped to accept it and aligned parallel to the channel to minimize erosion. Backfill will be thoroughly compacted. The culvert will be approximately 24 feet in length, with inlet and outlet drainage within the 50 ft rights-of-way. The snow will be removed from the road during winter as needed. Equipment used for snow removal will be equipped with shoes to keep the blade six (6) inches off the ground surface. Special precautions will be taken to ensure that equipment blades do not destroy vegetation. Include language for snow plow depth, etc.

Any topsoil (approximately 6 inches) removed in conjunction with road construction will be spread in the borrow area and will be seeded as discussed in the reclamation plan. Moffat County Road 4 is paved and maintained by Moffat County Road and Bridge. Moffat County Road 75N is a gravel field road that is also maintained by Moffat County Road and Bridge. Wexpro Company will maintain the immediate access road once constructed. Authorization for the new road will be granted under a rights-of-way with the Bureau of Land Management.

Rule 908.b.(5).B.:

A Location Drawing is included in this submittal. The distance at the surface to the nearest section lines are approximately 1038 feet from the north section line and approximately 1229 feet from the west section line.

Rule 908.b.(5).C.:

Public access to the facility will be controlled by a locked gate at the entrance of the PWEF. The access road will be graveled with 6 inches of pit run and maintained in good running condition. The snow will be removed from the road during the winter as needed. Wexpro Company will coordinate with Moffat County Road and Bridge on the maintenance of Moffat County Road 4 and Moffat County Road 75N.

The entire facility will be fenced, to restrict access to the facility by wildlife and domestic animals. The skim pit will be netted with #18 Twine 1" square mesh that is knotted and contains a UV blocker manufactured by American Nettings and Fabrication. The evaporation pond will not be netted. Wexpro Company is proposing the Peregrine Falcon Bird Avert system in lieu of netting. (Attachment A-3) Wexpro Company currently utilizes the Bird Avert System on three of our produced water evaporation facilities located in Wyoming. The system was highly recommended by Paul Brown with the U.S. Fish and Wildlife Service in Lander, Wyoming and has proven to be successful over the last five years.

There are several components that make this system effective. Over a quick two second period, the system has a Furuno radar that captures images upon software command and acts as a mediator between the computer software and the radar.(Attachment A-11) The Bird Avert software requests images from the radar and scans them for moving objects of sufficient size to be birds. Once birds are detected, the software issues a firing command over a radio link to the remote mechanized falcon unit(s). The controller units in-turn fire

their associated hazing device(s); sound, light, and motion. The oversized plastic falcons have a five-foot wingspan that violently flap their wings, high-intensity strobe lights come on, and the sound of a falcon screaming plays through the speaker system.

One cattle guard will be installed at the entrance of the facility to prohibit entrance by domestic animals and wildlife.

Fencing details are shown on attachment Figure 5. (Attachment A-10) The fence is designed to meet BLM requirements and will incorporate a 1-foot vertical barbed-wire arm extension to be added to the top of the current fence design to bring the total height to 9 feet. Chicken wire, three feet in height, will be added to the design to prevent small mammals from accessing the facility. The chicken wire will be added to the outside and anchored to the chain-link fence.

Rule 908.b.(5).D.:

A 30 ft. buffer zone/fire lane will surround the facility inside the fence.

Rule 908.b.(5).E.:

The grading and drainage plans are included in this submittal as shown on Sheet 2, Sheet 3, and Sheet 4 illustrated in Attachment A-10. Details of the surface water diversion structures designed to accommodate the precipitation events are outlined on Sheet 2. Based on the elevation difference between the PWEF and the Lower and Upper Powder Springs, 4 -5 miles north of the project area, it is highly unlikely that a flood would impact this facility. There are seasonal springs to the south.

Wexpro Company's Stormwater Management Plan (SWMP) (Attachment A-12) is provided as part of the submittal for this facility and is included as part of the Contingency Plan.

This facility has been designed to accommodate a 100-year, 24-hour event; by a certified professional engineer.

Rule 908.b.(6).:

Analytical data establishing a waste profile for the produced water anticipated to be evaporated at this facility is included in the submittal. The documentation includes:

- A mass-intake balance for the facility representing anticipated monthly volumes for intake and evaporation over a 7 year period.
- Chemical analysis of fluids that will be submitted as part of the COGCC Form 28.

All produced water goes through a separator on the individual well pads to remove the majority of hydrocarbons and dissolved solids prior to being stored in a produced water tank on location. Wexpro Company will be taking all precautions to avoid any Hydro-Carbons entering the evaporation pond. Initial Separation of Gas, Condensate and Produced Water occurs at the well location through a separation process. **Initial** Separation of Gas, Condensate and Produced Water occurs at the well location by interrupting the gas flow with pressure cuts, heat and forcing retention time in a three phase separator where the liquids and vapors are allowed to naturally separate from each other. Once the liquids have naturally separated and somewhat stabilize inside the vessel, mechanically controlled valves open at specifically set parameters allowing water to be dumped through piping to the water tank and

condensate dumped through piping to the condensate tank. Once the liquids have entered the specified tanks, a **second** point of much more efficient natural separation takes place which is manually interfered with to move water and condensate to their appropriate tankage via pump truck transferring. The produced water would then be hauled, by trucks within the Powder Wash, Jacks Draw, and Ace field to the evaporation facility where the water truck driver connects hoses equipped with camlock fittings to a pump skid, engages the skids electrically driven offload pump which pumps the contents of the truck through a series of filters, to a skimmer tank which would serve as a **third** point of separation to extract any potential hydrocarbons. From the tanks, the produced water is transferred to a lined and netted skim pit, which would be approximately 100' x 58', this skim pit would serve as a **fourth** point of separation to separate any potential hydrocarbons. The produced water would then be transferred to the evaporation pond, which would be approximately 300' x 300'. The produced water is then pumped from the pond to Barracuda Wastewater evaporators where the water is forced through a stainless steel manifold with 30 spray nozzles specifically designed to allow longer float times maximizing evaporation. The evaporators will be electronically controlled to operate only during specific weather conditions related to humidity, wind speed and temperature with intent of minimizing or eliminating overspray. Sheen or free product will not be allowed on the water disposal evaporation pond.

Rule 908.b.(7).:

The water disposal facility has been designed by a professional engineer with features to prevent spills or leaks from impacting ground water. Wexpro's operational procedures for this facility are designed to minimize risks to the environment and accommodate for rapid response in the event of an accidental spill or release of produced water. Wexpro Company's SPCC plan is attached to this submittal. (Attachment A-13)

Rule 908.b.(7).A.:

A comprehensive report from the Natural Resources Conservation Service (NRCS) Colorado is provided and a report on geological and hydrological conditions has been provided. A generalized geologic map and soil map of the project area is provided in the "Figures" section.

Soils encountered are part of the Tresano-Hiatha-Kandaly Association, which occur on 2-20% slopes and in alluvial fans and valley bottoms (Natural Resource Conservation Service 2017). Soils consist of lams, clay loams, and silty clay alluvium derived from sandstone and shale. Also present is loamy/silty sand derived from decomposed sandstone bedrock and redeposited in the form of Aeolian sheet and shadow deposits.

Underlying bedrock consists of alternating bands of tan to gray sandstone and mudstone.

Vegetation is sagebrush and bunchgrass, including greasewood in the lower, poorly drained alkaline soils. Juniper is common on the ridge slopes and tops.

Rule 908.b.(7).B.

A map of surface water features within two miles of the proposed facility is provided in TOPO W. The closest surface water is a seasonal drainage 481' south of the proposed facility. **Rule 317B.** Public Water System Protection. Rule 317B is applicable to DCPS Operations within Surface Water Supply Areas. Upon review of the Public Water System

Surface Water Supply Area Map, there are no surface waters subject to COGCC Rule 317B.

There are no shallow groundwater aquifers on or near the proposed facility. Data available from the Colorado Division of Water Resources (Aqua Map) service and COGCC online GIS indicates there are three registered wells within a one mile radius of the proposed facility. Information on these wells is provided below.

Permit #	Well Depth	Depth to Groundwater	Yield	Well Status
16212R	766'	Unknown	Unknown	Abandoned Musser 1
35880F	812'	639'	72 AF Annually	Constructed Musser 3
35879F	775'	Unknown	72 AF Annually	Constructed Musser 2

The area is not within a flood hazard as identified by FEMA. According to the Army Corps of Engineer standards it was determined that the proposed project will not have any impacts to wetlands, or adversely affect water quality in any nearby waterways.

The PWEF has been designed to significantly reduce the potential for the facility to impact nearby surface or ground water. The proposed skim pit and evaporation pond will be lined with a 4 part HDPE liner system, which will also include a leak detection system. (Attachment A-7)

1. Primary Liner, 60 mil min. HDPE.
2. 200 Mil GSE Hypernet Geonet or Approved Equal.
3. Secondary Liner, 60 mil min. HDPE.
4. Geotextile Fabric or Bedding Material Under Bottom Liner

In addition, Wexpro Company will install 3 leak detection observation sump monitoring wells; two at the evaporation pond and one at the skim pit. Sheet 4 shows the approximate location of the observation sumps.

Wexpro Company does not anticipate impacts to nearby surface and ground water from the facility. Potential impacts are addressed by adhering to the COGCC design criteria for liners, leak detection and operation. Additionally, potential impacts are also addressed by implementation of the SWMP document. All BMP's will be maintained throughout the life of the facility to contain any unintentional releases.

Rule 908.b.(7).C.:

The site plan for the facility and the grading plan and drainage report provide engineering details for the facility. The liners that will underlay the skim pit and evaporation pond will be two 60 mil impervious synthetic liners.

Field seams for the skim pit and evaporation pond will be installed and tested in accordance with manufacturer specification and good engineering practices. Test results will be maintained at Wexpro Company's Rock Springs office and provided to the Director upon request.

The synthetic material in the liners will be impervious, with high puncture and tear strength, adequate elongation, and resistance to deterioration by ultraviolet light, weathering, hydrocarbons, aqueous acids, alkali, fungi, or other substances in the produced water being evaporated.

In accordance with the "Guide to Construct and Administration of Dams in Colorado," Office of the State Engineer, Division of Water Resources, March 2010 (Guide), this design is considered to be a "Non-jurisdictional Size Dam", and the construction of the berms for the evaporation pond is not regulated by the DWR or the U.S. Army Corps of Engineers. The pond capacity is less than 100 acre-feet, and the surface area is less than 20 acres. The fill slope to be constructed for the pond does not exceed the statutory limit of 10 feet as described in the Guide.

Construction drawings demonstrating the design components of the pond and skim pit, depth to cut, dimensions, grades, structures and access road are included in this submittal.

Topsoil will be stripped to a depth of 6 inches and all organic material will be removed prior to placing fill. Fill will be keyed in to the native material with a 10 foot wide 2 foot deep keyway. All fill material will be compacted to at least 95% of optimum as obtained by AASHTO method T99. The pond is being constructed in cut material. No portion of any pond will be constructed on fill material, unless the pond and fill slope are designed and certified by a professional engineer. The top of the pond will be a minimum of 15 feet wide to accommodate compaction equipment and liner anchoring. The bottom of the ponds will slope toward each of the four corners to allow for the leak detection system. Final grade of the bottom and interior sides of the ponds will be worked until a smooth bedding surface is obtained meeting the liner manufacturer's requirements. The liner will be installed by qualified personnel. The construction and lining of the pond will be supervised by a professional engineer or their agent. Liner seams and welds will be tested according to manufacturer's specifications and procedures. The 60 mil HDPE liner adequately protects the interior slope from erosion due to wind/wave action.

Rule 908.b.(8):

An operating plan and contingency plan for the facility are included in this submittal.

The total approximate volumes and water surface elevations of the pond are illustrated on Sheet 2. The finished grade of the facilities pad is 6704.15'.

The 15' dike around the pond is loped at 2% toward the pond, so the inside edge is 6698.85' and the outside edge is 6699.15'.

The finished grade elevations for any of the reference points illustrated on Sheet 2 can be identified in the coordinate tables at the bottom right corner.

The pad is 5' higher than the top of the dike to give plenty of slope to flow from the skim pit to the pond, and to help reduce the amount of excess material.

Wexpro Company's policy is to maintain accessibility to the facility at all times.

Updates to the plan, as recorded, will be provided to the COGCC with a Form 4, Sundry Notice.

Rule 908.b.(9)A:

There are three water wells located within one mile of the proposed facility. All are owned by Dominion Energy Questar Pipeline Company, a sister company to Dominion Energy Wexpro. The wells are within a 1 mile radius east of the proposed facility. Wexpro Company currently samples the Musser 2 water well, Permit number 35879F on a quarterly basis. This water is utilized for the Powder Wash Camp facility as non-potable.

Permit #	Well Owner	Well Status	Last Analysis	Testing Interval	Comments
16212R	QPC	Abandoned	Unknown	Unknown	Plugged and Abandoned.
35880F	QPC	Active	Unknown	Not Tested	Used for field operations.
35879F	QPC	Active	1/11/2018	Quarterly	Used as camp water at Powder Wash Camp.

The last analytical results available are included in this submittal. (Attachment A-14) These results will be used as a baseline. Follow-up samples will be conducted once per year following the construction and initial operation of the facility, unless a leak is detected, in which case, sampling will be conducted immediately. All test results will be submitted within 3 months to the Director.

Rule 908.b.(9).B.:

As previously discussed above, under Rule 908.b.(7).B, the evaporation facility has been designed with a number of features that significantly reduce the potential for this facility to impact groundwater. In addition to these features, Wexpro will sample the existing water wells mentioned above.

The two monitoring wells will be sampled quarterly during the first year of operation. The samples will be analyzed for BTEX, TDS, Chlorides and Sulfates. The entire facility will be regularly inspected per the Operating Plan and according to the checklist criteria. If a leak is detected at the evaporation pond the testing criteria may be expanded to accommodate suggestions from the COGCC and BLM. In the event of significant variability in analytical results of any given sample or in the case of leak detection, Wexpro Company will cooperate with COGCC to modify the frequency of sampling. All test results will be provided to the Director within 3 months of collecting the samples, and laboratory results will be submitted in an electronic data deliverable format as required by 908.b.(9).A.

Rule 908.b.(10).:

Wexpro has no history of completing any surface water sampling within the Powder Wash field.

As described in the attached Geologic/Hydrologic Assessment; LT Environmental, Inc. installed six groundwater monitoring wells at the QEP Field Services Powder North CS South Pit to address environmental concerns. Please reference the Geologic and Hydrologic

assessment completed by Trihydro that has been included in this submittal.

Rule 908.b.(11).:

A contingency plan for the facility is included in this submittal.

The Operating Plan addresses all required elements including contingency planning. Wexpro Company's roles and responsibilities are outlined in the Operating Plan. Additional contingency planning details are part of the Emergency Response Plan that is also included in this submittal.

Rule 908.c.:

No response required.

Rule 908.d.:

A Reclamation Cost Estimate outlining the cost for proper reclamation, closure and abandonment of the proposed facility is provided in this submittal. Prior to the commencement of construction, Wexpro Company will provide the required financial assurance to the COGCC. A reclamation bond will also be required by the BLM, surface owner.

Rule 908.e.:

Throughout the life of the facility, Wexpro Company will submit all proposed modifications to the facility design, operating plan permit data, or permit conditions to the Director for prior approval via Sundry Notice.

Rule 908.f.:

Wexpro Company will submit an annual report summarizing operations, including the volume of waste actually handled at the facility.

Rule 908.g.:

A preliminary plan for reclamation and closure of the facility, as well as a cost estimate to reclaim the facility is provided in this submittal.

Rule 908.h.:

Wexpro Company has filed or will be filing the following permits with local government and surface owner entities. Wexpro Company will provide copies of the approval notices and permits to the Director.

Agency	Requirement	Status
Bureau of Land Management	Rights-of-way Application	Submitted – Pending
Colorado Dept of Public Health	Air Permit Application	Submitted – Pending
	SPCC Plan Revision	Submitted - Pending
Moffat County	Conditional Use Permit	Submitted – Pending

Rule 210.c.

The main point of access will be marked by a sign captioned "Wexpro Company E&P Waste Management Facility". The sign will be no less than three square feet and no more than six square feet and shall provide:

- Phone number where operator can be reached at all times
- Phone number for local emergency services (911 where available)
- Public road used to access the facility
- Legal location including quarter quarter section of the facility.

Rule 210.d.:

All tanks will be labeled with the following information:

- Name of Operator
- Operator's emergency contact telephone number
- Tank Capacity
- Tank Contents
- NFPA Label

Rule 210.e.:

No sign will be installed above 6 feet in height.
Signs will be maintained in legible condition and Wexpro Company will replace damaged or vandalized signs within sixty (60) days.

Rule 316.c.J Notice of Pit Liner Installation.

At least 48 hours advance written notice of intent of pit liner installation at the facility will be given to the COGCC by submitting a Field Operations Notice, Form 42 – Notice of Pit Liner Installation.

Rule 316.c.M Notice of Completion of Form 2A Permit Conditions.

If required by condition of approval, Wexpro Company will give written notice to the COGCC of completion of permit conditions by submitting a Field Operation Notice, Form 42, Notice of Inspection Corrective Actions Performed.

Single-Sided Geocomposite
200mil Geonet

Geonet Component[4]

Property	Test Method	4-200	6-200	8-200	10-200	12-200
		Minimum Average Roll Value[5]				
Thickness, mil	ASTM D5199	200	200	200	200	200
*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)						
Peak Tensile Strength, lbs./in. (MD)	ASTM D5035	45	45	45	45	45
Melt Flow Index, g/10 minutes (max.)	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Density, g/cm^3	ASTM D792, Method B	0.94	0.94	0.94	0.94	0.94
Carbon Black Content	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Transmissivity[1], m^2/sec.	ASTM D4716	2 x 10^{-3}	2 x 10^{-3}	2 x 10^{-3}	2 x 10^{-3}	2 x 10^{-3}

Geotextile Component (Prior to Lamination)

Property	Test Method	Minimum Average Roll Value[5]				
Mass per Unit Area, oz./sq. yd.	ASTM D5261	4.0	6.0	8.0	10.0	12.0
Grab Tensile Strength, lbs.	ASTM D4632	100	160	205	250	300
Grab Elongation, %	ASTM D4632	50	50	50	50	50
Trapezoidal Tear, lbs.	ASTM D4533	45	60	80	100	115
Puncture, lbs.	ASTM D4833	60	90	110	155	175
Mullen Burst, psi	ASTM D3786	210	305	350	460	585
Permittivity[2], sec.$^{-1}$	ASTM D4491	1.80	1.40	1.10	0.80	0.80
Water Flow[2], gpm./ft.^{2}	ASTM D4491	135	110	90	75	60
Apparent Opening Size, U.S. Stnd Sieve Size (max.)	ASTM D4751	70	70	80	100	100
UV Resistance after 500 hours, % Strength Retained	ASTM D4355	70	70	70	70	70

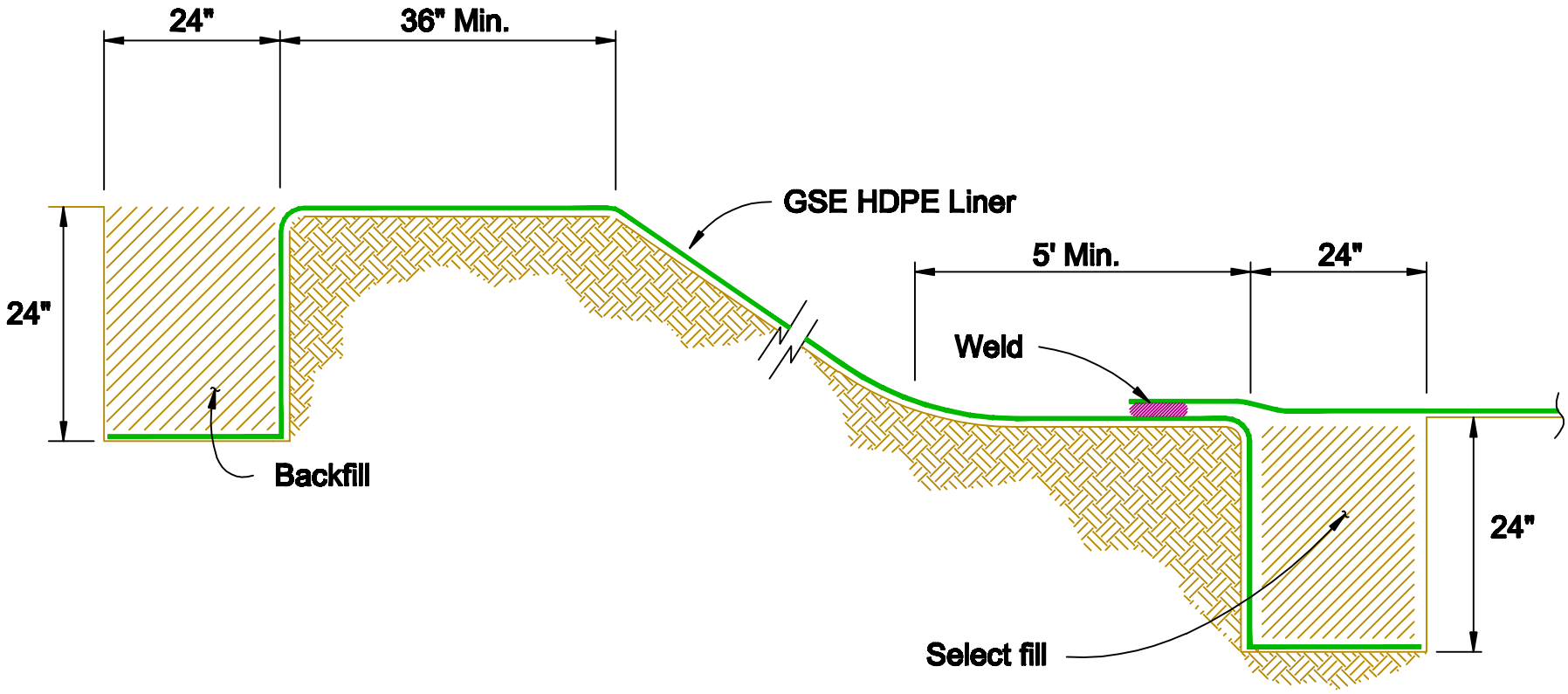
Geocomposite[4]

Property	Test Method	Minimum Average Roll Value[5]				
Laminated Strength (Ply Adhesion), lbs./in.	ASTM D7005	1	1	1	1	1
Transmissivity[3], m^2/sec.	ASTM D4716	1 x 10^{-3}	1 x 10^{-3}	1 x 10^{-3}	9 x 10^{-4}	9 x 10^{-4}

Agru America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), and Dimensional Stability via ASTM D1204 (±2% @ 100°C).

Notes:
(1) Geonet Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000psf: seating time 15 min. between steel plates.
(2) At time of manufacture. Handling may change these properties.
(3) Geocomposite Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000psf: seating time 15 min. between steel plates.
(4) Component properties are prior to Lamination
(5) Geonet, Melt Flow Index is a maximum value, and for Geotextile, AOS is a maximum average roll value.
(6) All roll lengths and widths have a tolerance of ±1%
(7) An alternate textile component may be supplied if required to meet project specifications.
(8) Weight is a TYPICAL value not a minimum average roll value.

500 Garrison Road, Georgetown, South Carolina 29440 843-546-0600 800-373-2478 Fax: 843-527-2738
email: salesmkg@agruamerica.com www.AgruAmerica.com

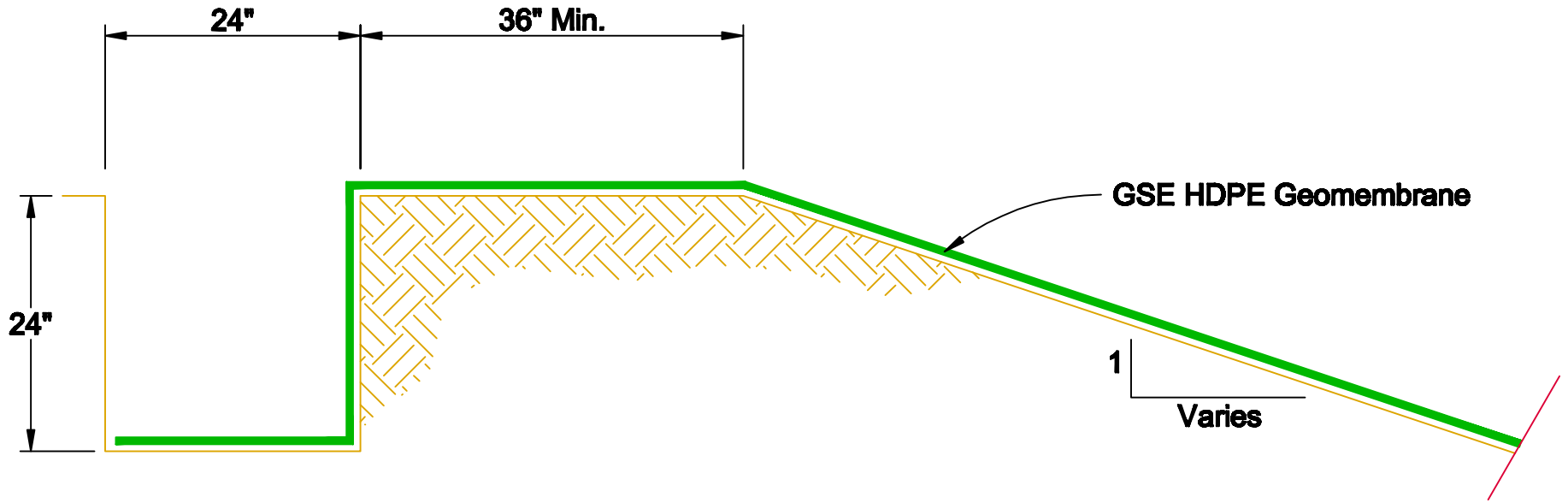


Anchor Trench @ Toe

Not to Scale

GSE Environmental, LLC
19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-006



Typical Anchor Trench

(Single Liner)
Not to scale

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19103 Gundle Road
Houston, Texas 77073-3598
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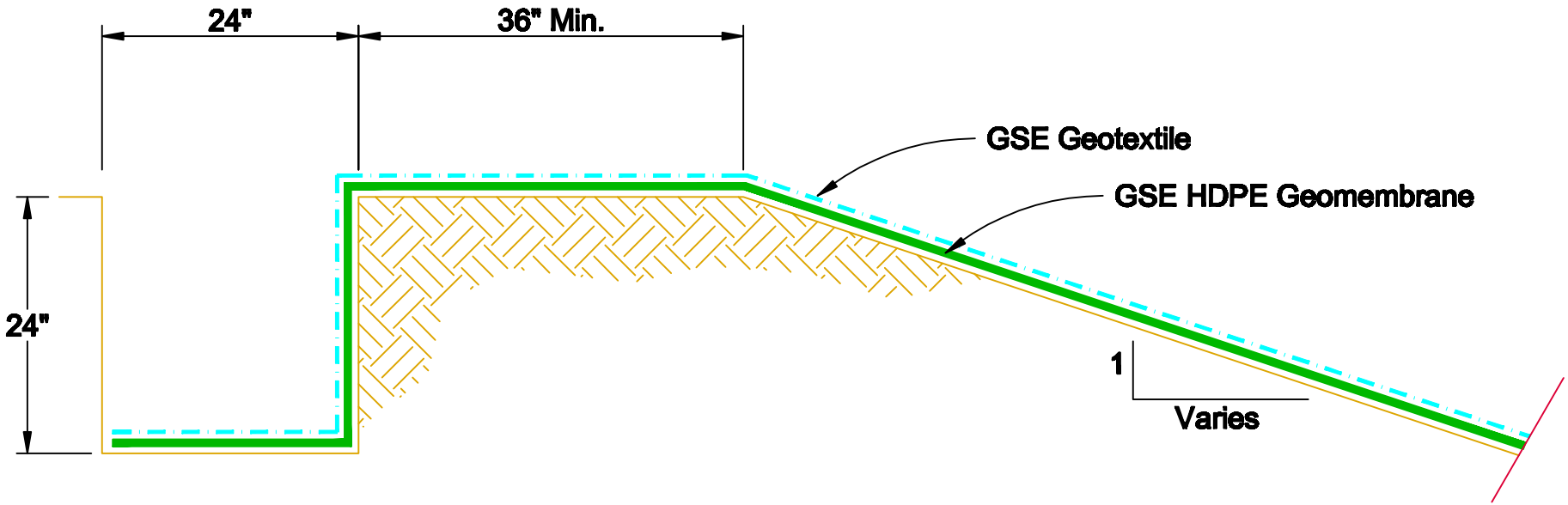
DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-001



Typical Anchor Trench

(Single Liner w/Cushion Geotextile)

Not to scale

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Houston, Texas 77073-3598
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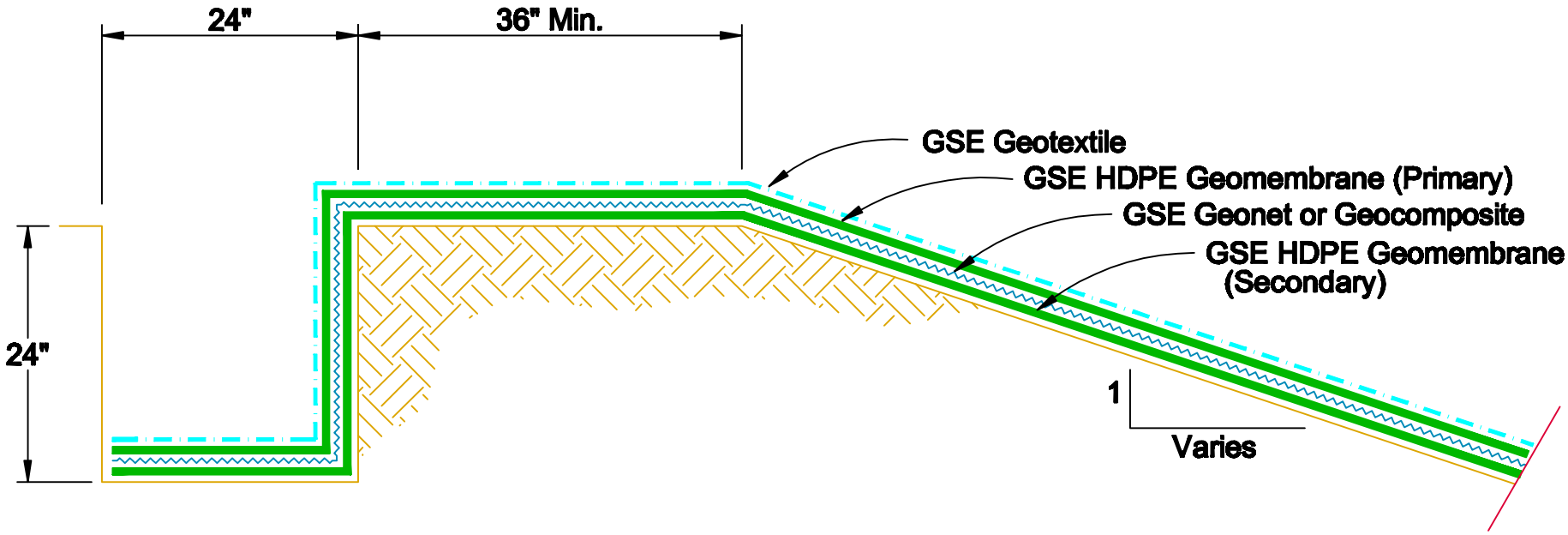
DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-002



Typical Anchor Trench

(Double Liner w/Drainage Layer & Cushion Geotextile)
Not to scale

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Houston, Texas 77073-3598
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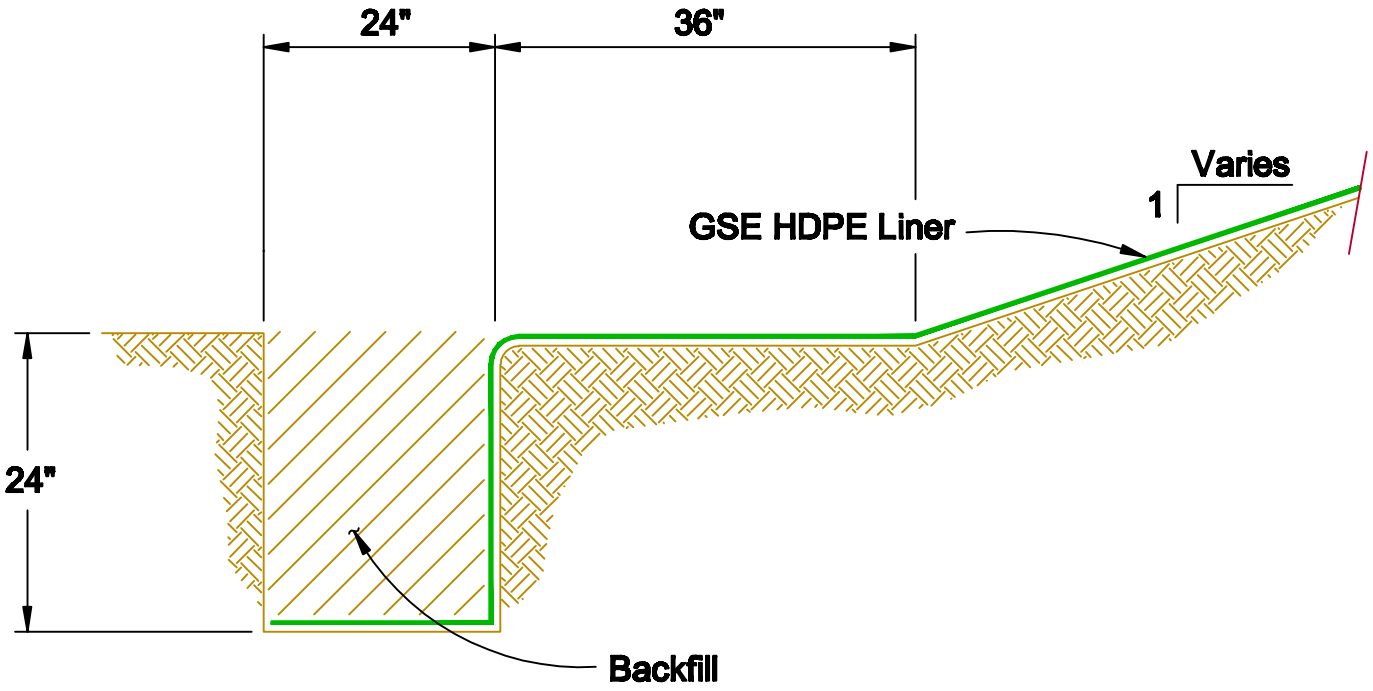
DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-003



Typical Cap Anchor Trench

Not to Scale

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19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

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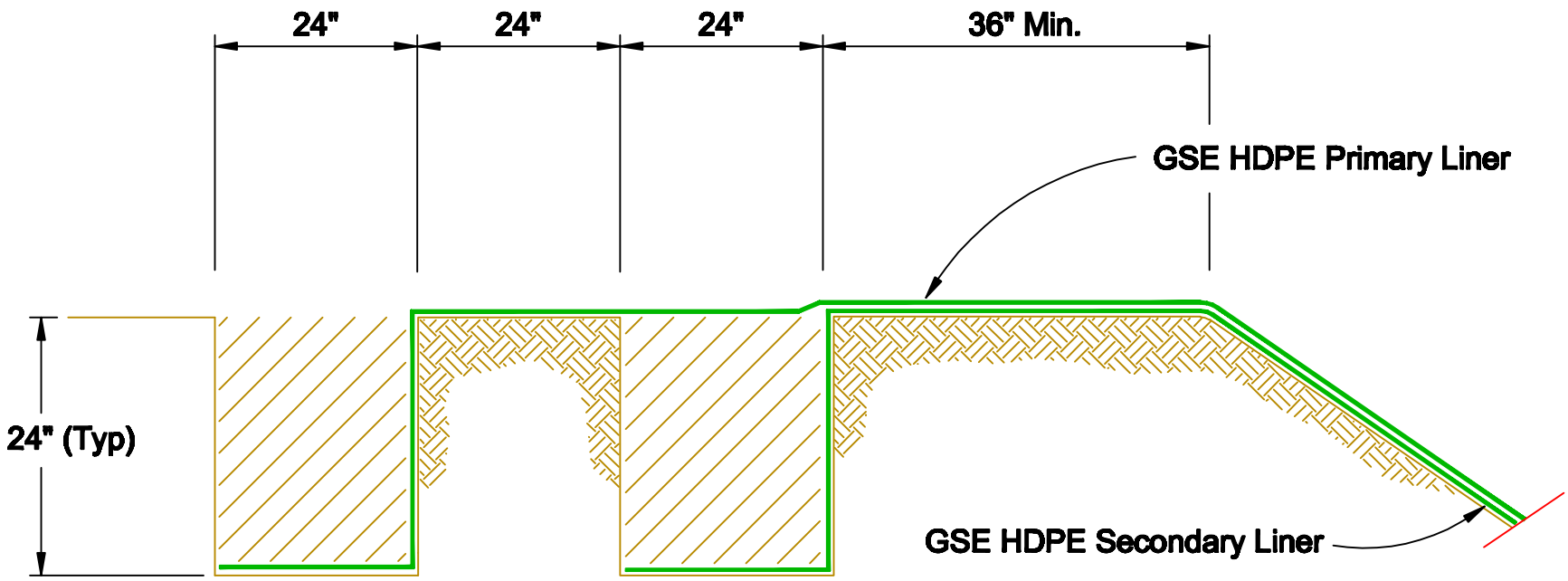

Typical Double Anchor Trench

Not to Scale

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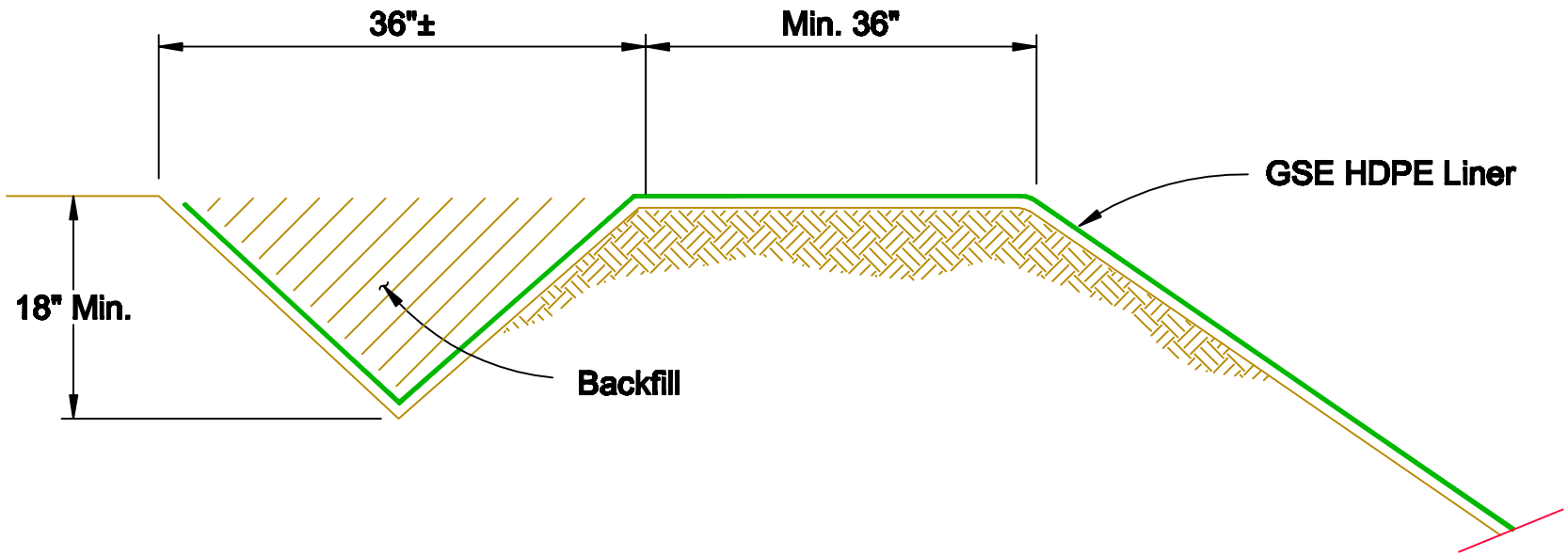
DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-005



V-Shaped Anchor Trench

Not to Scale

GSE Environmental, LLC
19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-007

Apex Evaporator Manual

Diamond Scientific, 55 East Broad Street, Titusville, Florida 32796, 1-321-223-7500, info@DiamondSci.com

Table of Contents

I. Handling and transporting the Apex
(Caution: when setting the floats on the ground they can be cut by sharp rocks and debris)

- To lift the Apex there are four slots in the frame to attach lifting equipment. If you purchased an diffuser for over spray a lifting bar is required so the ropes don't pinch the dish.
  Note: Adjust sub pump chains before lifting so this doesn't have to be done in the water.

II. Placing the evaporator;

- Choose a location where you can use the prevailing wind to help keep spray inside the pit.
- If diffuser was purchased, place dish at desire height before placing in pond. Adjustments might have to be made after turning on unit depending on weather. The higher the setting the more overspray you will have.
- Locking D rings are required to adjust height of diffuser dish if purchased.
- Before placing to Apex in the pond, lower both ends of the pump by the chain. The pump should be located approximately 18 inches below the surface of the water on the discharge front and hang lower in the rear to create an angle.

III. Connecting Power to Control Panel

- Take your power cord and hook it up to your power source. The onsite power source will be wired into the black circuit breaker box located in the upper right corner of the control panel. The electrical cords for the pump and Apex should be hooked up to the white mechanical contacts located in the lower left portion in the control panel. From left to right it should be wired black red white. The power cord for the Apex will be wired into the left white mechanical contacts. The power cord for the pump will be wired into the right white mechanical contact.
- Test the rotation of the pump and the Apex's fan to make sure that they are hooked up properly. To do this, briefly turn on the power to the Apex and pump then turn them off. The fans will continue to spin. For the pump, you should see a large amount of water spraying out. If there is a minimal amount spraying out you may need to change the wires. The fan for the Apex should spin clockwise. If the direction is not correct on the Apex fan, remove any two wires on the Apex

mechanical contacts and swap them. If the pump is not operating correctly, remove any two wires from the pump drive and swap them. If both fans are rotating in the wrong direction, swap any two wires from the power breaker box.

Apex

Type	Use	HP	Volts	Amps	Hrz.	Phase	RPM	
Toshiba	Fan	25	460	28	60	3	3520	Code G
Grundfos Pump		7.5	460	13.2	60	3	3460	Code G

IV. Placing the control panel and weather station;

- Set up the control panel in an area that will avoid over spray conditions if possible. Take your power cord and hook it up to your power source. The power source will be wired into the black circuit breaker box located in the upper right corner of the control panel. The electrical cords for the pump and Land Shark should be hooked up to the white mechanical contacts in the control panel. From left to right it should be wired black red white. The power cord for the pump will be wired into the right white mechanical contact unit located in the lower left side of the control box. The power cord for Apex will be wired into the white mechanical contacts located just to the left of the pump mechanical circuit.
- Test the rotation of the pump and the Apex's fan to make sure that they are hooked up properly. If the direction is not correct on the Apex's motor, remove any two wires on the Apex mechanical contacts and swap them. If the pump motor is not pumping correctly, remove any two wires from the pump drive and swap them. If both fans are rotating in the wrong direction, swap any two wires from the power breaker box.
- Now your weather station can be positioned by the control panel. Communication cable should be hooked up from the weather station to the control box.

V. **Attaching the Weather Station to the control box.**

First attach the Weather Station box mounting frame to the control box. The weather head attachment arm goes at the top. Attach the two legs of the mounting frame to the two predrilled holes on the top of the evaporator's control box. Next attach the Weather Station control box to the mounting frame. Once the Weather Station control box is attached, attach the weather head to the mounting arm located at the top of the mounting frame. The wind direction vane should be closest to the water. Once the weather head is attached, connect the weather head to the Weather Station via the communication cable. The weather head will attach to the Turk fitting on the bottom left side of the Weather Station.

VI. Connecting the Weather Station to the Control Panel

We prefer to connect the weather station to 110 volt power which can be found inside the main evaporator control box. There is a transformer that supplies 110 voltage to the switch and hour meter that we can tie into. This may require drilling a hole and installing a cord grip for a 14/2 gage wire with ground cable. After you verify the voltage and have connected to the main control box you will need to turn on the breaker for the main control box. The Weather Station should now have power. Make sure the control box is in auto mode and turn the Weather Station to ON after you have set all your parameters. The unit should start up on its own. You will also connect the Weather Station to the control box with the provided communication cable. This goes from the Turk connection located at the bottom right hand side of the Weather Station to the Turk connection on the bottom of the evaporator's control box. Make sure you have set the correct parameters; refer to the logo programming guide.

VII. Logo Programming Instructions for Weather Speed and Wind Direction

After powering up the wind station, press the down arrow until the date and time screen is shown then push the blue **esc (escape)** button. This should bring up the Set parameter screen as shown below.

>Stop
Set parameters
Set...
Program Name

To proceed scroll down to "Set Parameters" line with the down arrow key.

Stop
>Set parameters
Set...
Program Name

To change the settings for your parameters push the blue **OK** button to go to your next screen which should read "W speed".

W Speed
On=0
Off=x
Ax=Actual wind speed

This screen tells you the parameters the wind speed needs to be in for the evaporator pump to be running. Off=X will be the only number that we will be adjusting. **On** should always = 0 and **Off** should = the speed you wish to turn the evaporator off if there is a high wind. The wind will need to blow above the "Off speed" setting for a designated amount of time (see Off Delay p. 5) before it will shut down. After the wind calms down to 1mph below the off speed, for a designated amount of time, (see On Delay p. 4) the evaporator pump will turn back on. Ax = your actual wind speed at

that present time. To set the Off setting press OK, your screen should change to the Programming Screen. You will need to scroll continuously with the right arrow button to get from On=+00000 to >Off=+0000 as shown below. Again, On=+00000 needs to remain at 0. Your settings should **ALWAYS BE +** NOT –, as shown below.

W Speed
On =+00000
>Off =-00000
Ax = Actual Wind Speed

To adjust the off parameter you will use the up or down arrow button. You always start with your right most numbers. Below is an example of the off setting. If the wind reaches 15mph or higher for a designated amount of time, (see off delay setting p. 5) the evaporator pump will turn off. Once the wind slows down to 1mph less than your off speed for a designated amount of time, (see on delay setting p. 4) the evaporator pump will turn back on. The number in red is the number that has been adjusted.

W speed
On=+00000
Off=+00015
Ax= Actual Wind Speed

After setting your desired wind speed, press esc to return to the “W speed” screen. Proceed using the up arrow to scroll to the next screen. It will read:

Zone Dir
On= 20
Off=300
Ax= Actual Wind Direction

This screen creates the zones to enable you to turn the evaporator on and off with the wind directional vane. The wind vane detects the direction the wind is blowing on a 0^{o}-360^{o} clockwise scale. This allows the evaporator to be turned off if the wind is blowing from an undesirable direction. To adjust these parameters press OK. Manual manipulation of the wind vane will show the degree setting on the Ax line of the screen. The first setting (On=?) will set up the left hand side of your zone to turn the evaporator on. Turn the wind vane fin until it points at the area you want the unit to turn on. Then read the number displayed on the “Ax” line. This would be the number used for your “on” parameter. The second setting (Off=?) will set up the right side of the zone to the turn the evaporator off. Turn the vane towards the right side of the pit and get the “Ax” line reading for your “off” parameter. After setting your zones press ok to return to the “Zone Dir” screen.

Proceed using the up arrow to scroll to the next screen. This screen will be “Z Bypass” screen. The override setting is the maximum wind speed you would want it to run at while the wind is blowing from out of the parameters you just set. The screen below is a sample of a default setting.

Z Bypass
On= 0
Off= 3
AX= Actual Wind Direction

To change this parameter setting hit OK and adjust only the off =X setting. See below for example which shows an off speed of 3 mph. After this adjustment is made, press OK to return to the “Z Bypass” shown above.

Z Bypass On=+00000
Off=+00003
AX=+00000

Proceed using the up arrow to scroll to the next screen. This screen should read “On Delay”. This is the timer that turns the evaporator on after the wind has slowed down to the speed programmed previously in the “On Speed” screen. So if your unit is off due to the wind, it has to be back in its parameters for X seconds before it will turn back on. The unit comes with a default setting of 15 seconds. To adjust this timer press OK and use the arrow buttons to enter the desired time. When you are done press OK and the “On Delay” screen will reappear.

On delay
T=15:00s
Ta=Actual Timer

Proceed using the up arrow to scroll to the next screen. The “Off Delay” screen should appear as shown below.

Off Delay
T=15:00s
Ta= Timer

The “Off Delay” timer is used to turn the evaporator off after the wind has been blowing above your “off speed” for “X” amount of time. This delay time is what we are programming with this screen. To adjust this time first push OK, then use the arrow buttons to enter the desired time. When done press OK and the “Off Delay” screen will reappear.

Proceed using the up arrow to scroll to the next screen. This screen should read “Pump Hrs”.

Pump Hrs
MI=0h
MN=0h
OT= Actual pump run time

The OT=X shows you the total operation time of the evaporator pump. MI and MN can be ignored. None of these timers need to be adjusted.

Proceed using the up arrow to scroll to the next 3 screens. They should read “Q2 Delay”, “Q3 Delay”, and “Q4 Delay”. These screens are used if you have more than one evaporation unit hooked up to one weather station. The screens should appear as below.

Q = Delay

T = 05:00s

Ta = Actual Timer

This delay timer is used to help with the stress on the power source. When more than one unit is hooked up there will be a 5 second delay in each unit starting up or shutting down. No adjustments are needed for these screens.

There is a Weather Station Program Parameter sheet at the end of this document.

VIII. Starting the system;

- There are holes on the frame of the Apex on all four sides. Use these holes to attach a rope or cable. Once the rope or cable is tied securely, walk the Apex to the desired location in the pond. Secure the ropes or cables to the shore to stable anchoring device.
- Make sure control box cabinet door is locked.
- Start fan first
- Start pump

IX. Weather Station Program Parameters

Wind Speed (screen #1)

W Speed

On = +00000 (Needs to be set at 0)

Off = +00__

Ax = 00000

Off Delay (screen #5)

Offdelay

T = _____

Ta = 00:00

Zone Direction (screen #2)

Zone Dir

On = _____

Off = _____

Ax = 0

Pump Hours (screen #6)

MI = _____

MN = _____

OT = Actual pump run time

Zone Bypass(screen #3)	**Next 3 Screens**
Z Bypass	Q2 Delay, Q3 Delay, Q4 Delay
On = +00000 (needs to be set at 0)	T = 05:00s
Off = +00___	Ta = 00:00

On Delay(screen #4) ie. T=15:00s

On Delay

T= _____

Ta = 00:00

X. Definitions of the Headings

Wind Speed Off - This is the setting for turning off the evaporator in a high wind situation.

Zone Dir - This screen creates the zones to enable you to turn the evaporator on and off with the wind directional vane. The wind vane detects the direction the wind is blowing on a 0^{o}-360^{o} clockwise scale. This allows the evaporator to be turned off if the wind is blowing from an undesirable direction.

Z Bypass - This override setting will let the evaporation unit come back on while the wind is blowing out of its zone direction parameters until the wind hits this mph setting. The override setting is the maximum wind speed you would want to blow and still run the evaporator even though the wind is blowing out of its direction parameters

On delay - This is the delay timer that turns the evaporator on after the wind has slowed down to the speed programmed previously in the On Speed screen.

Off Delay – The Off Delay timer is used to turn the evaporator off after the wind has been blowing above your “off speed” for this amount of time.

Pump Hours – The amount of time that the pump has been in operation.

Q2, Q3, and Q4 Delays – These delays are used when multiple evaporation units are being used. This provides a delay in the start up of the evaporation units to save stress on the power source running the units.

XI. Storing your Apex

- Bring in the Apex and use the same lifting equipment as before.
- Pump is self-draining so will not freeze
- Hook the chains to the pump back up to secure pump.

  (Caution when setting the floats on the ground they can be cut by sharp rocks and debris)

XII. Warranty maintenance

Generally, Resource West Inc. Apex evaporators will be repaired or warranted as specified below;

The obligation of Resource West, Inc. (RWI) to the purchaser under this warranty is limited to the repair and replacement of defective parts by Resource West, Inc. free of charge for both parts and labor, using genuine RWI replacement parts. Repair or replacement in accordance with this warranty shall constitute fulfillment of all liabilities of RWI .

This warranty will not apply if the following situations occur:

- If the unit has been subject to misapplication, abuse, misuse, negligence, fire or other accident.
- If parts not made or supplied by RWI have been used in connection
  - with the unit and if in the sole judgment of RWI, such use adversely
  - affects its performance, stability or reliability.
- If the unit has been modified or altered without permission from RWI.

The customer will be responsible for payment of travel time and shipping costs to suitable location for repairs. This warranty does not cover shipping costs or travel costs or time loss due to failure.

This warranty does not cover normal maintenance and servicing. (eg. cleaning, de-scaling, grease points, or coupler alignments.) This warranty does not cover normal wear or surface finish damage due to exposure to harsh environments or chemicals, unless determined by RWI that they resulted from defective materials or workmanship.

Resource West, Inc. warrants the retail purchaser of each new product as listed below, that it will repair or have repaired or replace any part thereof found to be defective in materials or workmanship within 1 year. This warranty is for the benefits of the original purchaser only when purchased from RWI.

Motor: 12 months warranty, parts and labor; any defect in material or workmanship; when properly used for a period of one year after delivery. It is the end user's responsibility to ship to and from RWI the suspected faulty motor. F.O. B. RWI, Grand Junction, Colorado.

Pump: One year from delivery, manufacturer's defects only. F.O.B. RWI, Grand Junction, Colorado

Fan and Frame: Defects in workmanship and/or structural damage, for a period of one year from delivery. F.O.B. RWI, Grand Junction, Colorado

The warranty period will begin on the date of delivery. Repairs can be performed at your location by Diamond Scientific.

Monthly Maintenance

- Inspect fan and frame for any structural damage or scale build up.
  - This build up on the fan can cause an unbalanced problem and can be cleaned with a 10% muriatic acid and water mixture.
- Grease the fan motor with 3 to 6 grams of Mobil Polyrex Grease.
  - (Available at most Napa stores)
- Check spray ring for scale build up and observe the pump for signs of the pump plugging.

- Annual Maintenance
- Remove Apex from pit and inspect for any structural damage to fan, frame and pump.
- Remove pump from housing to inspect and clean any debris. Care should be taken not to cut or nick electrical wires.
- Winter maintenance: remove from pit, drain the pump and grease the fan motor.

ALWAYS DISCONNECT POWER PRIOR TO ANY MAINTENANCE BEING PERFORMED

If you have any questions or concerns please contact Ray Rivera 321-223-7500

System Design

EVAPORATOR

SMI SYSTEM DESIGN AND AUTOMATION

SMI Automation offers flexible software, high performance evaporators, proven communication options, accurate weather measurement, supporting equipment and instrumentation, integrated auxiliary equipment, and service that is second to none.

SMI systems can include:

Flexible Software:
SMI's Smart H20 automation software and control system makes it easy to operate your evaporation system with customer settable parameters, enabling the system to be adapted to the specific site and local weather conditions.

High Performance Evaporators Designed for Automation:
SMI offers the PoleCat and 420 product families with various automation levels to fit your needs.

Communications Options:
Our proven radio, fiber optic and hardwire options give you the ability to tie into existing networks for outside access and install the most reliable communication system for your site.

Accurate Weather Measurement:
Includes accurate weather sensors, optional weather tracking software and various power supply options (such as solar power).

Supporting Equipment and Instrumentation:
Our valves, sensors and instrumentation are field-proven for reliability.

SMI SMART H20™ SOFTWARE

Automation will shut down and start up the evaporator and pump based on different weather conditions (wind speed and direction, rainfall, humidity levels and temperature).

An automation system is highly desirable if the water being treated is corrosive or contains chemicals detrimental to the environment or people. The automation system ensures that water droplet drift is controlled so that droplets are deposited in a planned containment area without depending on human operators needing to respond to changing weather conditions.

SMI automation systems for evaporators come in various packages and are priced individually. The typical packages and features are listed below:

Stand Alone Automation Package:
The Stand Alone package is used for smaller systems (1-2 Evaporators) where a machine weather control panel, with HMI touch screen display and user interface, is mounted near shore in an optional SMI control panel shelter, along with weather devices to collect data like wind speed, wind direction, humidity and temperature in order to control the equipment.

System Design

EVAPORATOR

Single unit 420F (floating) Evaporator system with premium automation package

Galvanized control panel shelter with load center and machine control panels

Prefabricated control building shipped to your site complete

Control building interior

SmartH2O Software & Control

Operation: The stand alone package shuts off and starts evaporator(s) and pumps based on weather conditions (usually wind speed, wind direction; temperature and humidity). Speed and direction are set for 8 quadrants of compass. Equipment will shutdown or not start for temperatures below freezing. Shutdown for humidity is defaulted to 80% but is settable based upon specific weather and local experience. The system reacts after the length of time that new weather condition is experienced.

Premium Automation Package:
The premium package is used for systems with 3 or more Evaporators. A Master Control panel is typically located in an optional control building to allow local control and user interface near the equipment. Camera and weather devices are mounted on the control building to provide (wind speed, wind direction, temperature and humidity) inputs to the PLC for equipment control. A communication link is provided from Evaporators to master control panel and master control panel back to desktop PC located in remote control room or office. The desktop PC with SmartH20 software provides equipment control, zoom and pan visual on each Evaporator from camera, monitoring, data storage, alarms, event log, graphing and reporting.

Operation: Same as Stand Alone, plus allows control or setpoint input via computer or a local master control panel. Software can be customized to shutdown equipment due to low water level from customer supplied and installed level (normally an open/closed level sensor).

SMI Evaporative Solutions

SMI Evaporative Solutions
1512 North Rockwell Dr.
Midland, MI 48642
+1.989.631.6091
+1-800-248-6600
evapor.com

Typical Fillet Extrusion Weld

Not to scale

GSE Environmental, LLC
19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

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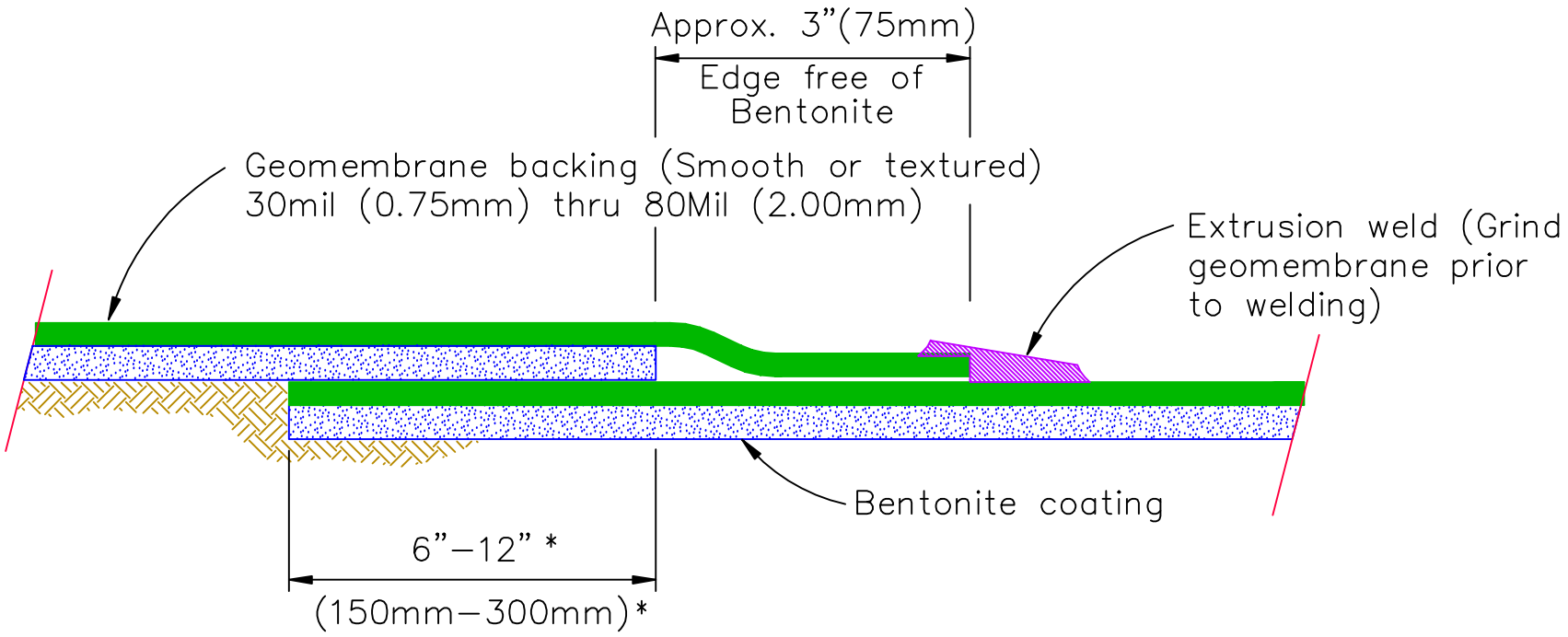

* Overlap length dependant on subgrade condition and anticipated settlement

Gundseal Extrusion Welded Seam

Not to scale

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Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

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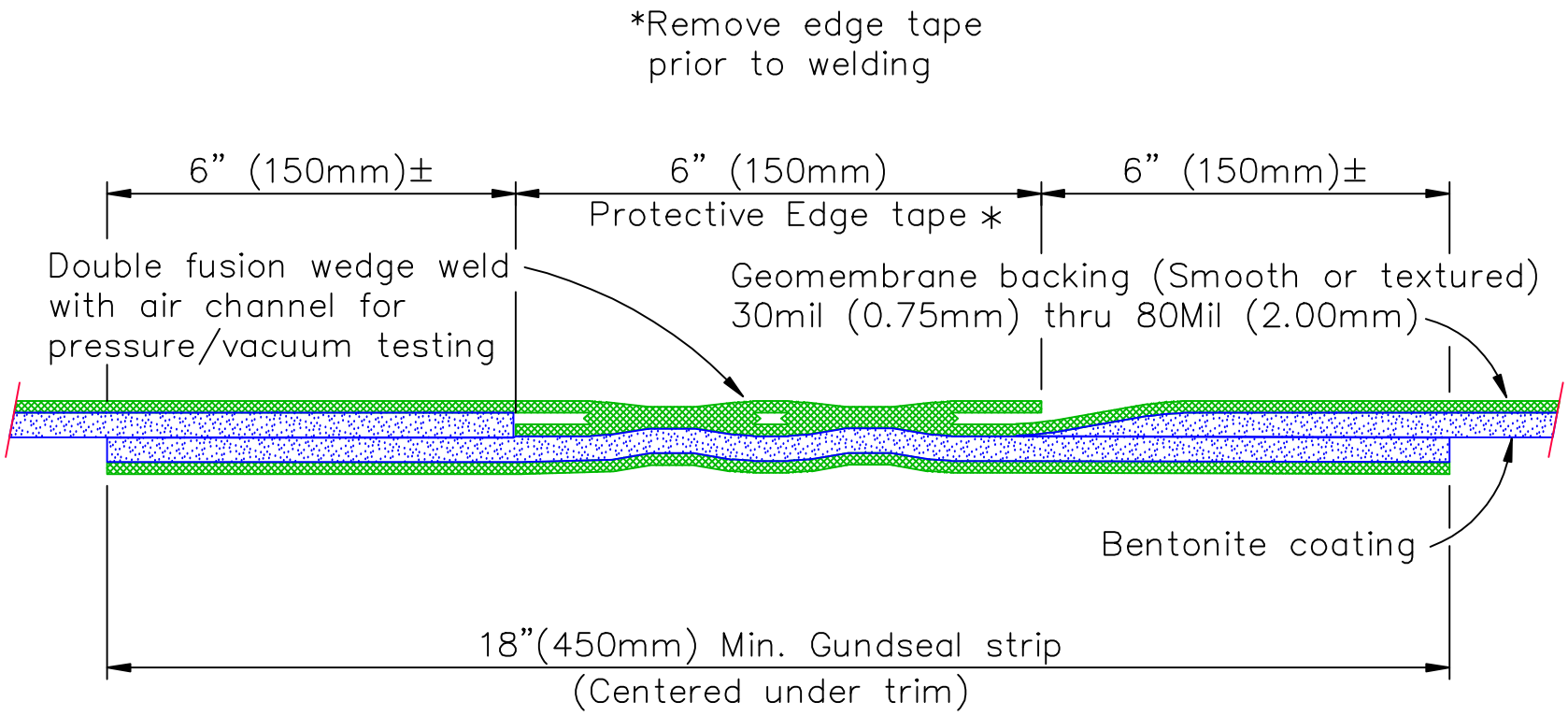

Gundseal Wedge Weld Seam

(Geomembrane side up)

Not to scale

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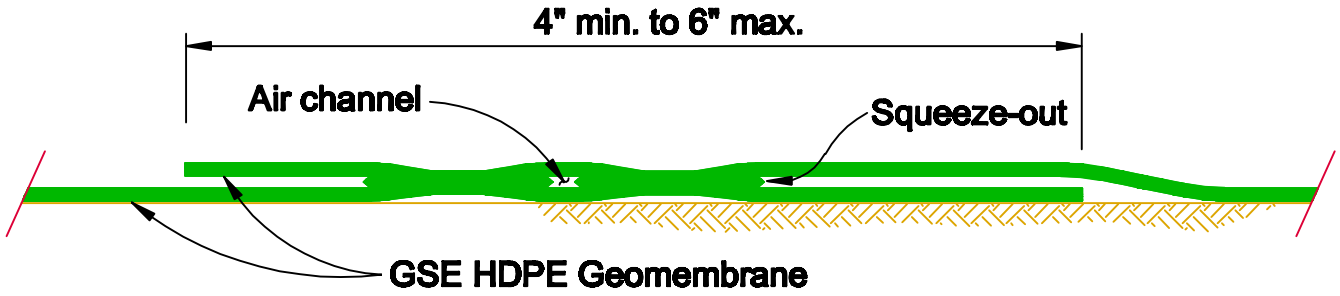
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-016



Typical Hot Wedge Double Track Fusion Weld

Not to scale

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19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-014

Typical Fillet Extrusion Weld

Not to scale

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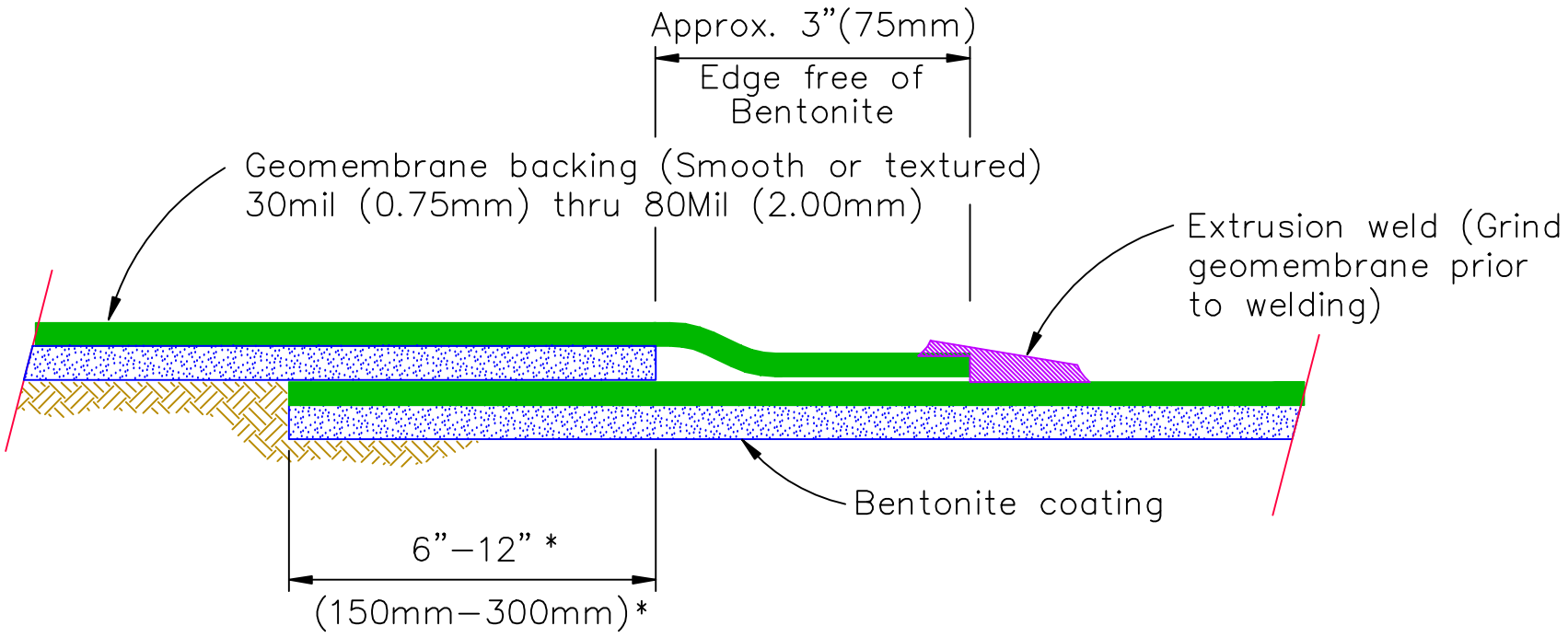

* Overlap length dependant on subgrade condition and anticipated settlement

Gundseal Extrusion Welded Seam

Not to scale

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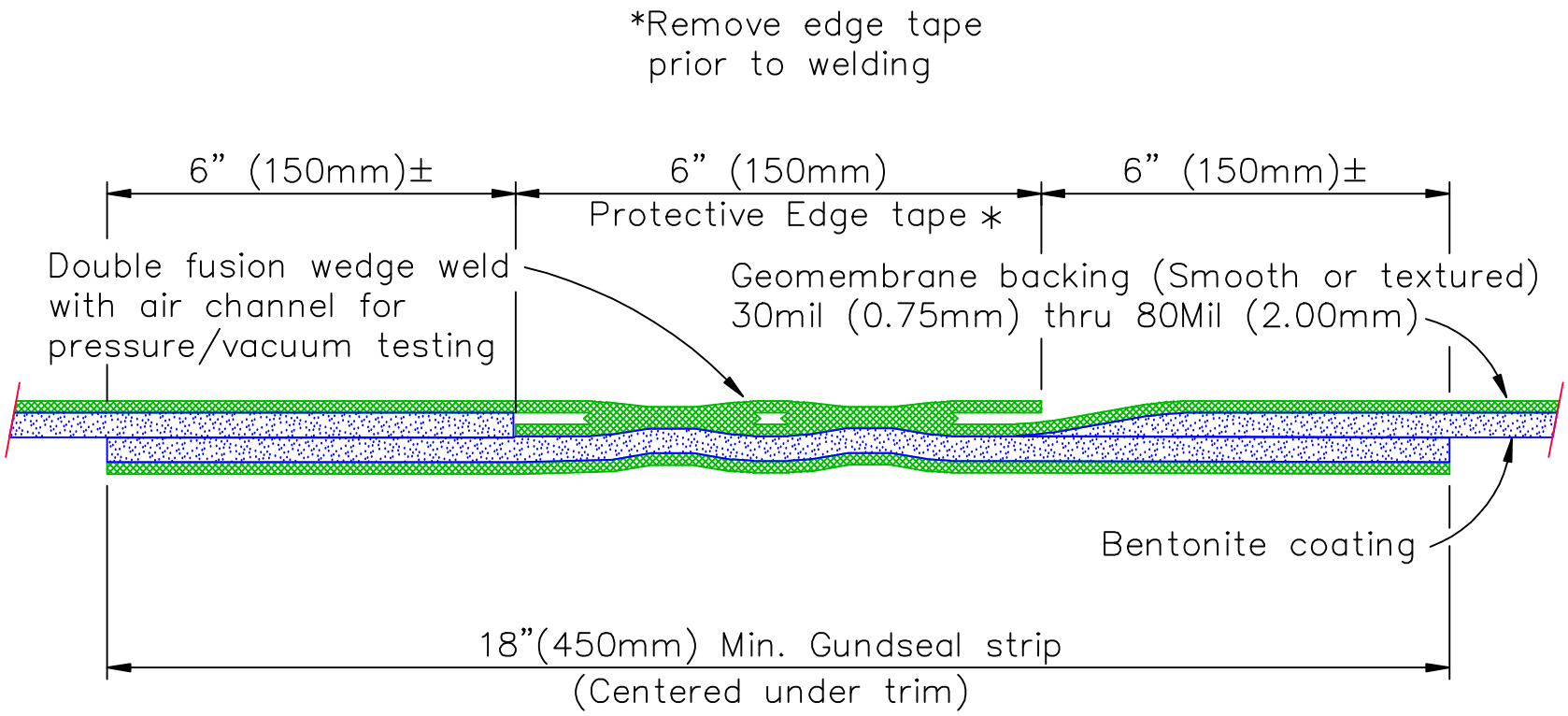

Gundseal Wedge Weld Seam

(Geomembrane side up)

Not to scale

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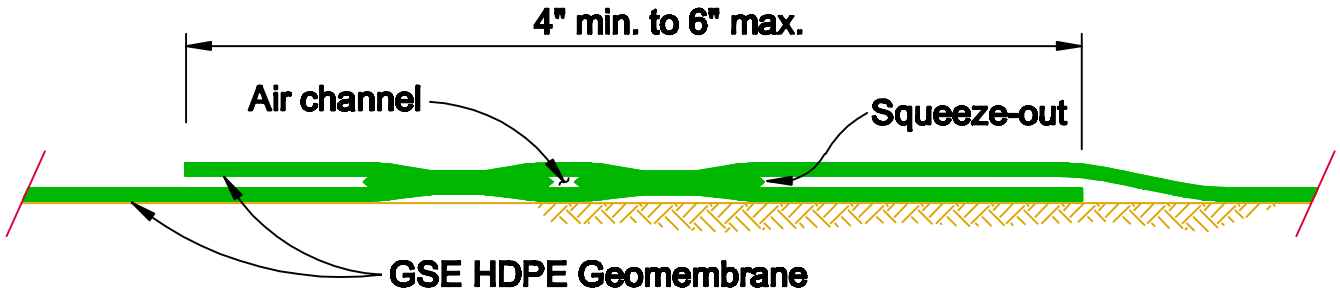
800-435-2008 / 281-443-8564

DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-016



Typical Hot Wedge Double Track Fusion Weld

Not to scale

GSE Environmental, LLC
19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008 / 281-443-8564

DRAWN	MG	DATE	01/10/2010	REVISION	0	DWG. NO.	GSE-014

Behrens and Associates, Inc.
Environmental Noise Control

August 7, 2014

Resource West
2323 Logos Drive
Grand Junction, CO 81505

Attention: John Baker, Production Manager

Subject: Land Shark Evaporation Unit Noise Modeling Report

Dear Mr. Baker:

The following report describes the development of noise models representing the Land Shark Evaporation Unit. The noise modeling includes both unmitigated and mitigated scenarios.

Sound Level Survey

Noise level measurements for the Land Shark Evaporation Unit were obtained on Wednesday, June 18, 2014. Measurements were taken adjacent to and at increasing distances from the noise emitting unit while it was operational on-site, with and without water running. Measurements of this equipment were conducted with a Brüel & Kjær Type 1 Model 2250 Sound Level Meter.

Noise Modeling

The noise model was created using SoundPlan 7.3 software which calculates noise levels in accordance with ISO 9613 standards. This noise model predicts noise levels based on the locations, noise levels and frequency spectra of the noise sources, and the geometry and reflective properties of the local terrain, buildings and barriers.

The units were modeled unmitigated, dry and with water running. A 12 ft high temporary acoustical perimeter panel with a Sound Transmission Class (STC) rating of 25 was added approximately 10 ft from the unit. The unit was then modeled as mitigated, dry and with water running.

Results

Noise contour maps are provided to show the results of the noise modeling for the evaporation unit. The maps contain contours provided in 5 dB increments. A color scale is provided on the right of the maps indicating the overall sound level of each contour. The sound levels are reported using both the A-weighted (dBA) and C-weighted decibel scale (dBC) and represent only the noise generated by the evaporation unit. Field sound level measurements may vary due

to the effects of other human activity or environmental factors not included in the noise modeling.

Noise levels vs distance charts are provided showing the noise level at increasing distances from the unit for the modeled unmitigated scenarios. The thickness of each curve represents the difference between the minimum and maximum noise levels.

Attachments are as follows:

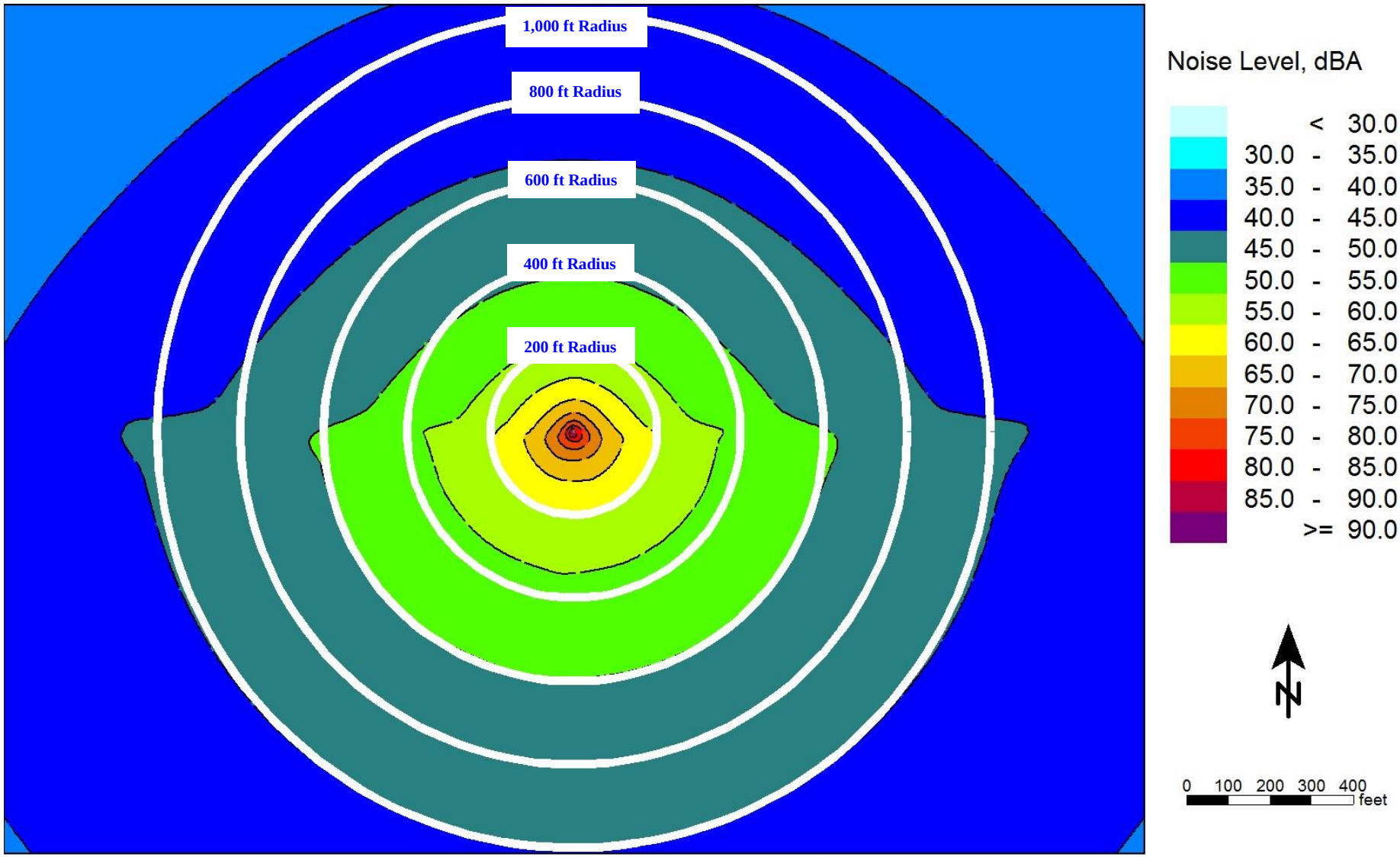
Attachment 1: Unmitigated (Running Dry) Noise Contour Map (dBA)
Attachment 2: Unmitigated (Running Dry) Noise Contour Map (dBC)
Attachment 3: Unmitigated (Water Running) Noise Contour Map (dBA)
Attachment 4: Unmitigated (Water Running) Noise Contour Map (dBC)
Attachment 5: Mitigated (Running Dry) Noise Contour Map (dBA)
Attachment 6: Mitigated (Running Dry) Noise Contour Map (dBC)
Attachment 7: Mitigated (Water Running) Noise Contour Map (dBA)
Attachment 8: Mitigated (Water Running) Noise Contour Map (dBC)
Attachment 9: Noise Level vs Distance Curves (dBA)
Attachment 10: Noise Level vs Distance Curves (dBC)
Attachments 11 & 12: Land Shark Noise Levels

Please contact me with any questions or comments.

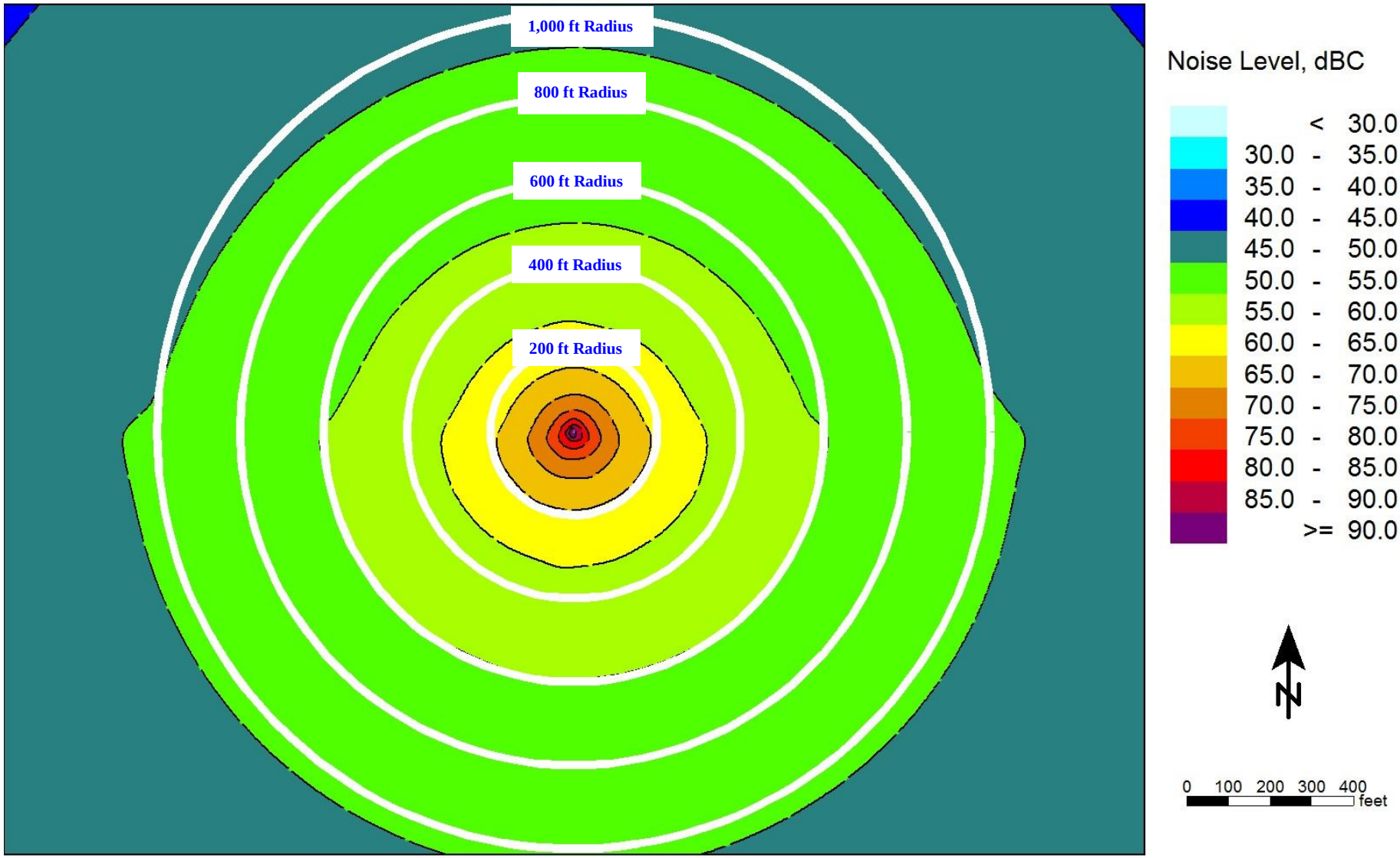
Very truly yours,

Deborah M Talarico
Acoustical Consultant

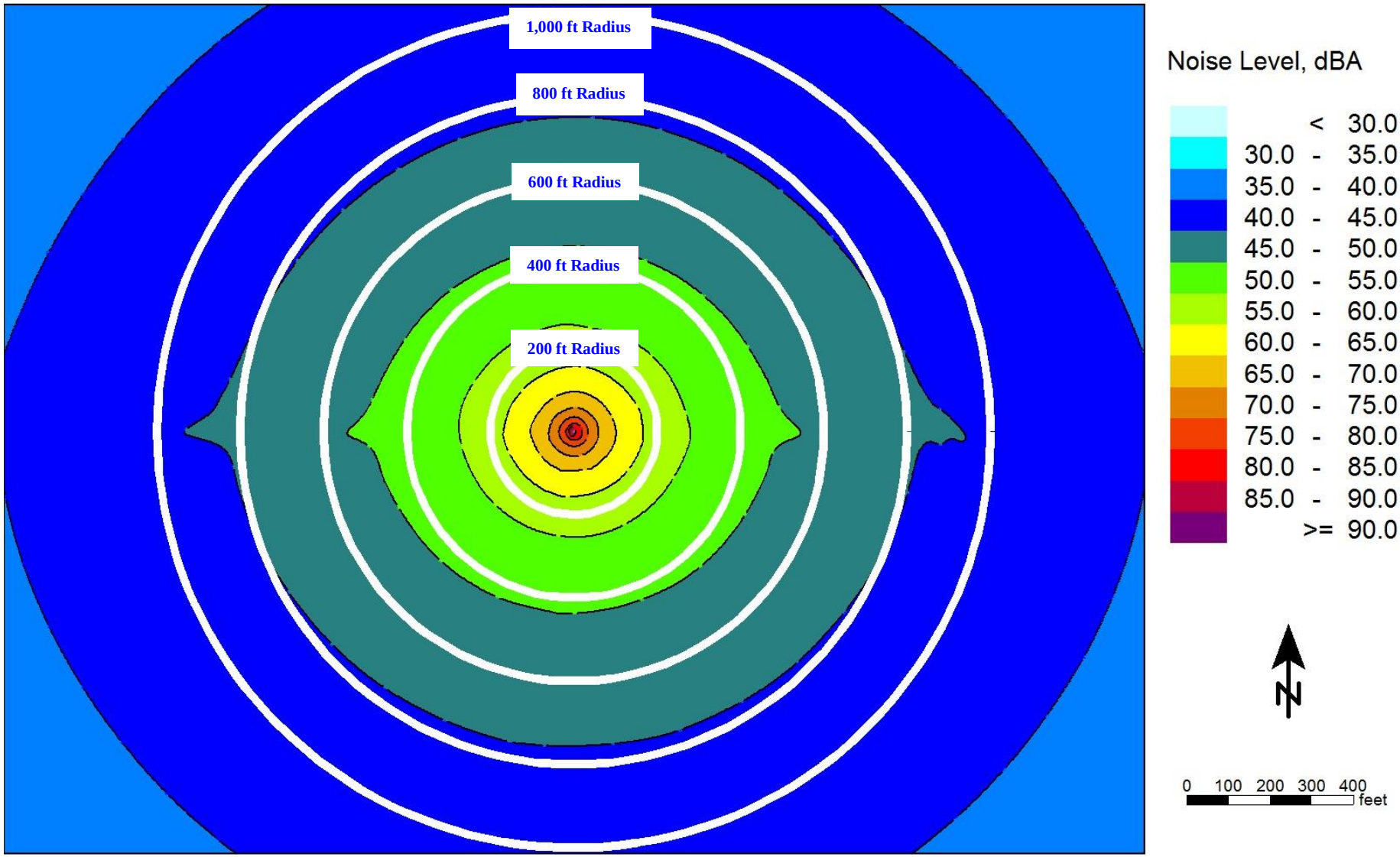
Attachments



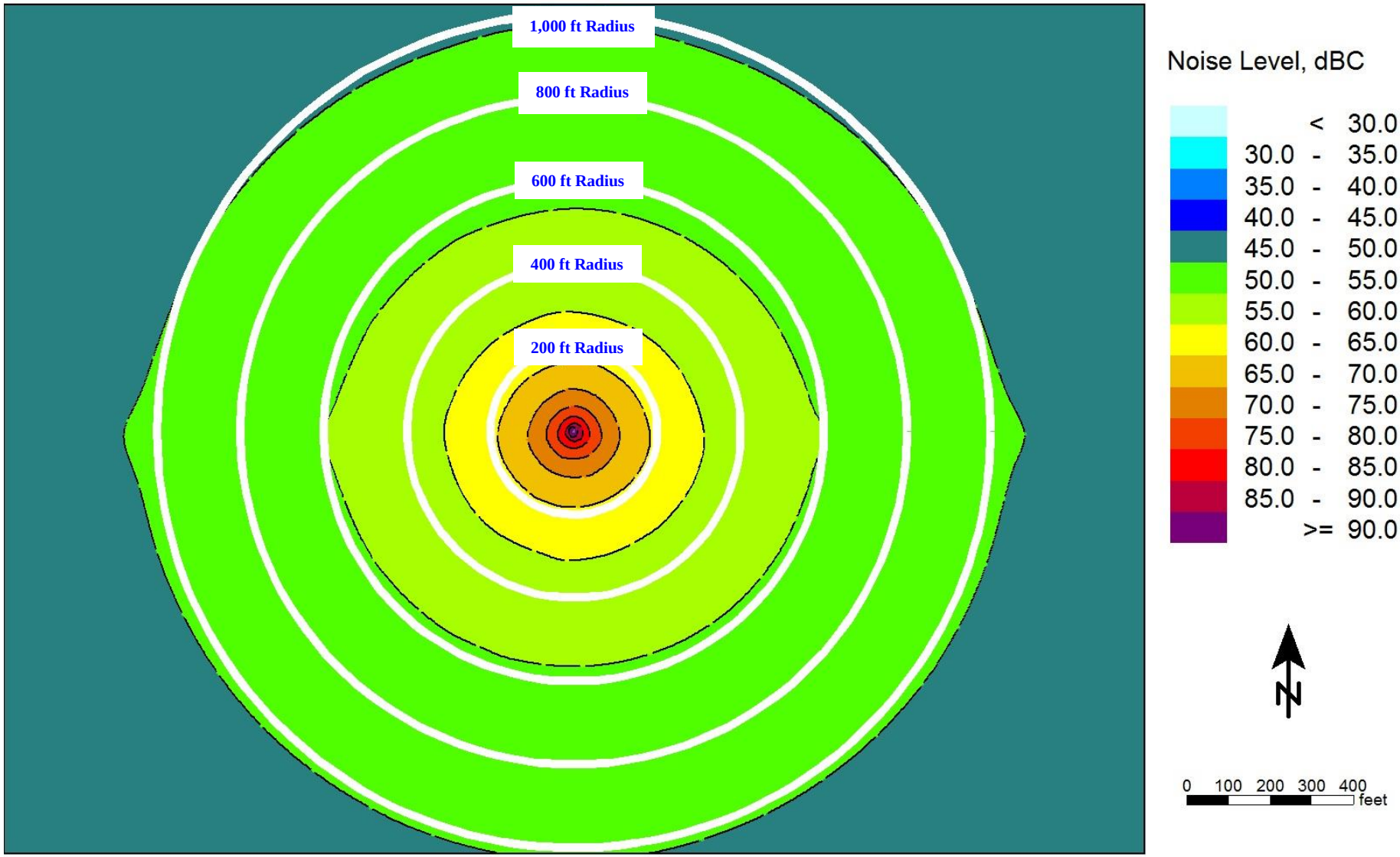
Attachment 1
Unmitigated (Running Dry) Noise Contour Map (dBA)



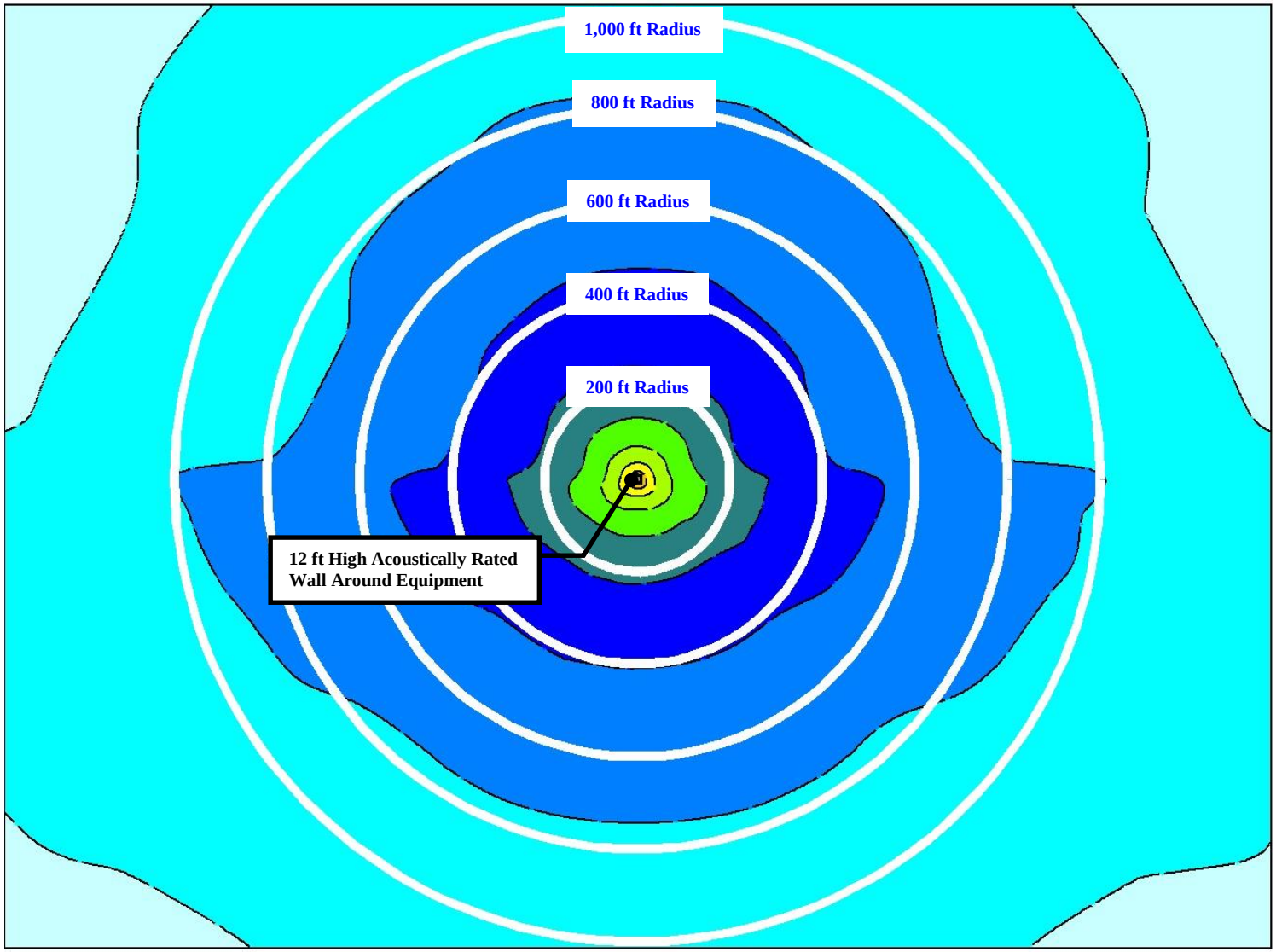
Attachment 2
Unmitigated (Running Dry) Noise Contour Map (dBC)

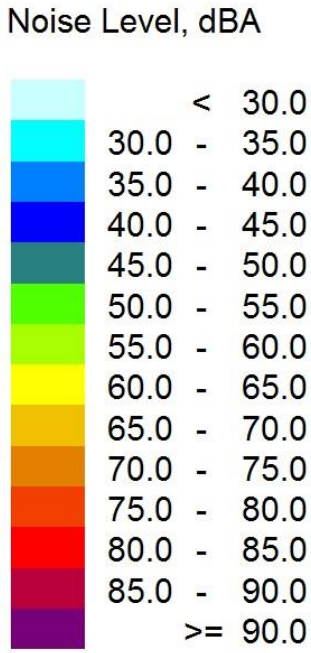


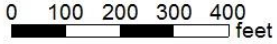
Attachment 3
Unmitigated (Water Running) Noise Contour Map (dBA)



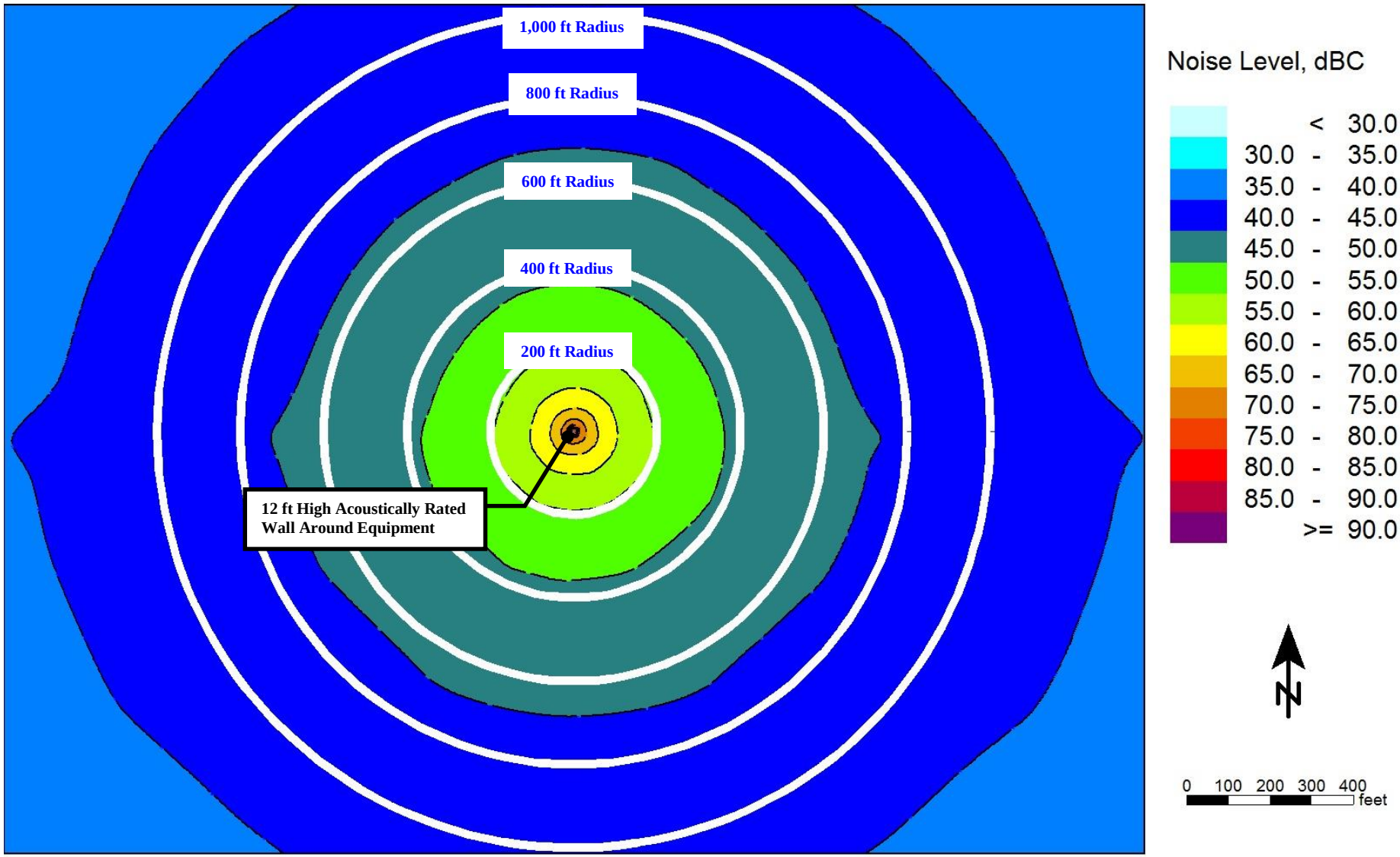
Attachment 4
Unmitigated (Water Running) Noise Contour Map (dBC)



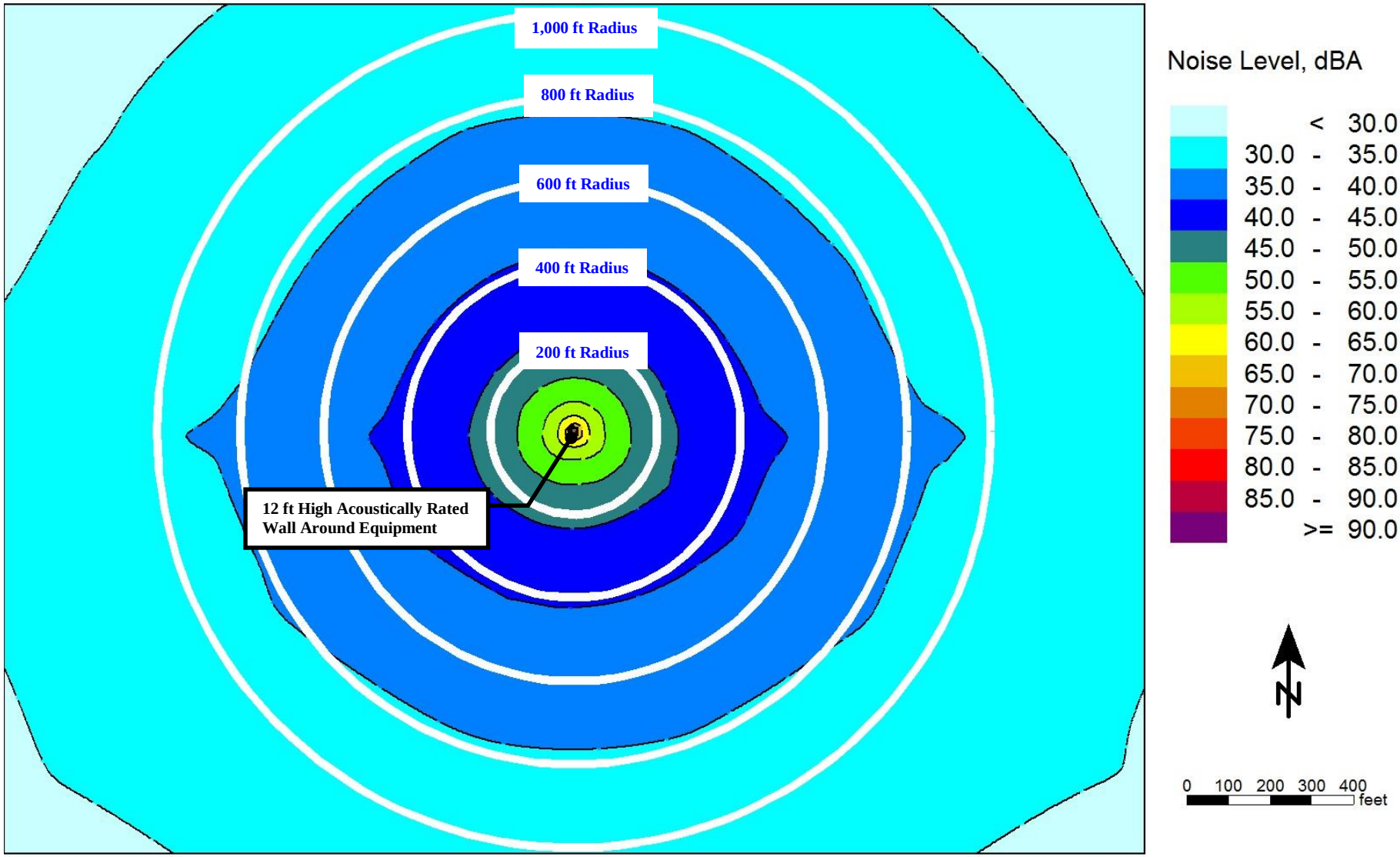




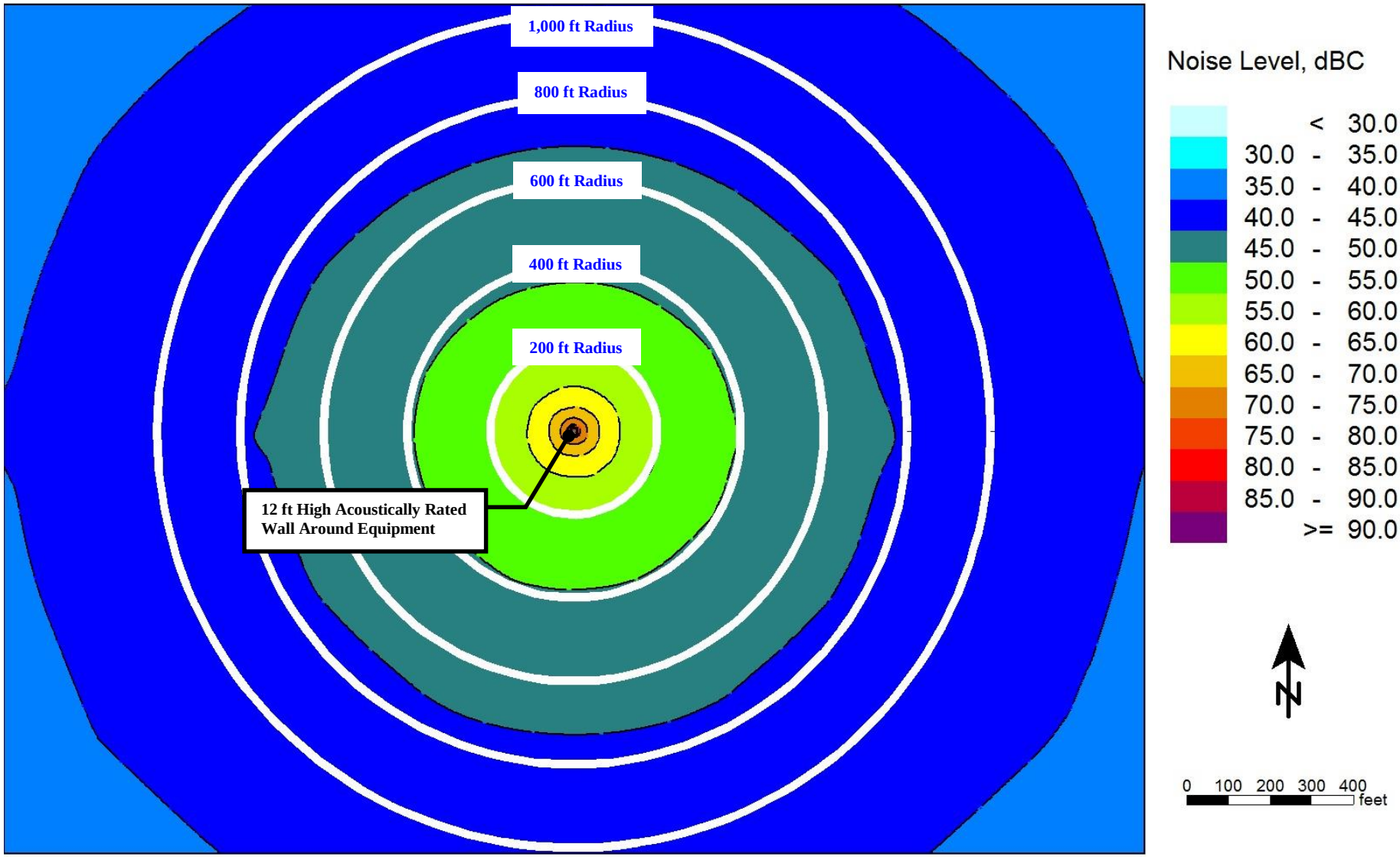
Attachment 5
Mitigated (Running Dry) Noise Contour Map (dBA)



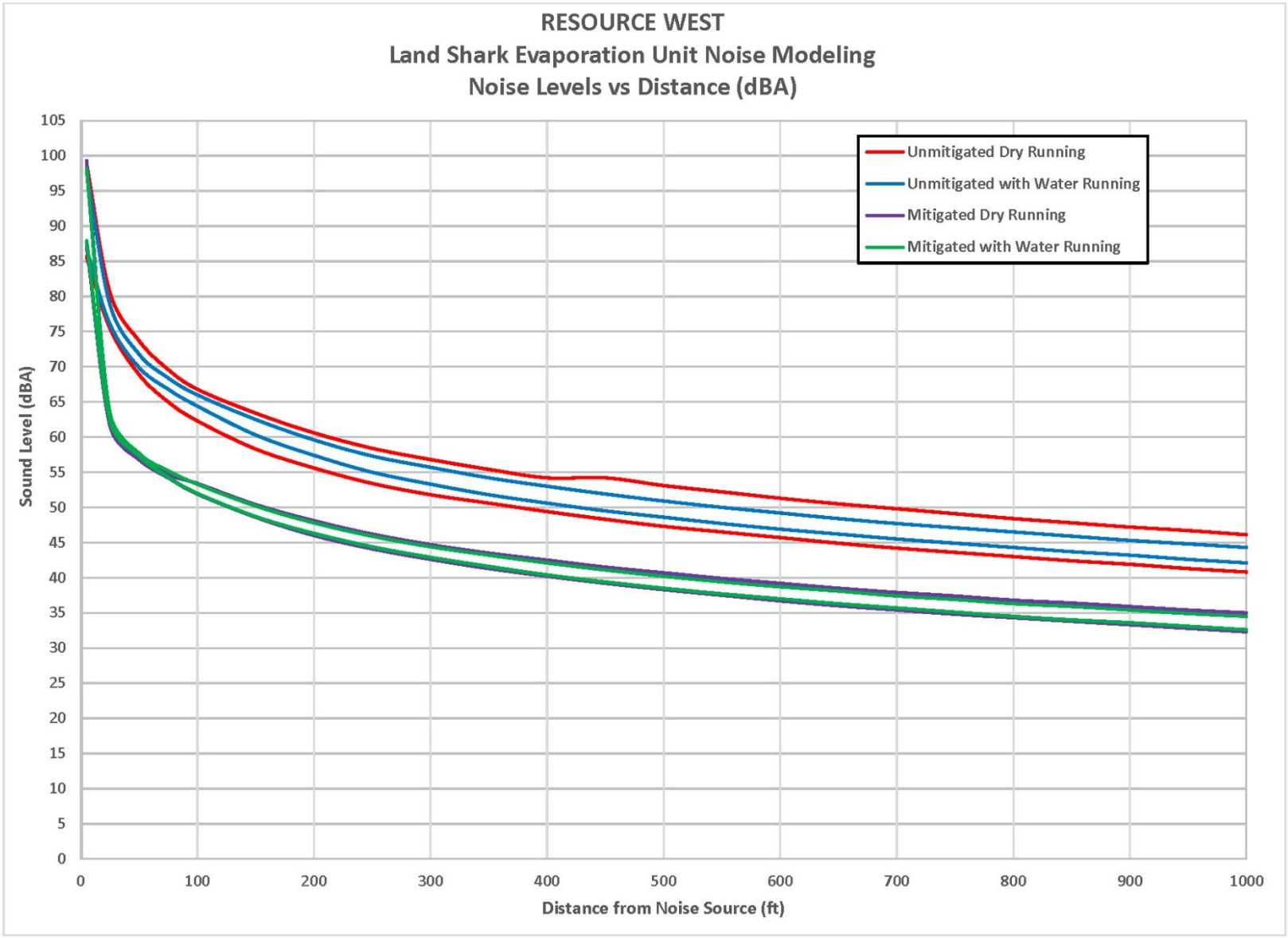
Attachment 6
Mitigated (Running Dry) Noise Contour Map (dBC)



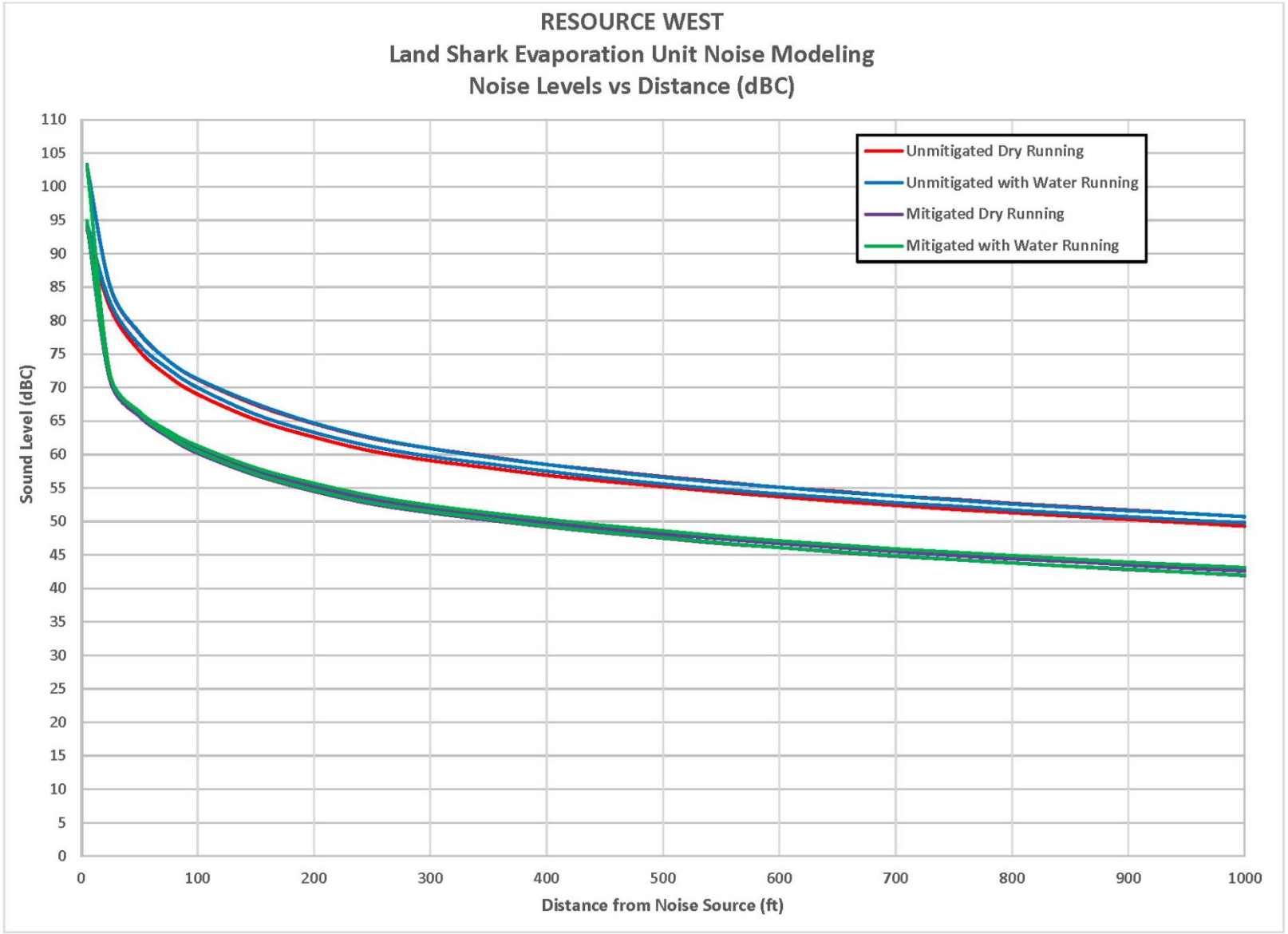
Attachment 7
Mitigated (Water Running) Noise Contour Map (dBA)



Attachment 8
Mitigated (Water Running) Noise Contour Map (dBC)



Attachment 9



Attachment 10

Table 1 - Scenario 1: Unmitigated Noise Levels at Distance Running Dry								
Dist	East	North	West	South	East	North	West	South
(ft)	(dBA)	(dBA)	(dBA)	(dBA)	(dBC)	(dBC)	(dBC)	(dBC)
5	85.6	94.6	86.2	98.9	93.7	100.4	94.1	103.1
25	76.2	75.5	76.3	80.6	82.2	81.9	82.3	85.0
50	70.2	68.9	70.5	73.7	76.1	75.5	76.2	78.1
75	68.2	65.0	67.7	69.6	73.1	71.7	72.9	74.0
100	66.2	62.3	66.0	66.8	70.8	69.0	70.8	71.2
150	63.4	58.3	63.4	62.9	67.4	65.2	67.4	67.3
200	60.4	55.6	60.6	59.9	64.6	62.6	64.6	64.3
250	58.4	53.4	58.4	57.6	62.4	60.5	62.4	62.1
300	56.8	51.8	56.8	55.9	60.9	59.1	60.9	60.6
350	55.4	50.6	55.1	54.6	59.7	58.0	59.6	59.3
400	54.2	49.4	54.2	53.4	58.5	56.9	58.5	58.2
450	53.1	48.3	53.2	52.3	57.6	56.0	57.6	57.2
500	52.2	47.3	52.2	51.3	56.7	55.2	56.7	56.4
550	51.3	46.5	51.3	50.5	55.9	54.4	55.9	55.6
600	50.5	45.7	50.5	49.7	55.1	53.7	55.1	54.8
650	49.8	44.9	49.8	48.9	54.5	53.0	54.5	54.2
700	49.1	44.2	49.1	48.2	53.8	52.4	53.8	53.5
750	48.4	43.6	48.4	47.6	53.2	51.8	53.3	52.9
800	47.8	43.0	47.8	47.0	52.7	51.3	52.7	52.4
850	47.2	42.4	47.3	46.4	52.2	50.8	52.2	51.9
900	46.7	41.9	46.7	45.8	51.7	50.3	51.7	51.4
950	46.1	41.3	46.1	45.3	51.2	49.8	51.2	50.9
1000	45.6	40.8	45.6	44.8	50.7	49.3	50.7	50.4

Table 2 - Scenario 2: Unmitigated Noise Levels at Distance with Water Running								
Dist	East	North	West	South	East	North	West	South
(ft)	(dBA)	(dBA)	(dBA)	(dBA)	(dBC)	(dBC)	(dBC)	(dBC)
5	86.7	97.9	86.8	97.4	94.5	102.9	94.7	103.1
25	76.1	78.2	76.1	78.9	82.7	83.5	82.7	85.1
50	69.9	71.3	70.0	71.8	76.4	76.7	76.6	78.2
75	68.4	67.3	66.8	67.6	73.7	72.8	73.2	74.0
100	66.0	64.4	64.7	64.7	71.3	70.0	70.9	71.1
150	62.5	60.3	62.5	60.6	67.6	66.0	67.6	67.1
200	59.5	57.5	59.6	57.4	64.7	63.3	64.7	64.0
250	57.3	55.2	57.3	55.0	62.5	61.2	62.5	61.8
300	55.6	53.6	55.7	53.3	60.9	59.7	60.9	60.2
350	54.2	52.2	54.1	51.8	59.6	58.6	59.6	58.9
400	53.0	51.0	53.0	50.6	58.5	57.5	58.5	57.8
450	51.9	49.8	51.9	49.5	57.5	56.5	57.5	56.9
500	50.9	48.8	50.9	48.6	56.6	55.6	56.6	56.0
550	50.0	47.9	50.0	47.7	55.8	54.8	55.8	55.2
600	49.2	47.1	49.2	46.9	55.1	54.1	55.1	54.5
650	48.4	46.3	48.4	46.2	54.4	53.5	54.4	53.8
700	47.7	45.6	47.7	45.5	53.8	52.8	53.8	53.2
750	47.1	44.9	47.1	44.9	53.2	52.3	53.2	52.6
800	46.5	44.3	46.5	44.3	52.6	51.7	52.6	52.1
850	45.9	43.7	45.9	43.7	52.1	51.2	52.1	51.6
900	45.3	43.2	45.3	43.2	51.6	50.7	51.6	51.1
950	44.8	42.6	44.8	42.7	51.1	50.2	51.2	50.6
1000	44.3	42.1	44.3	42.2	50.7	49.8	50.7	50.2

Table 3 - Scenario 3: Mitigated Noise Levels at Distance 12 ft Freestanding Acoustical Panels Running Dry								
Dist (ft)	East (dBA)	North (dBA)	West (dBA)	South (dBA)	East (dBC)	North (dBC)	West (dBC)	South (dBC)
5	87.4	94.8	87.8	99.3	94.3	100.6	94.6	103.3
25	61.7	62.0	61.8	63.5	71.0	71.0	71.0	71.6
50	56.8	57.2	56.9	57.6	65.8	65.7	65.7	65.9
75	54.7	54.3	54.6	54.2	62.9	62.6	62.8	62.6
100	53.3	52.1	53.4	51.9	60.8	60.2	60.7	60.3
150	50.4	48.9	50.3	48.6	57.5	56.9	57.5	57.1
200	48.1	46.6	48.0	46.0	55.2	54.5	55.1	54.6
250	46.2	44.7	46.1	44.1	53.3	52.6	53.2	52.7
300	44.7	43.3	44.7	42.6	51.9	51.3	51.9	51.4
350	43.5	42.1	43.5	41.3	50.8	50.2	50.8	50.2
400	42.5	41.0	42.4	40.2	49.8	49.2	49.7	49.2
450	41.5	40.0	41.5	39.2	48.9	48.3	48.8	48.3
500	40.7	39.2	40.6	38.3	48.1	47.5	48.0	47.5
550	39.9	38.4	39.8	37.5	47.4	46.7	47.3	46.8
600	39.2	37.6	39.1	36.7	46.7	46.1	46.6	46.1
650	38.5	37.0	38.5	36.0	46.1	45.4	46.0	45.4
700	37.9	36.4	37.9	35.4	45.5	44.8	45.4	44.9
750	37.4	35.8	37.3	34.8	44.9	44.3	44.9	44.3
800	36.8	35.2	36.8	34.3	44.4	43.8	44.3	43.8
850	36.4	34.7	36.3	33.8	44.0	43.3	43.9	43.3
900	35.9	34.3	35.8	33.3	43.5	42.8	43.4	42.9
950	35.4	33.8	35.4	32.8	43.0	42.4	43.0	42.4
1000	35.0	33.3	35.0	32.3	42.6	41.9	42.5	42.0

Table 4 - Scenario 4: Mitigated Noise Levels at Distance 12 ft Freestanding Acoustical Panels with Water Running								
Dist (ft)	East (dBA)	North (dBA)	West (dBA)	South (dBA)	East (dBC)	North (dBC)	West (dBC)	South (dBC)
5	87.9	98.2	87.9	97.6	94.9	103.0	95.0	103.2
25	62.4	62.8	62.5	63.5	71.6	71.7	71.6	71.9
50	57.3	57.5	57.3	57.7	66.3	66.2	66.3	66.4
75	55.2	54.3	54.9	54.4	63.5	62.9	63.4	63.1
100	53.3	52.0	53.1	52.1	61.3	60.5	61.2	60.8
150	50.2	48.7	50.1	48.9	58.0	57.1	58.0	57.6
200	47.8	46.3	47.7	46.3	55.7	54.7	55.6	55.1
250	45.9	44.4	45.8	44.4	53.8	52.8	53.7	53.2
300	44.4	42.9	44.4	42.9	52.4	51.5	52.4	51.9
350	43.2	41.7	43.1	41.6	51.3	50.4	51.2	50.7
400	42.1	40.5	42.0	40.4	50.3	49.3	50.2	49.7
450	41.1	39.5	41.0	39.4	49.4	48.4	49.3	48.8
500	40.2	38.6	40.2	38.5	48.6	47.6	48.5	48.0
550	39.4	37.8	39.4	37.7	47.8	46.8	47.7	47.2
600	38.7	37.0	38.6	37.0	47.1	46.1	47.1	46.6
650	38.1	36.3	38.0	36.3	46.5	45.5	46.4	45.9
700	37.4	35.7	37.4	35.7	45.9	44.9	45.8	45.4
750	36.9	35.1	36.8	35.1	45.4	44.3	45.3	44.8
800	36.3	34.6	36.3	34.5	44.9	43.8	44.8	44.3
850	35.9	34.1	35.8	34.0	44.4	43.3	44.3	43.8
900	35.4	33.6	35.3	33.6	43.9	42.9	43.9	43.4
950	34.9	33.1	34.8	33.1	43.5	42.4	43.4	42.9
1000	34.5	32.6	34.4	32.6	43.1	42.0	43.0	42.5

A-119 a

DEPARTMENT OF THE INTERIOR

GENERAL LAND OFFICE

OIL AND GAS LEASE

(Sec. 14-13)

Act of Feb. 25, 1920

MOUNTAIN FUEL SUPPLY COMPANY
a Delaware Corporation

Denver 038749 (a)

4-208 e

DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE

Serial Denver 038749 (a)

Lease of Oil and Gas Lands Under the Act of February 25, 1920.

(Sec. 14-13)

THIS INDENTURE OF LEASE, entered into, in triplicate, as of the 25th day of June, 1931, by and between the UNITED STATES OF AMERICA, party of the first part, hereinafter called the lessor, acting in this behalf by the Secretary of the Interior, and

MOUNTAIN FUEL SUPPLY COMPANY, a Delaware Corporation,
Findlay,
Ohio,

party of the second part, hereinafter called the lessee, under, pursuant, and subject to the terms and provisions of the act of Congress approved February 25, 1920 (Public No. 146), entitled "An Act to Promote the Mining of Coal, Phosphate, Oil, Oil Shale, Gas, and Sodium on the Public Domain," hereinafter referred to as the act, which is made a part hereof, WITNESSETH:

SEC. 1. Purposes.—That the lessor in consideration of rents and royalties to be paid, and the covenants to be observed as herein set forth, does hereby grant and lease to the lessee the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following-described tract of land situated in the Powder Wash structure, Colorado and more particularly described as follows:

Lot 8 ($NW\frac{1}{4}$ $NW\frac{1}{4}$), $SW\frac{1}{4}$ $NW\frac{1}{4}$, $W\frac{1}{2}$ $SW\frac{1}{4}$ Sec. 4, Lots 5 and 6 ($N\frac{1}{2}$ $NE\frac{1}{4}$), $S\frac{1}{2}$ $NE\frac{1}{4}$, Lot 7 ($NE\frac{1}{4}$ $NW\frac{1}{4}$), $SE\frac{1}{4}$ $NW\frac{1}{4}$, $E\frac{1}{2}$ $SW\frac{1}{4}$, $SE\frac{1}{4}$, Sec. 5, T. 11 N., R. 97 W., 6th P.M., containing 640.60 acres, more or less,

together with the right to construct and maintain thereupon all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipe lines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of twenty (20) years, with the preferential right in the lessee to renew this lease for successive periods of ten (10) years, upon such reasonable terms and conditions as may be prescribed by the lessor, unless otherwise provided by law at the time of the expiration of such periods.

*Serial*_____

SEC. 2. In consideration of the foregoing, the lessee hereby agrees:

(*a*) *Bond.*—To furnish a bond with approved corporate surety in the penal sum of $5,000, conditioned upon compliance with the terms of the lease.

(*b*) *Wells.*—To maintain in a state of production wells equal in number to the number of the now existing producing wells on the leased land until the oil deposits are exhausted or until the proven territory has been drilled, and in case such existing wells are less than the number of 40-acre tracts or lots embraced in the lease, to proceed with reasonable diligence within three months of delivery hereof to install on the leased land a standard or other efficient drilling outfit and equipment, and to commence drilling at least one well and to continue such drilling with reasonable diligence to production or to a point where the well is demonstrated unsuccessful, and thereafter to continue drilling with reasonable diligence at least one well at a time until the lessee shall have drilled producing wells which, with any producing wells now on the land, equal in number the number of 40-acre tracts or lots embraced in the leased premises, unless the lessor shall for any reason deemed sufficient consent in writing to the drilling of a less number of wells; the lessee further agrees to drill all necessary wells to offset the wells of others on adjoining land or deposits not the property of the United States and on adjoining land operated under Government lease at 5 per cent royalty.

(*c*) *Royalty and Rents.*—To pay the lessor in advance, beginning with the date of the execution of this lease, a rental of one dollar per acre per annum during the continuance hereof, the rental so paid for any one year to be credited on the royalty for that year, together with a royalty on all oil and gas produced from the land leased herein (except oil or gas used for production purposes on said land or unavoidably lost), as follows:--five per centum (5%):

~~(1) For all oil produced of 30° Baumé or over:~~

On that portion of the average production per well not exceeding 20 barrels per day for the calendar month ..... 12½ per cent.

On that portion of the average production per well of more than 20 barrels and not more than 50 barrels per day for the calendar month ..... 16⅔ per cent.

On that portion of the average production per well of more than 50 barrels and not more than 100 barrels per day for the calendar month ..... 20 per cent.

On that portion of the average production per well of more than 100 barrels per day for the calendar month ..... 25 per cent.

(2) For all oil produced of less than 30° Baumé:

On that portion of the average production per well not exceeding 20 barrels per day for the calendar month ..... 12½ per cent.

On that portion of the average production per well of more than 20 barrels and not more than 50 barrels per day for the calendar month ..... 14⅓ per cent.

On that portion of the average production per well of more than 50 barrels and not more than 100 barrels per day for the calendar month ..... 16⅔ per cent.

On that portion of the average production per well of more than 100 barrels per day for the calendar month ..... 20 per cent.

Only wells which have a commercial production during at least part of the month shall be considered in ascertaining the average production above provided for; and the Secretary of the Interior shall determine what are commercially productive wells under this provision.

MOUNTAIN FUEL SUPPLY CO.
31-A

(3) On gas and casing-head gasoline:

On gas, whether same shall be gas from which the casing-head gasoline has been extracted or otherwise, 12½ per cent of the value thereof in the field where produced.

On casing-head gasoline, 12½ per cent of the value of the casing-head gasoline extracted from the gas produced and sold, computed on the basis provided for in the operating regulations.

The value in the field where produced, of gas and casing-head gasoline, for royalty purposes, unless such gas or casing-head gasoline is disposed of under an approved sales contract or other method as provided in subdivision (d) of this section, shall be as fixed by the Secretary of the Interior.

In cases where the gas produced and sold has a value both for casing-head gasoline content and as dry gas from which the casing-head gasoline has been extracted, then the royalties above provided shall be paid on both of such values.

When paid in value, such royalties shall be due and payable monthly on the 15th of each calendar month following the calendar month in which produced, to the Register of the land district in which the land is situated; when paid in kind, such royalty oil shall be delivered in tanks provided by the lessee on the premises where produced, unless otherwise agreed to by the parties hereto, at such times as may be required by the lessor: Provided, That the lessee shall not be required to hold such royalty oil in storage longer than thirty days after the end of the calendar month in which said oil is produced: And provided further, That the said lessee shall be in no manner responsible or held liable for the loss or destruction of such oil in storage from causes over which the lessee has no control; such royalties, whether in value or kind, shall be subject to reduction whenever the average daily production of any oil well shall not exceed ten (10) barrels per day, if in the judgment of the lessor the wells can not be successfully operated upon the royalties fixed herein.

(d) Sales contracts.--To file with the Secretary of the Interior copies of all sales contracts for the disposition of oil and gas produced hereunder except for production purposes on the land leased, and in the event the United States shall elect to take its royalties in money instead of in oil or gas, not to sell or otherwise dispose of the products of the land leased except in accordance with a sales contract or other method first approved by the Secretary of the Interior.

(e) Monthly statements.--To furnish monthly statements in detail in such form as may be prescribed by the lessor, showing the amount, quality, and value of all oil and gas produced and saved during the preceding calendar month as the basis for computing the royalty due the lessor. The leased premises and all wells, improvements, machinery, and fixtures thereon or connected therewith and all books and accounts of the lessee shall be open at all times for the inspection of any duly authorized officer of the department.

(f) Plats and reports.--To furnish annually and at such times as the Secretary shall require, in the manner and form prescribed by the Secretary of the Interior, a plat showing all development work and improvements on the leased lands, and other related information, with a report as to all buildings, structures, or other works placed in or upon said leased lands, accompanied by a report in detail as to the stockholders, investment, depreciation, and cost of operation, together with a statement as to the amount and grade of oil and gas produced and sold, and the amount received therefor by operations hereunder.

(g) Log of wells.--To keep a log in the form prescribed by the Secretary of all the wells drilled by the lessee, showing the strata and character of the ground passed through by the drill, which log, or copy thereof, shall be furnished to said lessor on demand.

(h) Diligence--Prevention of waste--Health and safety of workmen.--To exercise reasonable diligence in drilling and operating wells for the oil and gas on the lands covered hereby, while such products can be secured in paying quantities, unless consent to suspend operations temporarily is granted by the Secretary of the Interior; to carry on all operations hereunder in a good and workmanlike manner in accordance with approved methods and practice, having due regard for the prevention of waste of oil or gas developed on the land, or the entrance of water through wells drilled by the lessee to the oil sands or oil-bearing strata to the destruction or injury of the oil deposits, the preservation and conservation of the property for future productive operations, and to the health and safety of workmen and employees;

to plug securely any well before abandoning the same so as to effectually shut off all water from the oil or gas-bearing strata; not to drill any well within 200 feet of any of the outer boundaries of the lands covered hereby, unless the adjoining lands have been patented or the title thereto otherwise vested in private owners; to conduct all mining, drilling, and related productive operations subject to the inspection of the lessor; to carry out at expense of the lessee all reasonable orders and requirements of lessor relative to prevention of waste, and preservation of the property and the health and safety of workmen, and on failure so to do the lessor shall have the right to enter on the property to repair damage or prevent waste at the lessee's cost; to abide by and conform to regulations in force at the time the lease is granted covering the matters referred to in this paragraph: Provided, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(i) Taxes and wages—Freedom of purchase.—To pay when due, all taxes lawfully assessed and levied under the laws of the State upon improvements, oil, and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(j) Reserved deposits.—To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under the laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(k) Assignment of lease.—Not to assign this lease or any interest therein, nor sublet any portion of the leased premises, except with the consent in writing of the Secretary of the Interior first had and obtained.

(l) Deliver premises in cases of forfeiture.—To deliver up the premises leased, with all permanent improvements thereon, in good order and condition in case of forfeiture of this lease; but this shall not be construed to prevent the removal, alteration, or renewal of equipment and improvements in the ordinary course of operations.

(m) See page 4½.

SEC. 3. The lessor expressly reserves:

(a) Rights reserved—Easements and rights of way.—The right to permit for joint or several use easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in said act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees, and for other public purposes.

(b) Disposition of surface.—The right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereafter enacted, insofar as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein., **provided this reservation shall not apply to any lands herein described, title to which has passed from the United States.**

(c) Pipe lines to convey at reasonable rates.—The right to require the lessee, his assignees or beneficiary, if owner or operator of, or owner of a controlling interest in, any pipe line, or any company operating the same which may be operated accessible to the oil derived from lands under such lease, to accept and convey at reasonable rates and without discrimination the oil of the Government or of any citizen or company, not the owner of any pipe line, operating a lease or purchasing oil or gas under the provisions of this act.

(d) Monopoly and fair prices.—Full power and authority to carry out and enforce all the provisions of section 30 of the act to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, to prevent monopoly, and to safeguard the public welfare.

(e) Helium.—Pursuant to section 1 of the act, the lessor reserves the right to take all helium from any gas produced under this lease, but the lessee shall not be required to extract and save the helium for the lessor; in case the lessor elects to take the helium, the lessee shall deliver all gas containing same, or portion thereof desired, to the lessor in the manner required by the lessor, for the extraction of the helium in such plant or reduction works for that purpose as the lessor may provide, whereupon the residue shall be returned to the lessee with no substantial delay in the delivery of gas produced from the well to the purchaser thereof: Provided, That the lessee shall not, as a result of the operation in this section provided for, suffer a diminution of value of the gas from which the helium has been extracted, or loss otherwise, for which the lessee is not reasonably compensated, save for the value of the helium extracted; the lessor further reserves the right to erect, maintain, and operate any and all reduction works and other equipment necessary for the extraction of helium on the premises leased.

Sec. 2(m). Conditions governing production.--If discovery of oil shall be made, or if discovery of gas be made in a horizon known or reasonably likely to contain oil in the same structure, the well, after testing, shall be placed in condition for indefinite suspension and shut in to the satisfaction of the supervisor of oil and gas operations, and shall so remain until otherwise authorized or directed by the Secretary of the Interior;

If discovery of gas shall be made in a horizon not known or reasonably likely to contain oil in the same structure, the well may be placed in condition for production and a reasonable portion of its capacity may be produced to the satisfaction of the supervisor of oil and gas operations, and if produced, gasoline shall, upon the demand of the supervisor and subject to appeal to the Secretary, be extracted by approved methods from all gas; or the well, at the option of the lessee, may be placed in condition for indefinite suspension and shut in to the satisfaction of said supervisor;

If the lessee or operator, directly or indirectly, individually or in association with others, purchases gas from any other permittee, lessee or any operator of Government lands, or from any operator or lessee of land held in fee, he shall offer to purchase gas of equal quality from all such permittees, lessees, operators or fee holders in the same general area, at a uniform price delivered under substantially similar conditions; and in case gas is offered in excess of pipe-line capacity or market demand, shall accept gas of equal quality from all on a prorata schedule, taking into consideration heat value, moisture, sulphur content, and impurities;

If and when natural gas shall be marketed from the field in which the permit or lease area is situated, the lessee shall either (a) drill wells and produce and market gas, or (b) shall pay a royalty estimated to reimburse the United States for the current loss of royalty through drainage, such royalty to be fixed by the supervisor of oil and gas operations, subject to the right of appeal to the Secretary of the Interior, whose decision shall be final.

SEC. 4. Surrender and termination of lease.—The lessee may, on consent of the Secretary of the Interior first had and obtained in writing, surrender and terminate this lease upon payment of all rents, royalties, and other obligations due and payable to the lessor, and upon payment of all wages and moneys due and payable to the workmen employed by the lessee, and upon a satisfactory showing to the Secretary that the public interest will not be impaired; but in no case shall such termination be effective until the lessee shall have made full provision for conservation and protection of the property; upon like consent had and obtained the lessee may surrender any legal subdivisions of the area included herein.

MOUNTAIN FUEL SUPPLY CO. LEGAL DIVISION
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SEC. 5. Purchase of materials, etc., on termination of lease.—Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessor or another lessee may, if the lessor shall so elect within six months from the termination of the lease purchase all materials, tools, machinery, appliances, structures, and equipment placed in or upon the land by the lessee, and in use thereon as a necessary or useful part of an operating or producing plant, on the payment to the lessee of such sum as may be fixed as a reasonable price therefor by a board of three appraisers, one of whom shall be chosen by the lessor, one by the lessee, and the other by the two so chosen; pending such election all equipment shall remain in normal position. If the lessor, or another lessee, shall not, within six months, elect to purchase all or any part of such materials, tools, machinery, appliances, structures, and equipment, the lessee shall have the right at any time, within ninety days, to remove from the premises all the materials, tools, machinery, appliances, structures, and equipment which the lessor shall not have elected to purchase, save and except casing in wells and other equipment or apparatus necessary for the preservation of the well or wells.

SEC. 6. Judicial proceedings in case of default.—If the lessee shall fail to comply with the provisions of the act, or make default in the performance or observance of any of the terms, covenants, and stipulations hereof, or of the general regulations promulgated and in force at the date hereof, and such default shall continue after service of written notice thereof by the lessor, then the lessor may institute appropriate judicial proceedings for the forfeiture and cancellation of this lease in accordance with the provisions of section 31 of said act; but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. A waiver of any particular cause of forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of forfeiture, or for the same cause occurring at any other time.

SEC. 7. Heirs and successors in interest.—It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors of, or assigns of the respective parties hereto.

SEC. 8. Unlawful interest.—It is also further agreed that no Member of or Delegate to Congress, or Resident Commissioner, after his election or appointment, or either before or after he has qualified, and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior, shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom; and the provisions of section 3741 of the Revised Statutes of the United States, and sections 114, 115, and 116 of the Codification of the Penal Laws of the United States approved March 4, 1919 (35 Stat., 1109), relating to contracts, enter into and form a part of this lease so far as the same may be applicable.

IN WITNESS WHEREOF

THE UNITED STATES OF AMERICA,

By Jno. M. Dyer
Acting (Secretary of the Interior.)

MOUNTAIN FUEL SUPPLY COMPANY

By C. F. Simmons
Vice President

Attest: E. M. Fitzpatrick
Secretary

Witness to signature of—

Hal W. Stewart

4-119 a

DEPARTMENT OF THE INTERIOR

GENERAL LAND OFFICE

OIL AND GAS LEASE

(Sec. 14-13)

Act of Feb. 25, 1920

MOUNTAIN FUEL SUPPLY COMPANY

Denver 038749 (b)

Reed Asplt 12-1933

A Baker

4-208 e

DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE

Serial Denver 038749 (b)

Lease of Oil and Gas Lands Under the Act of February 25, 1920.

(Sec. 14-13)

THIS INDENTURE OF LEASE, entered into, in triplicate, as of the 5th day of September, 1933, by and between the UNITED STATES OF AMERICA, party of the first part, hereinafter called the lessor, acting in this behalf by the Secretary of the Interior, and

MOUNTAIN FUEL SUPPLY COMPANY, a Delaware Corporation,
Findlay,
Ohio,

party of the second part, hereinafter called the lessee, under, pursuant, and subject to the terms and provisions of the act of Congress approved February 25, 1920 (Public No. 146), entitled "An Act to Promote the Mining of Coal, Phosphate, Oil, Oil Shale, Gas, and Sodium on the Public Domain," hereinafter referred to as the act, which is made a part hereof, WITNESSETH:

SEC. 1. Purposes.--That the lessor in consideration of rents and royalties to be paid, and the covenants to be observed as herein set forth, does hereby grant and lease to the lessee the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following-described tract of land situated in the Power Wash structure, Colorado and more particularly described as follows:

Lots 5 and 6 ($N\frac{1}{2}$ $NE\frac{1}{4}$), $S\frac{1}{2}$ $NE\frac{1}{4}$, Lot 7 ($NE\frac{1}{4}$ $NW\frac{1}{4}$), $SE\frac{1}{4}$ $NW\frac{1}{4}$, $E\frac{1}{2}$ $SW\frac{1}{4}$, $SE\frac{1}{4}$, Sec. 4, Lot 8 ($NW\frac{1}{4}$ $NW\frac{1}{4}$), $SW\frac{1}{4}$ $NW\frac{1}{4}$, $W\frac{1}{2}$ $SW\frac{1}{4}$, Sec. 5, all Secs. 6 and 9, T. 11 N., R. 97 W., 6th P.M., containing 1895.92 acres, more or less,

together with the right to construct and maintain thereupon all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipe lines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of twenty (20) years, with the preferential right in the lessee to renew this lease for successive periods of ten (10) years, upon such reasonable terms and conditions as may be prescribed by the lessor, unless otherwise provided by law at the time of the expiration of such periods.

Serial .....

SEC. 2. In consideration of the foregoing, the lessee hereby agrees:

(a) Bond.--To furnish a bond with approved corporate surety in the penal sum of $5,000, conditioned upon compliance with the terms of the lease.

(b) Wells.--To drill and produce only such wells on the leased land as are necessary to offset drainage from the leasehold through wells on adjoining lands unless and until authorized in writing by the Secretary of the Interior to drill or produce additional wells or unless directed by said Secretary to drill and produce wells in number not greater than the number of 40-acre tracts or lots embraced in the lease; provided that, for each month during which loss of royalty occurs by reason of drainage from the leasehold through producing wells on adjoining lands or deposits not the property of the United States or leased by the United States at lesser royalty rates, and until the drainage causing such loss shall have been fully offset by producing wells on the leasehold, the lessee shall pay a sum estimated to reimburse the United States for current loss of royalty through drainage.

(c) Royalty and Rents.--To pay the lessor in advance, beginning with the date of the execution of this lease, a rental of one dollar per acre per annum during the continuance hereof, the rental so paid for any one year to be credited on the royalty for that year, together with a royalty on all oil and gas produced from the land leased herein (except oil or gas used for production purposes on said land or unavoidably lost), as follows:

(1) For all oil produced of 30° Baume or over:

On that portion of the average production per well not exceeding 20 barrels per day for the calendar month	12½	per cent.
On that portion of the average production per well of more than 20 barrels and not more than 50 barrels per day for the calendar month	16⅔	per cent.
On that portion of the average production per well of more than 50 barrels and not more than 100 barrels per day for the calendar month	20	per cent.
On that portion of the average production per well of more than 100 barrels and not more than 200 barrels per day for the calendar month	25	per cent.
On that portion of the average production per well of more than 200 barrels per day for the calendar month	33⅓	per cent.

(2) For all oil produced of less than 30° Baume:

On that portion of the average production per well not exceeding 20 barrels per day for the calendar month	12½	per cent.
On that portion of the average production per well of more than 20 barrels and not more than 50 barrels per day for the calendar month	14 2/7	per cent.
On that portion of the average production per well of more than 50 barrels and not more than 100 barrels per day for the calendar month	16⅔	per cent.
On that portion of the average production per well of more than 100 barrels and not more than 200 barrels per day for the calendar month	20	per cent.
On that portion of the average production per well of more than 200 barrels per day for the calendar month	25	per cent.

Only wells which have a commercial production during at least part of the month shall be considered in ascertaining the average production above provided for; and the Secretary of the Interior shall determine what are commercially productive wells under this provision.

(3) On gas and casing-head gasoline:

On gas, whether same shall be gas from which the casing-head gasoline has been extracted or otherwise, 12½ per cent of the value thereof in the field where produced where the average production per day for the calendar month from the land leased is less than 3,000,000 cubic feet, and 16⅔ per cent where the average daily production is 3,000,000 cubic feet or over.

On casing-head gasoline, 16⅔ per cent of the value of the casing-head gasoline extracted from the gas produced and sold, computed on the basis provided for in the operating regulations.

The value in the field where produced, of gas and casing-head gasoline, for royalty purposes, unless such gas or casing-head gasoline is disposed of under an approved sales contract or other method as provided in subdivision (d) of this section, shall be as fixed by the Secretary of the Interior.

In cases where the gas produced and sold has a value both for casing-head gasoline content and as dry gas from which the casing-head gasoline has been extracted, then the royalties above provided shall be paid on both of such values.

When paid in value, such royalties shall be due and payable monthly on the 15th of each calendar month following the calendar month in which produced, to the Register of the land district in which the land is situated; when paid in kind, such royalty oil shall be delivered in tanks provided by the lessee on the premises where produced, unless otherwise agreed to by the parties hereto, at such times as may be required by the lessor: Provided, That the lessee shall not be required to hold such royalty oil in storage longer than thirty days after the end of the calendar month in which said oil is produced: And provided further, That the said lessee shall be in no manner responsible or held liable for the loss or destruction of such oil in storage from causes over which the lessee has no control; such royalties, whether in value or kind, shall be subject to reduction whenever the average daily production of any oil well shall not exceed ten (10) barrels per day, if in the judgment of the lessor the wells can not be successfully operated upon the royalties fixed herein.

(d) Sales contracts.—To file with the Secretary of the Interior copies of all sales contracts for the disposition of oil and gas produced hereunder except for production purposes on the land leased, and in the event the United States shall elect to take its royalties in money instead of in oil or gas, not to sell or otherwise dispose of the products of the land leased except in accordance with a sales contract or other method first approved by the Secretary of the Interior.

(e) Monthly statements.—To furnish monthly statements in detail in such form as may be prescribed by the lessor, showing the amount, quality, and value of all oil and gas produced and saved during the preceding calendar month as the basis for computing the royalty due the lessor. The leased premises and all wells, improvements, machinery, and fixtures thereon or connected therewith and all books and accounts of the lessee shall be open at all times for the inspection of any duly authorized officer of the department.

(f) Plats and reports.—To furnish annually and at such times as the Secretary shall require, in the manner and form prescribed by the Secretary of the Interior, a plat showing all development work and improvements on the leased lands, and other related information, with a report as to all buildings, structures, or other works placed in or upon said leased lands, accompanied by a report in detail as to the stockholders, investment, depreciation, and cost of operation, together with a statement as to the amount and grade of oil and gas produced and sold, and the amount received therefor by operations hereunder.

(g) Log of wells.—To keep a log in the form prescribed by the Secretary of all the wells drilled by the lessee, showing the strata and character of the ground passed through by the drill, which log, or copy thereof, shall be furnished to said lessor on demand.

(h) Diligence—Prevention of waste—Health and safety of workmen.—To exercise reasonable diligence in drilling and operating wells for the oil and gas on the lands covered hereby, while such products can be secured in paying quantities, unless consent to suspend operations temporarily is granted by the Secretary of the Interior; to carry on all operations hereunder in a good and workmanlike manner in accordance with approved methods and practice, having due regard for the prevention of waste of oil or gas developed on the land, or the entrance of water through wells drilled by the lessee to the oil sands or oil-bearing strata to the destruction or injury of the oil deposits, the preservation and conservation of the property for future productive operations, and to the health and safety of workmen and employees; to plug securely any well before abandoning the

same so as to effectually shut off all water from the oil or gas bearing strata; not to drill any well within 200 feet of any of the outer boundaries of the lands covered hereby, unless the adjoining lands have been patented or the title thereto otherwise vested in private owners; to conduct all mining, drilling, and related productive operations subject to the inspection of the lessor; to carry out at expense of the lessee all reasonable orders and requirements of lessor relative to prevention of waste, and preservation of the property and the health and safety of workmen, and on failure so to do the lessor shall have the right to enter on the property to repair damage or prevent waste at the lessee's cost; to abide by and conform to regulations in force at the time the lease is granted covering the matters referred to in this paragraph: Provided, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(i) Taxes and wages—Freedom of purchase.—To pay when due, all taxes lawfully assessed and levied under the laws of the State upon improvements, oil, and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(j) Reserved deposits.—To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under the laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(k) Assignment of lease.—Not to assign this lease or any interest therein, nor sublet any portion of the leased premises, except with the consent in writing of the Secretary of the Interior first had and obtained.

(l) Deliver premises in cases of forfeiture.—To deliver up the premises leased, with all permanent improvements thereon, in good order and condition in case of forfeiture of this lease; but this shall not be construed to prevent the removal, alteration, or renewal of equipment and improvements in the ordinary course of operations.

(m) See page 4½.

SEC. 3. The lessor expressly reserves:

(a) Rights reserved—Easements and rights of way.—The right to permit for joint or several use easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in said act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees, and for other public purposes.

(b) Disposition of surface.—The right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein, provided this reservation shall not apply to any lands herein described, title to which has passed from the United States.

(c) Pipe lines to convey at reasonable rates.—The right to require the lessee, his assignees or beneficiary, if owner or operator of, or owner of a controlling interest in, any pipe line, or any company operating the same which may be operated accessible to the oil derived from lands under such lease, to accept and convey at reasonable rates and without discrimination the oil of the Government or of any citizen or company, not the owner of any pipe line, operating a lease or purchasing oil or gas under the provisions of this act.

(d) Monopoly and fair prices.—Full power and authority to carry out and enforce all the provisions of section 30 of the act to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, to prevent monopoly, and to safeguard the public welfare.

(e) Helium.—Pursuant to section 1 of the act, the lessor reserves the right to take all helium from any gas produced under this lease, but the lessee shall not be required to extract and save the helium for the lessor; in case the lessor elects to take the helium, the lessee shall deliver all gas containing same, or portion thereof desired, to the lessor in the manner required by the lessor, for the extraction of the helium in such plant or reduction works for that purpose as the lessor may provide, whereupon the residue shall be returned to the lessee with no substantial delay in the delivery of gas produced from the well to the purchaser thereof: Provided, That the lessee shall not, as a result of the operation in this section provided for, suffer a diminution of value of the gas from which the helium has been extracted, or loss otherwise, for which the lessee is not reasonably compensated, save for the value of the helium extracted; the lessor further reserves the right to erect, maintain, and operate any and all reduction works and other equipment necessary for the extraction of helium on the premises leased.

Sec. 2(m). Conditions governing production.—If discovery of oil shall be made, or if discovery of gas be made in a horizon known or reasonably likely to contain oil in the same structure, the well, after testing, shall be placed in condition for indefinite suspension and shut in to the satisfaction of the supervisor of oil and gas operations, and shall so remain until otherwise authorized or directed by the Secretary of the Interior;

If discovery of gas shall be made in a horizon not known or reasonably likely to contain oil in the same structure, the well may be placed in condition for production and a reasonable portion of its capacity may be produced to the satisfaction of the supervisor of oil and gas operations, and if produced, gasoline shall, upon the demand of the supervisor and subject to appeal to the Secretary, be extracted by approved methods from all gas; or the well, at the option of the lessee, may be placed in condition for indefinite suspension and shut in to the satisfaction of said supervisor;

If the lessee or operator, directly or indirectly, individually or in association with others, purchases gas from any other permittee, lessee or any operator of Government lands, or from any operator or lessee of land held in fee, he shall offer to purchase gas of equal quality from all such permittees, lessees, operators or fee holders in the same general area, at a uniform price delivered under substantially similar conditions; and in case gas is offered in excess of pipe-line capacity or market demand, shall accept gas of equal quality from all on a prorata schedule, taking into consideration heat value, moisture, sulphur content, and impurities;

If and when natural gas shall be marketed from the field in which the permit or lease area is situated, the lessee shall either (a) drill wells and produce and market gas, or (b) shall pay a royalty estimated to reimburse the United States for the current loss of royalty through drainage, such royalty to be fixed by the supervisor of oil and gas operations, subject to the right of appeal to the Secretary of the Interior, whose decision shall be final.

SEC. 4. Surrender and termination of lease.—The lessee may, on consent of the Secretary of the Interior first had and obtained in writing, surrender and terminate this lease upon payment of all rents, royalties, and other obligations due and payable to the lessor, and upon payment of all wages and moneys due and payable to the workmen employed by the lessee, and upon a satisfactory showing to the Secretary that the public interest will not be impaired; but in no case shall such termination be effective until the lessee shall have made full provision for conservation and protection of the property; upon like consent had and obtained the lessee may surrender any legal subdivisions of the area included herein.

SEC. 5. Purchase of materials, etc., on termination of lease.—Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessor or another lessee may, if the lessor shall so elect within six months from the termination of the lease purchase all materials, tools, machinery, appliances, structures, and equipment placed in or upon the land by the lessee, and in use thereon as a necessary or useful part of an operating or producing plant, on the payment to the lessee of such sum as may be fixed as a reasonable price therefor by a board of three appraisers, one of whom shall be chosen by the lessor, one by the lessee, and the other by the two so chosen; pending such election all equipment shall remain in normal position. If the lessor, or another lessee, shall not, within six months, elect to purchase all or any part of such materials, tools, machinery, appliances, structures, and equipment, the lessee shall have the right at any time, within ninety days, to remove from the premises all the materials, tools, machinery, appliances, structures, and equipment which the lessor shall not have elected to purchase, save and except casing in wells and other equipment or apparatus necessary for the preservation of the well or wells.

SEC. 6. Judicial proceedings in case of default.—If the lessee shall fail to comply with the provisions of the act, or make default in the performance or observance of any of the terms, covenants, and stipulations hereof, or of the general regulations promulgated and in force at the date hereof, and such default shall continue after service of written notice thereof by the lessor, then the lessor may institute appropriate judicial proceedings for the forfeiture and cancellation of this lease in accordance with the provisions of section 31 of said act; but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. A waiver of any particular cause of forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of forfeiture, or for the same cause occurring at any other time.

SEC. 7. Heirs and successors in interest.—It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors of, or assigns of the respective parties hereto.

SEC. 8. Unlawful interest.—It is also further agreed that no Member of or Delegate to Congress, or Resident Commissioner, after his election or appointment, or either before or after he has qualified, and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior, shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom; and the provisions of section 3741 of the Revised Statutes of the United States, and sections 114, 115, and 116 of the Codification of the Penal Laws of the United States approved March 4, 1919 (35 Stat., 1109), relating to contracts, enter into and form a part of this lease so far as the same may be applicable.

IN WITNESS WHEREOF

THE UNITED STATES OF AMERICA,

MOUNTAIN FUEL SUPPLY CO. COLORADO DIVISION 31-B

By Harold L. Ickes
(Secretary of the Interior.)

MOUNTAIN FUEL SUPPLY COMPANY

By C. L. Flemming
Vice President

Witness to signature of—

Hal M. Stewart

Attest: E. V. Redpath
Secretary

WEXPRO COMPANY
POWDER WASH EVAPORATION FACILITY
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

DATE:	DESCRIPTION:
11/29/2017	ADD TOPO B
12/20/2017	FINAL PLATS

UINTAH
ENGINEERING & LAND SURVEYING

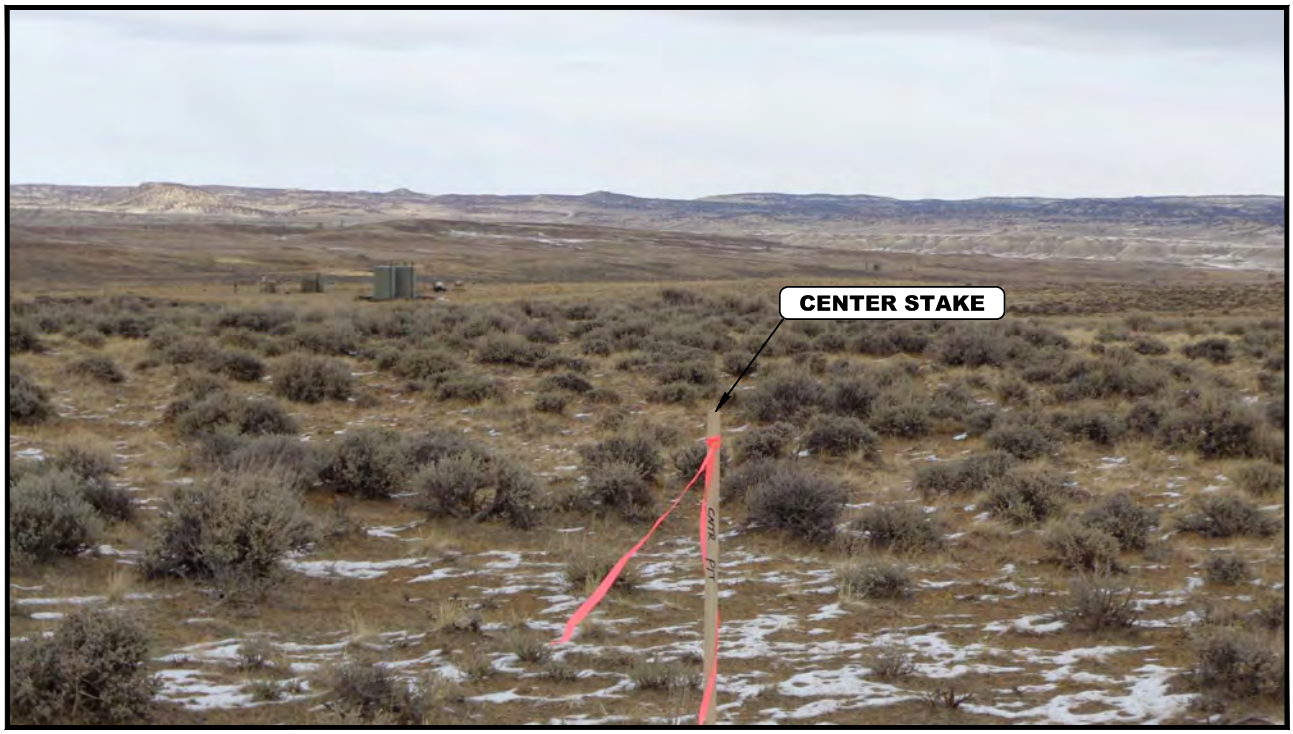

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: NORTHERLY

PHOTO: VIEW FROM BEGINNING OF PROPOSED ACCESS

CAMERA ANGLE: NORTHWESTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

UELS, LLC
Corporate Office * 85 South 200 East
Vernal, UT 84078 * (435) 789-1017

TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
LOCATION PHOTOS			PHOTO 1

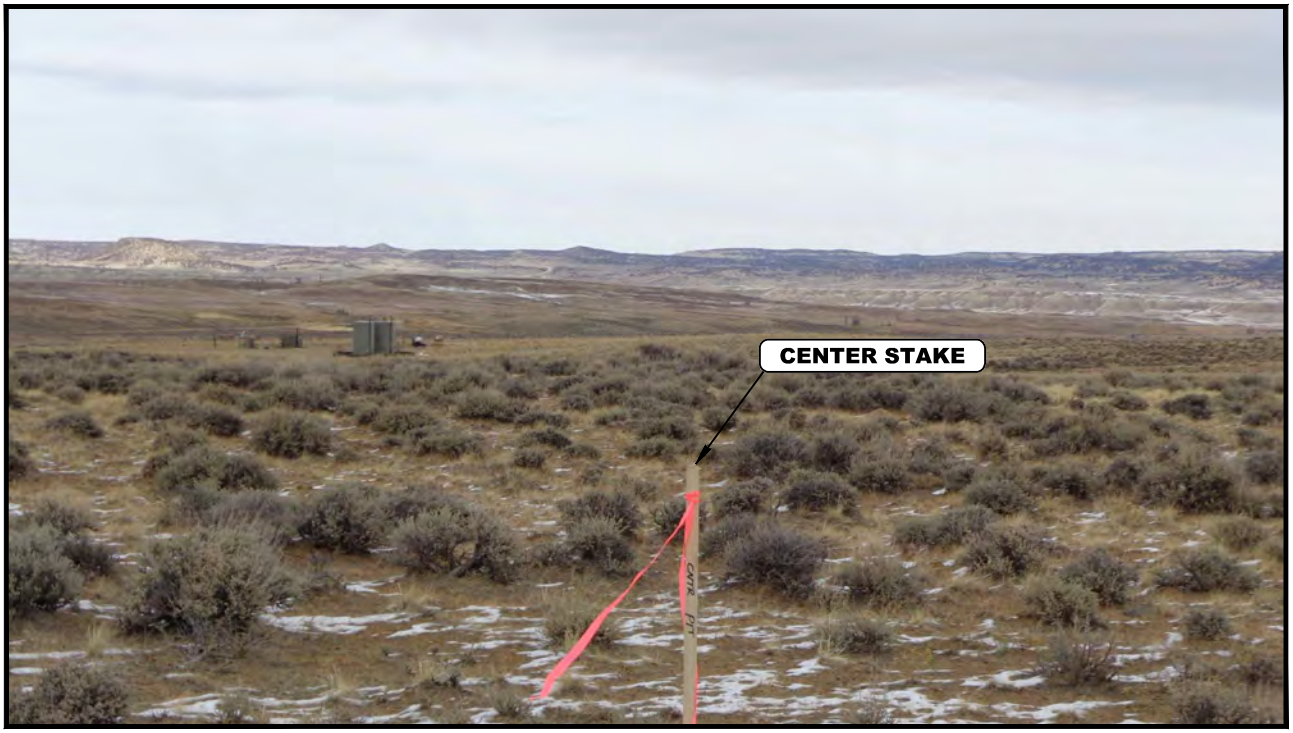

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: NORTHERLY

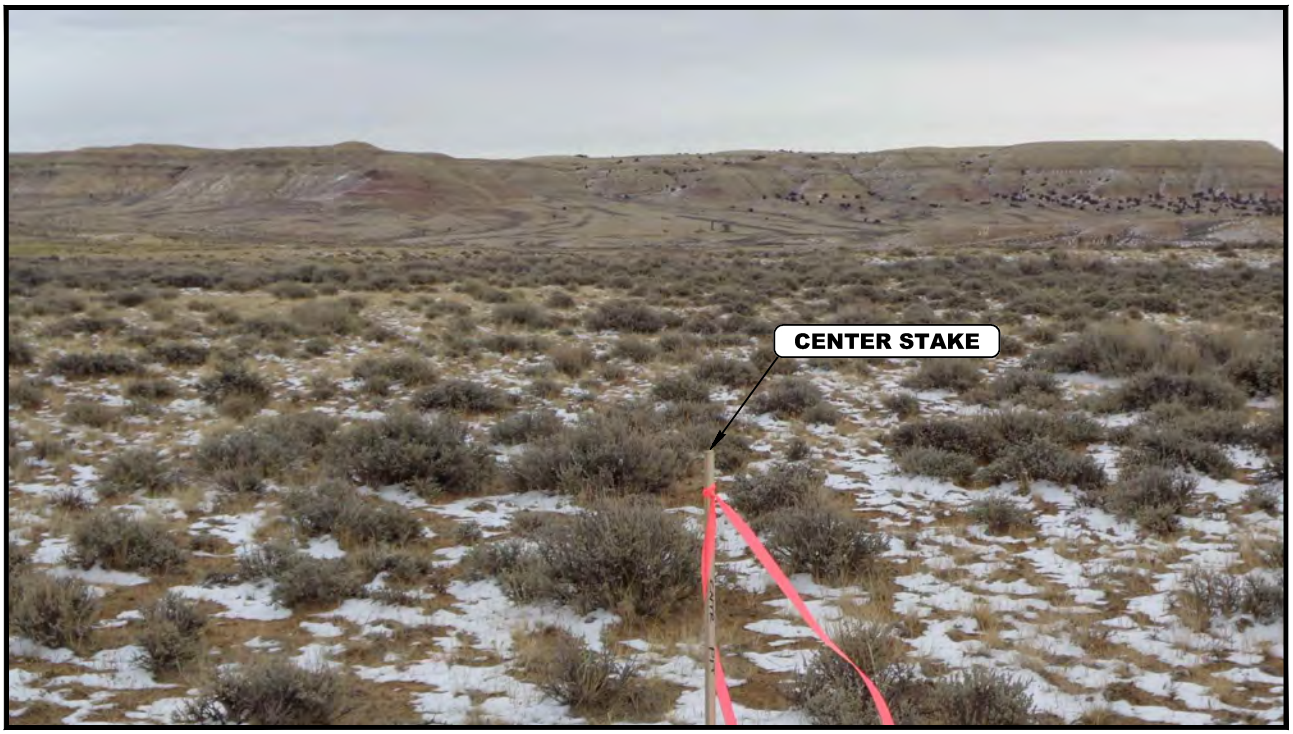

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: EASTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

UELS, LLC
Corporate Office * 85 South 200 East
Vernal, UT 84078 * (435) 789-1017

TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
LOCATION PHOTOS			PHOTO 2

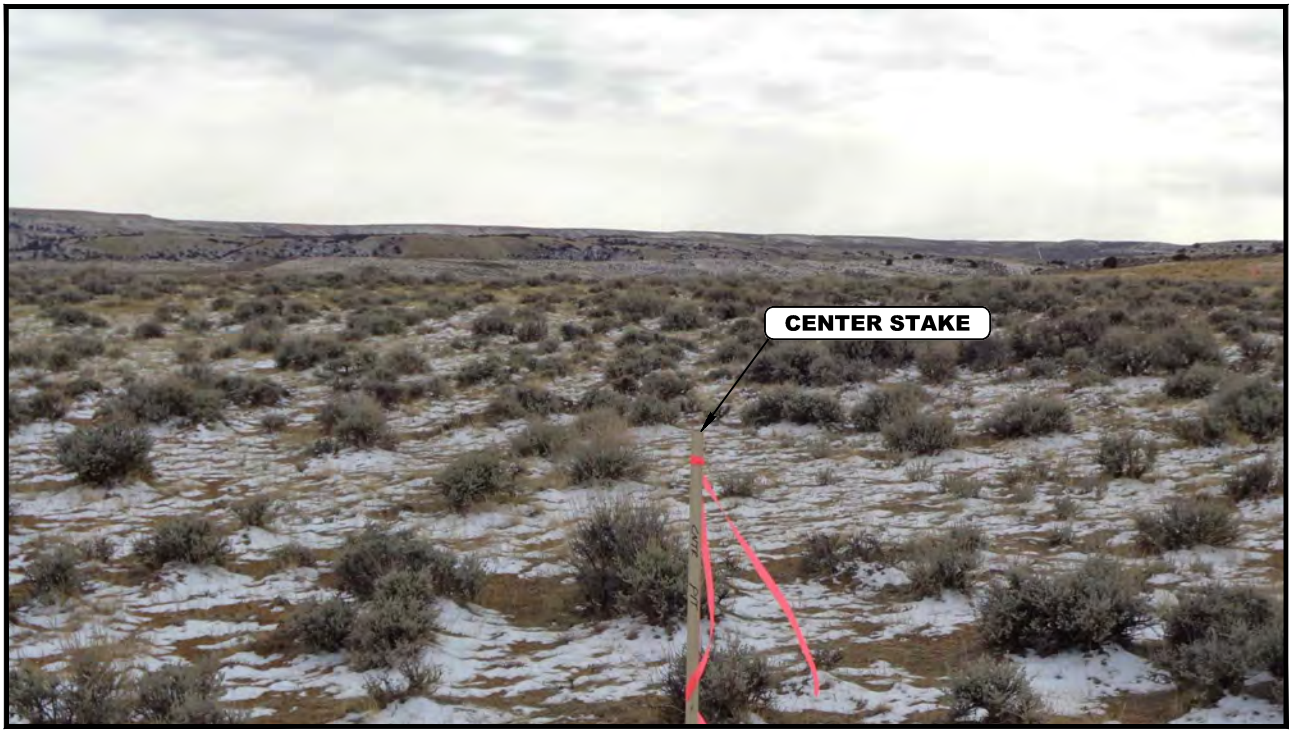

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: SOUTHERLY

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: WESTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
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MOFFAT COUNTY, COLORADO

UELS, LLC
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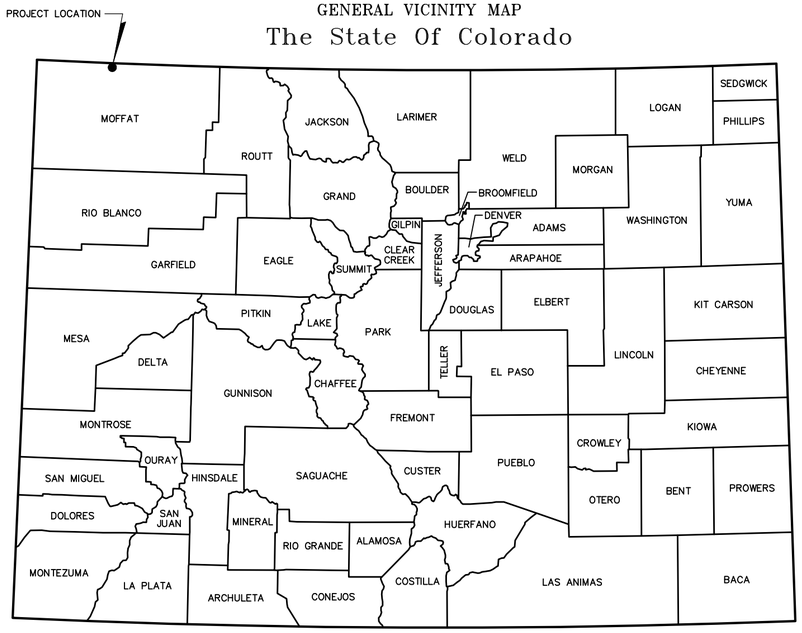
Vernal, UT 84078 * (435) 789-1017

TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
LOCATION PHOTOS			PHOTO 3

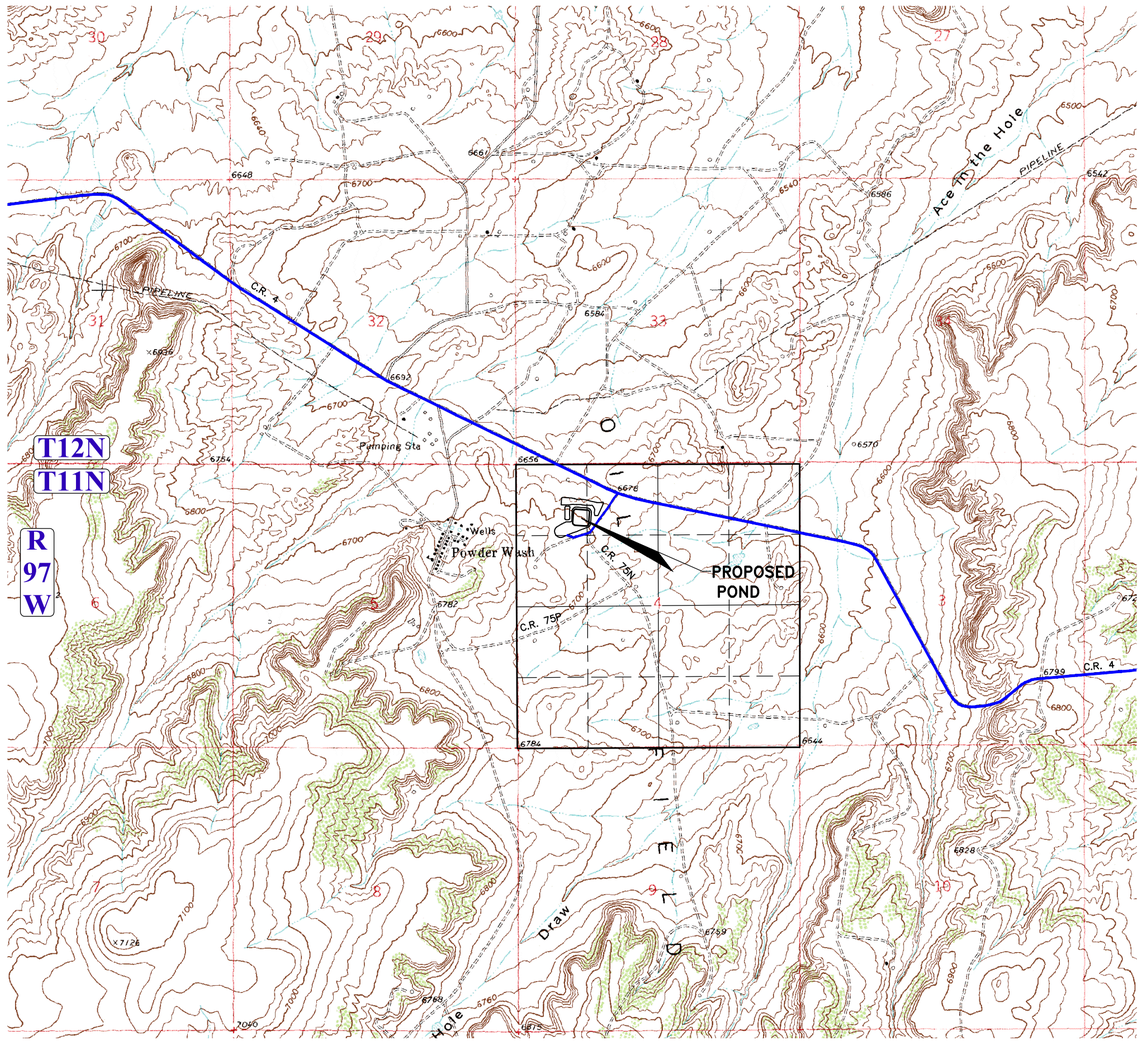
GENERAL VICINITY MAP

The State Of Colorado



NO SCALE

PROPOSED POND LOCATION
SECTION 4, T11N, R97W, 6TH P.M.



SCALE 1"=2000'

CENTER OF POND LOCATION:

LATITUDE: 40° 56' 48.06" N (NAD83)
LONGITUDE: 108° 18' 06.13" W (NAD83)

1038' FROM THE NORTH LINE OF SECTION 4
1229' FROM THE WEST LINE OF SECTION 4

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DOMINION ENERGY WEXPRO
POWDER WASH EVAPORATION FACILITY

LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

REV	DATE	BY	REVISIONS
1	11-20-17	D.G.W.	60 mil liners, spread out spoils, add gen. skid

RESPONSIBLE ENGINEER:

COLORADO REGISTERED
DANIEL G. NEW
37502
11/20/17
PROFESSIONAL ENGINEER

TITLE SHEET

SCALE: NOT TO SCALE
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W - 2 1 1 0
PROJ NO: DOM04-17-0033
FILE: 3 3 1 2 0

SHEET
1

GENERAL NOTES

– AS SHOWN ON PLANS, ALL DIKE INTERIOR SLOPES WILL BE 3:1 (H:V) AND ALL DIKE EXTERIOR SLOPES WILL BE 2:1 (H:V).

– VEGETATION WILL BE ADEQUATELY STRIPPED BEFORE CONSTRUCTION OF ANY POND OR ROAD. NO VEGETATION WILL BE PLACED IN FILL SLOPES.

– A LEAK DETECTION SYSTEM WILL BE INSTALLED UNDER THE POND. REGULAR MONITORING PROCEDURES WILL BE ACCORDING TO THE COLORADO OIL AND GAS CONSERVATION COMMISSION REGULATIONS.

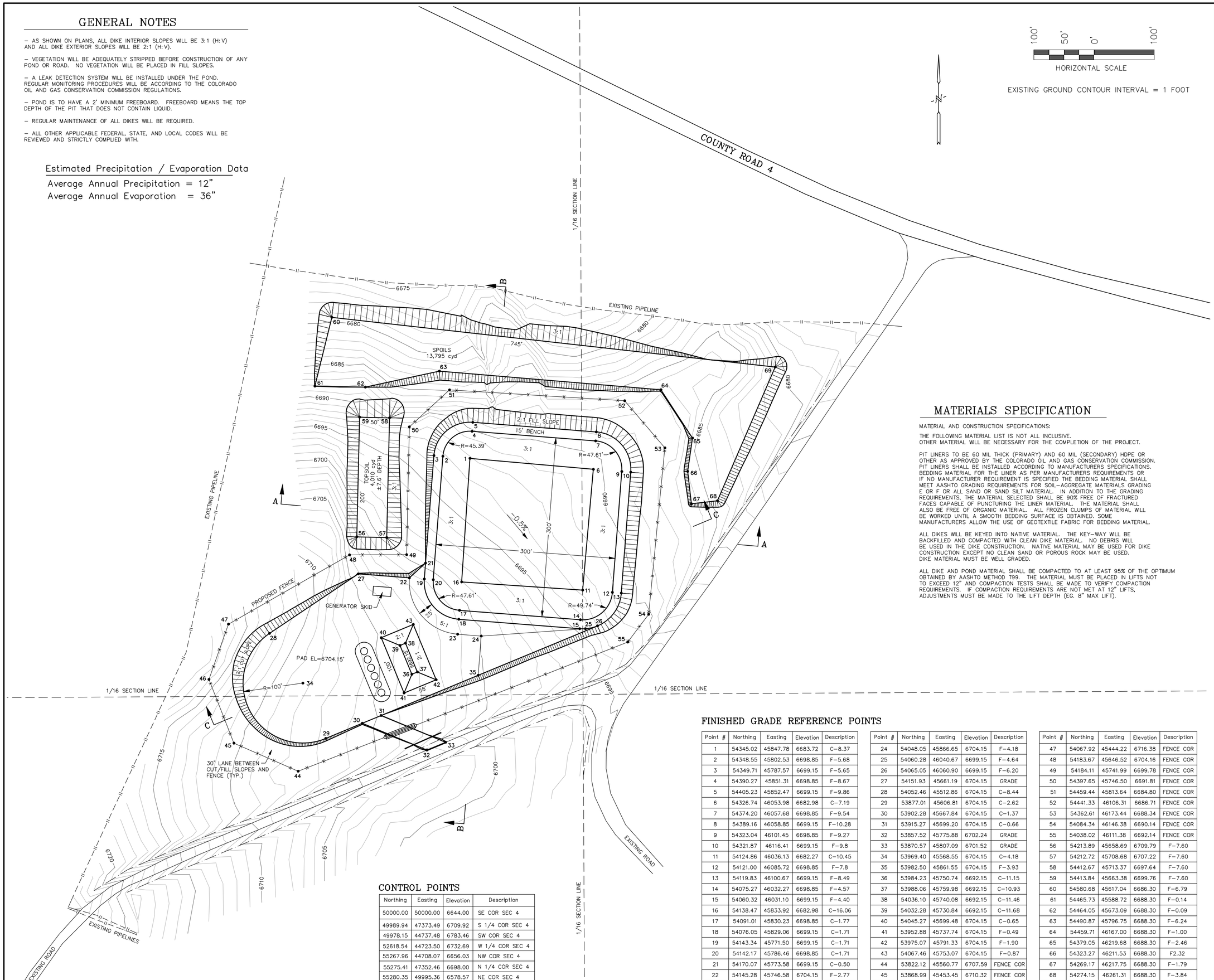
– POND IS TO HAVE A 2' MINIMUM FREEBOARD. FREEBOARD MEANS THE TOP DEPTH OF THE PIT THAT DOES NOT CONTAIN LIQUID.

– REGULAR MAINTENANCE OF ALL DIKES WILL BE REQUIRED.

– ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL CODES WILL BE REVIEWED AND STRICTLY COMPLIED WITH.

Estimated Precipitation / Evaporation Data

Average Annual Precipitation = 12"
Average Annual Evaporation = 36"



MATERIALS SPECIFICATION

MATERIAL AND CONSTRUCTION SPECIFICATIONS:

THE FOLLOWING MATERIAL LIST IS NOT ALL INCLUSIVE. OTHER MATERIAL WILL BE NECESSARY FOR THE COMPLETION OF THE PROJECT.

PIT LINERS TO BE 60 MIL THICK (PRIMARY) AND 60 MIL (SECONDARY) HDPE OR OTHER AS APPROVED BY THE COLORADO OIL AND GAS CONSERVATION COMMISSION. PIT LINERS SHALL BE INSTALLED ACCORDING TO MANUFACTURERS SPECIFICATIONS. BEDDING MATERIAL FOR THE LINER AS PER MANUFACTURERS REQUIREMENTS OR IF NO MANUFACTURER REQUIREMENT IS SPECIFIED THE BEDDING MATERIAL SHALL MEET AASHTO GRADING REQUIREMENTS FOR SOIL–AGGREGATE MATERIALS GRADING E OR F OR ALL SAND OR SAND SILT MATERIAL. IN ADDITION TO THE GRADING REQUIREMENTS, THE MATERIAL SELECTED SHALL BE 90% FREE OF FRACTURED FACES CAPABLE OF PUNCTURING THE LINER MATERIAL. THE MATERIAL SHALL ALSO BE FREE OF ORGANIC MATERIAL. ALL FROZEN CLUMPS OF MATERIAL WILL BE WORKED UNTIL A SMOOTH BEDDING SURFACE IS OBTAINED. SOME MANUFACTURERS ALLOW THE USE OF GEOTEXTILE FABRIC FOR BEDDING MATERIAL.

ALL DIKES WILL BE KEYED INTO NATIVE MATERIAL. THE KEY–WAY WILL BE BACKFILLED AND COMPACTED WITH CLEAN DIKE MATERIAL. NO DEBRIS WILL BE USED IN THE DIKE CONSTRUCTION. NATIVE MATERIAL MAY BE USED FOR DIKE CONSTRUCTION EXCEPT NO CLEAN SAND OR POROUS ROCK MAY BE USED. DIKE MATERIAL MUST BE WELL GRADED.

ALL DIKE AND POND MATERIAL SHALL BE COMPACTED TO AT LEAST 95% OF THE OPTIMUM OBTAINED BY AASHTO METHOD T99. THE MATERIAL MUST BE PLACED IN LIFTS NOT TO EXCEED 12" AND COMPACTION TESTS SHALL BE MADE TO VERIFY COMPACTION REQUIREMENTS. IF COMPACTION REQUIREMENTS ARE NOT MET AT 12" LIFTS, ADJUSTMENTS MUST BE MADE TO THE LIFT DEPTH (EG. 8" MAX LIFT).

CONTROL POINTS

Northing	Easting	Elevation	Description
50000.00	50000.00	6644.00	SE COR SEC 4
49989.94	47373.49	6709.92	S 1/4 COR SEC 4
49978.15	44737.48	6783.46	SW COR SEC 4
52618.54	44723.50	6732.69	W 1/4 COR SEC 4
55267.96	44708.07	6656.03	NW COR SEC 4
55275.41	47352.46	6698.00	N 1/4 COR SEC 4
55280.35	49995.36	6578.57	NE COR SEC 4
52662.21	49999.72	6640.58	E 1/4 COR SEC 4

FINISHED GRADE REFERENCE POINTS

Point #	Northing	Easting	Elevation	Description
1	54345.02	45847.78	6683.72	C–8.37
2	54348.55	45802.53	6698.85	F–5.68
3	54349.71	45787.57	6699.15	F–5.65
4	54390.27	45851.31	6698.85	F–8.67
5	54405.23	45852.47	6699.15	F–9.86
6	54326.74	46053.98	6682.98	C–7.19
7	54374.20	46057.68	6698.85	F–9.54
8	54389.16	46058.85	6699.15	F–10.28
9	54323.04	46101.45	6698.85	F–9.27
10	54321.87	46116.41	6699.15	F–9.8
11	54124.86	46036.13	6682.27	C–10.45
12	54121.00	46085.72	6698.85	F–7.8
13	54119.83	46100.67	6699.15	F–8.49
14	54075.27	46032.27	6698.85	F–4.57
15	54060.32	46031.10	6699.15	F–4.40
16	54138.47	45833.92	6682.98	C–16.06
17	54091.01	45830.23	6698.85	C–1.77
18	54076.05	45829.06	6699.15	C–1.71
19	54143.34	45771.50	6699.15	C–1.71
20	54142.17	45786.46	6698.85	C–1.71
21	54170.07	45773.58	6699.15	C–0.50
22	54145.28	45746.58	6704.15	F–2.77
23	54051.13	45827.12	6704.15	F–2.96
24	54048.05	45866.65	6704.15	F–4.18
25	54060.28	46040.67	6699.15	F–4.64
26	54065.05	46060.90	6699.15	F–6.20
27	54151.93	45661.19	6704.15	GRADE
28	54052.46	45512.86	6704.15	C–8.44
29	53877.01	45606.81	6704.15	C–2.62
30	53902.28	45667.84	6704.15	C–1.37
31	53915.27	45699.20	6704.15	C–0.66
32	53857.52	45775.88	6702.24	GRADE
33	53870.57	45807.09	6701.52	GRADE
34	53969.40	45568.55	6704.15	C–4.18
35	53982.50	45861.55	6704.15	F–3.93
36	53984.23	45750.74	6692.15	C–11.15
37	53988.06	45759.98	6692.15	C–10.93
38	54036.10	45740.08	6692.15	C–11.46
39	54032.28	45730.84	6692.15	C–11.68
40	54045.27	45699.48	6704.15	C–0.65
41	53952.88	45737.74	6704.15	F–0.49
42	53975.07	45791.33	6704.15	F–1.90
43	54067.46	45753.07	6704.15	F–0.87
44	53822.12	45560.77	6707.59	FENCE COR
45	53868.99	45453.45	6710.32	FENCE COR
46	53975.53	45411.67	6716.04	FENCE COR
47	54067.92	45444.22	6716.38	FENCE COR
48	54183.67	45646.52	6704.16	FENCE COR
49	54184.11	45741.99	6699.78	FENCE COR
50	54397.65	45746.50	6691.81	FENCE COR
51	54459.44	45813.64	6684.80	FENCE COR
52	54441.33	46106.31	6686.71	FENCE COR
53	54362.61	46173.44	6688.34	FENCE COR
54	54084.34	46146.38	6690.14	FENCE COR
55	54038.02	46111.38	6692.14	FENCE COR
56	54213.89	45658.69	6709.79	F–7.60
57	54212.72	45708.68	6707.22	F–7.60
58	54412.67	45713.37	6697.64	F–7.60
59	54413.84	45663.38	6699.76	F–7.60
60	54580.68	45617.04	6686.30	F–6.79
61	54465.73	45588.72	6688.30	F–0.14
62	54464.05	45673.09	6688.30	F–0.09
63	54490.87	45796.75	6688.30	F–6.24
64	54459.71	46167.00	6688.30	F–1.00
65	54379.05	46219.68	6688.30	F–2.46
66	54323.27	46211.53	6688.30	F2.32
67	54269.17	46217.75	6688.30	F–1.79
68	54274.15	46261.31	6688.30	F–3.84
69	54497.62	46357.72	6686.30	F–5.57

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DOMINION ENERGY WEXPRO
POWDER WASH EVAPORATION FACILITY
LOCATED IN THE SW 1/4 OF THE NE 1/4 AND THE NW 1/4 OF THE SE 1/4 OF SECTION 30, T12N, R97W, 6th P.M. MOFFAT COUNTY, COLORADO

REV	DATE	BY	REVISIONS
1	11-20-17	D.G.W.	60 mil liners, spread out spoils, add gen. skid

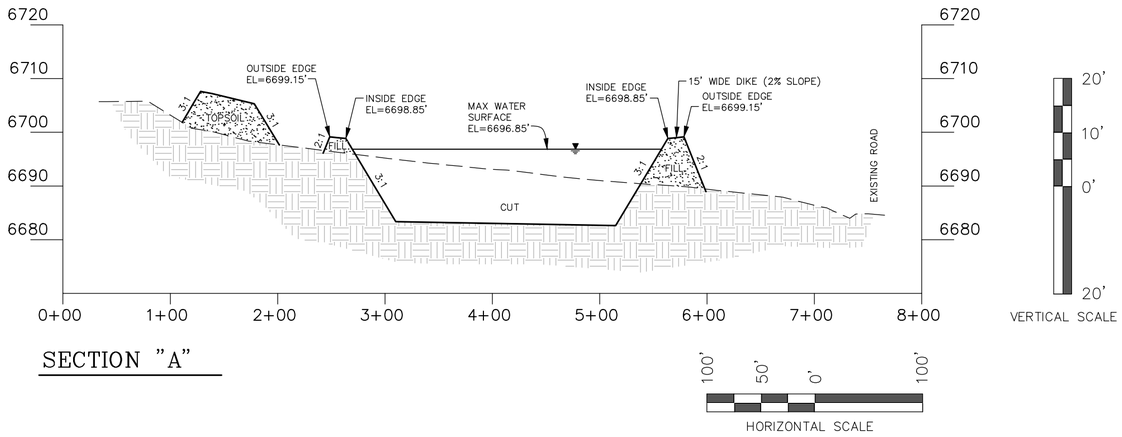
RESPONSIBLE ENGINEER:

COLORADO REGISTERED GLENN WARNICK 37502 11/20/17 PROFESSIONAL ENGINEER

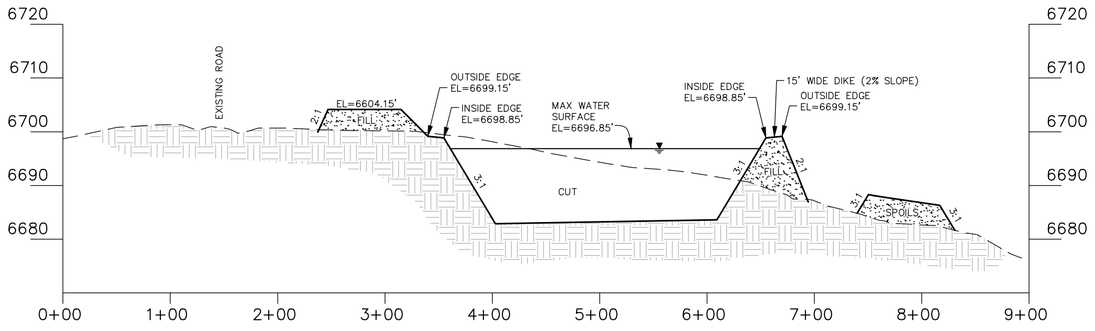
GRADING PLAN

SCALE: 1" = 100'
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W - 2 1 1 0
PROJ. NO: DOM04-17-0033
FILE: 3 3 1 2 0

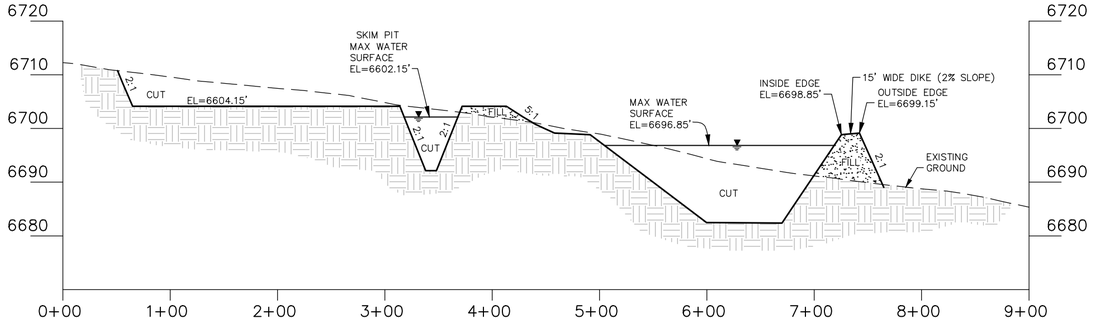
SHEET 2



SECTION "A"



SECTION "B"



SECTION "C"

DISTURBANCE AREA

4.97 ACRES (DISTURBANCE FOOTPRINT)
6.49 ACRES (FENCED AREA)

EARTHWORK APPROXIMATE YARDAGES

RAW CUT	= 27,713	CU. YDS.
FILL	= 12,652	CU. YDS.
FILL+10%	= 13,918	CU. YDS.
EXCESS	= 13,795	CU. YDS.

TOP SOIL CUT & STOCKPILE

RAW CUT = 4,011 CU. YDS.
Top soil for area within all areas of new disturbance (6" depth)

EVAPORATION POND VOLUME

POND VOLUME EXCLUDING FREEBOARD
31,195 cyd, 19.34 acre feet, 150,014 BBL

SURFACE AREA AT MAX. LIQUID DEPTH
81,457 SQUARE FEET (1.870 ACRES)

SKIM PIT VOLUME

POND VOLUME EXCLUDING FREEBOARD
849 cyd, 0.53 acre feet, 4,085 BBL

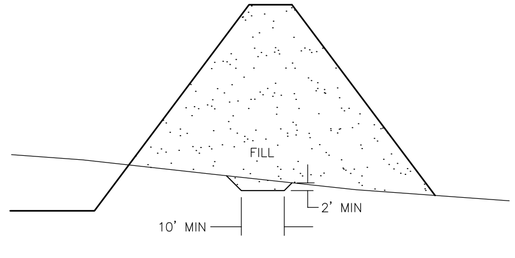
SURFACE AREA AT MAX. LIQUID DEPTH
4,600 SQUARE FEET (0.106 ACRES)

MAXIMUM DAM HEIGHT

TOP OF DIKE ELEVATION (AT CENTERLINE) TO LOWEST NATURAL GROUND = 10.00 FT

DAM LENGTH

PERIMETER OF POND (FILL SECTION)
980 FT



KEY-WAY DETAIL
NO SCALE

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REV	DATE	BY	REVISIONS
1	11-20-17	D.G.W.	60 mil liners, spread out spoils, add gen. skid

RESPONSIBLE ENGINEER:

CROSS SECTIONS

SCALE:	AS SHOWN
DRAWN BY:	D.G.W.
DATE DRAWN:	11-13-17
UELS FILE NO.:	W - 2 1 1 0
PROJ. NO:	DOM04-17-0033
FILE:	3 3 1 2 0

SHEET
3

100' 50' 0' 100'

HORIZONTAL SCALE

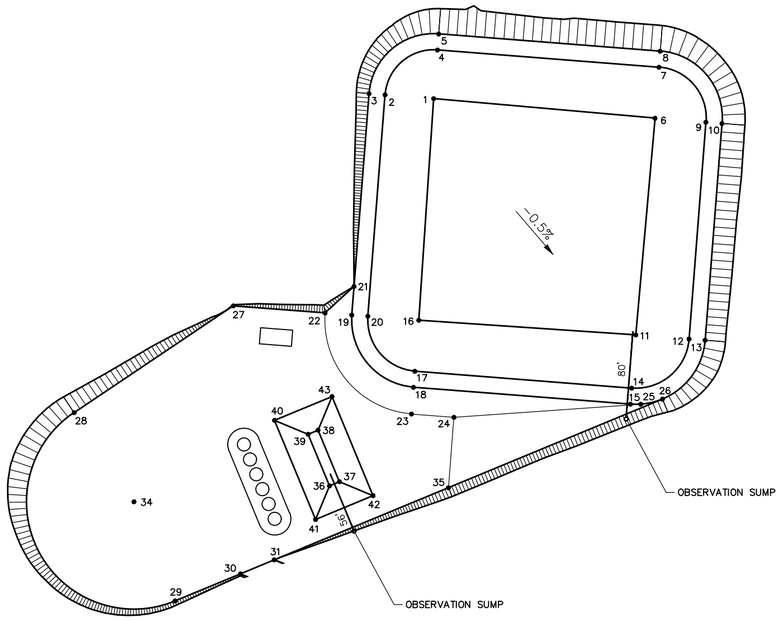
LINER QUANTITIES

(7 FT AROUND PERIMETER FOR ANCHORAGE, NO ALLOWANCE SHOWN FOR SEAMS OR WASTE)

EVAPORATION POND
98,315 SQ FT

SKIM PIT
8,835 SQ FT

TOTAL
107,150 SQ FT



RECORDKEEPING, REPORTING, AND REPAIRS

THE OBSERVATION SUMP WILL BE CHECKED ACCORDING TO THE COLORADO OIL AND GAS CONSERVATION COMMISSION REQUIREMENTS.

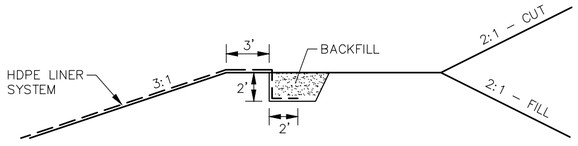
IF LIQUID IS FOUND WITHIN THE OBSERVATION SUMP THE FOLLOWING PROCEDURES WILL BE FOLLOWED:

– THE COLORADO OIL AND GAS CONSERVATION COMMISSION WILL BE PROMPTLY INFORMED AND CONSULTED DURING CORRECTIVE ACTION PLANNING.

– IF REPAIRS ARE NECESSARY, ALL REPAIRS WILL BE MADE IN ACCORDANCE WITH THE LINER MANUFACTURERS SPECIFICATIONS.

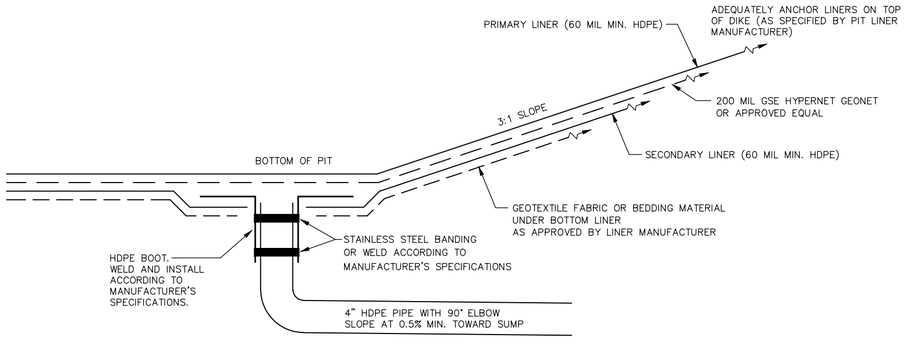
NOTE

TEXTURED "LADDERS" SHALL BE INSTALLED ON THE INSIDE SLOPE AROUND THE PERIMETER OF THE PONDS SPACED AT 50' O.C. MAX. OR AS APPROVED BY OWNER. LADDER SHALL BE CONSTRUCTED OF 60 MIL HDPE LINER 36" WIDE WITH POLYLOC STRIPS FUSED HORIZONTALLY AT 24" O.C. WITH STUDS FACING OUT. LADDERS SHALL BE FUSED TO PRIMARY LINER. TEXTURED PANELS OR OTHER EMERGENCY EGRESS METHODS MAY BE USED WITH APPROVAL OF THE ENGINEER AND OWNER.



ANCHOR TRENCH DETAIL

NO SCALE

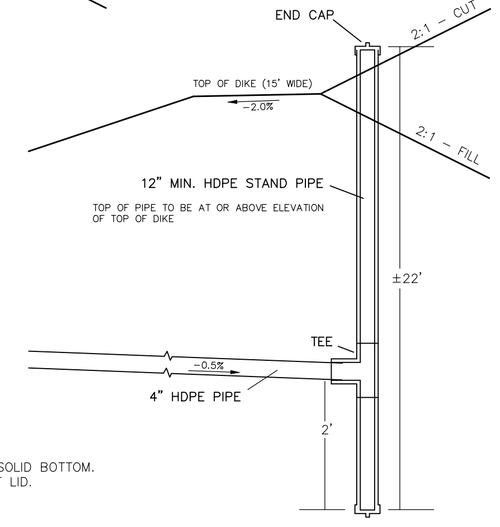


LEAK DETECTION SYSTEM

NO SCALE

OBSERVATION SUMP NOTES

– OBSERVATION SUMP TO BE PIPE STAND WITH SOLID BOTTOM.
– OBSERVATION SUMP WILL HAVE RODENT PROOF LID.
– OBSERVATION SUMP WILL HAVE AN INVERT 2' LOWER THAN THE PIPE INVERT ELEVATION.



OBSERVATION SUMP DETAIL

NO SCALE

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REV	DATE	BY	REVISIONS
1	11-20-17	D.G.W.	60 mil liners, spread out spoils, add gen. skid

RESPONSIBLE ENGINEER:

COLORADO REGISTERED DANIEL GLEN WEBSTER 37502 11/20/17 PROFESSIONAL ENGINEER

DETAILS

SCALE: NO SCALE
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W - 2 1 1 0
PROJ. NO: DOM04-17-0033
FILE: 3 3 1 2 0

SHEET
4

N

Prevailing Winds

Existing Pad

Existing County Road 4

Existing 3" Surface Pipeline

6680

Reclaimed Spoils Stockpile Area

6680

6680

6690

Existing Buried Tesoro Pipeline

6700

Reclaimed Topsoil Stockpile Area

Approx. Top of Cut Slope

Approx. Toe of Fill Slope

Cut/Fill Transition Line

6690

Existing Road

Access Road

Culvert

Cattle Guard

6700

Existing Ditch

6710

LEGEND:

Reclaimed Area

APPROXIMATE UN-RECLAIMED ACREAGE = ±0.000 ACRES
APPROXIMATE RECLAIMED ACREAGE = ±9.250 ACRES
TOTAL ACREAGE = ±9.250 ACRES

100' 50' 0' 100'

NOTES:

- Contours shown at 2' intervals.

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	CODY RICH	12-07-17	SCALE
DRAWN BY	C.D.L.	12-11-17	1" = 100'
INTERIM RECLAMATION PLAN			FIGURE #4

UINTAH ENGINEERING & LAND SURVEYING

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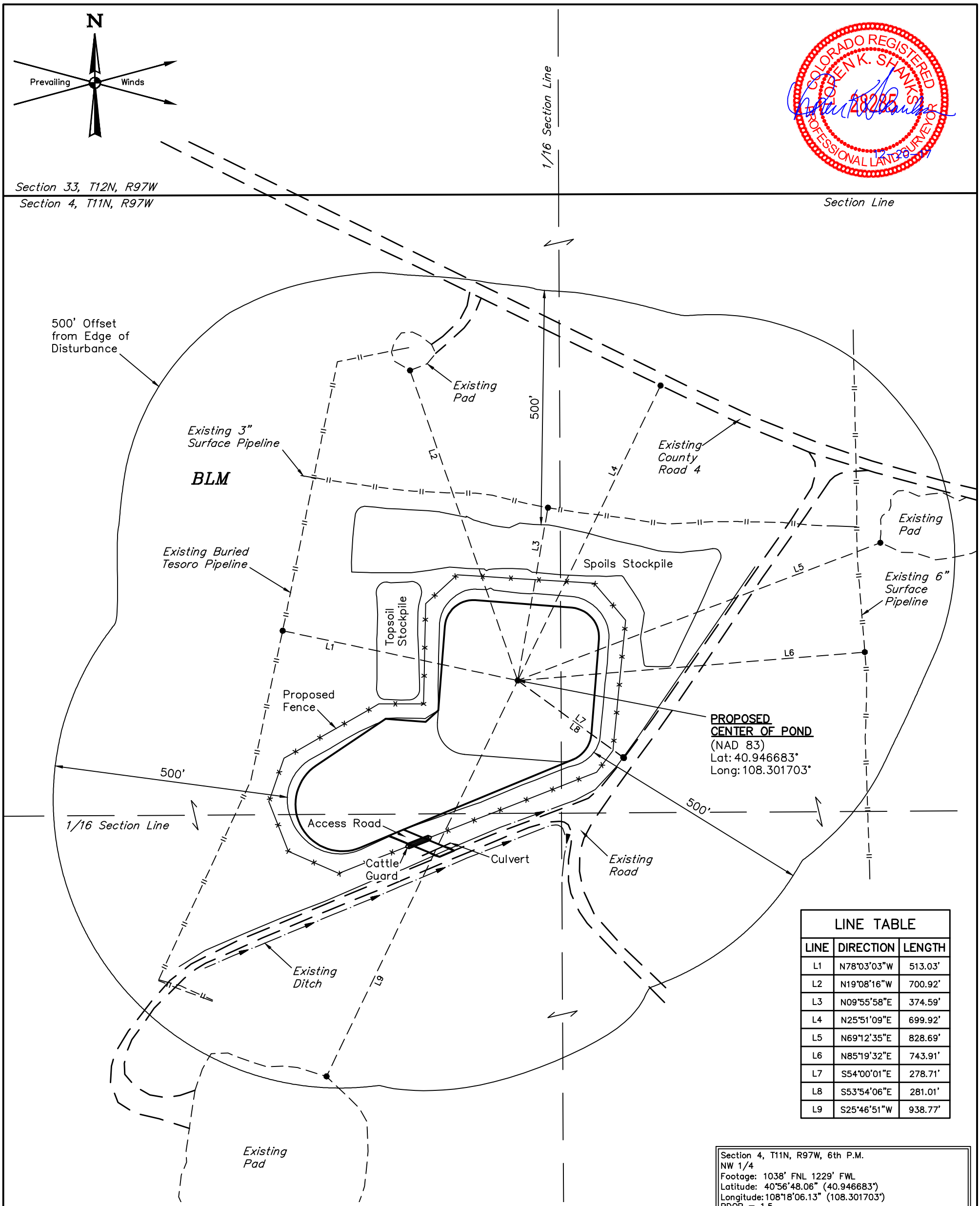
Vernal, UT 84078 * (435) 789-1017



LINE TABLE		
LINE	DIRECTION	LENGTH
L1	N78°03'03"W	513.03'
L2	N19°08'16"W	700.92'
L3	N09°55'58"E	374.59'
L4	N25°51'09"E	699.92'
L5	N69°12'35"E	828.69'
L6	N85°19'32"E	743.91'
L7	S54°00'01"E	278.71'
L8	S53°54'06"E	281.01'
L9	S25°46'51"W	938.77'

Section 4, T11N, R97W, 6th P.M.
NW 1/4
Footage: 1038' FNL 1229' FWL
Latitude: 40°56'48.06" (40.946683°)
Longitude: 108°18'06.13" (108.301703°)
PDOP = 1.5
Instrument Operator: Cody Rich
Date of Measurement: 12-07-17
Measurement Ref. Point: CENT. OF EVAPORATION POND

PLANT COMMUNITY

- ☐ DISTURBED GRASSLAND
- ☐ NATIVE GRASSLAND
- ☐ SHRUB LAND
- ☐ PLAINS RIPARIAN
- ☐ MOUNTAIN RIPARIAN
- ☐ FOREST LAND
- ☐ WETLANDS AQUATIC
- ☐ ALPINE
- ☐ OTHER (Describe):_____

CURRENT LAND USE

CROP LAND:	☐ IRRIGATED	☐ DRY LAND	☐ IMPROVED PASTURE	☐ HAY MEADOW	☐ CRP
NON-CROP LAND:	☐ RANGELAND	☐ TIMBER	☐ RECREATIONAL	☐ OTHER (Describe)	
SUBDIVIDED:	☐ INDUSTRIAL	☐ COMMERCIAL	☐ RESIDENTIAL	_____	

FUTURE LAND USE

CROP LAND:	☐ IRRIGATED	☐ DRY LAND	☐ IMPROVED PASTURE	☐ HAY MEADOW	☐ CRP
NON-CROP LAND:	☐ RANGELAND	☐ TIMBER	☐ RECREATIONAL	☐ OTHER (Describe)	
SUBDIVIDED:	☐ INDUSTRIAL	☐ COMMERCIAL	☐ RESIDENTIAL	_____	

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

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SURVEYED BY	CODY RICH	12-07-17	SCALE
DRAWN BY	C.D.L.	12-11-17	1" = 200'
LOCATION DRAWING			FIGURE #5

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO
DATE: 12-11-17 C.D.L.

DISTANCES FROM WELLHEAD

WELL NAME	BUILDING		BUILDING UNIT		HIGH OCCU. BUILDING		D.O.A.A.		PUBLIC ROAD		ABOVE GROUND UTILITY		RAILROAD		PROPERTY LINE	
	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH
CENTER OF POND	S86°W	2212'	S82°W	2480'	OVER 1 MILE		OVER 1 MILE		N30°E	714'	S88°W	2274'	OVER 1 MILE		OVER 1 MILE	

UINTAH
ENGINEERING & LAND SURVEYING

PROCEED IN A SOUTHERLY, THEN SOUTHEASTERLY DIRECTION FROM BAGGS, WYOMING ALONG COUNTY ROAD 789 APPROXIMATELY 2.7 MILES TO COUNTY ROAD 13 CONTINUE IN A SOUTHEASTERLY, THEN SOUTHERLY DIRECTION APPROXIMATELY 1.9 MILES TO THE JUNCTION OF THIS ROAD AND COUNTY ROAD 4 TO THE WEST; TURN RIGHT AND PROCEED IN A WESTERLY, THEN SOUTHWESTERLY, THEN NORTHWESTERLY, THEN WESTERLY, THEN SOUTHWESTERLY, THEN NORTHWESTERLY DIRECTION APPROXIMATELY 38.6 MILES TO THE JUNCTION OF THIS ROAD AND AN EXISTING ROAD TO THE SOUTHWEST; TURN LEFT AND PROCEED IN A SOUTHWESTERLY DIRECTION APPROXIMATELY 0.2 MILES TO THE JUNCTION OF THIS ROAD AND AN EXISTING ROAD TO THE SOUTHWEST; TURN RIGHT AND PROCEED IN A SOUTHWESTERLY DIRECTION APPROXIMATELY 315' TO THE BEGINNING OF THE PROPOSED ACCESS ROAD TO THE NORTHWEST; FOLLOW ROAD FLAGS IN A NORTHWESTERLY DIRECTION APPROXIMATELY 117' TO THE PROPOSED LOCATION.

TOTAL DISTANCE FROM BAGGS, WYOMING TO THE PROPOSED WELL LOCATION IS APPROXIMATELY 43.4 MILES.

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	

ROAD DESCRIPTION

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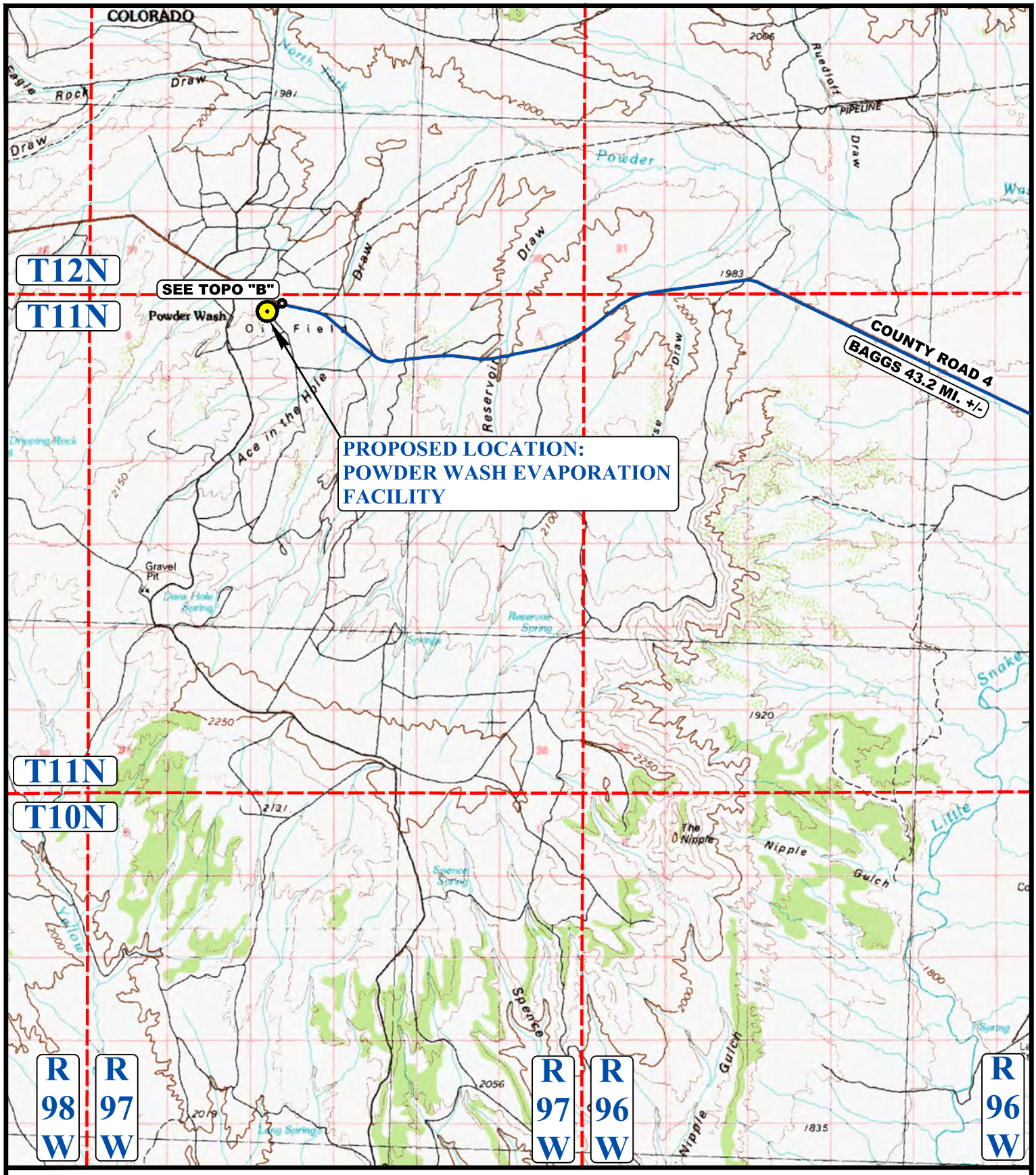

LEGEND:

- PROPOSED LOCATION

N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 100,000
ACCESS ROAD MAP			TOPO A

UINTAH ENGINEERING & LAND SURVEYING

UELS, LLC
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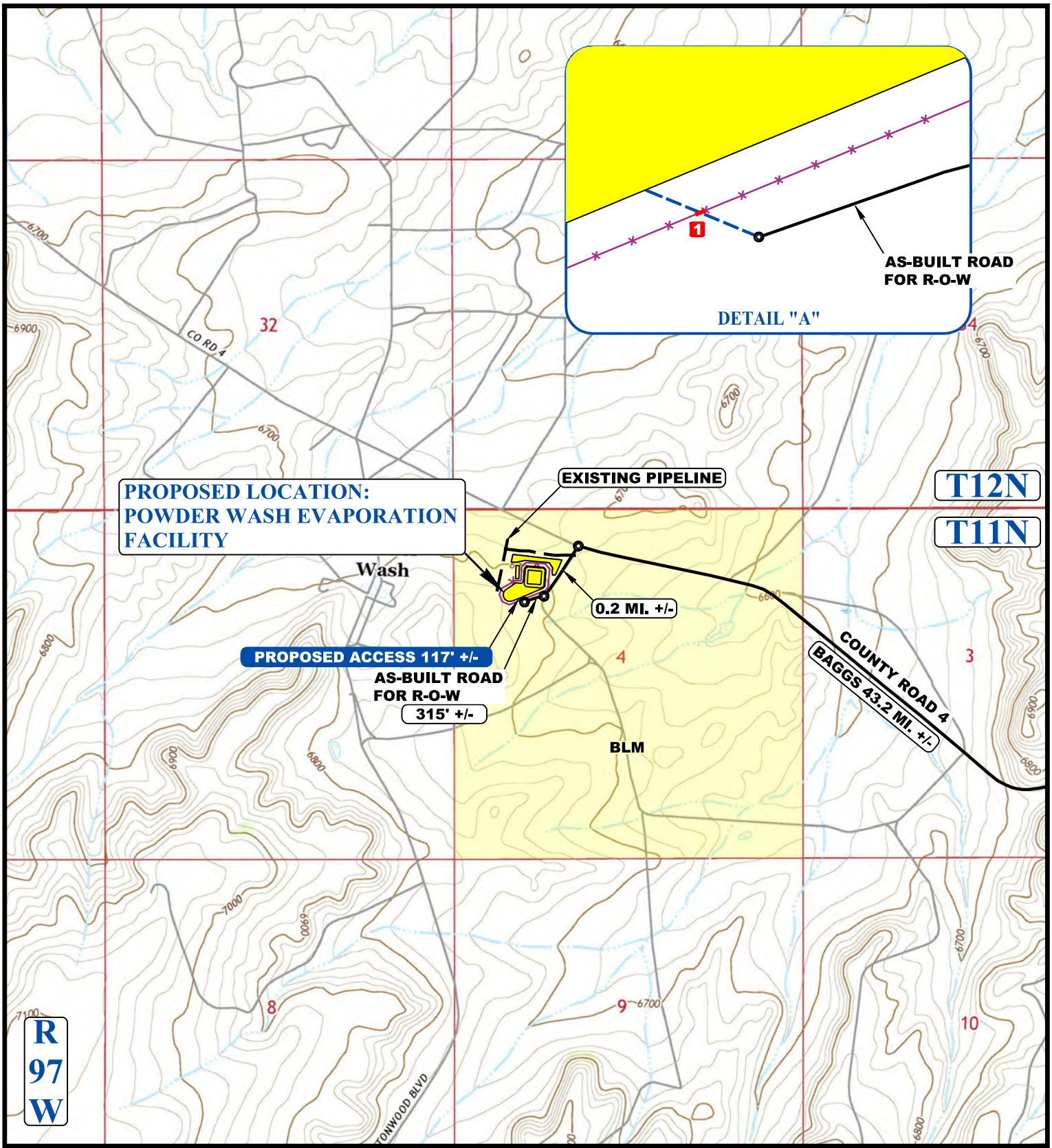

NOTE: PARCEL DATA SHOWN HAS BEEN OBTAINED FROM VARIOUS SOURCES AND SHOULD BE USED FOR MAPPING, GRAPHIC AND PLANNING PURPOSES ONLY. NO WARRANTY IS MADE BY UINTAH ENGINEERING AND LAND SURVEYING (UELS) FOR ACCURACY OF THE PARCEL DATA.

LEGEND:

- EXISTING ROAD
- PROPOSED ROAD
- EXISTING PIPELINE
- PROPOSED FENCE
- 1 INSTALL CATTLE GUARD

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UELS, LLC
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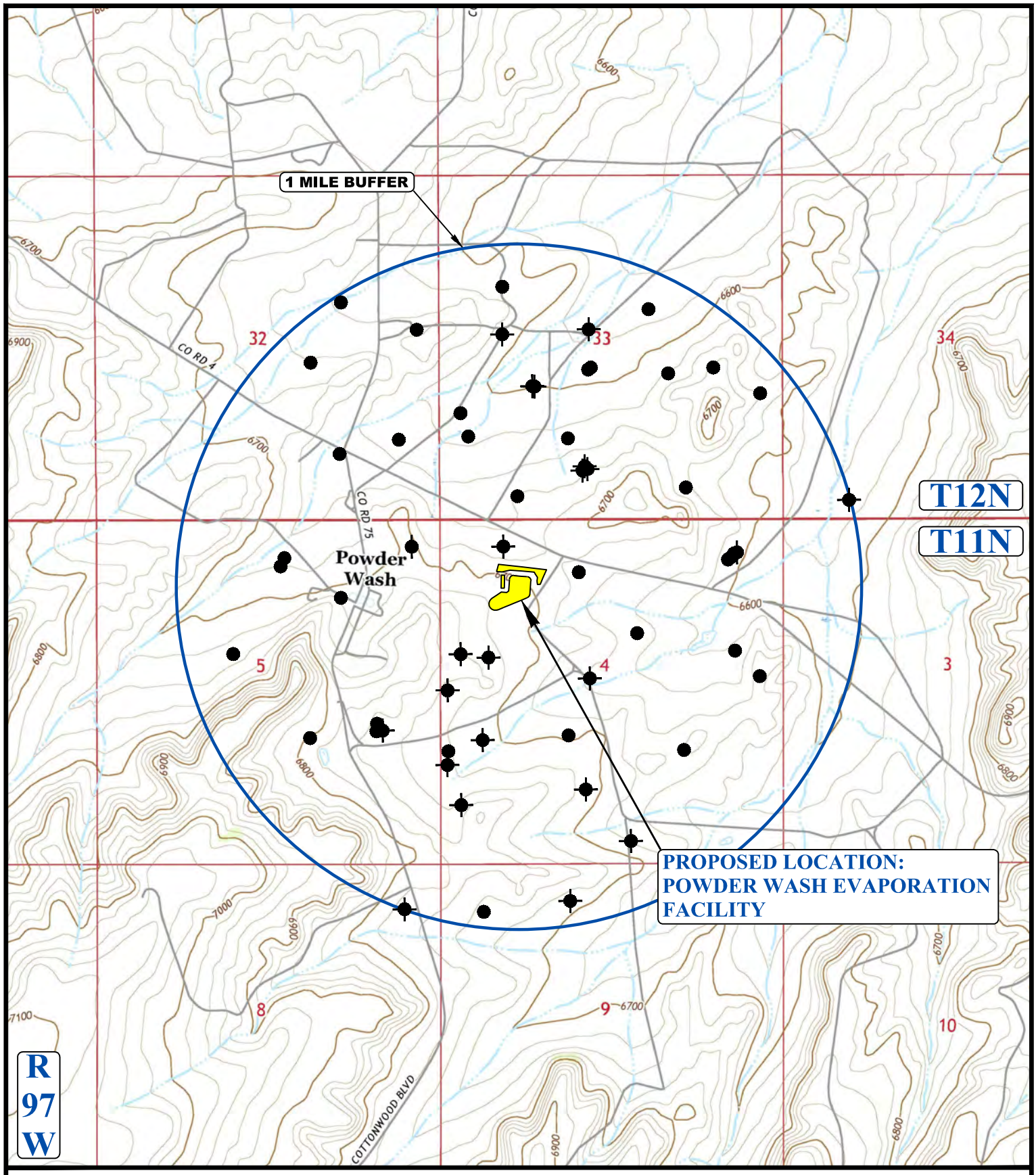
N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 24,000
ACCESS ROAD MAP			TOPO B



LEGEND:

- DISPOSAL WELLS
- PRODUCING WELLS
- SHUT IN WELLS
- ABANDONED WELLS
- TEMPORARILY ABANDONED
- CONFIDENTIAL

N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 24,000
WELL PROXIMITY MAP			TOPO C

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POWDER WASH EVAPORATION FACILITY

SUPPLEMENTAL OIL & GAS SPREADSHEET TO TOPO "C"

DATE: 12-11-17 Z.T.

Township 12 North Range 97 West Section 32					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-07365	WEXPRO COMPANY	CARL ALLEN WELL NO.25	NW SE	2425 FSL 1980 FEL	PRODUCING
05-081-05478	WEXPRO COMPANY	H. STEWART 2	SE NE	2310 FNL 330 FEL	PRODUCING
05-081-07466	WEXPRO COMPANY	CARL ALLEN 32	SE SE	1214 FSL 620 FEL	PRODUCING
05-081-07573	WEXPRO COMPANY	HAL STEWART 6	SW NE	1950 FNL 1503 FEL	PRODUCING
05-081-05463	WEXPRO COMPANY	CARL ALLEN 1	SW SE	1020 FSL 1520 FEL	ABANDONED
Township 12 North Range 97 West Section 33					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-05472	WEXPRO COMPANY	ALLEN, C. "B" 15	NE SE	1980 FSL 330 FEL	PRODUCING
05-081-07284	WEXPRO COMPANY	CARL ALLEN WELL NO.26	NE SE	2341 FSL 1053 FEL	PRODUCING
05-081-07569	WEXPRO COMPANY	CARL ALLEN 31	NE SW	2343 FSL 2350 FWL	PRODUCING
05-081-07642	WEXPRO COMPANY	Carl Allen 38	NE SW	2048 FSL 1478 FWL	ABANDONED
05-081-07643	WEXPRO COMPANY	Carl Allen 39	NE SW	2049 FSL 1462 FWL	ABANDONED
05-081-05470	WEXPRO COMPANY	ALLEN, C. "A" 11	NE SW	1320 FSL 1980 FWL	PRODUCING
05-081-07465	WEXPRO COMPANY	CARL ALLEN 30	NE SW	2333 FSL 2338 FWL	PRODUCING
05-081-06048	WEXPRO COMPANY	ALLEN, C. "B" 17	NW SE	2310 FSL 1750 FEL	PRODUCING
05-081-06044	WEXPRO COMPANY	CARL ALLEN "A" 16	NW SW	1650 FSL 330 FWL	PRODUCING
05-081-05475	WEXPRO COMPANY	ALLEN, C. "B" 3	SE NW	2310 FNL 2310 FWL	ABANDONED
05-081-07703	WEXPRO COMPANY	Musser 81	SE SW	776 FSL 2292 FWL	ABANDONED
05-081-07704	WEXPRO COMPANY	Carl Allen 46	SE SW	784 FSL 2305 FWL	ABANDONED
05-081-07705	WEXPRO COMPANY	Carl Allen 43	SE SW	767 FSL 2278 FWL	ABANDONED
05-081-06980	WEXPRO COMPANY	CARL ALLEN 23	SW NE	2003 FNL 2056 FEL	PRODUCING
05-081-06135	WEXPRO COMPANY	ALLEN, CARL "A" 19	SW NW	1650 FNL 990 FWL	PRODUCING
05-081-05481	WEXPRO COMPANY	ALLEN, C. "A" 14	SW NW	2375 FNL 990 FWL	ABANDONED
05-081-05473	WEXPRO COMPANY	CARL ALLEN 6	SW SE	545 FSL 1482 FEL	PRODUCING
05-081-07467	WEXPRO COMPANY	CARL ALLEN 34	SW SW	360 FSL 1204 FWL	PRODUCING
05-081-07410	WEXPRO COMPANY	CARL ALLEN NO.29	SW SW	1293 FSL 443 FWL	PRODUCING
Township 12 North Range 97 West Section 34					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-05462	WEXPRO COMPANY	ACE UNIT 1	SW SW	330 FSL 1040 FWL	ABANDONED

POWDER WASH EVAPORATION FACILITY

SUPPLEMENTAL OIL & GAS SPREADSHEET TO TOPO "C"

DATE: 12-11-17 Z.T.

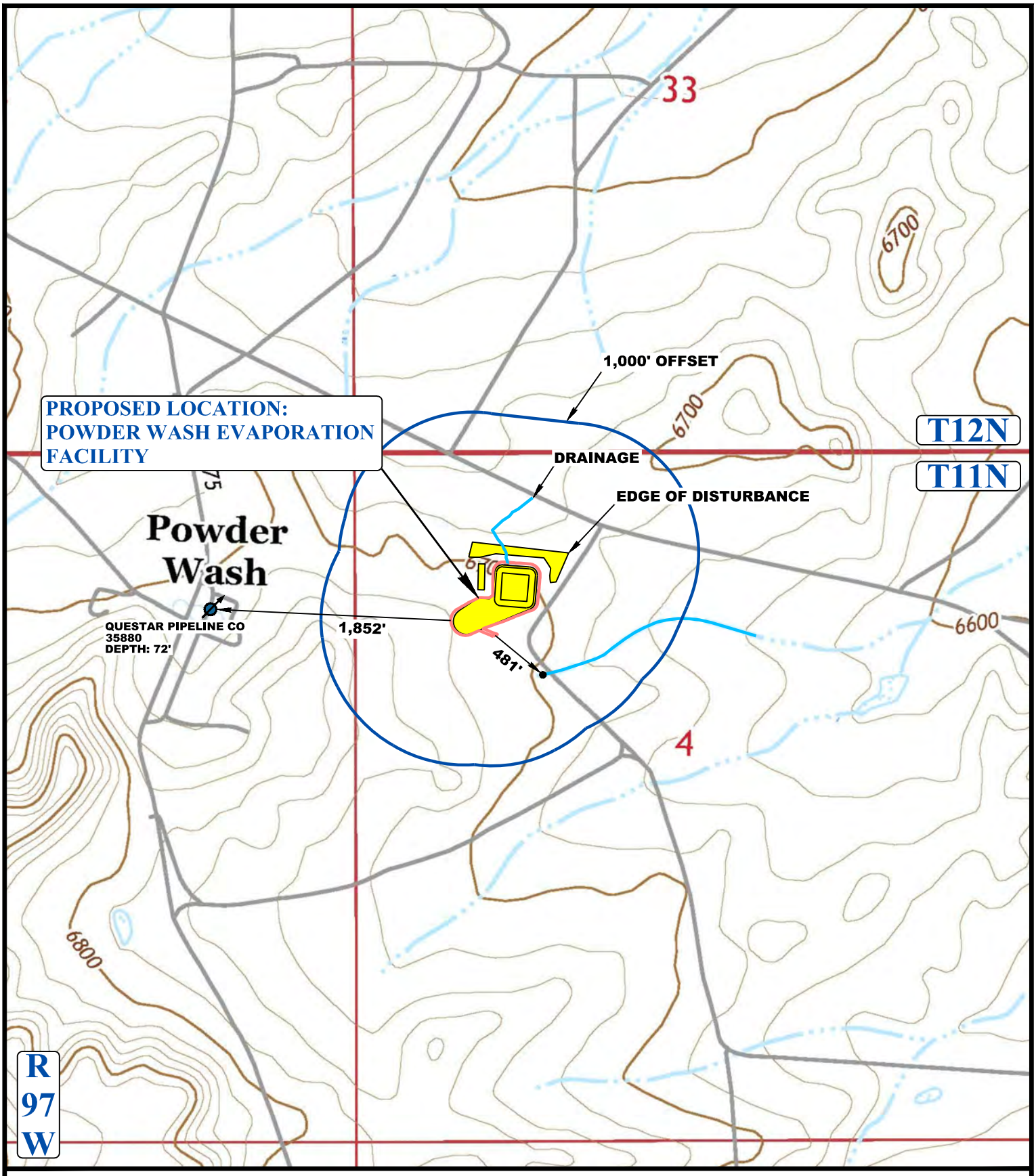
Township 11 North Range 97 West Section 4					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-07468	WEXPRO COMPANY	B W MUSSER 31	NE NE	348 FNL 607 FEL	PRODUCING
05-081-07617	WEXPRO COMPANY	CARL ALLEN 37	NE NE	325 FNL 586 FEL	SHUT IN
05-081-07618	WEXPRO COMPANY	BW MUSSER 38	NE NE	336 FNL 597 FEL	PRODUCING
05-081-07619	WEXPRO COMPANY	B.W. MUSSER 39	NE NE	360 FNL 618 FEL	PRODUCING
05-081-06095	WEXPRO COMPANY	MUSSER, B W "B" 13	NE NW	750 FNL 2150 FWL	PRODUCING
05-081-07014	WEXPRO COMPANY	MUSSER, B W 10	NE SW	1980 FSL 1980 FWL	PRODUCING
05-081-05454	WEXPRO COMPANY	MUSSER, B W 4	NW NW	330 FNL 990 FWL	ABANDONED
05-081-07114	WEXPRO COMPANY	MUSSER NO.23	NW SE	1800 FSL 1500 FEL	PRODUCING
05-081-07366	WEXPRO COMPANY	B W MUSSER 26	NW SW	1527 FSL 111 FWL	ABANDONED
05-081-07402	WEXPRO COMPANY	B W MUSSER 26R	NW SW	1713 FSL 130 FWL	PRODUCING
05-081-06037	WEXPRO COMPANY	MUSSER 2	NW SW		ABANDONED
05-081-60037	WEXPRO COMPANY	MUSSER, B W 2	NW SW	980 FSL 330 FWL	ABANDONED
05-081-06191	WEXPRO COMPANY	MUSSER, B W "B" 18	SE NE	1980 FNL 710 FEL	PRODUCING
05-081-05447	WEXPRO COMPANY	MUSSER, B W "B" 6	SE NE	2378 FNL 333 FEL	PRODUCING
05-081-05448	WEXPRO COMPANY	MUSSER, B W 5	SE NW	2392 FNL 2310 FWL	ABANDONED
05-081-07613	WEXPRO COMPANY	BW MUSSER 30	SE SW	1126 FSL 2237 FWL	ABANDONED
05-081-07406	WEXPRO COMPANY	B W MUSSER 27	SW NE	1743 FNL 2238 FEL	PRODUCING
05-081-07283	WEXPRO COMPANY	MUSSER WELL NO.25	SW NW	2053 FNL 736 FWL	ABANDONED
05-081-05452	WEXPRO COMPANY	MUSSER, B W "A" 9	SW NW	1980 FNL 330 FWL	ABANDONED
05-081-06894	WEXPRO COMPANY	B.W. MUSSER 22	SW NW	2540 FNL 115 FWL	ABANDONED
05-081-05434	WEXPRO COMPANY	MUSSER, B W 7	SW SE	405 FSL 2310 FEL	ABANDONED
Township 11 North Range 97 West Section 5					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-06159	WEXPRO COMPANY	BW MUSSER 16	NE NE	330 FNL 460 FEL	SHUT IN
05-081-07607	WEXPRO COMPANY	BW MUSSER 35	NE SE	2057 FSL 893 FEL	ABANDONED
05-081-07631	WEXPRO COMPANY	BW MUSSER 72	NE SE	2054 FSL 909 FEL	PRODUCING
05-081-07632	WEXPRO COMPANY	BW MUSSER 73	NE SE	2059 FSL 877 FEL	PRODUCING
05-081-05453	WEXPRO COMPANY	MUSSER, B W "A" 1	NW NE	1120 FNL 1520 FEL	PRODUCING
05-081-07582	WEXPRO COMPANY	CARL ALLEN 36	NW NE	747 FNL 2412 FEL	PRODUCING
05-081-07583	WEXPRO COMPANY	CARL ALLEN 35	NW NE	737 FNL 2395 FEL	PRODUCING

POWDER WASH EVAPORATION FACILITY

SUPPLEMENTAL OIL & GAS SPREADSHEET TO TOPO "C"

DATE: 12-11-17 Z.T.

05-081-07584	WEXPRO COMPANY	BW MUSSER 36	NW NE	778 FNL 2465 FEL	PRODUCING
05-081-07585	WEXPRO COMPANY	BW MUSSER 32	NW NE	758 FNL 2430 FEL	PRODUCING
05-081-07586	WEXPRO COMPANY	BW MUSSER 37	NW NE	767 FNL 2448 FEL	PRODUCING
05-081-06110	WEXPRO COMPANY	MUSSER, B W 14	NW SE	1980 FSL 1980 FEL	PRODUCING
05-081-07421	WEXPRO COMPANY	B.W. MUSSER 29	SE NW	2112 FNL 2110 FWL	PRODUCING
Township 11 North Range 97 West Section 8					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-07684	WEXPRO COMPANY	BW Musser 64	NE NE	726 FNL 608 FEL	ABANDONED
05-081-07685	WEXPRO COMPANY	BW Musser 65	NE NE	713 FNL 579 FEL	ABANDONED
05-081-07686	WEXPRO COMPANY	BW Musser 46	NE NE	706 FNL 565 FEL	ABANDONED
05-081-07687	WEXPRO COMPANY	Powder Wash Government 4	NE NE	719 FNL 594 FEL	ABANDONED
05-081-07688	WEXPRO COMPANY	Powder Wash Government 11	NE NE	733 FNL 623 FEL	ABANDONED
05-081-07689	WEXPRO COMPANY	BW Musser 45	NE NE	740 FNL 637 FEL	ABANDONED
05-081-07690	WEXPRO COMPANY	BW Musser 47	NE NE	699 FNL 551 FEL	ABANDONED
Township 11 North Range 97 West Section 9					
Api	**Company**	**Well Name**	**Qtr/Qtr**	**Location**	**Status**
05-081-07695	WEXPRO COMPANY	BW Musser 49	NE NW	567 FNL 2045 FWL	ABANDONED
05-081-07696	WEXPRO COMPANY	BW Musser 41	NE NW	591 FNL 2004 FWL	ABANDONED
05-081-07697	WEXPRO COMPANY	BW Musser 59	NE NW	575 FNL 2031 FWL	ABANDONED
05-081-07698	WEXPRO COMPANY	BW Musser 48	NE NW	599 FNL 1990 FWL	ABANDONED
05-081-07699	WEXPRO COMPANY	BW Musser 58	NE NW	583 FNL 2018 FWL	ABANDONED
05-081-06141	WEXPRO COMPANY	B. W. MUSSER 15	NW NW	660 FNL 660 FWL	PRODUCING



LEGEND:

- EXISTING DRAINAGE
- 1000' OFFSET BOUNDARY
- EDGE OF DISTURBANCE
- FLOOD PLAINS
- WATER WELLS

N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 6,000
HYDROLOGY MAP			TOPO W

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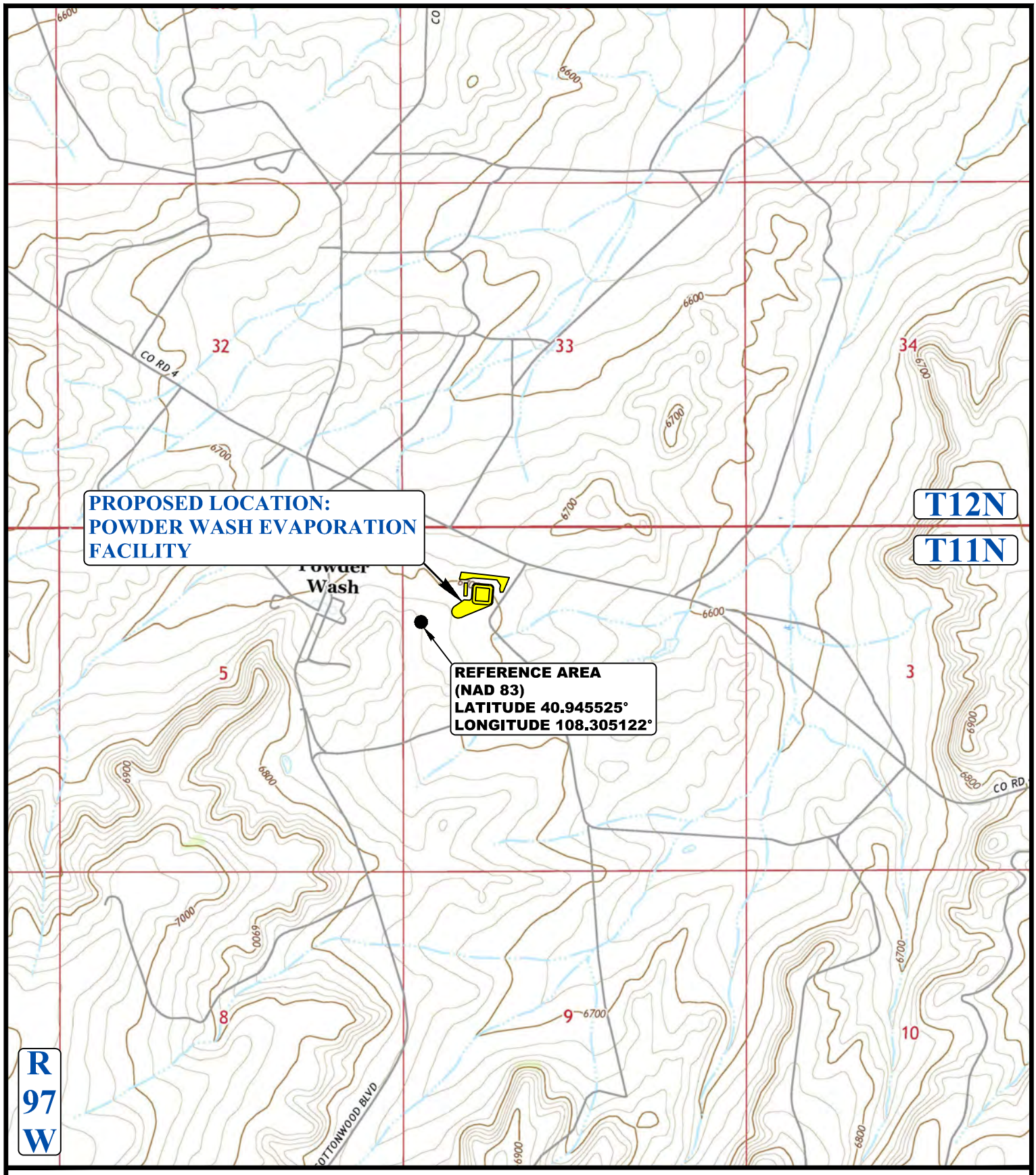

LEGEND:

N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 24,000
REFERENCE AREA MAP			REF TOPO

UINTAH ENGINEERING & LAND SURVEYING

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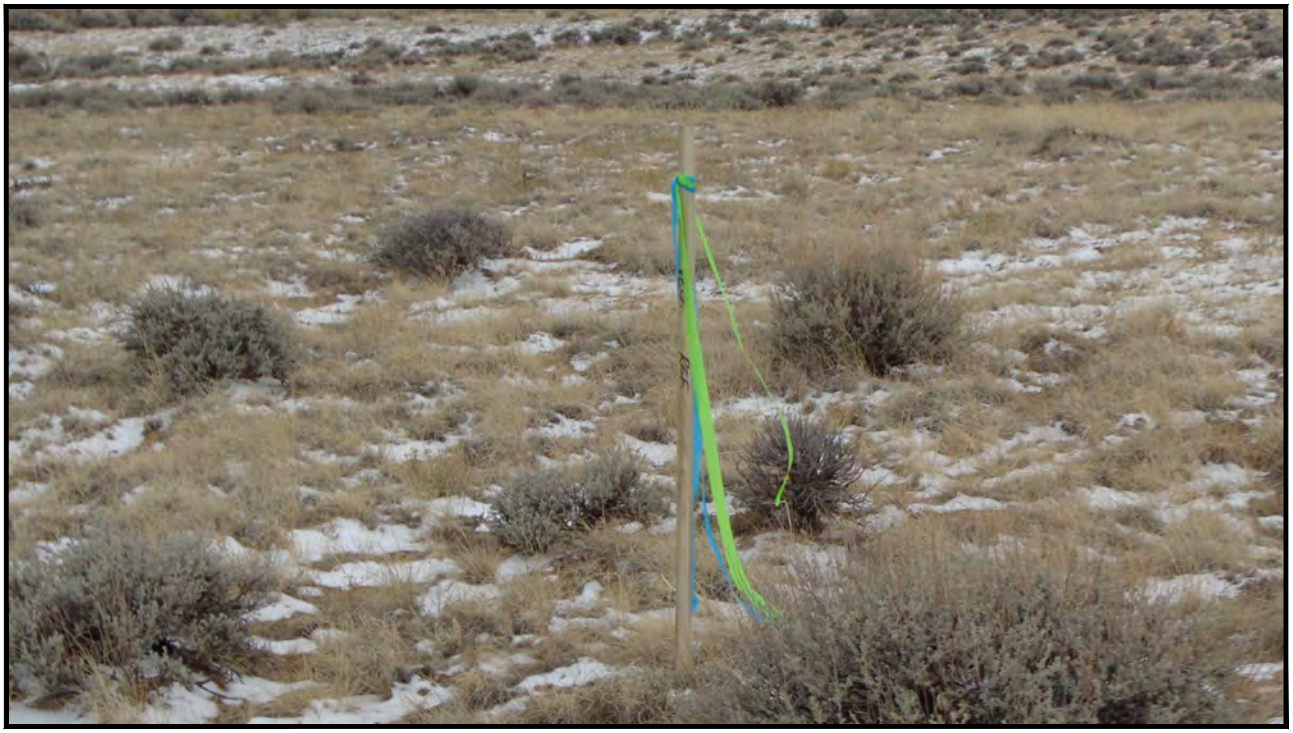

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: SOUTHERLY

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: WESTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

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Vernal, UT 84078 * (435) 789-1017

TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
REFERENCE AREA PHOTOS			REF 2

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: NORTHERLY

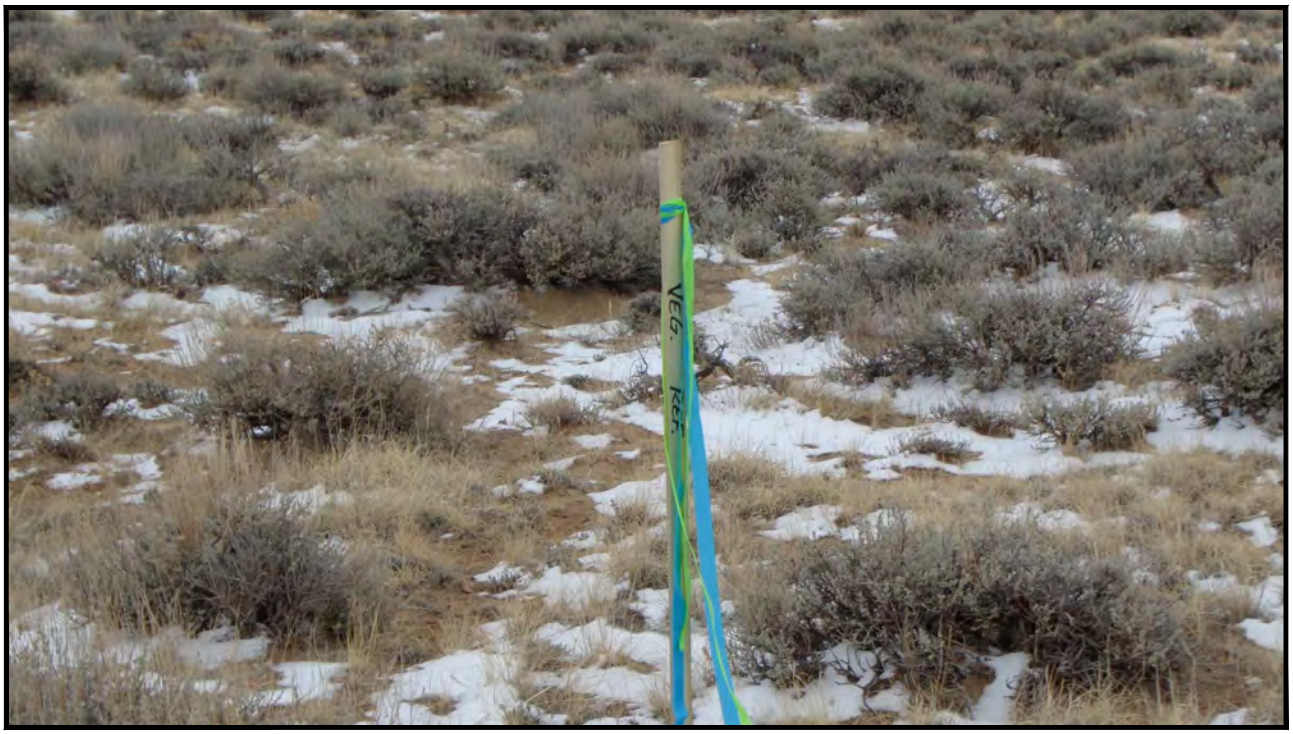

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: EASTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

UELS, LLC
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TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
REFERENCE AREA PHOTOS			REF 1

High Density Polyethylene Smooth Liner®

Product Data

Property	Test Method	Values				
Thickness (min. ave.), mil (mm)	ASTM D5199*	30 (.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (lowest indiv.), mil (mm)	ASTM D5199*	27 (.68)	36 (.90)	54 (1.35)	72 (1.80)	90 (2.25)
*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)						
Density, g/cc, minimum	ASTM D792, Method B	0.94	0.94	0.94	0.94	0.94
Tensile Properties (ave. both directions)	ASTM D6693, Type IV					
Strength @ Yield (min. ave.), lb/in width (N/mm)	2 in/minute	66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield (min. ave.), % (GL=1.3in)	5 specimens in each direction	13	13	13	13	13
Strength @ Break (min. ave.), lb/in width (N/mm)		120 (21)	160 (28)	240 (42)	320 (56)	400 (70)
Elongation @ Break (min. ave.), % (GL=2.0in)		700	700	700	700	700
Tear Resistance (min. ave.), lbs. (N)	ASTM D1004	23 (102)	30 (133)	45 (200)	60 (267)	72 (320)
Puncture Resistance (min. ave.), lbs. (N)	ASTM D4833	60 (267)	80 (356)	120 (534)	160 (712)	190 (845)
Carbon Black Content (range in %)	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3				
Stress Crack Resistance (Single Point NCTL), hours	ASTM D5397, Appendix	300	300	300	300	300
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	≥140	≥140	≥140	≥140	≥140
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Oven Aging	ASTM D5721	80	80	80	80	80
with HP OIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O_2					
UV Resistance	ASTM D7238	20hr. Cycle @ 75°C/4 hr. dark condensation @ 60°C				
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O_2	50	50	50	50	50

Agru America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), and Dimensional Stability via ASTM D1204 (±2% @ 100°C).

These product specifications meet or exceed GRI's GM13

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)		Weight (average)	
mil	mm	ft	m	ft	m	ft^2	m^2	lbs	kg
30	.75	23	7	1,040	316.99	23,920	2,222	3,900	1,770
40	1.0	23	7	835	254.51	19,205	1,784	3,900	1,770
60	1.5	23	7	540	164.59	12,420	1,154	3,900	1,770
80	2.0	23	7	415	126.49	9,545	887	3,900	1,770
100	2.5	23	7	335	102.109	7,705	716	3,900	1,770

Notes:

All rolls are supplied with two slings. All rolls are wound on a 6 inch core. Special lengths are available on request. All roll lengths and widths have a tolerance of ±1%
**The weight values may change due to project specifications (i.e. absolute minimum thickness or special roll lengths) or shipping requirements (i.e. international containerized shipments).*

500 Garrison Road, Georgetown, South Carolina 29440 843-546-0600 800-373-2478 Fax: 843-527-2738
email: salesmkg@agruamerica.com www.AgruAmerica.com

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Dominion Energy

Climate Data
Rule 908.b(4)

Wexpro Company®

Powder Wash Evaporation Facility

BAGGS, WYOMING (480484)

Period of Record Monthly Climate Summary

Period of Record : 09/01/1979 to 01/31/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	32.2	35.7	47.3	58.3	67.8	79.0	86.2	83.6	74.0	60.3	43.4	33.1	58.4
Average Min. Temperature (F)	5.3	9.1	20.8	28.0	34.8	41.8	48.5	46.7	38.2	28.0	17.1	7.4	27.1
Average Total Precipitation (in.)	0.42	0.41	0.50	0.81	1.35	0.86	1.07	0.88	1.16	1.29	0.62	0.57	9.95
Average Total SnowFall (in.)	8.0	5.6	5.6	2.0	0.5	0.0	0.0	0.0	0.0	2.0	6.0	9.2	38.9
Average Snow Depth (in.)	2	1	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record.
Max. Temp.: 99.5% Min. Temp.: 98.6% Precipitation: 97.2% Snowfall: 95% Snow Depth: 71.7%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

DIXON, WYOMING (482610)

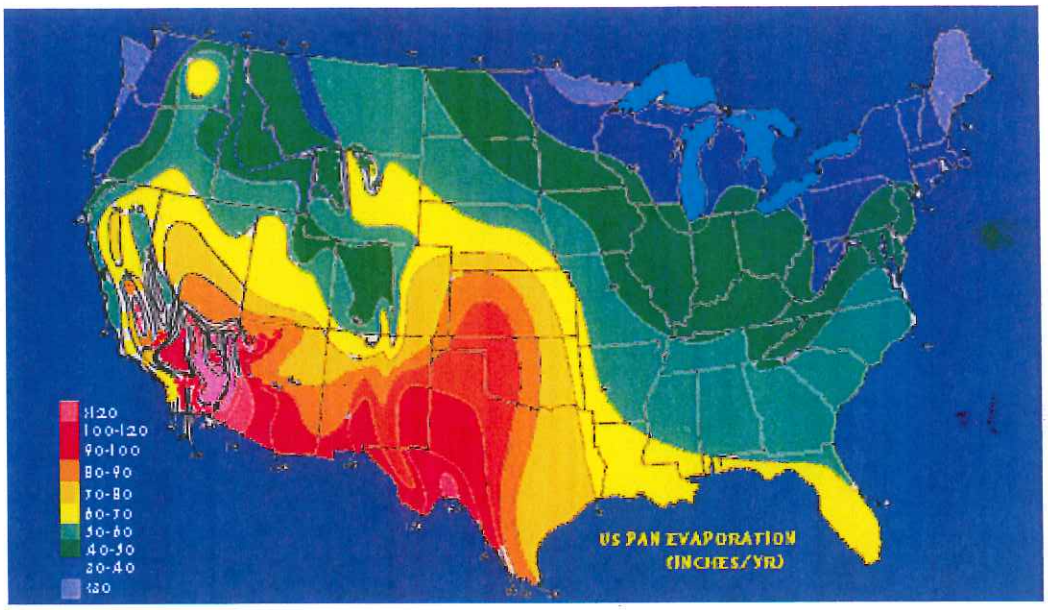
Period of Record Monthly Climate Summary

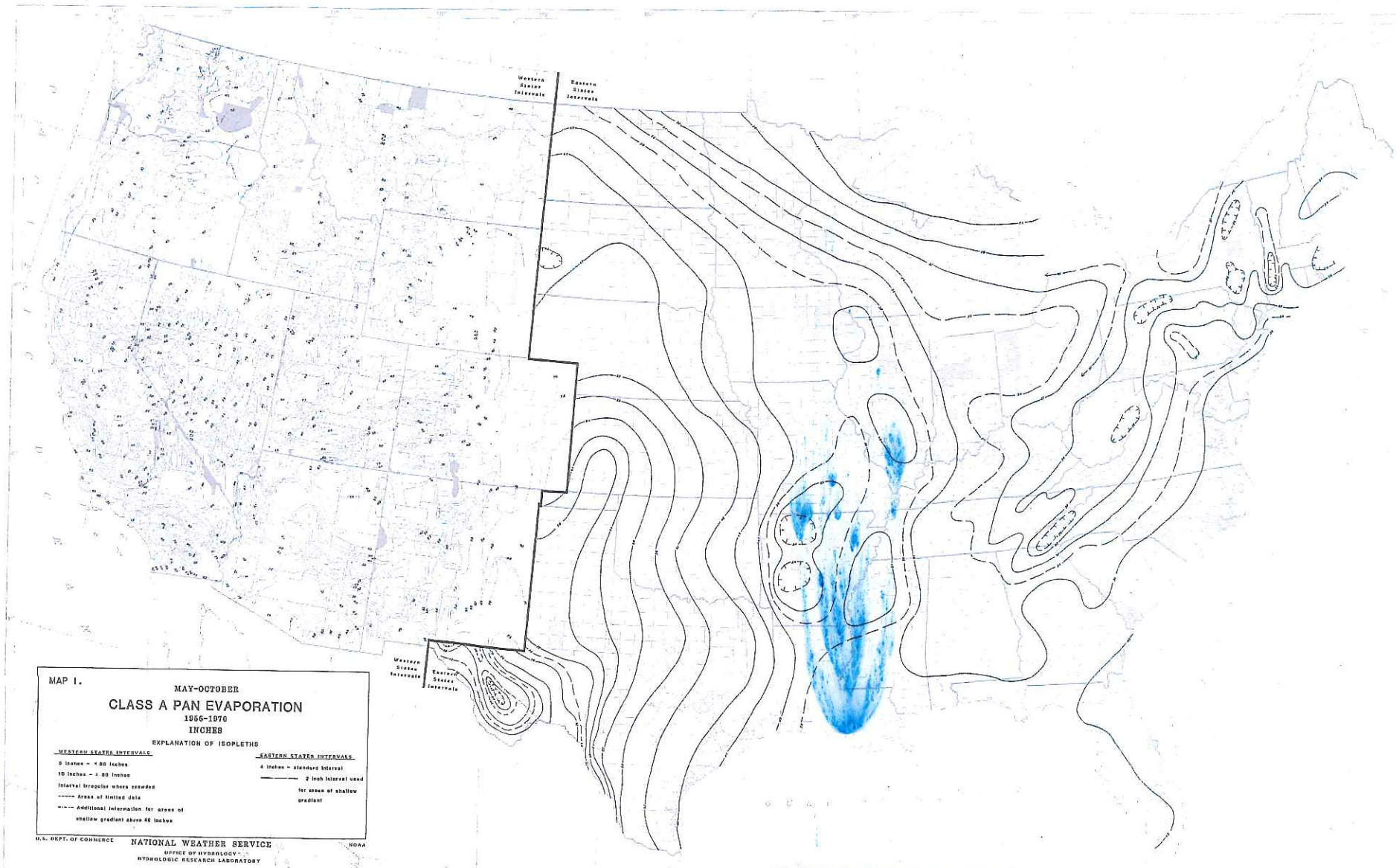
Period of Record : 02/01/1922 to 04/30/1978

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	31.7	35.8	42.6	55.5	66.7	76.0	83.3	80.9	72.3	60.6	44.4	34.6	57.0
Average Min. Temperature (F)	2.8	7.6	16.5	26.9	34.1	40.6	47.0	45.0	36.2	26.7	16.2	6.3	25.5
Average Total Precipitation (in.)	0.89	0.72	0.96	1.14	1.18	0.94	1.07	1.12	1.04	1.23	0.80	1.02	12.09
Average Total SnowFall (in.)	14.0	11.0	11.8	6.4	0.9	0.0	0.0	0.0	0.3	3.4	8.1	14.8	70.6
Average Snow Depth (in.)	7	6	3	0	0	0	0	0	0	0	1	3	2

Percent of possible observations for period of record.
Max. Temp.: 97.7% Min. Temp.: 98.3% Precipitation: 98.7% Snowfall: 95.5% Snow Depth: 42.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu


H20
100-120
90-100
80-90
70-80
60-70
50-60
40-50
30-40
<30
US PAN EVAPORATION
(INCHES/YR)



MAP 1.

MAY-OCTOBER

CLASS A PAN EVAPORATION

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS

5 inches – < 80 inches

10 inches – > 80 inches

Interval irregular where crowded

----- Areas of limited data

-·-·- Additional information for areas of shallow gradient above 40 inches

EASTERN STATES INTERVALS

4 inches – standard interval

——— 2 inch interval used for areas of shallow gradient

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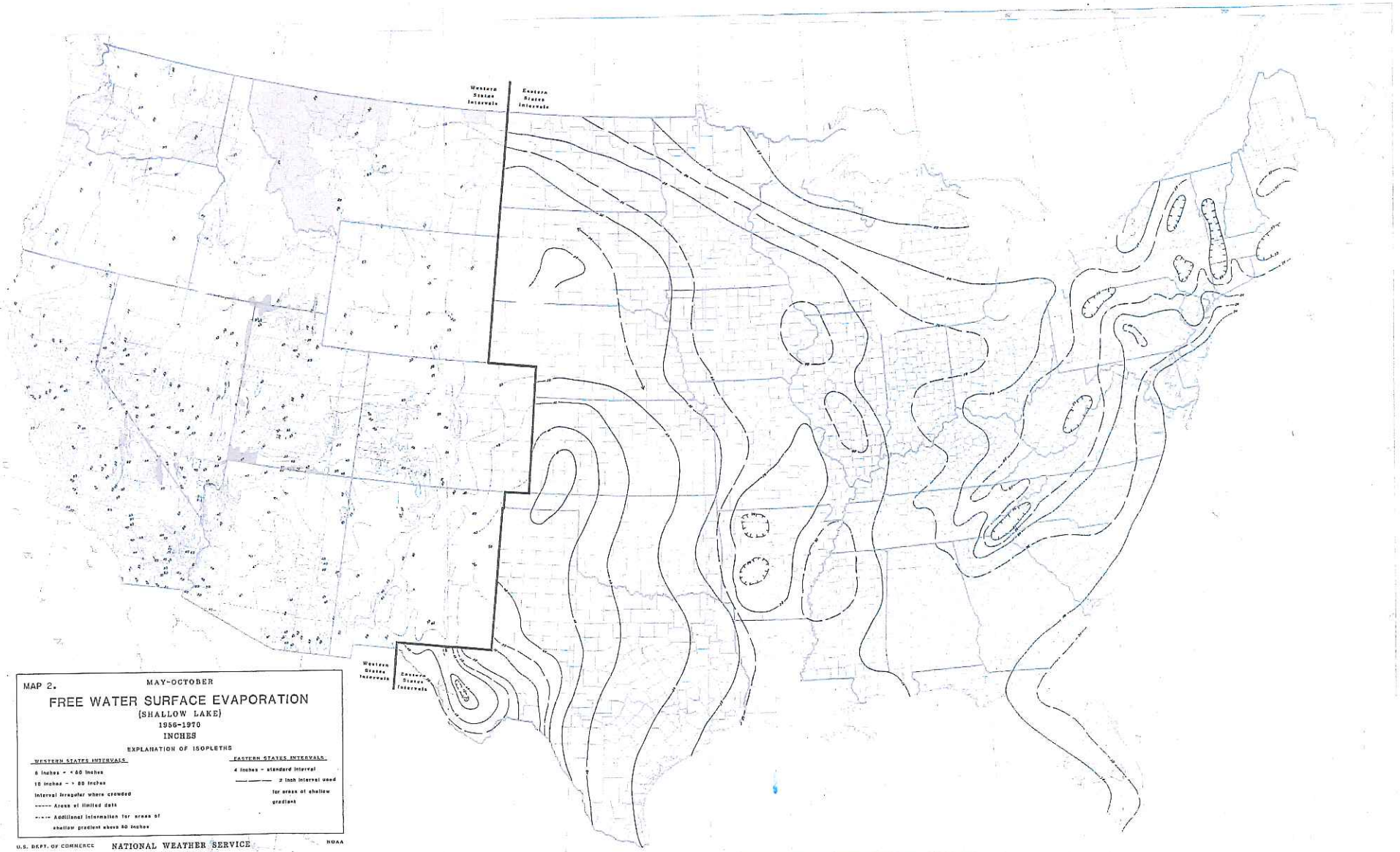
HYDROLOGIC RESEARCH LABORATORY

NOAA



MAP 2.

MAY-OCTOBER

FREE WATER SURFACE EVAPORATION

(SHALLOW LAKE)

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS

6 inches - < 60 inches

10 inches - ≥ 60 inches

Interval irregular where crowded

----- Areas of limited data

-·-·- Additional information for areas of shallow gradient above 60 inches

EASTERN STATES INTERVALS

4 inches - standard interval

—— 2 inch interval used for areas of shallow gradient

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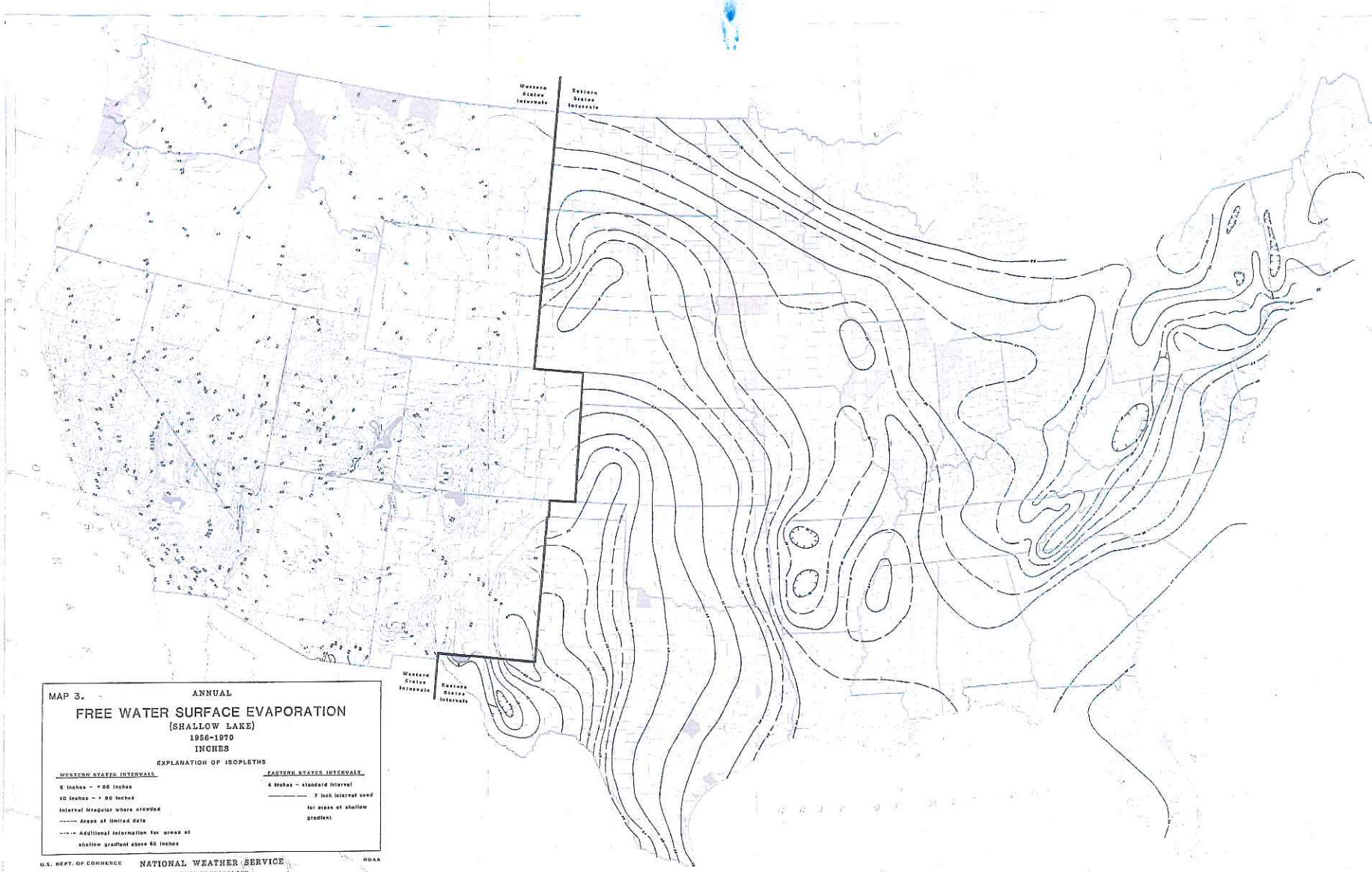
OFFICE OF HYDROLOGY,

HYDROLOGIC RESEARCH LABORATORY

NOAA



MAP 3.

ANNUAL

FREE WATER SURFACE EVAPORATION

(SHALLOW LAKE)

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS

5 inches – < 50 inches

10 inches – > 50 inches

interval irregular where crowded

----- Areas of limited data

---·--- Additional information for areas of shallow gradient above 50 inches

EASTERN STATES INTERVALS

4 inches – standard interval

——— 2 inch interval used for areas of shallow gradient

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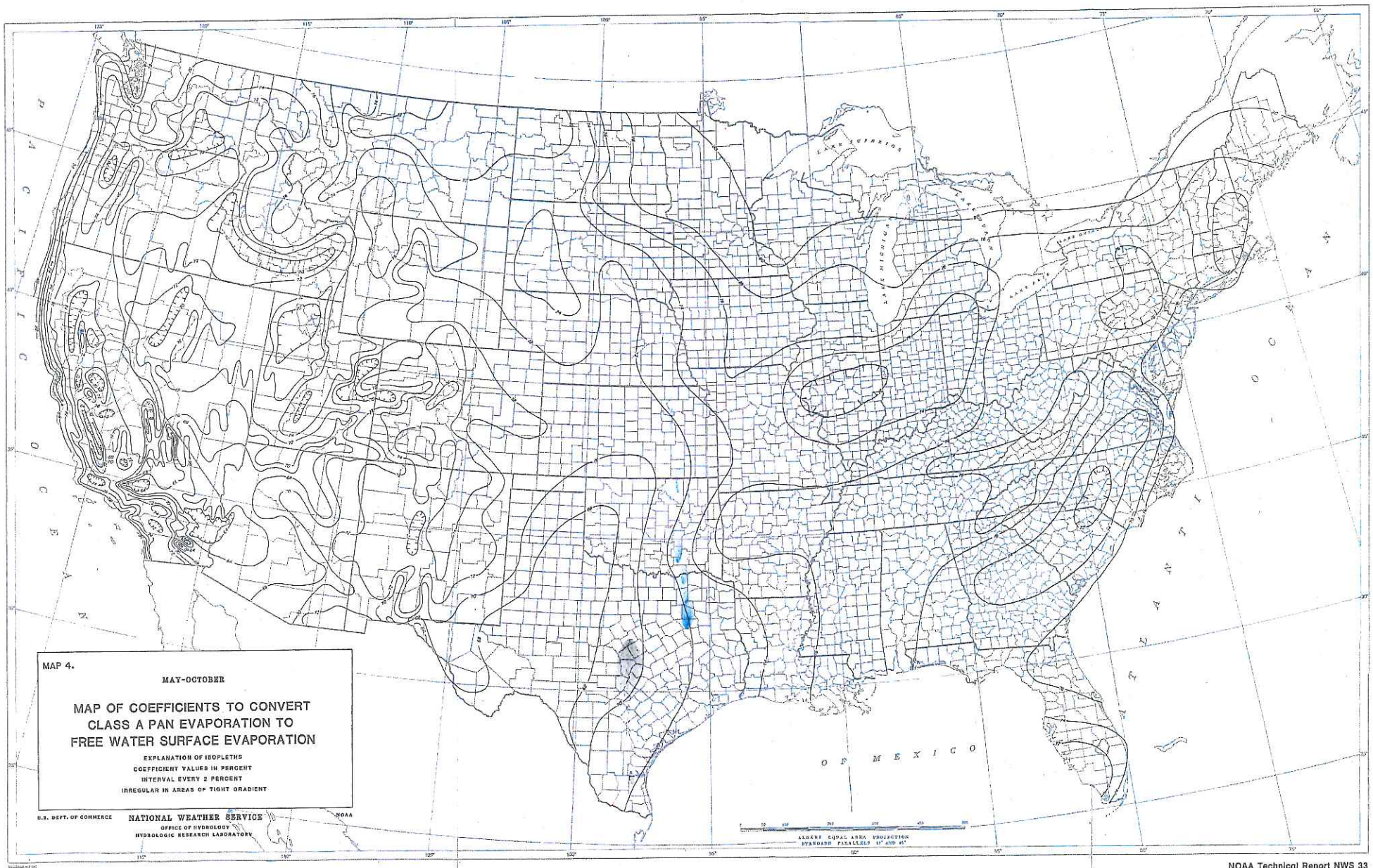
MAP 4.
MAY-OCTOBER
MAP OF COEFFICIENTS TO CONVERT
CLASS A PAN EVAPORATION TO
FREE WATER SURFACE EVAPORATION
EXPLANATION OF ISOPLETHS
COEFFICIENT VALUES IN PERCENT
INTERVAL EVERY 2 PERCENT
IRREGULAR IN AREAS OF TIGHT GRADIENT
U.S. DEPT. OF COMMERCE
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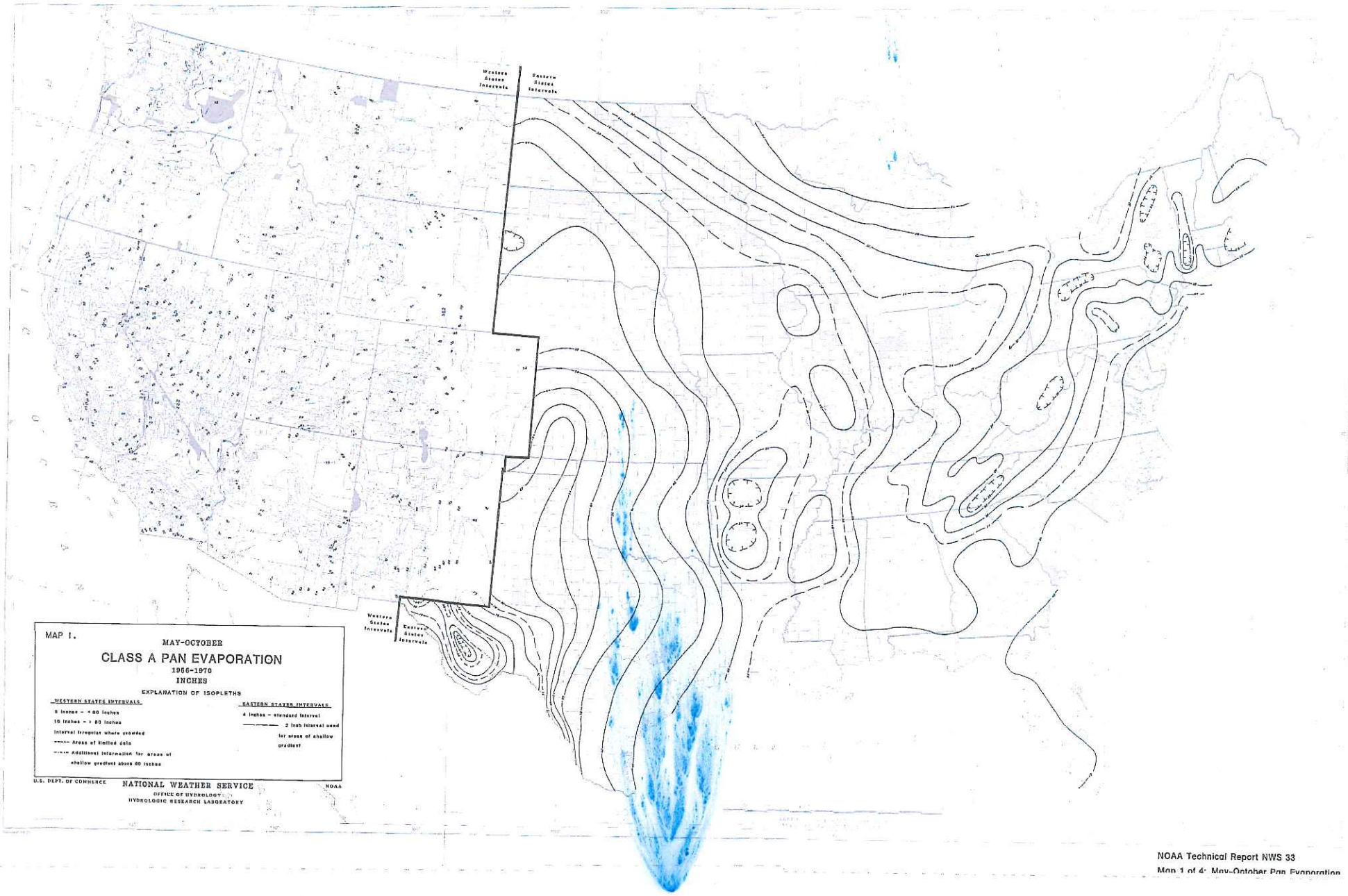
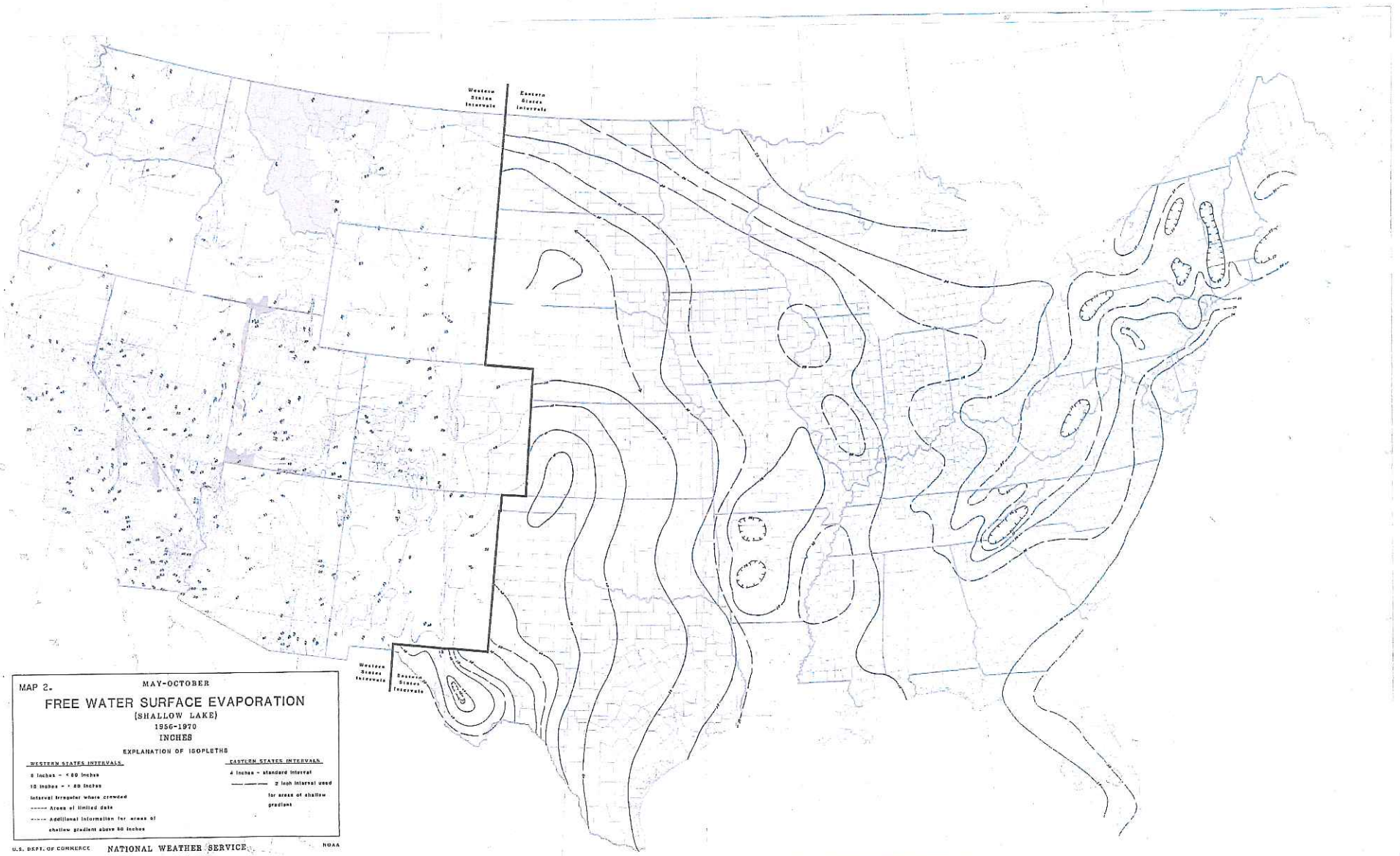
NOAA
OFFICE OF HYDROLOGY
HYDROLOGIC RESEARCH LABORATORY
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 29° AND 45°
LAKE SUPERIOR
LAKE MICHIGAN
LAKE ERIE
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO



NOAA Technical Report NWS 33
Map 1 of 4: May-October Pan Evaporation



MAP 2.

MAY-OCTOBER

FREE WATER SURFACE EVAPORATION

(SHALLOW LAKE)

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS

6 inches - < 60 inches

10 inches - > 60 inches

Interval irregular where crowded

----- Areas of limited data

----- Additional information for areas of shallow gradient above 60 inches

EASTERN STATES INTERVALS

4 inches - standard interval

2 inch interval used for areas of shallow gradient

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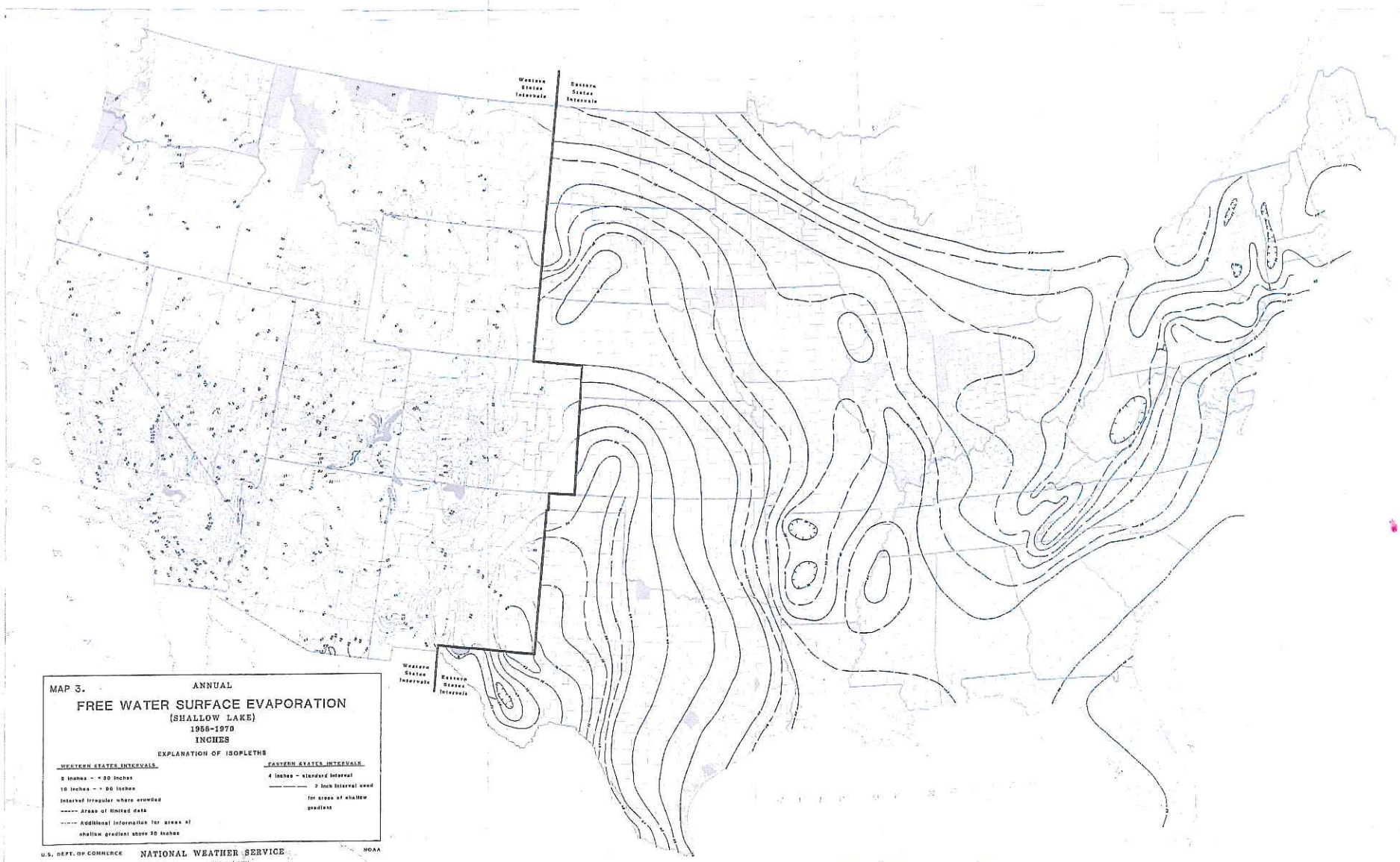
HYDROLOGIC RESEARCH LABORATORY



MAP 3.

ANNUAL

FREE WATER SURFACE EVAPORATION

(SHALLOW LAKE)

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS	EASTERN STATES INTERVALS
5 inches - < 80 inches	4 inches - standard interval
10 inches - > 80 inches	2 inch interval used for areas of shallow gradient
Interval irregular where crowded	
----- Areas of limited data	
----- Additional information for areas of shallow gradient above 50 inches	

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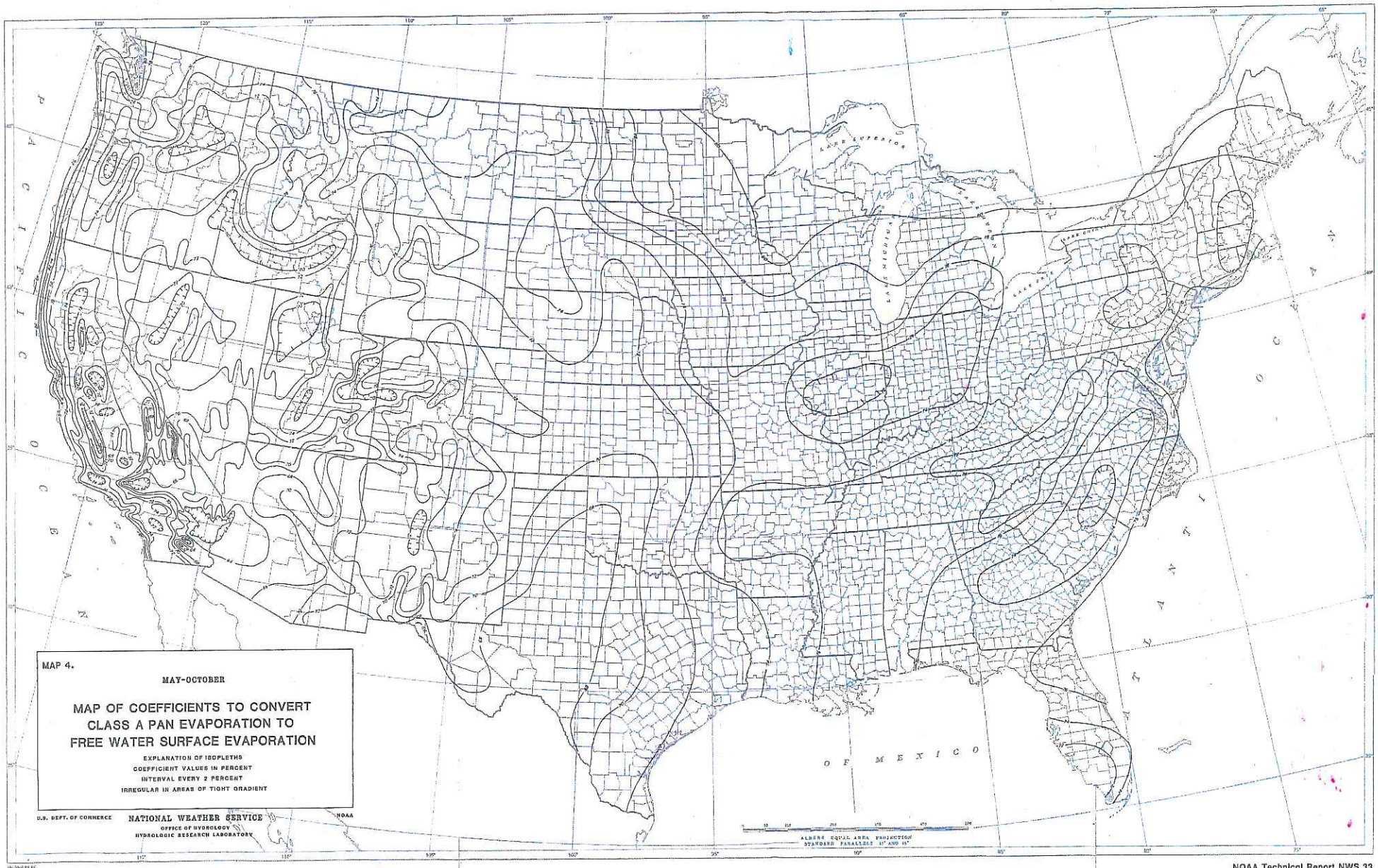
MAP 4.
MAY-OCTOBER
MAP OF COEFFICIENTS TO CONVERT
CLASS A PAN EVAPORATION TO
FREE WATER SURFACE EVAPORATION
EXPLANATION OF ISOPLETHS
COEFFICIENT VALUES IN PERCENT
INTERVAL EVERY 2 PERCENT
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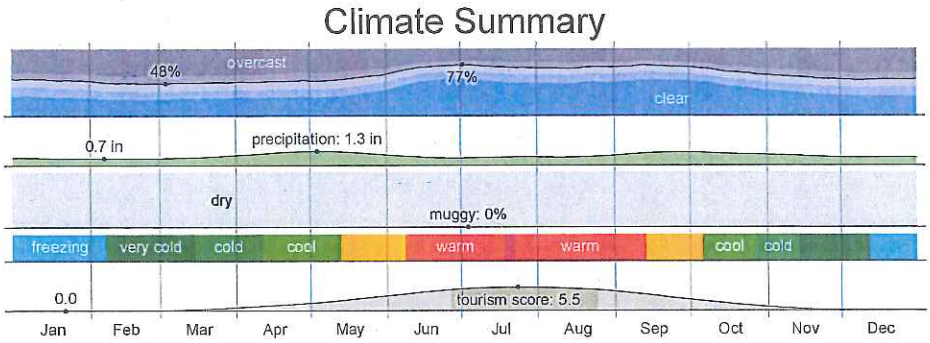
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 31° AND 45°
LAKE SUPERIOR
LAKE MICHIGAN
LAKE ERIE
LAKE ONTARIO
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO

Average Weather in Craig Colorado, United States

In Craig, the summers are warm, dry, and mostly clear and the winters are freezing, snowy, and partly cloudy. Over the course of the year, the temperature typically varies from 6°F to 85°F and is rarely below -11°F or above 92°F.



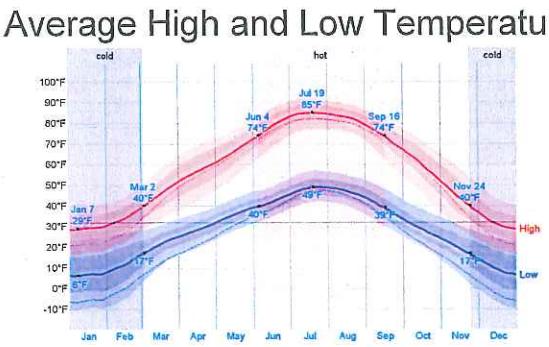
Click on each chart for more information.

Based on the tourism score (https://weatherspark.com/y/3222/Average-Weather-in-Craig-Colorado-United-States-Year-Round#Sections-BestTime), the best time of year to visit Craig for warm-weather activities is from late June to late August.

Temperature

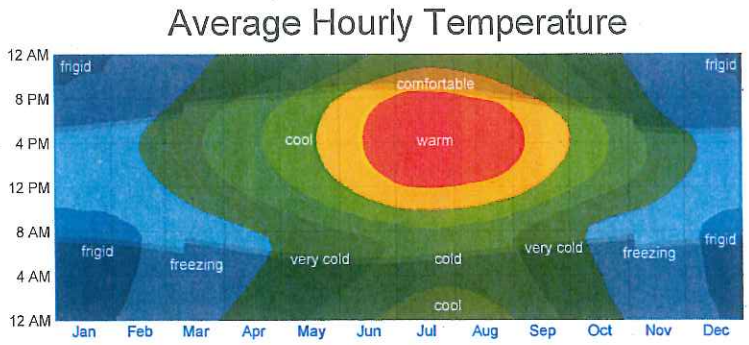
The hot season lasts for 3.4 months, from June 4 to September 16, with an average daily high temperature above 74°F. The hottest day of the year is July 19, with an average high of 85°F and low of 49°F.

The cold season lasts for 3.3 months, from November 24 to March 2, with an average daily high temperature below 40°F. The coldest day of the year is January 7, with an average low of 6°F and high of 29°F.



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

The figure below shows you a compact characterization of the entire year of hourly average temperatures. The horizontal axis is the day of the year, the vertical axis is the hour of the day, and the color is the average temperature for that hour and day.



The average hourly temperature, color coded into bands: frigid < 15°F < freezing < 32°F < very cold < 45°F < cold < 55°F < cool < 65°F < comfortable < 75°F < warm < 85°F < hot < 95°F < sweltering. The shaded overlays indicate night and civil twilight.

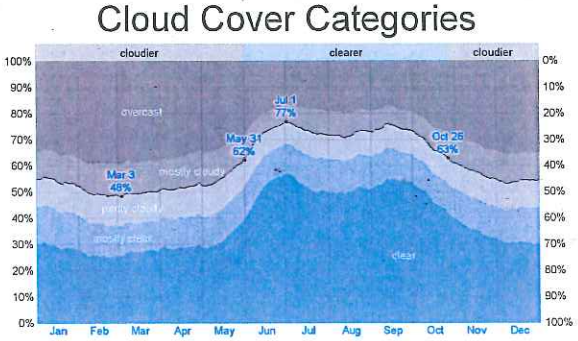
Pasinler, Turkey (/y/102035/Average-Weather-in-Pasinler-Turkey-Year-Round) (6,555 miles away) is the far-away foreign place with temperatures most similar to Craig (view comparison (/compare/y/3222~102035/Comparison-of-the-Average-Weather-in-Craig-and-Pasinler)).

Clouds

In Craig, the average percentage of the sky covered by clouds experiences significant seasonal variation over the course of the year.

The clearer part of the year in Craig begins around May 31 and lasts for 4.8 months, ending around October 26. On July 1, the clearest day of the year, the sky is clear, mostly clear, or partly cloudy 77% of the time, and overcast or mostly cloudy 23% of the time.

The cloudier part of the year begins around October 26 and lasts for 7.2 months, ending around May 31. On March 3, the cloudiest day of the year, the sky is overcast or mostly cloudy 52% of the time, and clear, mostly clear, or partly cloudy 48% of the time.



The percentage of time spent in each cloud cover band, categorized by the percentage of the sky covered by clouds: clear < 20% < mostly clear < 40% < partly cloudy < 60% < mostly cloudy < 80% < overcast.

Precipitation

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in Craig varies throughout the year.

The wetter season lasts 10 months, from July 20 to May 30, with a greater than 18% chance of a given day being a wet day. The chance of a wet day peaks at 24% on May 3.

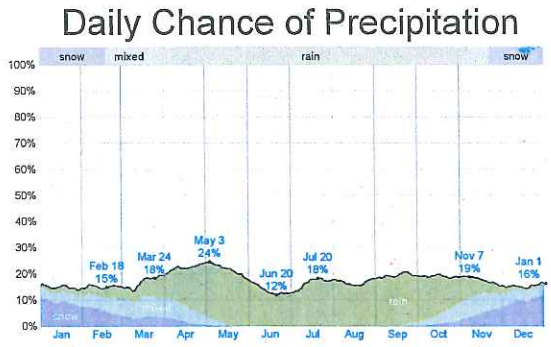
The drier season lasts 1.7 months, from May 30 to July 20. The smallest chance of a wet day is 12% on June 20.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. Based on this categorization, the most common form of precipitation in Craig changes throughout the year.

Rain alone is the most common for 7.5 months, from March 24 to November 7. The highest chance of a day with rain alone is 21% on May 16.

Snow alone is the most common for 2.9 months, from November 22 to February 18. The highest chance of a day with snow alone is 12% on December 30.

Mixed snow and rain is the most common for 1.6 months, from February 18 to March 24 and from November 7 to November 22. The highest chance of a day with mixed snow and rain is 8% on March 19.



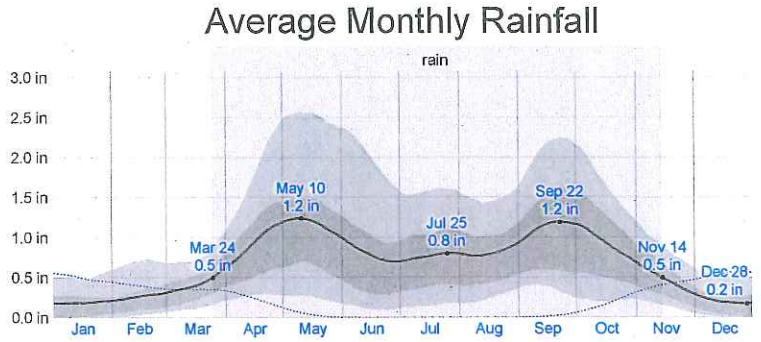
The percentage of days in which various types of precipitation are observed, excluding trace quantities: rain alone, snow alone, and mixed (both rain and snow fell in the same day).

Rainfall

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered around each day of the year. Craig experiences some seasonal variation in monthly rainfall.

The rainy period of the year lasts for 7.7 months, from March 24 to November 14, with a sliding 31-day rainfall of at least 0.5 inches. The most rain falls during the 31 days centered around May 10, with an average total accumulation of 1.2 inches.

The rainless period of the year lasts for 4.3 months, from November 14 to March 24. The least rain falls around December 28, with an average total accumulation of 0.2 inches.



The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average liquid-equivalent snowfall.

Snowfall

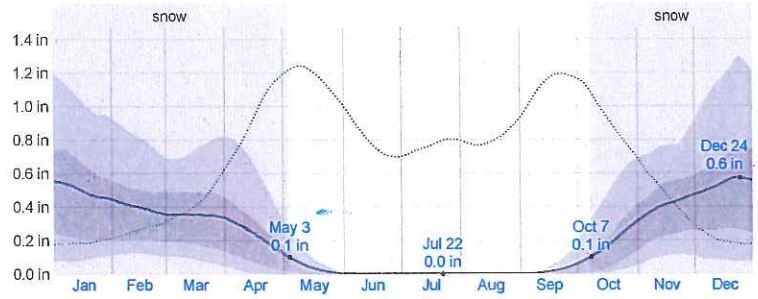
We report snowfall in liquid-equivalent terms. The actual depth of new snowfall is typically between 5 and 10 times the liquid-equivalent amount, assuming the ground is frozen. Colder, drier snow tends to be on the higher end of that range and warmer, wetter snow on the lower end.

As with rainfall, we consider the snowfall accumulated over a sliding 31-day period centered around each day of the year. Craig experiences some seasonal variation in monthly liquid-equivalent snowfall.

The snowy period of the year lasts for 6.9 months, from October 7 to May 3, with a sliding 31-day liquid-equivalent snowfall of at least 0.1 inches. The most snow falls during the 31 days centered around December 24, with an average total liquid-equivalent accumulation of 0.6 inches.

The snowless period of the year lasts for 5.1 months, from May 3 to October 7. The least snow falls around July 22, with an average total liquid-equivalent accumulation of 0.0 inches.

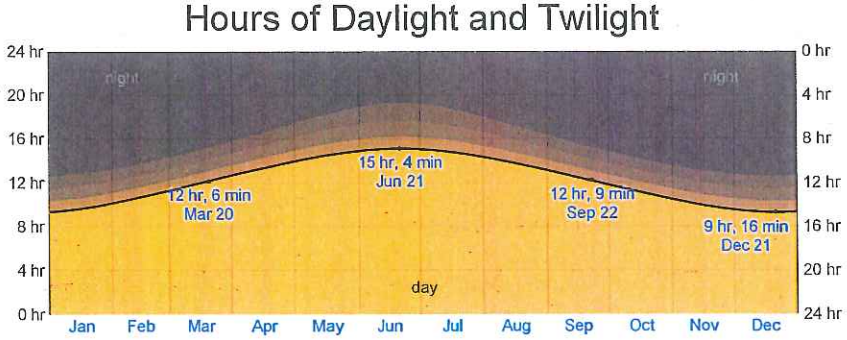
Average Liquid-Equivalent Monthly Snowfall



The average liquid-equivalent snowfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average rainfall.

Sun

The length of the day in Craig varies significantly over the course of the year. In 2018, the shortest day is December 21, with 9 hours, 16 minutes of daylight; the longest day is June 21, with 15 hours, 4 minutes of daylight.

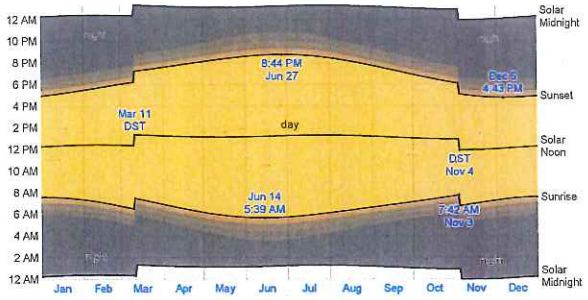


The number of hours during which the Sun is visible (black line). From bottom (most yellow) to top (most gray), the color bands indicate: full daylight, twilight (civil, nautical, and astronomical), and full night.

The earliest sunrise is at 5:39 AM on June 14, and the latest sunrise is 2 hours, 4 minutes later at 7:42 AM on November 3. The earliest sunset is at 4:43 PM on December 6, and the latest sunset is 4 hours, 2 minutes later at 8:44 PM on June 27.

Daylight saving time (DST) is observed in Craig during 2018, starting in the spring on March 11, lasting 7.8 months, and ending in the fall on November 4.

Sunrise & Sunset with Twilight and Daylight Saving Time

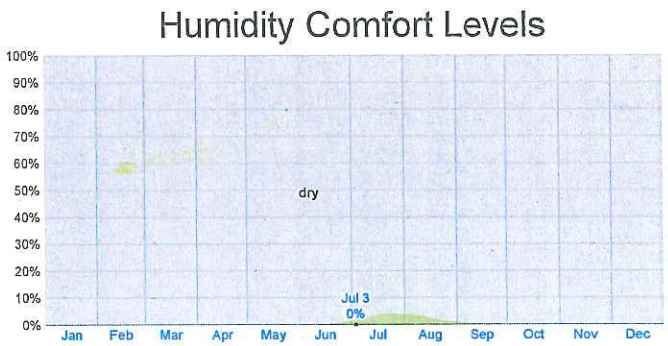


The solar day over the course of the year 2018. From bottom to top, the black lines are the previous solar midnight, sunrise, solar noon, sunset, and the next solar midnight. The day, twilights (civil, nautical, and astronomical), and night are indicated by the color bands from yellow to gray. The transitions to and from daylight saving time are indicated by the 'DST' labels.

Humidity

We base the humidity comfort level on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night.

The perceived humidity level in Craig, as measured by the percentage of time in which the humidity comfort level is muggy, oppressive, or miserable, does not vary significantly over the course of the year, remaining a virtually constant 0% throughout.



The percentage of time spent at various humidity comfort levels, categorized by dew point: dry < 55°F < comfortable < 60°F < humid < 65°F < muggy < 70°F < oppressive < 75°F < miserable.

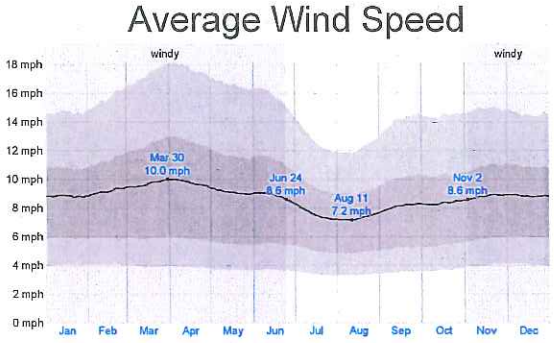
Wind

This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Craig experiences mild seasonal variation over the course of the year.

The windier part of the year lasts for 7.7 months, from November 2 to June 24, with average wind speeds of more than 8.6 miles per hour. The windiest day of the year is March 30, with an average hourly wind speed of 10.0 miles per hour.

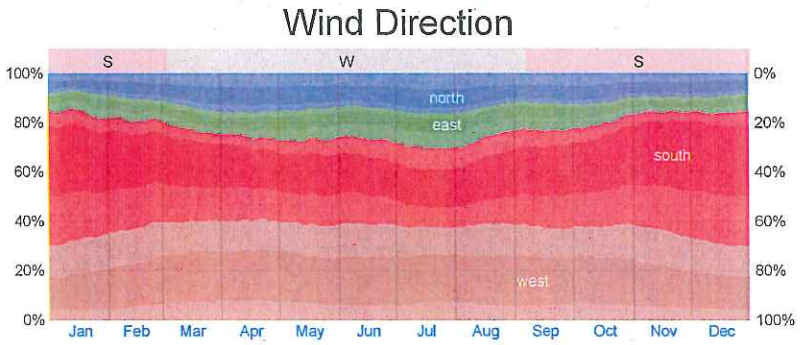
The calmer time of year lasts for 4.3 months, from June 24 to November 2. The calmest day of the year is August 11, with an average hourly wind speed of 7.2 miles per hour.



The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

The predominant average hourly wind direction in Craig varies throughout the year.

The wind is most often from the west for 6.1 months, from March 3 to September 6, with a peak percentage of 41% on April 22. The wind is most often from the south for 5.9 months, from September 6 to March 3, with a peak percentage of 54% on January 1.



The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions (north, east, south, and west), excluding hours in which the mean wind speed is less than 1 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

Best Time of Year to Visit

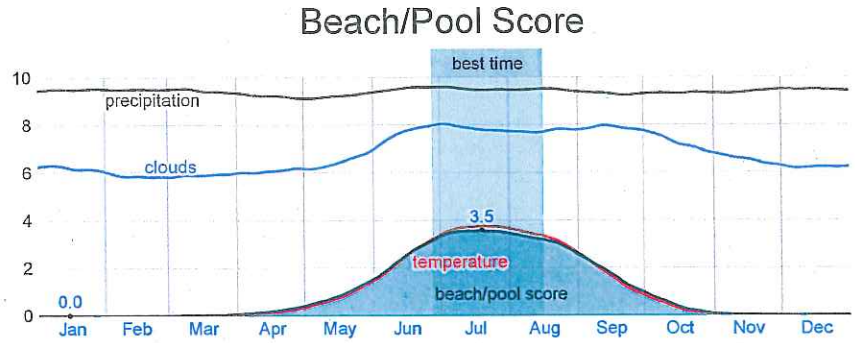
To characterize how pleasant the weather is in Craig throughout the year, we compute two

travel scores.

The tourism score favors clear, rainless days with perceived temperatures between 65°F and 80°F. Based on this score, the best time of year to visit Craig for general outdoor tourist activities is from late June to late August, with a peak score in the last week of July.

The tourism score (filled area), and its constituents: the temperature score (red line), the cloud cover score (blue line), and the precipitation score (green line).

The beach/pool score favors clear, rainless days with perceived temperatures between 75°F and 90°F. Based on this score, the best time of year to visit Craig for hot-weather activities is from late June to mid August, with a peak score in the third week of July.



The beach/pool score (filled area), and its constituents: the temperature score (red line), the cloud cover score (blue line), and the precipitation score (green line).

Methodology

For each hour between 8:00 AM and 9:00 PM of each day in the analysis period (1980 to 2016), independent scores are computed for perceived temperature, cloud cover, and total precipitation. Those scores are combined into a single hourly composite score, which is then aggregated into days, averaged over all the years in the analysis period, and smoothed.

Our cloud cover score is 10 for fully clear skies, falling linearly to 9 for mostly clear skies, and to 1 for fully overcast skies.

Our precipitation score, which is based on the three-hour precipitation centered on the hour in question, is 10 for no precipitation, falling linearly to 9 for trace precipitation, and to 0 for 0.04 inches of precipitation or more.

Our tourism temperature score is 0 for perceived temperatures below 50°F, rising linearly to 9 for 65°F, to 10 for 75°F, falling linearly to 9 for 80°F, and to 1 for 90°F or hotter.

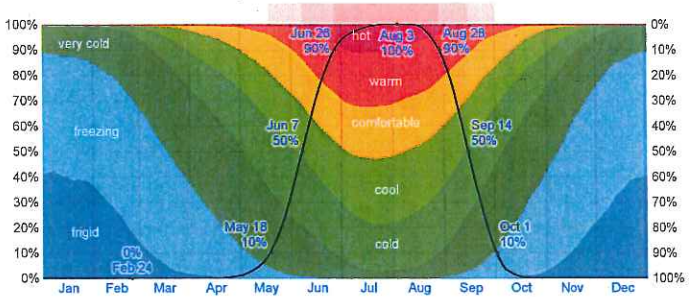
Our beach/pool temperature score is 0 for perceived temperatures below 65°F, rising linearly to 9 for 75°F, to 10 for 82°F, falling linearly to 9 for 90°F, and to 1 for 100°F or hotter.

Growing Season

Definitions of the growing season vary throughout the world, but for the purposes of this report, we define it as the longest continuous period of non-freezing temperatures (≥ 32°F) in the year (the calendar year in the Northern Hemisphere, or from July 1 until June 30 in the Southern Hemisphere).

The growing season in Craig typically lasts for 3.2 months (100 days), from around June 7 to around September 14, rarely starting before May 18 or after June 26, and rarely ending before August 28 or after October 1.

Time Spent in Various Temperature Bands and the Growing Season

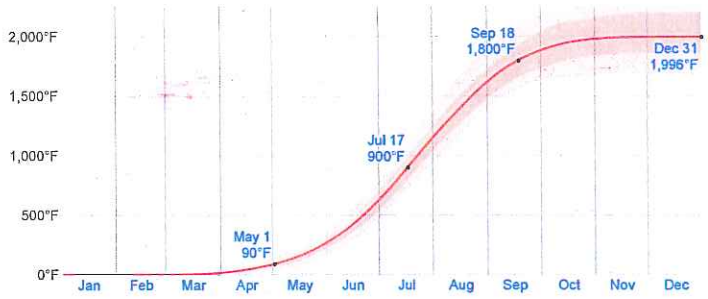


The percentage of time spent in various temperature bands: frigid < 15°F < freezing < 32°F < very cold < 45°F < cold < 55°F < cool < 65°F < comfortable < 75°F < warm < 85°F < hot < 95°F < sweltering. The black line is the percentage chance that a given day is within the growing season.

Growing degree days are a measure of yearly heat accumulation used to predict plant and animal development, and defined as the integral of warmth above a base temperature, discarding any excess above a maximum temperature. In this report, we use a base of 50°F and a cap of 86°F.

Based on growing degree days alone, the first spring blooms in Craig should appear around May 1, only rarely appearing before April 20 or after May 16.

Growing Degree Days



The average growing degree days accumulated over the course of the year, with 25th to 75th and 10th to 90th percentile bands.

Solar Energy

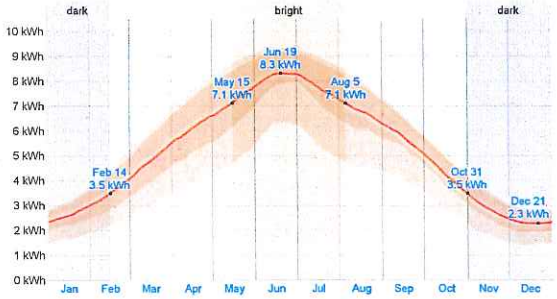
This section discusses the total daily incident shortwave solar energy reaching the surface of the ground over a wide area, taking full account of seasonal variations in the length of the day, the elevation of the Sun above the horizon, and absorption by clouds and other atmospheric constituents. Shortwave radiation includes visible light and ultraviolet radiation.

The average daily incident shortwave solar energy experiences extreme seasonal variation over the course of the year.

The brighter period of the year lasts for 2.7 months, from May 15 to August 5, with an average daily incident shortwave energy per square meter above 7.1 kWh. The brightest day of the year is June 19, with an average of 8.3 kWh.

The darker period of the year lasts for 3.5 months, from October 31 to February 14, with an average daily incident shortwave energy per square meter below 3.5 kWh. The darkest day of the year is December 21, with an average of 2.3 kWh.

Average Daily Incident Shortwave Solar Energy



The average daily shortwave solar energy reaching the ground per square meter (orange line), with 25th to 75th and 10th to 90th percentile bands.

Topography

For the purposes of this report, the geographical coordinates of Craig are 40.515 deg latitude, -107.546 deg longitude, and 6,302 ft elevation.

The topography within 2 miles of Craig contains only modest variations in elevation, with a maximum elevation change of 413 feet and an average elevation above sea level of 6,263 feet. Within 10 miles contains only modest variations in elevation (1,854 feet). Within 50 miles contains very significant variations in elevation (6,801 feet).

The area within 2 miles of Craig is covered by shrubs (72%) and grassland (21%), within 10 miles by shrubs (55%) and grassland (35%), and within 50 miles by shrubs (54%) and trees (33%).

Data Sources

This report illustrates the typical weather in Craig, based on a statistical analysis of historical hourly weather reports and model reconstructions from January 1, 1980 to December 31, 2016.

Temperature and Dew Point

There are 2 weather stations near enough to contribute to our estimation of the temperature and dew point in Craig.

For each station, the records are corrected for the elevation difference between that station and Craig according to the International Standard Atmosphere (https://en.wikipedia.org/wiki/International_Standard_Atmosphere), and by the relative change present in the MERRA-2 satellite-era reanalysis (https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/) between the two locations.

The estimated value at Craig is computed as the weighted average of the individual contributions from each station, with weights proportional to the inverse of the distance between Craig and a given station.

The stations contributing to this reconstruction are: Craig-Moffat Airport (/y/145603/Average-Weather-at-Craig-Moffat-Airport-Colorado-United-States-Year-Round) (98%, 3.1 kilometers, southeast) and Dixon Airport (2.2%, 58 kilometers, north).

Other Data

All data relating to the Sun's position (e.g., sunrise and sunset) are computed using astronomical formulas from the book, Astronomical Tables of the Sun, Moon and Planets (https://www.amazon.com/Astronomical-Tables-Sun-Moon-Planets/dp/094339645X), by Jean Meeus.

All other weather data, including cloud cover, precipitation, wind speed and direction, and solar flux, come from NASA's MERRA-2 Modern-Era Retrospective Analysis (https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/). This reanalysis combines a variety of wide-area measurements in a state-of-the-art global meteorological model to reconstruct the hourly history of weather throughout the world on a 50-kilometer grid.

Land Use data comes from the Global Land Cover SHARE database (http://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/category/details/en/c/1036355/), published by the Food and Agriculture Organization of the United Nations.

Elevation data comes from the Shuttle Radar Topography Mission (SRTM) (http://www2.jpl.nasa.gov/srtm/), published by NASA's Jet Propulsion Laboratory.

Names, locations, and time zones of places and some airports come from the GeoNames Geographical Database (http://www.geonames.org/).

Time zones for aiports and weather stations are provided by AskGeo.com (https://askgeo.com/).

Disclaimer

The information on this site is provided as is, without any assurances as to its accuracy or suitability for any purpose. Weather data is prone to errors, outages, and other defects. We assume no responsibility for any decisions made on the basis of the content presented on this site.

We draw particular cautious attention to our reliance on the MERRA-2 model-based reconstructions for a number of important data series. While having the tremendous advantages of temporal and spatial completeness, these reconstructions: (1) are based on computer models that may have model-based errors, (2) are coarsely sampled on a 50 km grid and are therefore unable to reconstruct the local variations of many microclimates, and (3) have particular difficulty with the weather in some coastal areas, especially small islands.

We further caution that our travel scores are only as good as the data that underpin them, that weather conditions at any given location and time are unpredictable and variable, and that the definition of the scores reflects a particular set of preferences that may not agree with those of any particular reader.

Temperature - Precipitation - Sunshine - Snowfall

US Climate Data on

Home United States Wyoming

Enter a location

Monthly | History | Geo & Map | Weather Forecast

You are here: United States > Wyoming > Baggs

Geo Baggs - Wyoming

Country:	United States
State:	Wyoming
County:	Carbon
City	Baggs
Zip code	82321
Longitude:	-107.658
Latitude:	41.0383
Altitude - Elevation:	6319 feet
ICAO:	-
IATA:	-

Date and Time Baggs - Wyoming

Local Time:	14:52
Sunrise:	07:39
Sunset:	16:51
Day / Night:	Day
Timezone:	MST - Mountain Standard Time
Timezone DB	America/Denver

Previous Map of Baggs

Map of Baggs - Wyoming

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Dominion Energy®

Site Plan
Rule 908.b(5)

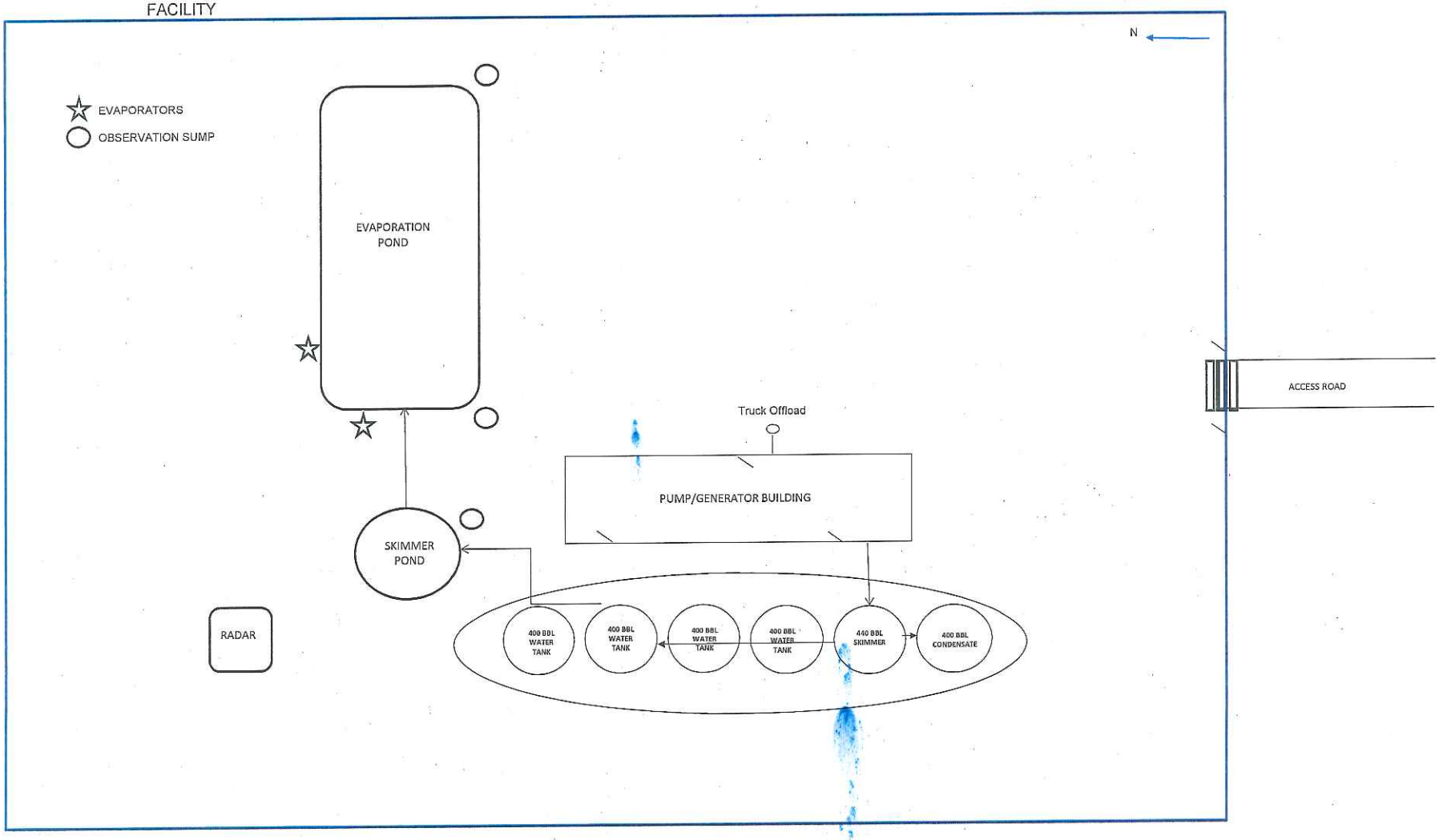
Wexpro Company®

Powder Wash Evaporation Facility

DOWN GRAIDIENT WELL APP 400FT FROM POND

DOWN GRAIENT WELL APP 500' FROM POND

POWDER WASH EVAPORATION FACILITY



Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Rule 908.b(6)
Waste Profile

Wexpro Company®

Powder Wash Evaporation Facility (PWEF)

Powder Wash Produced Water Evaporation Facility
Produced Water Flow

Facility Intake (Produced Water)			
Type	**Percentage**	**BPM**	**MGM**
Water	95.00%	4750	199.50
Condensate	5.00%	250	10.50
Total	100.00 %	5000	210

↓

Tanks			
Type	**Percentage**	**BPM**	**MGM**
Water	97.00%	4750	199.50
Condensate	3.00%	250	10.50
Solid Waste	0.00%	0	0.00
Total	100.00 %	5000	210

↓

Skim Pit			
Type	**Percentage**	**BPM**	**MGM**
Water	100.0%	4750	199.50
Condensate	0.0%	0	0.00
Total	100.00 %	4750	199.50

↓

Evaporation Pond			
Type	**Percentage**	**BPM**	**MGM**
Water	100.00%	4750	199.50
Condensate	0.00%	0	0.00
Total	100.00 %	4750	199.50

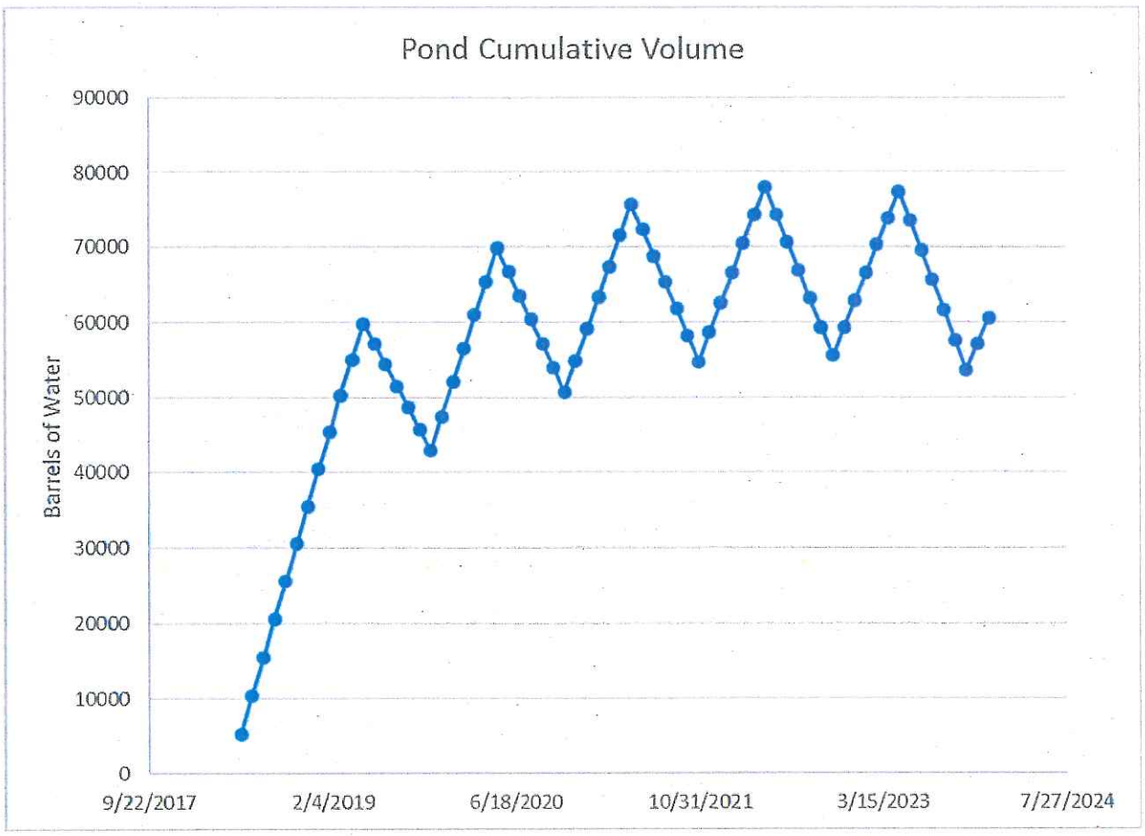
Produced Water Pond Intake/Evaporated
Wexpro Company
Moffat County, Colorado

Estimated Volume Based on Current Production
Evaporation Rate: 500 BPD
Cumulative Days Evap/Month: 15

Month	Intake	Cumulative	Evaporated	Evaporated Volume
	BPM	*BBL*	*BBL*	*BBL*
5/31/2018	5,196	5196		
6/30/2018	5,155	10351		
7/31/2018	5,114	15465		
8/31/2018	5,074	20539		
9/30/2018	5,035	25574		
10/31/2018	4,998	30572		
11/30/2018	4,961	35533		
12/31/2018	4,925	40458		
1/31/2019	4,889	45347		
2/28/2019	4,855	50201		
3/31/2019	4,820	55022		
4/30/2019	4,787	59809	7500	52309
5/31/2019	4,754	57063	7500	49563
6/30/2019	4,722	54285	7500	46785
7/31/2019	4,690	51475	7500	43975
8/31/2019	4,659	48634	7500	41134
9/30/2019	4,628	45762	7500	38262
10/31/2019	4,598	42860		
11/30/2019	4,568	47428		
12/31/2019	4,539	51966		
1/31/2020	4,510	56476		
2/29/2020	4,463	60939		
3/31/2020	4,435	65373		
4/30/2020	4,407	69780	7500	62280
5/31/2020	4,380	66660	7500	59160
6/30/2020	4,353	63513	7500	56013
7/31/2020	4,326	60339	7500	52839
8/31/2020	4,300	57139	7500	49639
9/30/2020	4,274	53913	7500	46413
10/31/2020	4,248	50662		

11/30/2020	4,223	54885		
12/31/2020	4,198	59082		
1/31/2021	4,173	63255		
2/28/2021	4,148	67404		
3/31/2021	4,124	71528		
4/30/2021	4,100	75628	7500	68128
5/31/2021	4,076	72204	7500	64704
6/30/2021	4,053	68757	7500	61257
7/31/2021	4,029	65286	7500	57786
8/31/2021	4,006	61792	7500	54292
9/30/2021	3,983	58276	7500	50776
10/31/2021	3,961	54736		
11/30/2021	3,938	58675		
12/31/2021	3,916	62591		
1/31/2022	3,894	66485		
2/28/2022	3,872	70357		
3/31/2022	3,851	74207		
4/30/2022	3,829	78037	7500	70537
5/31/2022	3,808	74345	7500	66845
6/30/2022	3,787	70632	7500	63132
7/31/2022	3,766	66898	7500	59398
8/31/2022	3,745	63143	7500	55643
9/30/2022	3,725	59368	7500	51868
10/31/2022	3,704	55572		
11/30/2022	3,684	59257		
12/31/2022	3,664	62921		
1/31/2023	3,646	66567		
2/28/2023	3,629	70196		
3/31/2023	3,613	73809		
4/30/2023	3,597	77406	7500	69906
5/31/2023	3,580	73486	7500	65986
6/30/2023	3,564	69550	7500	62050
7/31/2023	3,548	65598	7500	58098
8/31/2023	3,532	61630	7500	54130
9/30/2023	3,516	57646	7500	50146
10/31/2023	3,500	53647		
11/30/2023	3,485	57131		
12/31/2023	3,469	60600		
1/31/2024	3,454	64054		
2/29/2024	3,438	67492		

3/31/2024	3,423	70915		
4/30/2024	3,404	74319	7500	66819
5/31/2024	3,389	70208	7500	62708
6/30/2024	3,316	66024	7500	58524
7/31/2024	3,302	61826	7500	54326
8/31/2024	3,288	57613	7500	50113
9/30/2024	3,273	53387	7500	45887
10/31/2024	3,259	56646		
11/30/2024	3,244	59889		
12/31/2024	3,229	63119		



Powder Wash Produced Water Evaporation Facility
Contributing Wells and Waste Profile

Wexpro Company Operated Wells in the Ace Unit/Field

Well Name	Well Number	Field/Unit	Operator	Operator Number	Legal Description	API Number	Formation	Analysis Attached	Transported to Disposal Via	notes	TDS	Sample Date	Facility ID	Location ID
ACE UNIT	2	ACE UNIT	WEX	95960	SW SW 3-11N-97W	05-081-05433	Fort Union (FTUN)	N	Truck				222430	312786
ACE UNIT	3	ACE UNIT	WEX	95960	SE SE 28-12N-97W	05-081-05493	Fort Union	N	Truck	SI - DOWNHOLE PROBLEMS			222484	312811
ACE UNIT	10	ACE UNIT	WEX	95960	NW SW 3-11N-97W	05-081-07281	Fort Union	Y	Truck		36498	5/6/2008	283862	313267
ACE UNIT	11	ACE UNIT	WEX	95960	SW SE 28-12N-97W	05-081-07369	Fort Union	Y	Truck		10443	5/6/2008	289421	313343
ACE UNIT	12	ACE UNIT	WEX	95960	NE NW 3-11N-97W	05-081-07372	Fort Union	Y	Truck		39008	5/6/2008	289132	313345
ACE UNIT	13	ACE UNIT	WEX	95960	NE SE 28-12N-97W	05-081-07408	Fort Union	Y	Truck		42542	5/6/2008	293131	313370

Wexpro Company Operated Wells in the Jacks Draw Unit/Field

Well Name	Well Number	Field/Unit	Operator	Operator Number	Legal Description	API Number	Formation	Analysis Attached	Transported to Disposal Via	Lease	notes	TDS	Analysis Date	Facility ID	Location ID
JACKS DRAW UNIT	2	Jacks Draw Unit	WEX	95960	NE NW 28-12N-97W	05-081-05512	**Fort Union**		Truck	COD040867B				222501	312816
JACKS DRAW UNIT	3	Jacks Draw Unit	WEX	95960	NE SW 21-12N-97W	05-081-05538	**Fort Union**		Truck	FEE				222523	312824
JACKS DRAW UNIT	9	Jacks Draw Unit	WEX	95960	SW NW 27-12N-97W	05-081-06040	**Fort Union**		Truck	COC02964				222680	312870
JACKS DRAW UNIT	17	Jacks Draw Unit	WEX	95960	SW NW 28-12N-97W	05-081-06966	**Fort Union**	Y	Truck	COD040867B		12301	4/4/017	223598	313098
JACKS DRAW UNIT	18	Jacks Draw Unit	WEX	95960	NE NW 28-12N-97W	05-081-07635	**Fort Union**	Y	Truck	COD040867B		13113	2/13/2012	420762	416378
JACKS DRAW UNIT	19	Jacks Draw Unit	WEX	95960	NW SE 10-11N-97W	05-081-07616	**Fort Union**	Y	Truck	COD052897		2619	2/13/2012	418294	416425
JACKS DRAW UNIT	20	Jacks Draw Unit	WEX	95960	NE NW 28-12N-97W	05-081-07634	**Fort Union**	Y	Truck	COD040867B		16401	2/13/2012	420761	416378

Wexpro Company Operated Wells in the Powder Wash Unit/Field

Well Name	Well Number	Field/Unit	Operator Number	Legal Description	API Number	Formation	Analysis Attached	Transported to Disposal Via	TDS	Analysis Date	Facility ID	Location ID
BW MUSSER	1	POWDER WASH UNIT	95960	LOT 6 NW NE 5-11N-97W	05-081-05453	Wasatch	Y	Truck			222447	312792
BW MUSSER	6	POWDER WASH UNIT	95960	SE NE 4-11N-97W	05-081-05447	Wasatch	Y	Truck			222441	312790
BW MUSSER	10	POWDER WASH UNIT	95960	NE SW 4-11N-97W	05-081-07014	Fort Union	Y	Truck			223607	313125
BW MUSSER	11	POWDER WASH UNIT	95960	SW SE 9-11N-97W	05-081-66375	Fort Union	Y	Truck			223631	313422
BW MUSSER	13	POWDER WASH UNIT	95960	NE NW 4-11N-97W	05-081-06095	Fort Union	Y	Truck	63839	5/7/2008	222735	312885
BW MUSSER	14	POWDER WASH UNIT	95960	NW SE 5-11N-97W	05-081-06110	Fort Union	Y	Truck			222750	312887
BW MUSSER	15	POWDER WASH UNIT	95960	NW NW 9-11N-97W	05-081-06141	Upper Fort Union	Y	Truck	13053	2/5/2010	222781	312896
BW MUSSER	16	POWDER WASH UNIT	95960	NE NE 5-11N-97W	05-081-06159	Wasatch	Y	Truck	12805	7/27/2010	222799	312903
BW MUSSER	18	POWDER WASH UNIT	95960	SE NE 4-11N-97W	05-081-06191	Fort Union	Y	Truck			222831	312917
BW MUSSER	19	POWDER WASH UNIT	95960	SW NW 5-11N-97W	05-081-06203	Fort Union	Y	Truck			222843	312923
BW MUSSER	20	POWDER WASH UNIT	95960	NW NE 6-11N-97W	05-081-06228	Fort Union	Y	Truck			222868	312926
BW MUSSER	23	POWDER WASH UNIT	95960	NW SE 4-11N-97W	05-081-07114	Fort Union	Y	Truck	2924	5/29/2007	265677	313161
BW MUSSER	24	POWDER WASH UNIT	95960	SW NE 9-11N-97W	05-081-07220	Fort Union	Y	Truck	3552	4/4/2007	275134	313222
BW MUSSER	27	POWDER WASH UNIT	95960	SW NE 4-11N-97W	05-081-07406	Fort Union	Y	Truck	16545	7/8/2008	293069	313368
BW MUSSER	28	POWDER WASH UNIT	95960	SW NE 6-11N-97W	05-081-07413	Fort Union	Y	Truck	15965	4/8/2009	294131	313374
BW MUSSER	29	POWDER WASH UNIT	95960	SE NW 5-11N-97W	05-081-07421	Fort Union	Y	Truck	11152	4/23/2009	294333	313382
BW MUSSER	26 R	POWDER WASH UNIT	95960	NW SW 4-11N-97W	05-081-07402	Fort Union	Y	Truck	6815	5/6/2008	291704	311778
BW MUSSER	31	POWDER WASH UNIT	95960	NE NE 4-11N-97W	05-081-07468	Fort Union	Y	Truck	16406	7/19/2012	411959	414020
BW MUSSER	32	POWDER WASH UNIT	95960	NE NW 5-11N-97W	05-081-07585	Fort Union	Y	Truck	8401	9/28/2011	412562	413462
BW MUSSER	34	POWDER WASH UNIT	95960	SE SW 5-11N-97W	05-081-07608	Fort Union	Y	Truck	31251	1/11/2012	416769	416367

BW MUSSER	36	POWDER WASH UNIT	95960	NW NE 5-11N-97W	05-081-07584	Fort Union	Y	Truck	16521	9/8/2010	412561	414060
BW MUSSER	37	POWDER WASH UNIT	95960	NW NE 5-11N-97W	05-081-07586	Fort Union	Y	Truck	4398	10/6/2011	412563	414061
BW MUSSER	38	POWDER WASH UNIT	95960	NE NE 4-11N-97W	05-081-07618	Fort Union	Y	Truck	18771	7/20/2012	418299	414020
BW MUSSER	39	POWDER WASH UNIT	95960	NE NE 4-11N-97W	05-081-07619	Fort Union	Y	Truck	27316	7/20/2012	418306	414020
BW MUSSER	42	POWDER WASH UNIT	95960	SE SW 5-11N-97W	05-081-07611	Fort Union	Y	Truck			417055	416367
BW MUSSER	72	POWDER WASH UNIT	95960	NE SE 5-11N-97W	05-081-07631	Fort Union	Y	Truck	38110	1/10/2012	419888	416341
BW MUSSER	73	POWDER WASH UNIT	95960	NE SE 5-11N-97W	05-081-07632	Fort Union	Y	Truck	21063	1/11/2012	419913	416341
BW MUSSER	73	POWDER WASH UNIT		SE SE 5-11N-97W	05-081-07632	Lance	Y					
CARL ALLEN	4	POWDER WASH UNIT	95960	NW SW 28-12N-97W	05-081-05503	Wasatch	Y	Truck	11384	2/26/2001	222492	312812
CARL ALLEN	6	POWDER WASH UNIT	95960	SW SE 33-12N-97W	05-081-05473	Fort Union	Y	Truck			222466	312802
CARL ALLEN	6	POWDER WASH UNIT		SW SE 33-12N-97W	05-081-05473	Lower Fort Union	Y					
CARL ALLEN	7	POWDER WASH UNIT	95960	NE SW 28-12N-97W	05-081-05508	Fort Union	Y	Truck	31678	5/7/2008	222497	312813
CARL ALLEN	8	POWDER WASH UNIT	95960	NE SW 32-12N-97W	05-081-05474	Fort Union	Y	Truck			222467	312803
CARL ALLEN	10	POWDER WASH UNIT	95960	NW NE 33-12N-97W	05-081-05485	Wasatch	Y	Truck			222478	312809
CARL ALLEN	11	POWDER WASH UNIT	95960	NE SW 33-12N-97W	05-081-05470	Fort Union	Y	Truck	11390	7/27/2010	222464	312800
CARL ALLEN	11	POWDER WASH UNIT		NE SW 33-12N-97W	05-081-05470	Lower Fort Union	Y					
CARL ALLEN	15	POWDER WASH UNIT	95960	NE SE 33-12N-97W	05-081-05472	Wasatch	Y	Truck			222465	312801
CARL ALLEN	17	POWDER WASH UNIT	95960	NW SE 33-12N-97W	05-081-06048	Wasatch	Y	Truck			222688	312874
CARL ALLEN	19	POWDER WASH UNIT	95960	SW NW 33-12N-97W	05-081-06135	Fort Union	Y	Truck			222775	312892
CARL ALLEN	20	POWDER WASH UNIT	95960	NW NW 32-12N-97W	05-081-06162	Fort Union	Y	Truck			222802	312905
CARL ALLEN	16	POWDER WASH UNIT	95960	NW SW 33-12N-97W	05-081-06044	Wasatch	Y	Truck			222684	312872
CARL ALLEN	9	POWDER WASH UNIT	95960	NE NE 33-12N-97W	05-081-05487	Upper Wasatch	Y	Truck			222479	312810

CARL ALLEN	2	POWDER WASH UNIT	95960	NE NW 32-12N-97W	05-081-05483	Wasatch	Y	Truck			222476	312808
CARL ALLEN	22	POWDER WASH UNIT	95960	SW SW 28-12N-97W	05-081-06974	Fort Union	Y	Truck	9838	2/11/2000	256112	313102
CARL ALLEN	23	POWDER WASH UNIT	95960	SW NE 33-12N-97W	05-081-06980	Fort Union	Y	Truck			256792	313107
CARL ALLEN	26	POWDER WASH UNIT	95960	NE SE 33-12N-97W	05-081-07284	Fort Union	Y	Truck	36916	4/4/2007	283861	313270
CARL ALLEN	25	POWDER WASH UNIT	95960	NW SE 32-12N-97W	05-081-07365	Fort Union	Y	Truck			288548	313341
CARL ALLEN	27	POWDER WASH UNIT	95960	NE NW 33-12N-97W	05-081-07409	Fort Union	Y	Truck			293170	313371
CARL ALLEN	28	POWDER WASH UNIT	95960	NW SW 28-12N-97W	05-081-07411	Fort Union	Y	Truck	14944	6/6/2008	293787	313373
CARL ALLEN	29	POWDER WASH UNIT	95960	SW SW 33-12N-97W	05-081-07410	Fort Union	Y	Truck	17430	6/4/2008	293171	313372
CARL ALLEN	30	POWDER WASH UNIT	95960	NE SW 33-12N-97W	05-081-07465	Fort Union	Y	Truck	31089	10/11/2010	411956	413947
CARL ALLEN	31	POWDER WASH UNIT	95960	NE SW 33-12N-97W	05-081-07569	Fort Union	Y	Truck	33022	10/11/2010	412218	413947
CARL ALLEN	32	POWDER WASH UNIT	95960	SE SE 32-12N-97W	05-081-07466	Fort Union	Y	Truck	23931	10/9/2009	411957	413594
CARL ALLEN	33	POWDER WASH UNIT	95960	SW NW 32-12N-97W	05-081-07572	Fort Union	Y	Truck			412389	413617
CARL ALLEN	34	POWDER WASH UNIT	95960	SW SW 33-12N-97W	05-081-07467	Fort Union	Y	Truck	27956	10/9/2009	411958	413772
CARL ALLEN	35	POWDER WASH UNIT	95960	NW NE 5-11N-97W	05-081-07583	Fort Union	Y	Truck	4236	8/4/2010	412560	413461
CARL ALLEN	36	POWDER WASH UNIT	95960	NW NE 5-11N-97W	05-081-07582	Fort Union	Y	Truck	8221	10/11/2010	412559	413880
CARL ALLEN	37	POWDER WASH UNIT	95960	NE NE 4-11N-97W	05-081-07617	Fort Union	Y	Truck	3707	7/20/2012	418298	414020
CARL ALLEN	40	POWDER WASH UNIT	95960	SW SW 28-12N-97W	05-081-07645	Fort Union	Y	Truck	32885	7/20/2012	421619	421618
CARL ALLEN	41	POWDER WASH UNIT	95960	SW SW 28-12N-97W	05-081-07644	Fort Union	Y	Truck	12332	7/19/2012	421613	421618
GOVERNMENT	1	POWDER WASH UNIT	95960	SW SE 8-11N-97W	05-081-05686	Fort Union	Y	Truck			222597	312849
GOVERNMENT	17	POWDER WASH UNIT	95960	SE SW 5-11N-97W	05-081-07630	Fort Union	Y	Truck			419887	416367
HW STEWART	1	POWDER WASH UNIT	95960	SW SW 32-12N-97W	05-081-05465	Fort Union	Y	Truck			222459	312798

HW STEWART	2	POWDER WASH UNIT	95960	SE NE 32-12N-97W	05-081-05478	Fort Union	Y	Truck	5372	5/7/2008	222471	312804
HW STEWART	5	POWDER WASH UNIT	95960	SE NE 32-12N-97W	05-081-07383	Fort Union	Y	Truck	3441	5/6/2008	290910	313351
HW STEWART	6	POWDER WASH UNIT	95960	SW NE 30-12N-97W	05-081-07573	Fort Union	Y	Truck			412387	413703
JA LEE	1	POWDER WASH UNIT	95960	NW NE 8-11N-97W	05-081-05429	Fort Union	Y	Truck			222426	312784
JC DONNELL	3	POWDER WASH UNIT	95960	NW SE 29-12N-97W	05-081-05509	Wasatch	Y	Truck			222498	312814
JC DONNELL	5	POWDER WASH UNIT	95960	NE NW 29-12N-97W	05-081-05514	Fort Union	Y	Truck			222503	312817
JC DONNELL	9	POWDER WASH UNIT	95960	SW SE 29-12N-97W	05-081-06112	Fort Union	Y	Truck			222752	312888
JC DONNELL	10	POWDER WASH UNIT	95960	SE NE 29-12N-97W	05-081-06136	Fort Union	Y	Truck			222776	312893
JC DONNELL	11	POWDER WASH UNIT	95960	NE SE 30-12N-97W	05-081-06175	Fort Union	Y	Truck	722	5/7/2008	222815	312909
JC DONNELL	1	POWDER WASH UNIT	95960	SE NE 31-12N-97W	05-081-05479	Fort Union	Y	Truck			222472	312805
JC DONNELL	14-29	POWDER WASH UNIT	95960	SW SE 29-12N-97W	05-081-06979	Fort Union	Y	Truck			256790	313106
JC DONNELL	14	POWDER WASH UNIT	95960	NE NE 30-12N-97W	05-081-07423	Fort Union	Y	Truck	4660	9/5/2008	294414	313384
JC DONNELL	15	POWDER WASH UNIT	95960	SE SE 30-12N-97W	05-081-07425	Fort Union	Y	Truck			294415	313386
JC DONNELL	16	POWDER WASH UNIT	95960	SW NW 29-12N-97W	05-081-07424	Fort Union	Y	Truck	15575	8/11/2008	294413	313385
JC DONNELL	17	POWDER WASH UNIT	95960	SW NE 30-12N-97W	05-081-07422	Wasatch	Y	Truck			419887	416367
JC DONNELL	18	POWDER WASH UNIT	95960	NW NE 29-12N-97W	05-081-07575	Fort Union	Y	Truck			412420	413707
MOUNTAIN FUEL	20-1	POWDER WASH UNIT	95960	SE SW 20-12N-97W	05-081-06293	Fort Union	Y	Truck	(NON UNIT)		222931	312936
CHAPMAN STATE	1	POWDER WASH UNIT	95960	NE SE 16-11N-97W	05-081-07015	Fort Union	Y	Truck			223608	313126
STATE OF COLORADO	21-16	POWDER WASH UNIT	95960	NE NW 16-11N-97W	05-081-07244	Fort Union	Y	Truck	AL		279347	392534

Contributing Wells Water Analysis Reports

Questar Applied Technology Division

1005 D Street, PO Box 1129
Rock Springs, Wyoming 82902
Phone: (307) 352-7292
Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY:	**WEXPRO**	**FORMATION:**	**N/A**
FIELD:	**Powder Wash**	**SAMPLE POINT:**	
LEGAL DESC:	**N/A**	**TYPE OF WATER:**	**N/A**
COUNTY:	**Moffat**	**DATE SAMPLED:**	**N/A**
STATE:	**Colorado**	**DATE ANALYZED:**	**5/6/08**
WELL:	**Ace 10**	**SAMPLED BY:**	**N/A**
DEPTH:	**N/A**	**ANALYZED BY:**	**PUTNAM**

DISSOLVED SOLIDS	**mg / L**
CATIONS:	
Sodium, Na:	12,696
Calcium, Ca:	1,256
Magnesium, Mg:	146
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	21,900
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	500
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	36498

OTHER PROPERTIES:	
pH:	7.24
Specific Gravity, 60/60F:	1.03
Resistivity: (ohms/meter)	0.203
Sample Temperature:	70*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Division

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Rock Springs, Wyoming 82902
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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	N/A
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC:	N/A	TYPE OF WATER:	N/A
COUNTY:	Moffat	DATE SAMPLED:	N/A
STATE:	Colorado	DATE ANALYZED:	5/6/08
WELL:	Ace 11	SAMPLED BY:	N/A
DEPTH:	N/A	ANALYZED BY:	PUTNAM

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	3,772
Calcium, Ca:	158
Magnesium, Mg:	15
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	5,750
Sulfate, SO_4:	148
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	600
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	10443

OTHER PROPERTIES:	
pH:	7.74
Specific Gravity, 60/60F:	1.0106
Resistivity: (ohms/meter)	0.663
Sample Temperature:	68*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Division

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	N/A
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC:	N/A	TYPE OF WATER:	N/A
COUNTY:	Moffat	DATE SAMPLED:	N/A
STATE:	Colorado	DATE ANALYZED:	5/6/08
WELL:	ACE 12	SAMPLED BY:	N/A
DEPTH:	N/A	ANALYZED BY:	PUTNAM

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	13,593
Calcium, Ca:	1,264
Magnesium, Mg:	151
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	23,100
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	900
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	39008

OTHER PROPERTIES:	
pH:	6.97
Specific Gravity, 60/60F:	1.0324
Resistivity: (ohms/meter)	0.175
Sample Temperature:	72*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	N/A
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC:	N/A	TYPE OF WATER:	N/A
COUNTY:	Moffat	DATE SAMPLED:	N/A
STATE:	Colorado	DATE ANALYZED:	5/6/08
WELL:	Ace 13	SAMPLED BY:	N/A
DEPTH:	N/A	ANALYZED BY:	PUTNAM

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	14,030
Calcium, Ca:	1,960
Magnesium, Mg:	292
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	25,550
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	700
Iron, Fe:	10
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	42542

OTHER PROPERTIES:	
pH:	6.52
Specific Gravity, 60/60F:	1.0338
Resistivity: (ohms/meter)	0.182
Sample Temperature:	69*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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Rock Springs, Wyoming 82902
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WATER ANALYSIS REPORT

COMPANY: WEXPRO	FORMATION:
FIELD: POWDER WASH	SAMPLE POINT: DST #3
LEGAL DESCRIPTION:	TYPE OF WATER:
COUNTY:	DATE SAMPLED: 2/23/01
STATE: COLORADO	DATE ANALYZED: 2/26/01
WELL: ALLEN 4	ANALYZED BY: PUTNAM
DEPTH:	SAMPLED BY:

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	4,094
Calcium, Ca:	202
Magnesium, Mg:	34
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	6,250
Sulfate, SO_4:	404
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	400
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	11,384

OTHER PROPERTIES:	
pH:	7.18
Specific Gravity, 60/60F:	1.0132
Resistivity: (ohms/meter)	.374 ohms
Sample Temperature:	66*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:	N/A	TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	
STATE:	CO	DATE ANALYZED:	5/7/08
WELL:	CARL ALLEN 7	ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	11,063
Calcium, Ca:	952
Magnesium, Mg:	97
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	18,551
Sulfate, SO_4:	50
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	800
Iron, Fe:	165
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	31,678

OTHER PROPERTIES:	
pH:	5.6
Specific Gravity, 60/60F:	1.0206
Resistivity: (ohms/meter)	0.319
Sample Temperature:	68*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	
WELL:	Allen # 11	DATE ANALYZED:	7/27/10
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	3,933
Calcium, Ca:	364
Magnesium, Mg:	43
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	6,550
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	500
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	11,390

OTHER PROPERTIES:	
pH:	5.88
Specific Gravity, 60/60F:	1.0114
Resistivity: (ohms/meter)	0.615
Sample Temperature:	72*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology

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WATER ANALYSIS REPORT

COMPANY: WEXPRO FIELD: POWDER WASH LEGAL DESCRIPTION: COUNTY: MOFFAT STATE: CO WELL: CARL ALLEN #22 DEPTH:8304-8326,8332-8344,8354-8372	FORMATION: SAMPLE POINT: D.S.T. TYPE OF WATER: DATE SAMPLED: 02-11-00 DATE ANALYZED: 02-11-00 SAMPLED BY: ANALYZED BY: Kelly

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	3,358
Calcium, Ca:	69
Magnesium, Mg:	10
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	5,050
Sulfate, SO_4:	350
Carbonate, CO_4:	200
Bicarbonate, HCO_4:	800
Iron, Fe:	1
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	9,838

OTHER PROPERTIES:	
pH:	8.99
Specific Gravity, 60/60F:	1.0056
Resistivity: (ohms/meter)	0.614
Sample Temperature:	70*F

REMARKS & RECOMMENDATIONS: SAMPLE #1

Questar Applied Technology Services

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	03\30\07
STATE:	COLORADO	DATE ANALYZED:	04/04\07
WELL:	CARL ALLEN 26	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	HOLLANDER

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	12,604
Calcium, Ca:	1,352
Magnesium, Mg:	185
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	22,000
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	700
Iron, Fe:	75
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	36,916

OTHER PROPERTIES:	
pH:	6.51
Specific Gravity, 60/60F:	1.0264
Resistivity: (ohms/meter)	0.195
Sample Temperature:	72*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	Moffat	DATE SAMPLED:	6/4/08
STATE:	Colorado	DATE ANALYZED:	6/6/08
WELL:	Carl Allen 28	ANALYZED BY:	Putnam
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	3,956
Calcium, Ca:	1,296
Magnesium, Mg:	228
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	8,750
Sulfate, SO_4:	90
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	600
Iron, Fe:	24
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	14,944

OTHER PROPERTIES:	
pH:	7.05
Specific Gravity, 60/60F:	1.0244
Resistivity: (ohms/meter)	0.254
Sample Temperature:	72*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	Ft.Union / Wasatch
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC.:	SW SW 33 12N R97W	TYPE OF WATER:	
COUNTY:	Moffat	DATE SAMPLED:	5/21/08
STATE:	Colorado	DATE ANALYZED:	6/4/08
WELL:	Carl Allen 29	ANALYZED BY:	Putnam
		SAMPLED BY:	Gross

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	6,164
Calcium, Ca:	406
Magnesium, Mg:	72
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	10,000
Sulfate, SO_4:	68
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	700
Iron, Fe:	20
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	17,430

OTHER PROPERTIES:	
pH:	7.79
Specific Gravity, 60/60F:	1.0156
Resistivity: (ohms/meter)	0.387
Sample Temperature:	73*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	9/22/10
WELL:	Allen 30	DATE ANALYZED:	10/11/10
		ANALYZED BY:	Putnam
		SAMPLED BY:	Lison

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	11,224
Calcium, Ca:	248
Magnesium, Mg:	447
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	18,850
Sulfate, SO_4:	120
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	200
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	31,089

OTHER PROPERTIES:	
pH:	7.69
Specific Gravity, 60/60F:	1.026
Resistivity: (ohms/meter)	0.228
Sample Temperature:	70*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	9/22/10
WELL:	Allen 31	DATE ANALYZED:	10/11/10
		ANALYZED BY:	Putnam
		SAMPLED BY:	Lison

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	10,442
Calcium, Ca:	2,200
Magnesium, Mg:	0
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	19,500
Sulfate, SO_4:	80
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	800
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	33,022

OTHER PROPERTIES:	
pH:	7.45
Specific Gravity, 60/60F:	1.028
Resistivity: (ohms/meter)	0.22
Sample Temperature:	70*f

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

1210 D Street
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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	10/6/09
STATE:	COLORADO	DATE ANALYZED:	10/9/09
WELL:	CARL ALLEN 32	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	8,533
Calcium, Ca:	608
Magnesium, Mg:	90
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	14,200
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	500
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	23,931

OTHER PROPERTIES:	
pH:	6.79
Specific Gravity, 60/60F:	1.017
Resistivity: (ohms/meter)	0.326
Sample Temperature:	70*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	10/6/09
STATE:	COLORADO	DATE ANALYZED:	10/9/09
WELL:	CARL ALLEN 34	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	9,844
Calcium, Ca:	740
Magnesium, Mg:	122
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	16,400
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	800
Iron, Fe:	50
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	27,956

OTHER PROPERTIES:	
pH:	7.12
Specific Gravity, 60/60F:	1.0254
Resistivity: (ohms/meter)	0.283
Sample Temperature:	71*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	8/2/10
WELL:	Allen 35	DATE ANALYZED:	8/4/10
		ANALYZED BY:	Putnam
		SAMPLED BY:	Lison

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	1,288
Calcium, Ca:	29
Magnesium, Mg:	1
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	800
Sulfate, SO_4:	118
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	2,000
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	4,236

OTHER PROPERTIES:	
pH:	8.3
Specific Gravity, 60/60F:	1.0066
Resistivity: (ohms/meter)	1.953
Sample Temperature:	73*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	**Wexpro**	**FORMATION:**	
FIELD:	**Powder Wash**	**SAMPLE POINT:**	
COUNTY:	**Moffat**	**TYPE OF WATER:**	
STATE:	**Colorado**	**DATE SAMPLED:**	**9/22/10**
WELL:	**Allen 36**	**DATE ANALYZED:**	**10/11/10**
		ANALYZED BY:	**Putnam**
		SAMPLED BY:	**Lison**

DISSOLVED SOLIDS	**mg / L**
CATIONS:	.
Sodium, Na:	2,691
Calcium, Ca:	171
Magnesium, Mg:	5
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	3,250
Sulfate, SO_4:	4
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	2,100
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	8,221

OTHER PROPERTIES:	
pH:	8.32
Specific Gravity, 60/60F:	1.0068
Resistivity: (ohms/meter)	0.852
Sample Temperature:	69*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/10/12
WELL:	Allen #37	DATE ANALYZED:	7/20/12
		ANALYZED BY:	Dreben
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	13685 +
Calcium, Ca:	2,160
Magnesium, Mg:	267
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	25000 +
Sulfate, SO_4:	255
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,000
Iron, Fe:	25
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	3,707

OTHER PROPERTIES:	
pH:	6.86
Specific Gravity, 60/60F:	1.0456
Resistivity: (ohms/meter)	0.133
Sample Temperature:	68*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/10/12
WELL:	Allen #40	DATE ANALYZED:	7/20/12
		ANALYZED BY:	Dreben
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	11,615
Calcium, Ca:	840
Magnesium, Mg:	170
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	19,250
Sulfate, SO_4:	510
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	500
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	32,885

OTHER PROPERTIES:	
pH:	7.11
Specific Gravity, 60/60F:	1.0236
Resistivity: (ohms/meter)	0.221
Sample Temperature:	68*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/10/12
WELL:	Allen #41	DATE ANALYZED:	7/1912
		ANALYZED BY:	Dreben
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	4,508
Calcium, Ca:	220
Magnesium, Mg:	41
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	7,350
Sulfate, SO_4:	13
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	200
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	12,332

OTHER PROPERTIES:	
pH:	6.79
Specific Gravity, 60/60F:	1.0142
Resistivity: (ohms/meter)	0.467
Sample Temperature:	71*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:	N/A	TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	
STATE:	CO	DATE ANALYZED:	5/7/08
WELL:	DONELL 11	ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	253
Calcium, Ca:	8
Magnesium, Mg:	8
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	300
Sulfate, SO_4:	3
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	200
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	772

OTHER PROPERTIES:	
pH:	7.14
Specific Gravity, 60/60F:	1.002
Resistivity: (ohms/meter)	14.54
Sample Temperature:	64*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	Moffat	DATE SAMPLED:	
STATE:	Colorado	DATE ANALYZED:	09/05/08
WELL:	Donnell 14	ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	1,587
Calcium, Ca:	17
Magnesium, Mg:	46
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	2,000
Sulfate, SO_4:	3
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,000
Iron, Fe:	7
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	4,660

OTHER PROPERTIES:	
pH:	7.9
Specific Gravity, 60/60F:	1.0074
Resistivity: (ohms/meter)	1.192
Sample Temperature:	67*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY: Wexpro	**FORMATION:**
FIELD: Powder Wash	**SAMPLE POINT:**
LEGAL DESCRIPTION:	**TYPE OF WATER:**
COUNTY:	**DATE SAMPLED:** 8/5/08
STATE: N/A	**DATE ANALYZED:** 8/11/08
WELL: Donnell 16	**ANALYZED BY:** Putnam
DEPTH: N/A	**SAMPLED BY:**

DISSOLVED SOLIDS	**mg / L**
CATIONS:	
Sodium, Na:	5,796
Calcium, Ca:	154
Magnesium, Mg:	21
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	8,900
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	700
Iron, Fe:	4
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	15,575

OTHER PROPERTIES:	
pH:	7.61
Specific Gravity, 60/60F:	1.0148
Resistivity: (ohms/meter)	0.448
Sample Temperature:	69*f

REMARKS & RECOMMENDATIONS: **Bottom Final Run**

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	03\30\07
STATE:	COLORADO	DATE ANALYZED:	04/04\07
WELL:	JACKS DRAW 17	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	HOLLANDER

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	4,531
Calcium, Ca:	212
Magnesium, Mg:	29
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	7,300
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	200
Iron, Fe:	29
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	12,301

OTHER PROPERTIES:	
pH:	6.56
Specific Gravity, 60/60F:	1.0118
Resistivity: (ohms/meter)	0.579
Sample Temperature:	69*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	2/8/2012
WELL:	Jacks Draw #18	DATE ANALYZED:	2/13/2012
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	4,531
Calcium, Ca:	316
Magnesium, Mg:	46
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	7,000
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,200
Iron, Fe:	20
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	13,113

OTHER PROPERTIES:	
pH:	7.26
Specific Gravity, 60/60F:	1.0134
Resistivity: (ohms/meter)	0.487
Sample Temperature:	67*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	2/8/2012
WELL:	Jacks Draw #19	DATE ANALYZED:	2/13/2012
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	over 1350
Calcium, Ca:	2,380
Magnesium, Mg:	12
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	over 25000
Sulfate, SO_4:	2
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	200
Iron, Fe:	25
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	2,619

OTHER PROPERTIES:	
pH:	6.93
Specific Gravity, 60/60F:	1.0313
Resistivity: (ohms/meter)	0.172
Sample Temperature:	66*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	2/8/2012
WELL:	Jacks Draw #20	DATE ANALYZED:	2/13/2012
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	5,865
Calcium, Ca:	284
Magnesium, Mg:	32
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	8,700
Sulfate, SO_4:	320
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,200
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	16,401

OTHER PROPERTIES:	
pH:	7.77
Specific Gravity, 60/60F:	1.0154
Resistivity: (ohms/meter)	0.411
Sample Temperature:	67*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:	N/A	TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	
STATE:	CO	DATE ANALYZED:	5/7/08
WELL:	MUSSER 13	ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	21,896
Calcium, Ca:	2,320
Magnesium, Mg:	243
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	37,400
Sulfate, SO_4:	5
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,400
Iron, Fe:	575
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	63,839

OTHER PROPERTIES:	
pH:	5.31
Specific Gravity, 60/60F:	1.0518
Resistivity: (ohms/meter)	0.119
Sample Temperature:	69*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
COUNTY:	MOFFAT	TYPE OF WATER:	
STATE:	COLORADO	DATE SAMPLED	2/3/10
WELL:	MUSSER 15	DATE ANALYZED:	2/5/10
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	4,485
Calcium, Ca:	488
Magnesium, Mg:	22
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	7,550
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	500
Iron, Fe:	8
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	13,053

OTHER PROPERTIES:	
pH:	6.63
Specific Gravity, 60/60F:	1.013
Resistivity: (ohms/meter)	0.576
Sample Temperature:	65*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	Wexpro	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/13/10
WELL:	Musser #16	DATE ANALYZED:	7/27/10
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	4,347
Calcium, Ca:	460
Magnesium, Mg:	33
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	7,150
Sulfate, SO_4:	290
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	500
Iron, Fe:	25
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	12,805

OTHER PROPERTIES:	
pH:	5.58
Specific Gravity, 60/60F:	1.0124
Resistivity: (ohms/meter)	0.488
Sample Temperature:	72*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	05/21\07
STATE:	COLORADO	DATE ANALYZED:	05/29\07
WELL:	MUSSER 23	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	943
Calcium, Ca:	91
Magnesium, Mg:	38
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	1,550
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	300
Iron, Fe:	2
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	2,924
OTHER PROPERTIES:	
pH:	6.43
Specific Gravity, 60/60F:	1.0032
Resistivity: (ohms/meter)	1.875
Sample Temperature:	71*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED:	03\30\07
STATE:	COLORADO	DATE ANALYZED:	04/04\07
WELL:	MUSSER 24	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	HOLLANDER

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	1,173
Calcium, Ca:	22
Magnesium, Mg:	4
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	1,250
Sulfate, SO_4:	2
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,100
Iron, Fe:	1
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	3,552
OTHER PROPERTIES:	
pH:	7.83
Specific Gravity, 60/60F:	1.0032
Resistivity: (ohms/meter)	1.975
Sample Temperature:	71*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	N/A
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC:	N/A	TYPE OF WATER:	N/A
COUNTY:	Moffat	DATE SAMPLED:	N/A
STATE:	Colorado	DATE ANALYZED:	5/6/08
WELL:	BW MUSSER 26	SAMPLED BY:	N/A
DEPTH:	N/A	ANALYZED BY:	PUTNAM

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	5,129
Calcium, Ca:	496
Magnesium, Mg:	32
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	11,950
Sulfate, SO_4:	173
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	600
Iron, Fe:	39
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	18419

OTHER PROPERTIES:	
pH:	6.63
Specific Gravity, 60/60F:	1.0206
Resistivity: (ohms/meter)	0.322
Sample Temperature:	73*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	N/A
FIELD:	Powder Wash	SAMPLE POINT:	
LEGAL DESC:	N/A	TYPE OF WATER:	N/A
COUNTY:	Moffat	DATE SAMPLED:	N/A
STATE:	Colorado	DATE ANALYZED:	5/6/08
WELL:	BW MUSSER 26 R	SAMPLED BY:	N/A
DEPTH:	N/A	ANALYZED BY:	PUTNAM

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	2,346
Calcium, Ca:	26
Magnesium, Mg:	4
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	2,600
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1800
Iron, Fe:	39
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	6815

OTHER PROPERTIES:	
pH:	7.52
Specific Gravity, 60/60F:	1.0068
Resistivity: (ohms/meter)	1.064
Sample Temperature:	69*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

1210 D Street
Rock Springs, Wyoming 82902
Phone: (307) 352-7292
Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY: WEXPRO	**FORMATION:** WASATCH / FT. UNION
FIELD: POWDER WASH	**SAMPLE POINT:** SEPERATOR
LEGAL: SW NE 4 11N 97W	**TYPE OF WATER:**
COUNTY: MOFFAT	**DATE SAMPLED:** 06/24/08
STATE: COLORADO	**DATE ANALYZED:** 07/08/08
WELL: MUSSER 27	**ANALYZED BY:** Putnam
DEPTH: 8373'	**SAMPLED BY:**

DISSOLVED SOLIDS	**mg / L**
CATIONS:	
Sodium, Na:	5,842
Calcium, Ca:	252
Magnesium, Mg:	46
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	9,400
Sulfate, SO_4:	2
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,000
Iron, Fe:	3
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	16,545
OTHER PROPERTIES:	
pH:	8.29
Specific Gravity, 60/60F:	1.0146
Resistivity: (ohms/meter)	0.0389
Sample Temperature:	73*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	POWDER WASH	SAMPLE POINT:	
LEGAL DESC.:		TYPE OF WATER:	
COUNTY:	MOFFAT	DATE SAMPLED	4/2/09
STATE:	COLORADO	DATE ANALYZED:	4/8/09
WELL:	MUSSER 28	ANALYZED BY:	PUTNAM
DEPTH:		SAMPLED BY:	

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	5,428
Calcium, Ca:	416
Magnesium, Mg:	68
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	8,350
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,700
Iron, Fe:	3
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	15,965

OTHER PROPERTIES:	
pH:	7.35
Specific Gravity, 60/60F:	1.016
Resistivity: (ohms/meter)	0.449
Sample Temperature:	70*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY: WEXPRO	FORMATION:
FIELD: POWDER WASH	SAMPLE POINT:
COUNTY: MOFFAT	TYPE OF WATER:
STATE: COLORADO	DATE SAMPLED: 04/22/09
WELL: MUSSER 29	DATE ANALYZED: 04/23/09
DEPTH:	ANALYZED BY: Putnam
	SAMPLED BY:

DISSOLVED SOLIDS	mg / L
CATIONS:	.
Sodium, Na:	3,611
Calcium, Ca:	90
Magnesium, Mg:	44
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	3,800
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	3,600
Iron, Fe:	7
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	11,152

OTHER PROPERTIES:	
pH:	8.27
Specific Gravity, 60/60F:	1.0085
Resistivity: (ohms/meter)	0.76
Sample Temperature:	70*F

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/10/12
WELL:	Musser #31	DATE ANALYZED:	7/19/12
		ANALYZED BY:	Dreben
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	6,003
Calcium, Ca:	286
Magnesium, Mg:	61
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	9,850
Sulfate, SO_4:	6
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	200
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	16,406

OTHER PROPERTIES:	
pH:	7.08
Specific Gravity, 60/60F:	1.015
Resistivity: (ohms/meter)	0.374
Sample Temperature:	70*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/11/11
WELL:	Musser 32	DATE ANALYZED:	9/28/2011
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	2,875
Calcium, Ca:	62
Magnesium, Mg:	10
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	3,350
Sulfate, SO_4:	4
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	2,100
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	8,401

OTHER PROPERTIES:	
pH:	7.36
Specific Gravity, 60/60F:	1.008
Resistivity: (ohms/meter)	0.842
Sample Temperature:	68*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	1/4/2012
WELL:	Musser 34	DATE ANALYZED:	1/11/2012
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	10,442
Calcium, Ca:	1,264
Magnesium, Mg:	165
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	17,950
Sulfate, SO_4:	325
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,100
Iron, Fe:	5
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	31,251

OTHER PROPERTIES:	
pH:	7.38
Specific Gravity, 60/60F:	1.0254
Resistivity: (ohms/meter)	0.22
Sample Temperature:	67*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	1/4/2012
WELL:	Musser 35	DATE ANALYZED:	1/9/2012
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	1,978
Calcium, Ca:	38
Magnesium, Mg:	18
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	2,000
Sulfate, SO_4:	1
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	2,000
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	6,035

OTHER PROPERTIES:	
pH:	8.24
Specific Gravity, 60/60F:	1.009
Resistivity: (ohms/meter)	1.094
Sample Temperature:	70*f

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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Rock Springs, Wyoming 82902
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Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY:	**Wexpro**	**FORMATION:**	
FIELD:	**Powder Wash**	**SAMPLE POINT:**	
COUNTY:	**Moffat**	**TYPE OF WATER:**	
STATE:	**Colorado**	**DATE SAMPLED:**	
WELL:	**Musser # 36**	**DATE ANALYZED:**	**9/8/10**
		ANALYZED BY:	**PUTNAM**
		SAMPLED BY:	

DISSOLVED SOLIDS	**mg / L**
CATIONS:	.
Sodium, Na:	5,313
Calcium, Ca:	724
Magnesium, Mg:	175
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	9,200
Sulfate, SO_4:	9
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,100
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	16,521

OTHER PROPERTIES:	
pH:	7.02
Specific Gravity, 60/60F:	1.0142
Resistivity: (ohms/meter)	0.438
Sample Temperature:	71*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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Rock Springs, Wyoming 82902
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Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY:	**WEXPRO**	**FORMATION:**	
FIELD:	**Powder Wash**	**SAMPLE POINT:**	
COUNTY:	**Moffat**	**TYPE OF WATER:**	
STATE:	**Colorado**	**DATE SAMPLED:**	**8/2011**
WELL:	**Musser 37**	**DATE ANALYZED:**	**10/6/2011**
		ANALYZED BY:	**PUTNAM**
		SAMPLED BY:	**Powder Wash**

DISSOLVED SOLIDS	**mg / L**
CATIONS:	
Sodium, Na:	989
Calcium, Ca:	5
Magnesium, Mg:	2
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	900
Sulfate, SO_4:	2
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	2,500
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	4,398

OTHER PROPERTIES:	
pH:	7.41
Specific Gravity, 60/60F:	1.0066
Resistivity: (ohms/meter)	1.734
Sample Temperature:	68*f

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/10/12
WELL:	Musser #38	DATE ANALYZED:	7/20/12
		ANALYZED BY:	Dreben
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	6,486
Calcium, Ca:	524
Magnesium, Mg:	95
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	10,800
Sulfate, SO_4:	39
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	700
Iron, Fe:	127
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	18,771

OTHER PROPERTIES:	
pH:	7.08
Specific Gravity, 60/60F:	1.0166
Resistivity: (ohms/meter)	0.412
Sample Temperature:	68*f

REMARKS & RECOMMENDATIONS:

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WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	7/10/12
WELL:	Musser #39	DATE ANALYZED:	7/20/12
		ANALYZED BY:	Dreben
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	9,223
Calcium, Ca:	1,152
Magnesium, Mg:	78
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	16,050
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	800
Iron, Fe:	13
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	27,316

OTHER PROPERTIES:	
pH:	7.04
Specific Gravity, 60/60F:	1.022
Resistivity: (ohms/meter)	0.243
Sample Temperature:	70*f

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

1210 D Street
Rock Springs, Wyoming 82902
Phone: (307) 352-7292
Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY:	**WEXPRO**	**FORMATION:**	
FIELD:	**Powder Wash**	**SAMPLE POINT:**	
COUNTY:	**Moffat**	**TYPE OF WATER:**	
STATE:	**Colorado**	**DATE SAMPLED:**	**1/4/2012**
WELL:	**Musser 72**	**DATE ANALYZED:**	**1/10/2012**
		ANALYZED BY:	**PUTNAM**
		SAMPLED BY:	**Powder Wash**

DISSOLVED SOLIDS	**mg / L**
CATIONS:	
Sodium, Na:	12,811
Calcium, Ca:	1,400
Magnesium, Mg:	224
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	22,000
Sulfate, SO_4:	10
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,500
Iron, Fe:	165
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	38,110

OTHER PROPERTIES:	
pH:	6.79
Specific Gravity, 60/60F:	1.0292
Resistivity: (ohms/meter)	0.195
Sample Temperature:	66*f

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

1210 D Street
Rock Springs, Wyoming 82902
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Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY:	WEXPRO	FORMATION:	
FIELD:	Powder Wash	SAMPLE POINT:	
COUNTY:	Moffat	TYPE OF WATER:	
STATE:	Colorado	DATE SAMPLED:	1/4/2012
WELL:	Musser 73	DATE ANALYZED:	1/11/2012
		ANALYZED BY:	PUTNAM
		SAMPLED BY:	Powder Wash

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	7,337
Calcium, Ca:	544
Magnesium, Mg:	82
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	11,850
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1,200
Iron, Fe:	50
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	21,063

OTHER PROPERTIES:	
pH:	7.06
Specific Gravity, 60/60F:	1.0192
Resistivity: (ohms/meter)	0.319
Sample Temperature:	66*f

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Services

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Rock Springs, Wyoming 82902
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WATER ANALYSIS REPORT

COMPANY: WEXPRO	FORMATION:
FIELD: POWDER WASH	SAMPLE POINT:
LEGAL DESC.: N/A	TYPE OF WATER:
COUNTY: MOFFAT	DATE SAMPLED:
STATE: CO	DATE ANALYZED: 5/7/08
WELL: POWDER WASH GOVT. 2	ANALYZED BY: PUTNAM
	SAMPLED BY:

DISSOLVED SOLIDS	mg / L
CATIONS:	
Sodium, Na:	1,656
Calcium, Ca:	14
Magnesium, Mg:	2
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	1,000
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	2,700
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	5,372
OTHER PROPERTIES:	
pH:	8.13
Specific Gravity, 60/60F:	1.0064
Resistivity: (ohms/meter)	1.431
Sample Temperature:	67*F

REMARKS & RECOMMENDATIONS:

Questar Applied Technology Division

1005 D Street, PO Box 1129
Rock Springs, Wyoming 82902
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Fax: (307) 352-7326

WATER ANALYSIS REPORT

COMPANY: WEXPRO	**FORMATION:** N/A
FIELD: Powder Wash	**SAMPLE POINT:**
LEGAL DESC: N/A	**TYPE OF WATER:** N/A
COUNTY: Moffat	**DATE SAMPLED:** N/A
STATE: Colorado	**DATE ANALYZED:** 5/6/08
WELL: STEWART 5	**SAMPLED BY:** N/A
DEPTH: N/A	**ANALYZED BY:** PUTNAM

DISSOLVED SOLIDS	**mg / L**
CATIONS:	
Sodium, Na:	1,173
Calcium, Ca:	16
Magnesium, Mg:	2
Barium, Ba:	N/A
ANIONS:	
Chloride, Cl:	1,250
Sulfate, SO_4:	0
Carbonate, CO_4:	0
Bicarbonate, HCO_4:	1000
Iron, Fe:	0
Sulfide, H_2S:	N/A
TOTAL DISSOLVED:	3441
OTHER PROPERTIES:	
pH:	7.05
Specific Gravity, 60/60F:	1.0042
Resistivity: (ohms/meter)	1.909
Sample Temperature:	71*F

REMARKS & RECOMMENDATIONS:

RULE 908.B(7)
GEOLOGIC AND HYDROLOGIC ASSESSMENT
COGCC FORM 28
POWDER WASH EVAPORATION FACILITY
MOFFAT COUNTY, COLORADO

February 28, 2018

Project #: 19G-002-001

SUBMITTED ON BEHALF OF: Dominion Energy Wexpro

2221 Westgate Drive, Rock Springs, WY 82901

Geologic and Hydrologic Assessment

COGCC Form 28

Dominion Energy Wexpro
Powder Wash Evaporation Facility

Rule 908.b.(7).A. Facility design and engineering - Geologic Data

The Dominion Energy Wexpro (Wexpro) Powder Wash Evaporation Facility (PWEF) is located in the northwest quarter of the northwest quarter of Section 4, Township 11 North, Range 97 West of the sixth principal meridian, in Moffat County, Colorado. A comprehensive report from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) for Moffat County Area, Colorado (NRCS 2018) is provided as Attachment A. The following figures are included:

- Figure S-1: Soils Map for the PWEF
- Figure G-1: Geologic Map for the PWEF
- Figure H-1: Hydrology Map for the PWEF

The proposed operation of the PWEF includes hauling produced water by trucks from the Powder Wash, Jacks Draw, and Ace fields to the PWEF. The trucks will hook onto camlock-equipped hoses that are connected to a pump skid with an electrically driven offload pump. The pump will transfer the contents of the trucks through a series of filters to a skimmer tank, which will separate any potential hydrocarbons. From the tank, the produced water will be transferred to a lined and netted skim pit, which will provide additional hydrocarbon separation. The produced water will then be transferred to the evaporation pond, and pumped to Barracuda Wastewater evaporators where the water is forced through a stainless steel manifold with 30 spray nozzles specifically designed to allow longer float times and maximize evaporation. Oil accumulating in the skim pit oil will be skimmed off and transferred into the skim (off load) tank.

Type and Thickness of Unconsolidated Units and Soils

The proposed location of the PWEF is underlain by unconsolidated Tertiary age sediments consisting of silty sands and sandy silts. These sediments are moderately thick and represent alluvium derived from weathering of the underlying bedrock. The proposed site location is primarily underlain by soils of the Tresano-Hiatha-Kandaly association. This unit association is found on hill slopes and summits with 2 to 20 percent slopes. The slope of the proposed PWEF location is 3 to 4 percent to the north and northeast (NRSC 2018).

The Tresano soils are found on the shallow footslopes and toeslopes of hills (2 to 12 percent), and are deep (40 to 60 inches) well-drained soils formed in residuum derived predominantly from sandstone and shale. The surface layer of the Tresano is typically composed of about 2 inches thick loam. The subsoil is a clay loam, about 28 inches thick. The substratum is a loam to an approximate depth of 60 inches. Permeability in the Tresano soils is moderately high to high and the available water capacity is high. Tresano type soils compose approximately 35 percent of the unit (NRSC 2018).

The Hiatha soils are found on the backslopes and summits of hills, as a shallow, well drained, soil from residuum derived shale. The surface layer of the Hiatha is typically about 2 inches thick and consists of a silty clay. The subsoil is a silty clay up to a foot thick. The substratum is typically a thin weathered shale. Permeability and available water capacity in the Hiatha soils are both very low. Hiatha soils comprise approximately 30 percent of the soil in the unit (NRSC 2018).

The Kandaly soils are normally found on the hill summits, are also deep and excessively drained, and are eolian sands derived predominantly from sandstone. The surface layer is typically a loamy sand approximately 3 inches thick. The subsoil is also a loamy sand up to 60 inches thick. Permeability in the Kandaly soils is high to very high and the available water capacity is low. Kandaly soils comprise approximately 15 percent of the unit (NRSC 2018). The remaining 20 percent is composed of minor components of no more than 4 percent each. These minor components consist of moderately deep sandy loamy soils, badlands (See Glossary, Attachment), Simanni (coarse sandy loams), Ruedloff (loamy coarse sands), and shallow sandy soils.

The Tresano-Hiatha-Kandaly soils are found in areas that are not considered prime farmland. The soils are moderately alkaline and the depth to bedrock typically ranges from 20 inches to over 12 feet below ground surface (bgs) (NRSC 2018).

Areas of Tresano-Hiatha-Kandaly are not susceptible to massive slumps because of the shallow slopes. Stormwater runoff in the Tresano and Kandaly soils is low to medium with a moderate water erosion hazard. Stormwater runoff in Hiatha soils is high with a high water erosion hazard (NRSC 2018).

Type and Thickness of Consolidated Bedrock

The location of the proposed facility is underlain by bedrock of the Tertiary age Wasatch Formation (intertongued with Tertiary Green River Formation), the Paleocene Fort Union Formation, and Cretaceous to Pennsylvanian sedimentary units to depths greater than 20,000 feet bgs. The Wasatch Formation is divided into an upper Cathedral Bluffs Tongue that ranges from 1,500 to 2,000 feet thick, and the main body of the Wasatch is approximately 3,000 to 3,500 feet thick. The Cathedral Bluffs Tongue consists of variegated shale, mudstone, and clay interbedded with sandstone and conglomerate. The main body is composed of variegated shale and clay interbedded with sandstone, conglomerate, and limestone. Figure G-1 shows the surface geology for the area around the proposed facility.

The Fort Union Formation is approximately 4,000 feet thick at the proposed site according to existing well logs. Friable fine to medium grained sandstone interbedded with shale dominates the Fort Union Formation.

Local and Regional Geologic Structures

The proposed facility is located in the Sand Wash Basin, which is separated from the Washakie Basin to the north. The proposed facility is located on the eastern limb of an anticlinal structure centered on Powder Wash. The top of the Cathedral Bluffs Tongue slopes to the east at a 1.6 percent slope. There are no mapped faults or folds shown on the geologic map in the immediate area of the proposed PWEF.

Geologic Hazards

The proposed PWEF is in an area that is underlain by the Cathedral Bluffs Tongue of the Wasatch Formation. The Cathedral Bluffs Tongue consists primarily of shallow sloping, geologically stable, interbedded claystone and sandstone beds that are less than 20 feet bgs at the site.

According to the digital United States Geological Survey (USGS) Geological Map of the State of Colorado (2005), no geological faults, landslide, or slump block features are within 5 miles of the proposed facility. Based on the topography in the vicinity of the proposed PWEF, geologic and soil hazards appear to be low to moderate (NRSC 2018). The site is not in an area that is susceptible to slumping.

Rule 908.b.(7).B. Hydrologic Data

Surface Water Features

A map of surface water features within two miles of the proposed facility is provided in Figure H-1 Hydrology. The proposed facility is located approximately 2.5 miles south of Powder Wash, and approximately 170 feet greater in elevation. Based on the USGS map, Powder Wash is an intermittent stream. No flood plain maps for Moffat County exist at the time of this report; however, given that the proposed facility is located 170 feet above the nearest large drainage, it is reasonably assumed that the facility is not located within a flood hazard area. No surface waters subject to COGCC Rule 317B are located in the vicinity of the proposed facility.

There are six surface water bodies that appear to be intermittent stock ponds within a two mile radius of the proposed facility. One is located approximately 1.75 miles due north of the site. Another is located almost two miles northwest of the site just south of County Road 4. There is a small stock pond approximately 0.65 miles southwest of the site. Approximately 0.5 miles southeast of the site is another small intermittent stock pond in an intermittent drainage. The last stock pond is in Ace in the Hole Draw approximately 1.75 south of the site. All six water bodies are depicted as intermittent on the USGS topographical map. Additionally, there are several drainages/draws within the two mile radius that are shown on the USGS map as intermittent streams.

Depth to Shallow Groundwater and Major Aquifers

The depth to shallow groundwater is dependent on proximity to drainages. The depth to groundwater along the drainages may range from 5 to 10 feet bgs while in upland areas the depth to groundwater is expected to range from 25 to greater than 30 feet bgs based on shallow monitoring wells in the area.

LT Environmental, Inc. installed six groundwater monitoring wells at the QEP Field Services Powder North CS South Pit to address environmental concerns. The location is similar in soil type, bedrock, elevation, and setting to the proposed facility. The monitoring wells are located approximately 6,500 feet north of the proposed facility, and were installed to depths between 30 and 33 feet bgs. Depths to groundwater ranged between 25 and 30 bgs in four monitoring wells, and groundwater was not encountered in two monitoring wells. The boring logs show that the depth to the top of bedrock (i.e, claystone and sandstone) ranged from less than 10 feet to 15 feet bgs, and bedrock was overlain by silty sands and sandy silts.

Permitted Water Wells within a One Mile Radius

According to the Colorado Division of Water Resources database (2018), there are three permitted water wells within a 1 mile radius of the site boundary (see Figure H-1). The closest well (Musser Water Well #3) is owned by Wexpro and is located 1,975 feet west of the proposed PWEF. The well reportedly has a total depth of 812 feet bgs, a yield of 37 gallons per minute, and a static water level of 639 feet bgs. The pump intake is set at 766 feet bgs. Water from this well is for field or drilling use only.

The next closest water well (Musser Water Well #2) is owned by Wexpro and is located 2,479 feet southwest of the proposed PWEF in the Powder Wash camp. The well reportedly has a total depth of 775 feet bgs with a yield of 44.5 gallons per minute. The static water level and pump intake depths are unknown. The water from this well is for domestic use.

The third well (Musser Water Well #1) is owned by Wexpro and is located 2,666 feet southwest of the proposed PWEF in the Powder Wash camp. The well reportedly has a total depth of 766 feet bgs, and is abandoned due to deteriorated casing. The static water level and pump intake depths are unknown. The water from this well was used for domestic use.

Hydrologic Properties of Shallow Groundwater and Major Aquifers

According to the Colorado Geological Survey's Groundwater Atlas of Colorado (Colorado Geological Survey, 2003) Tertiary sedimentary rocks in the Sand Wash Basin are generally fine-grained and well cemented resulting in very small hydraulic conductivities. Lenses of sandstone and siltstone are widely spaced and not interconnected.

The Wasatch Formation underlies and intertongues with the overlying Green River Formation, and the two formations form a confining unit. The Fort Union Formation in the Sand Wash Basin, especially at the proposed facility is a major oil and gas bearing formation.

Sedimentary rocks of Paleozoic, Mesozoic, and Cenozoic age are represented within the Sand Wash Basin. Tertiary-age geologic formations lie at or near the surface throughout most of the basin, and as such the Wasatch-Fort Union aquifer is the uppermost regional aquifer in the Sand Wash Basin. The thickness of Tertiary rocks in the Sand Wash Basin increases from a feather edge at the margins to about 12,000 feet in the center of the basin. The thickness of the Tertiary rocks at the proposed facility is about 10,000 feet.

Nearby Surface Water Features and Flood Plain Information

Although there are no flood plain maps currently available for Moffat County, it is reasonably assumed that the area surrounding the proposed facility is not within a flood plain. The elevation of the proposed facility is about 170 feet higher in elevation than that of the closest surface water body or Powder Wash, which only has intermittent flow.

Existing Quality of Shallow Groundwater

Water quality data for the shallow groundwater onsite is not available. Based on available water quality data in the area from deeper (600 feet) in the aquifer, groundwater quality is slightly alkaline with pH near slightly above 8.5 and contains total dissolved solids concentrations in the 1,000 mg/L range.

Evaluation for Potential Impacts to Surface Water and Groundwater

The PWEF has been designed with a number of features designed to reduce the potential for releases at the facility to impact surface and ground water. The facility will be staffed by operators trained in identifying and mitigating potential releases. The facility has been designed with a leak detection system built under the pond (see design drawings). Regular monitoring procedures will be in accordance with Colorado Oil and Gas Conservation Commission regulations.

The proposed water impoundment has been designed to maintain a sufficient free board capacity that is able to contain a volume of storm water equivalent to the 100-year/24-hour storm event for this area. Water evaporation is the primary mechanism for maintaining appropriate water levels in the pond.

According to information from the Western Regional Climate Center, pan evaporation rates for a station northeast of Grand Junction (closest station with similar climate) indicate that the average monthly pan evaporation rates in June and July are between 11 and 12 inches, and the annual average pan evaporation rate is 64 inches.

Water samples will be collected from the permitted Musser Water Well #2, as it is the only water well being used for domestic purposes. Groundwater samples that have recently been collected and analyzed will be used to establish baseline quality conditions. Analytical parameters will be selected based on the proposed waste streams handled in the impoundment and will include, at a minimum, all major cations and anions, total dissolved solids, iron, nitrates, nitrites, and, pH, and specific conductance.

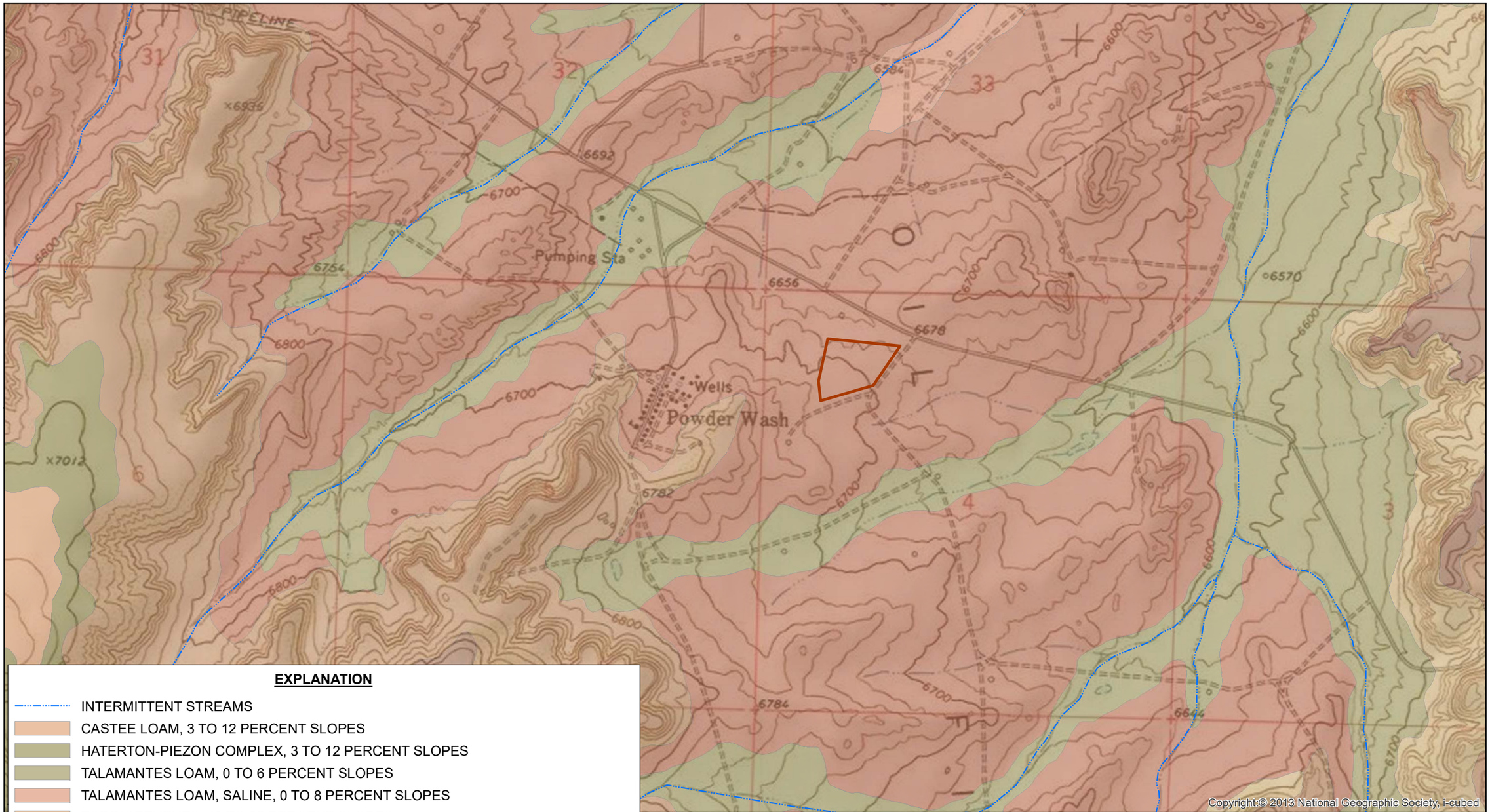
References

Natural Resources Conservation Services (NRSC). 2018. Custom Soil Resource Report for Moffat County Area, Colorado. Powder Wash Evaporation Facility. United States Department of Agriculture. https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx Created February 13, 2018.

Colorado Geological Survey. 2003. Groundwater Atlas of Colorado. Special Publication 53. Colorado Geological Survey. http://coloradogeologicalsurvey.org/water/groundwater-atlas/ . Accessed February 13, 2018.

Colorado Division of Water Resources. 2018. DWR Well Permit Research Viewer. http://coloradogeologicalsurvey.org/water/groundwater-atlas/ . Accessed February 13, 2018.

Figures



EXPLANATION

- INTERMITTENT STREAMS
- CASTEE LOAM, 3 TO 12 PERCENT SLOPES
- HATERTON-PIEZON COMPLEX, 3 TO 12 PERCENT SLOPES
- TALAMANTES LOAM, 0 TO 6 PERCENT SLOPES
- TALAMANTES LOAM, SALINE, 0 TO 8 PERCENT SLOPES
- TORRIORTHENTS, 12 TO 25 PERCENT SLOPES
- TORRIORTHENTS-ROCK OUTCROP, SHALE COMPLEX, 30 TO 75 PERCENT SLOPES
- TRESANO-HIATHA-KANDALY ASSOCIATION, 2 TO 20 PERCENT SLOPES
- VERMILLION-LANGSPRING COMPLEX, 3 TO 25 PERCENT SLOPES
- YELLOWWASH-PIEZON COMPLEX, 5 TO 15 PERCENT SLOPES
- PROPOSED EVAPORATION FACILITY

N

0 1,250'

Trihydro Corporation
152 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE S-1

SOILS MAP

POWDER WASH EVAPORATION FACILITY
MOFFAT COUNTY, COLORADO

Drawn By: PH	Checked By: PH	Scale: 1 " = 1,250 '	Date: 2/23/18	File: DomEnergy_Soils_S_1.mxd

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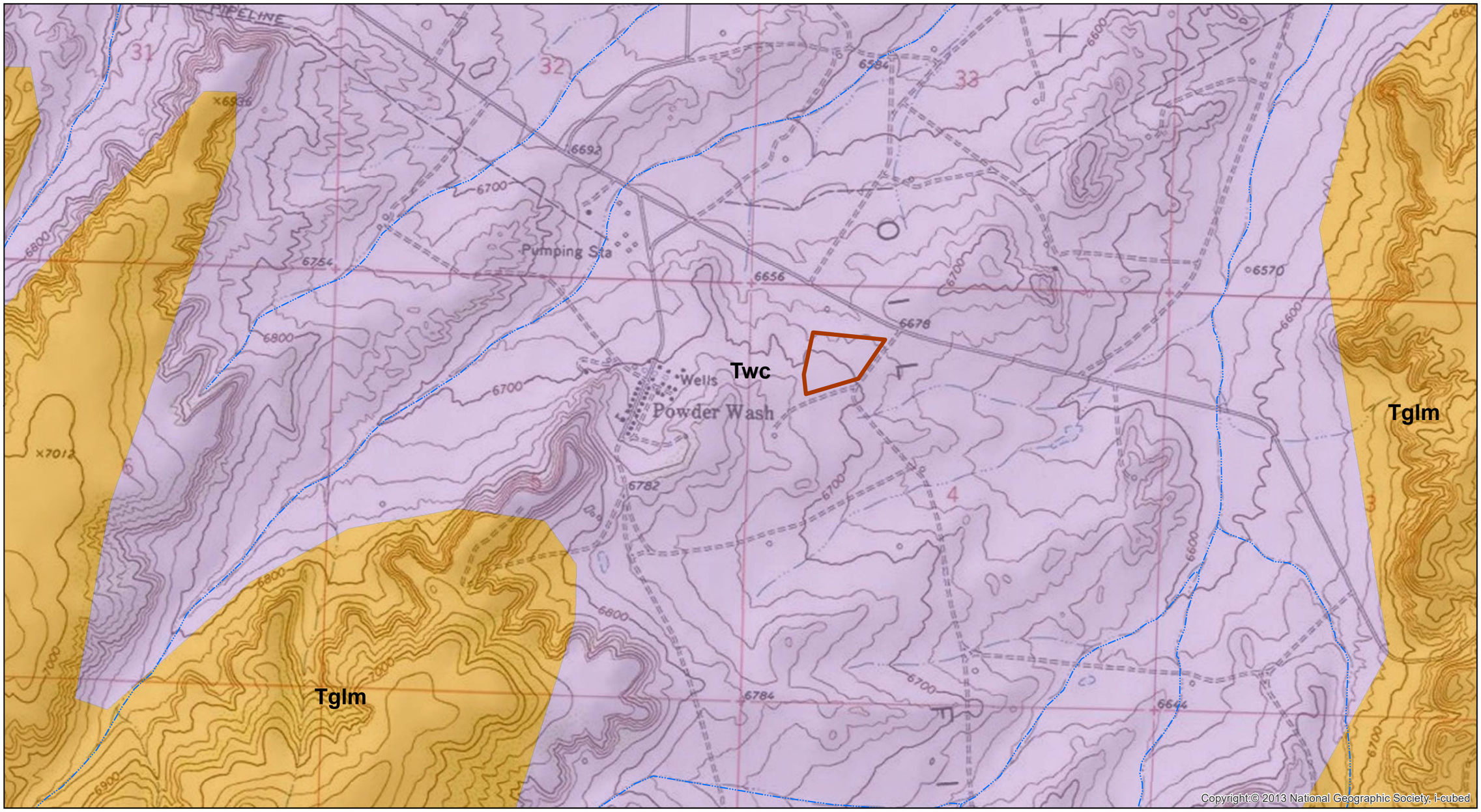

EXPLANATION

- INTERMITTENT STREAMS
- Tglm - LANEY MEMBER OF THE GREEN RIVER FORMATION
- Twc - CATHEDRALI BLUFFS TONGUE OF THE WASATCH FORMATION
- PROPOSED EVAPORATION FACILITY

N

0 1,240'

Tribyl
CORPORATION
52 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE G-1

GEOLOGIC MAP

POWDER WASH EVAPORATION FACILITY
MOFFAT COUNTY, COLORADO

Drawn By: PH	Checked By: PH	Scale: 1 " = 1,250 '	Date: 2/23/18	File: DomEnergy_Geology_G_1.mxd

M:\CTO\DOMINIONENERGY\WEXPROG\SPOWDERWASH\PERMITTING\DOMENERGY_GEOLOGY_G_1.MXD

MW-06 MW-01
MW-03 MW-02
MW-04 MW-05

MUSSER B.W.
WATER WELL #3

MUSSER B.W.
WATER WELL #1

MUSSER B.W.
WATER WELL #2

Beaver Slide 4WD

Powder Draw

Ace of the Hole Draw

Reservoir

Pumping Sta

West Dripping Rock Spring

PIPELINE

BR 6687

EXPLANATION

- GROUNDWATER MONITORING WELL
- INTERMITTENT STREAMS
- INTERMITTENT STOCK PONDS
- ONE MILE RADIUS
- TWO MILE RADIUS
- PROPOSED EVAPORATION FACILITY

N

0 3,000 '

Trihydro Corporation
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307.745.7729

FIGURE H-1

HYDROLOGY MAP

POWDER WASH EVAPORATION FACILITY
MOFFAT COUNTY, COLORADO

Drawn By: PH	Checked By: PH	Scale: 1 " = 3,000 '	Date: 2/22/18	File: DomEnergy_Hydrology_H_1.mxd

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Attachment A

United States Department of Agriculture

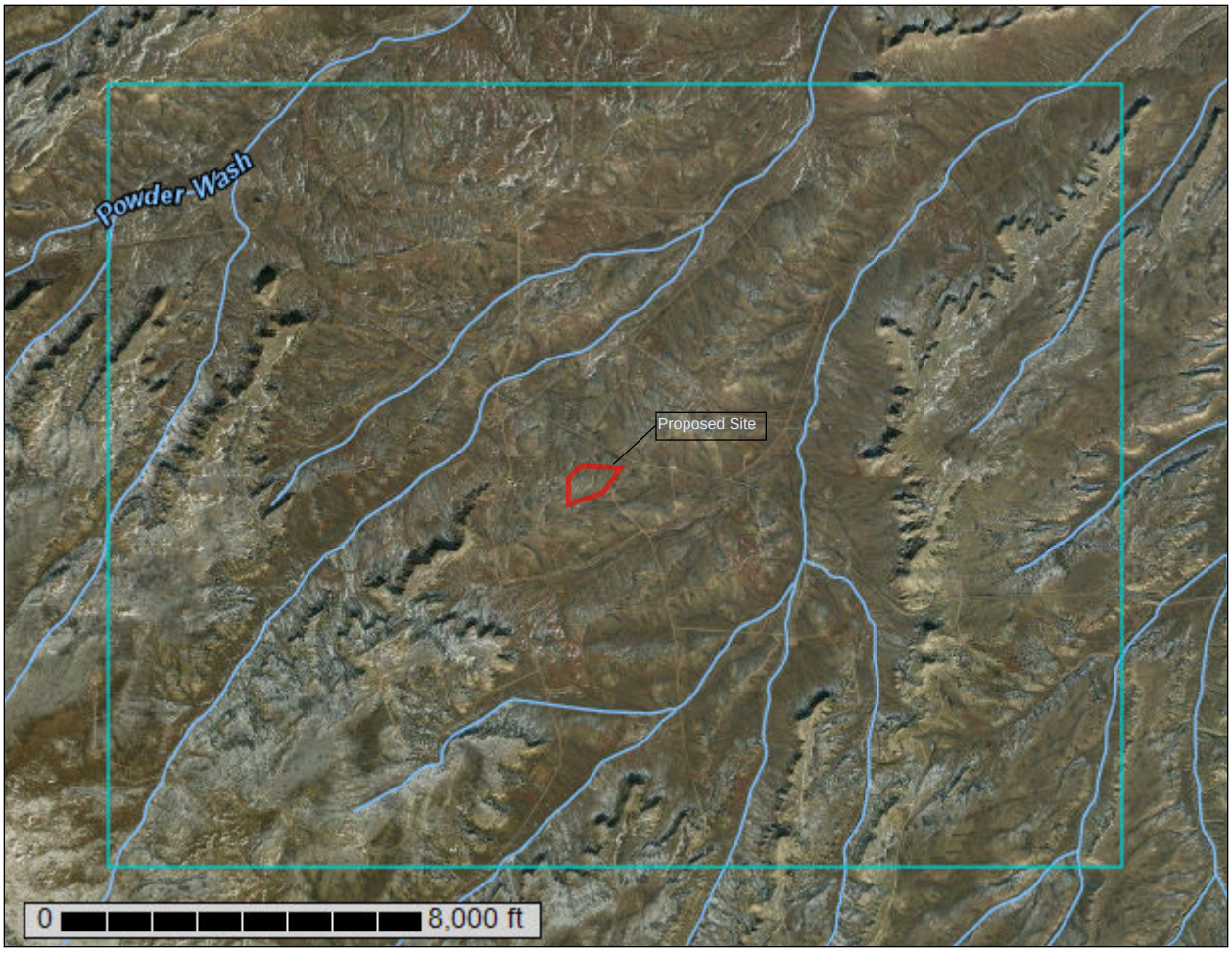
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Moffat County Area, Colorado

Powder Wash Evaporation Facility



February 13, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

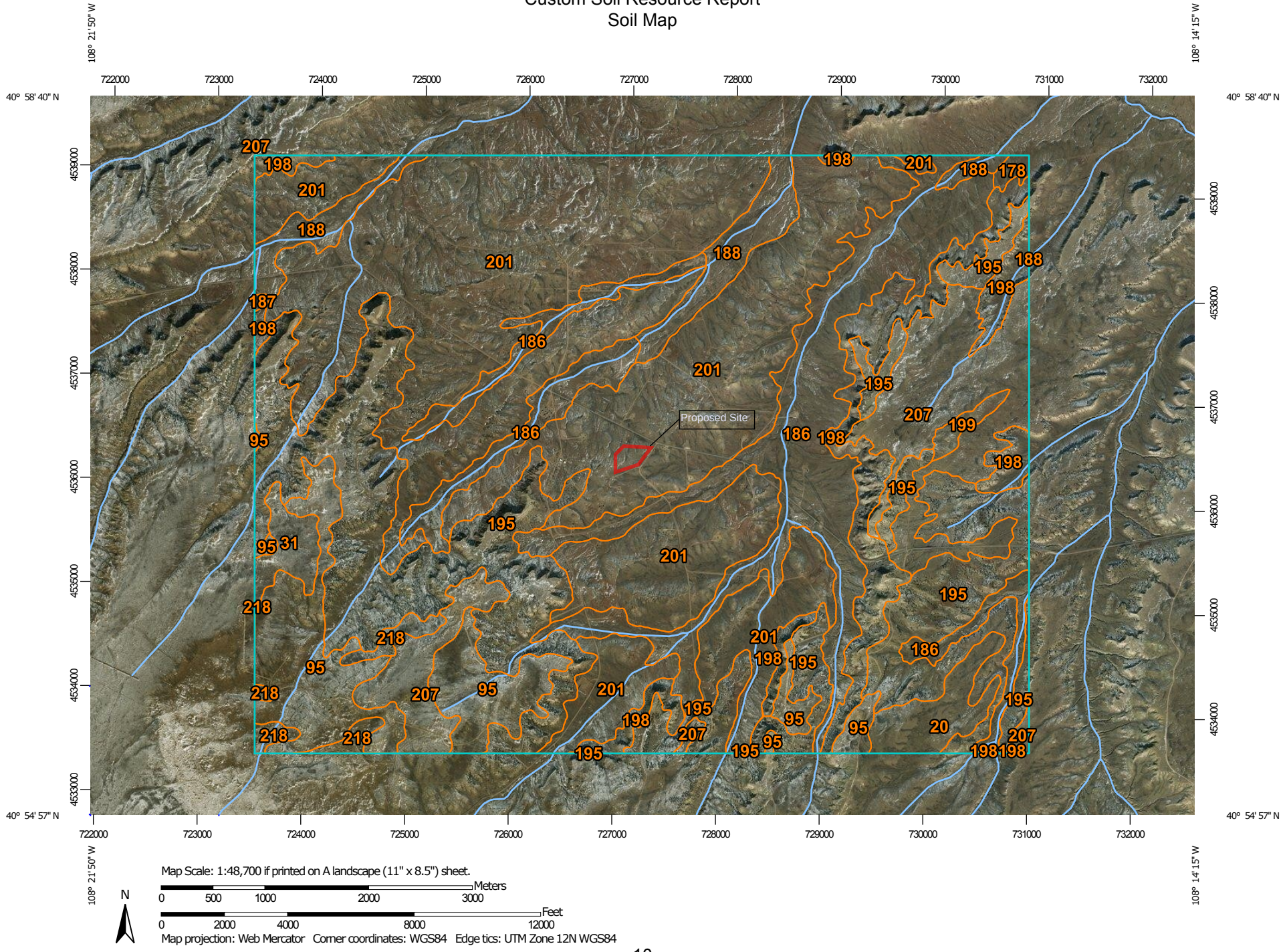
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	90.0	0.8%
Totals for Area of Interest		**10,638.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class.

Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The

pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Moffat County Area, Colorado

20—Brownsto-Castee complex, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: jpbq
Elevation: 6,400 to 7,400 feet
Mean annual precipitation: 11 to 13 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Brownsto and similar soils: 50 percent
Castee and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brownsto

Setting

Landform: Breaks, plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Relict fluvial gravel deposits derived from mixed sources

Typical profile

H1 - 0 to 3 inches: gravelly loam
H2 - 3 to 14 inches: gravelly loam
H3 - 14 to 29 inches: very cobbly loam
H4 - 29 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy 10-14" P.Z. (R034XY425CO)
Hydric soil rating: No

Description of Castee

Setting

Landform: Breaks, plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess deposited on relict fluvial gravel deposits

Typical profile

H1 - 0 to 2 inches: loam
H2 - 2 to 32 inches: loam
H3 - 32 to 53 inches: gravelly loam
H4 - 53 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy 10-14" P.Z. (R034XY425CO)
Hydric soil rating: No

Minor Components

Moderately deep soils over sandstone bedrock

Percent of map unit: 20 percent

31—Castee loam, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: jpcx
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 11 to 13 inches
Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Castee and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Castee

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess deposited on relict fluvial gravel deposits

Typical profile

H1 - 0 to 2 inches: loam
H2 - 2 to 32 inches: loam
H3 - 32 to 53 inches: gravelly loam
H4 - 53 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Loamy 10-14" P.Z. (R034XY425CO)
Hydric soil rating: No

Minor Components

Brownsto

Percent of map unit: 10 percent

95—Haterton-Piezon complex, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: jpg5
Elevation: 6,100 to 7,200 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Haterton and similar soils: 60 percent
Piezon and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haterton

Setting

Landform: Plateaus, hillslopes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from siltstone and fine grained sandstone

Typical profile

H1 - 0 to 2 inches: loam
H2 - 2 to 16 inches: channery loam
H3 - 16 to 20 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 7 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D
Ecological site: Alkali Upland (R034XY418CO)
Hydric soil rating: No

Description of Piezon

Setting

Landform: Plateaus, hillslopes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from siltstone and fine grained sandstone

Typical profile

H1 - 0 to 2 inches: loam
H2 - 2 to 13 inches: loam
H3 - 13 to 23 inches: channery loam
H4 - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: Rolling Loam (R034XY298CO)
Hydric soil rating: No

Minor Components

Thenipel

Percent of map unit: 5 percent
Hydric soil rating: No

Fenster

Percent of map unit: 5 percent
Hydric soil rating: No

178—Simanni-Ruedloff complex, 1 to 10 percent slopes

Map Unit Setting

National map unit symbol: jp9x
Elevation: 6,000 to 6,500 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Simanni and similar soils: 50 percent
Ruedloff and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Simanni

Setting

Landform: Hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone

Typical profile

H1 - 0 to 10 inches: coarse sandy loam
H2 - 10 to 22 inches: sandy clay loam
H3 - 22 to 33 inches: coarse sandy loam
H4 - 33 to 60 inches: loamy coarse sand

Properties and qualities

Slope: 1 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Sandy (R034XY427CO)
Hydric soil rating: No

Description of Ruedloff

Setting

Landform: Hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

H1 - 0 to 2 inches: loamy coarse sand
H2 - 2 to 24 inches: coarse sandy loam
H3 - 24 to 60 inches: loamy coarse sand

Properties and qualities

Slope: 1 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sandy (R034XY427CO)
Hydric soil rating: No

Minor Components

Kandaly

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Toeslope

Tresano

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Toeslope
Hydric soil rating: No

186—Talamantes loam, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: jpb6
Elevation: 6,200 to 7,200 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Talamantes and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Talamantes

Setting

Landform: Hills, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rocks

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 48 inches: loam
H3 - 48 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Silty Swale (R034XY433CO)
Hydric soil rating: No

Minor Components

Coarse textured soils
Percent of map unit: 8 percent
Hydric soil rating: No

Debone
Percent of map unit: 7 percent

187—Talamantes loam, 6 to 15 percent slopes

Map Unit Setting
National map unit symbol: jpb7
Elevation: 6,200 to 7,200 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition
Talamantes and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Talamantes

Setting
Landform: Hills, alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rocks

Typical profile
H1 - 0 to 3 inches: loam
H2 - 3 to 48 inches: loam
H3 - 48 to 60 inches: sandy loam

Properties and qualities
Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy 7-10" P.Z. (R034XY424CO)
Hydric soil rating: No

Minor Components

Coarse textured soils

Percent of map unit: 10 percent
Hydric soil rating: No

188—Talamantes loam, saline, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: jpb8
Elevation: 6,000 to 7,200 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Talamantes, saline, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Talamantes, Saline

Setting

Landform: Alluvial fans, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rocks

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 24 inches: clay loam

H3 - 24 to 60 inches: loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 10 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Alkali Upland (R034XY418CO)
Hydric soil rating: No

Minor Components

Clayey soils

Percent of map unit: 10 percent
Landform: Hills
Hydric soil rating: No

Quealman

Percent of map unit: 5 percent
Landform: Flood plains

195—Torriorthents, 12 to 25 percent slopes

Map Unit Setting

National map unit symbol: jpbj
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 42 to 48 degrees F
Frost-free period: 75 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Torriorthents and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Torriorthents

Setting

Landform: Breaks
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from interbedded sandstone and shale

Typical profile

H1 - 0 to 8 inches: stony loam
H2 - 8 to 12 inches: weathered bedrock

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 4 to 30 inches to paralithic bedrock; 4 to 30 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 3 percent

Badland

Percent of map unit: 2 percent
Hydric soil rating: No

198—Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: jpbm
Elevation: 6,000 to 7,200 feet
Mean annual precipitation: 9 to 11 inches

Mean annual air temperature: 42 to 48 degrees F
Frost-free period: 75 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Torriorthents and similar soils: 60 percent
Rock outcrop, shale: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Torriorthents

Setting

Landform: Breaks, hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from shale

Typical profile

H1 - 0 to 8 inches: silty clay loam
H2 - 8 to 12 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 4 to 30 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 10 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Rock Outcrop, Shale

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 0 inches to paralithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

199—Torriorthents-Torripsamments complex, 12 to 40 percent slopes

Map Unit Setting

National map unit symbol: jpbn
Elevation: 6,000 to 7,200 feet
Mean annual precipitation: 9 to 13 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Torriorthents and similar soils: 60 percent
Torripsamments and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Torriorthents

Setting

Landform: Hillslopes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from sandstone and shale

Typical profile

H1 - 0 to 2 inches: clay loam
H2 - 2 to 15 inches: clay
H3 - 15 to 19 inches: weathered bedrock

Properties and qualities

Slope: 12 to 40 percent
Depth to restrictive feature: 4 to 30 inches to paralithic bedrock; 4 to 30 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D
Hydric soil rating: No

Description of Torripsamments

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits and residuum derived from sandstone

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 26 inches: loamy sand
H3 - 26 to 30 inches: unweathered bedrock

Properties and qualities

Slope: 12 to 40 percent
Depth to restrictive feature: 20 to 80 inches to lithic bedrock; 20 to 80 inches to paralithic bedrock
Natural drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Ruedloff

Percent of map unit: 4 percent

Ryan park

Percent of map unit: 3 percent
Hydric soil rating: No

Rock river

Percent of map unit: 3 percent
Hydric soil rating: No

201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: jpbs
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Tresano and similar soils: 35 percent
Hiatha and similar soils: 30 percent
Kandaly and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tresano

Setting

Landform: Alluvial fans, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 2 inches: loam
H2 - 2 to 28 inches: clay loam
H3 - 28 to 60 inches: loam

Properties and qualities

Slope: 2 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Clayey 9-11" P.Z. (R034XY419CO)
Hydric soil rating: No

Description of Hiatha

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from shale

Typical profile

H1 - 0 to 2 inches: silty clay
H2 - 2 to 14 inches: silty clay
H3 - 14 to 18 inches: weathered bedrock

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 7.0
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Alkali Upland (R034XY418CO)
Hydric soil rating: No

Description of Kandaly

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone

Typical profile

H1 - 0 to 3 inches: loamy sand
H2 - 3 to 60 inches: loamy sand

Properties and qualities

Slope: 2 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Dry Sandy (R034XY434CO)
Hydric soil rating: No

Minor Components

Moderately deep sandy loamy soils

Percent of map unit: 4 percent
Landform: Hills, hillslopes
Landform position (two-dimensional): Footslope

Badlands

Percent of map unit: 4 percent
Landform: Hillslopes

Simanni

Percent of map unit: 4 percent
Hydric soil rating: No

Ruedloff

Percent of map unit: 4 percent

Shallow sandy soils

Percent of map unit: 4 percent
Landform: Hillslopes, hills
Landform position (two-dimensional): Summit

207—Vermillion-Langspring complex, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: jpbz
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Vermillion and similar soils: 40 percent
Langspring and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vermillion

Setting

Landform: Hillslopes, plateaus
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from sandstone and siltstone

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 23 inches: channery loam
H3 - 23 to 28 inches: extremely cobbly loam
H4 - 28 to 32 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Loamy 7-10" P.Z. (R034XY424CO)
Hydric soil rating: No

Description of Langspring

Setting

Landform: Hillslopes, plateaus
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over residuum derived from sandstone and siltstone

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 17 inches: sandy clay loam
H3 - 17 to 60 inches: sandy clay loam

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy 7-10" P.Z. (R034XY424CO)
Hydric soil rating: No

Minor Components

Moderately deep soils over soft shale

Percent of map unit: 9 percent

Deep gravelly soils

Percent of map unit: 8 percent
Hydric soil rating: No

Fenster

Percent of map unit: 8 percent

218—Yellowwash-Piezon complex, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: jpcc
Elevation: 6,800 to 7,700 feet
Mean annual precipitation: 11 to 13 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Yellowwash and similar soils: 50 percent
Piezon and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yellowwash

Setting

Landform: Hillslopes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from siltstone

Typical profile

H1 - 0 to 2 inches: channery loam
H2 - 2 to 10 inches: channery loam
H3 - 10 to 14 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 7 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Loamy 7-10" P.Z. (R034XY424CO)

Hydric soil rating: No

Description of Piezon

Setting

Landform: Hillslopes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from siltstone

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 30 inches: loam
H3 - 30 to 34 inches: weathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Rolling Loam (R034XY298CO)
Hydric soil rating: No

Minor Components

Deep soils

Percent of map unit: 15 percent
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

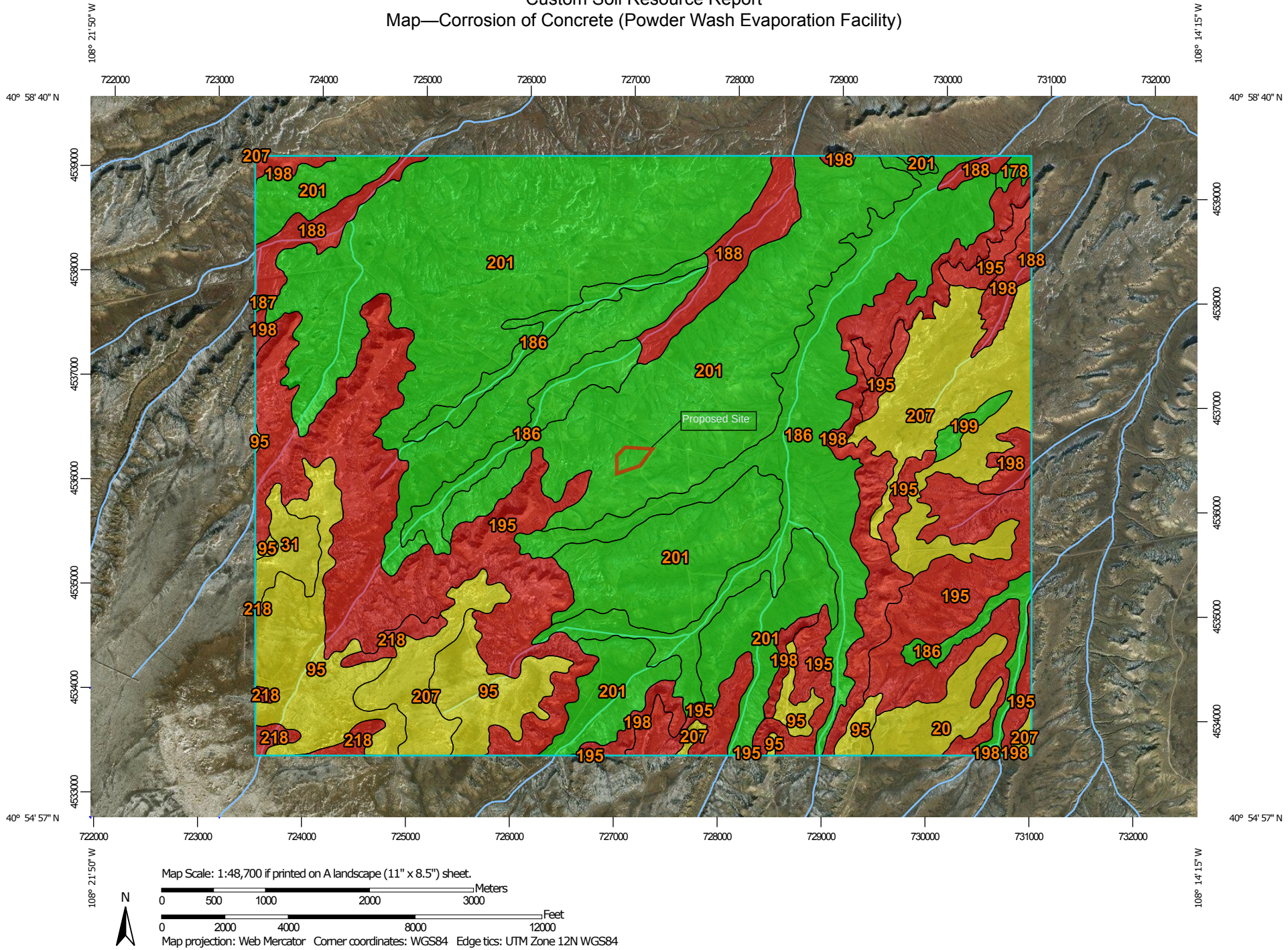
Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete (Powder Wash Evaporation Facility)

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Concrete (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Corrosion of Concrete (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Moderate	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	Moderate	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	Moderate	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Low	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	Low	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Low	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	High	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	High	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	High	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	Low	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Low	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	Moderate	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	High	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Corrosion of Concrete (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

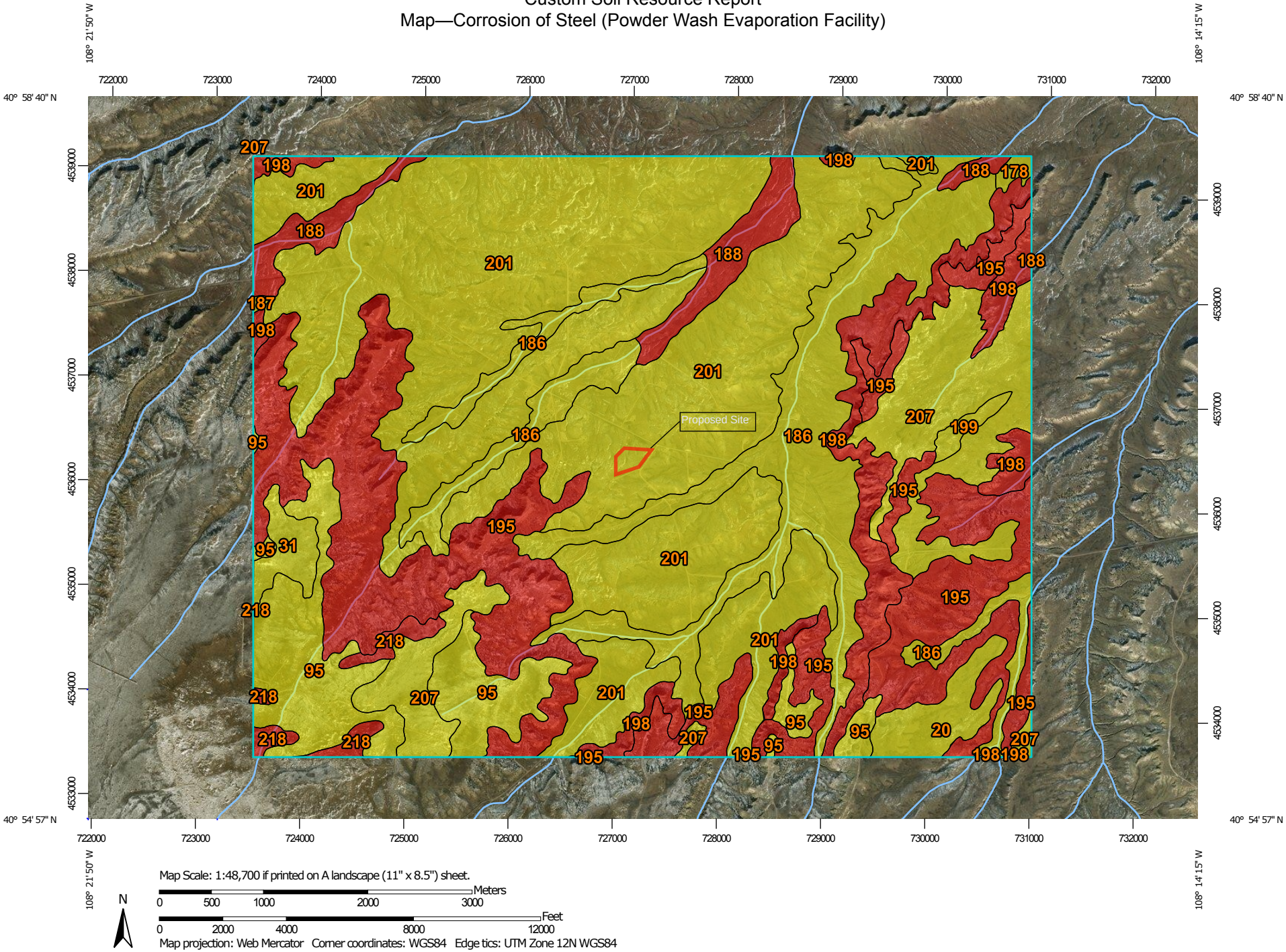
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Corrosion of Steel (Powder Wash Evaporation Facility)

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Steel (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

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 1:31,700.

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.

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Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Corrosion of Steel (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Moderate	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	Moderate	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	Moderate	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Moderate	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	Moderate	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Moderate	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	High	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	High	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	High	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	Moderate	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Moderate	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	Moderate	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	High	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Corrosion of Steel (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

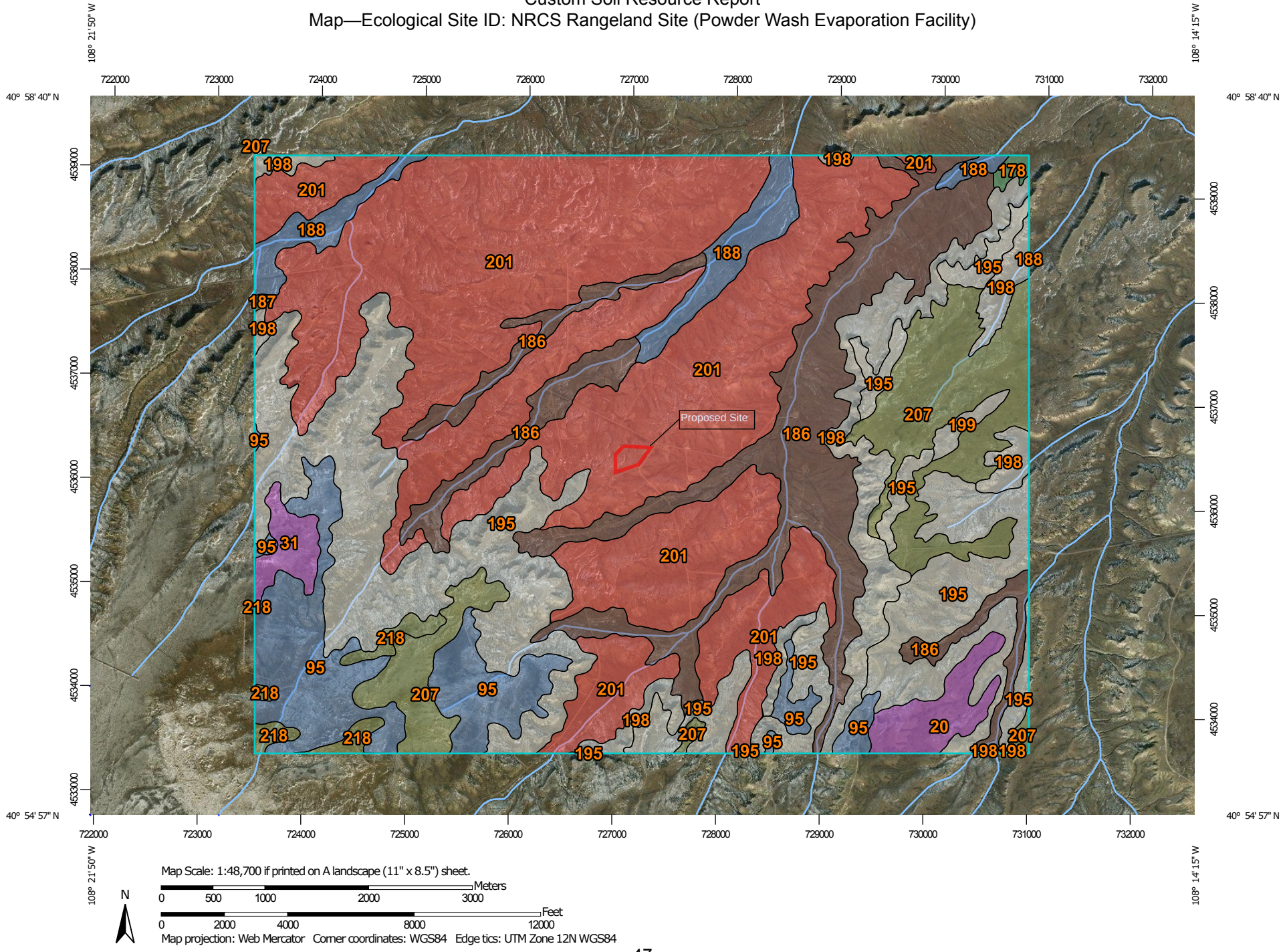
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Ecological Site ID: NRCS Rangeland Site (Powder Wash Evaporation Facility)

An "ecological site ID" is the symbol assigned to a particular ecological site. An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Map—Ecological Site ID: NRCS Rangeland Site (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- R034XY418CO
- R034XY419CO
- R034XY424CO
- R034XY425CO
- R034XY427CO
- R034XY433CO
- Not rated or not available

Soil Rating Lines
- R034XY418CO
- R034XY419CO
- R034XY424CO
- R034XY425CO
- R034XY427CO
- R034XY433CO
- Not rated or not available

Soil Rating Points
- R034XY418CO
- R034XY419CO
- R034XY424CO
- R034XY425CO
- R034XY427CO
- R034XY433CO
- 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 1:31,700.

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)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Ecological Site ID: NRCS Rangeland Site (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	R034XY425CO	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	R034XY425CO	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	R034XY418CO	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	R034XY427CO	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	R034XY433CO	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	R034XY424CO	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	R034XY418CO	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes		2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes		631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes		35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	R034XY419CO	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	R034XY424CO	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	R034XY424CO	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Ecological Site ID: NRCS Rangeland Site (Powder Wash Evaporation Facility)

Class: NRCS Rangeland Site

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Land Management

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Mechanical Site Preparation (Surface) (Powder Wash Evaporation Facility)

The ratings in this interpretation indicate the suitability for use of surface-altering soil tillage equipment during site preparation in forested areas. The ratings are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

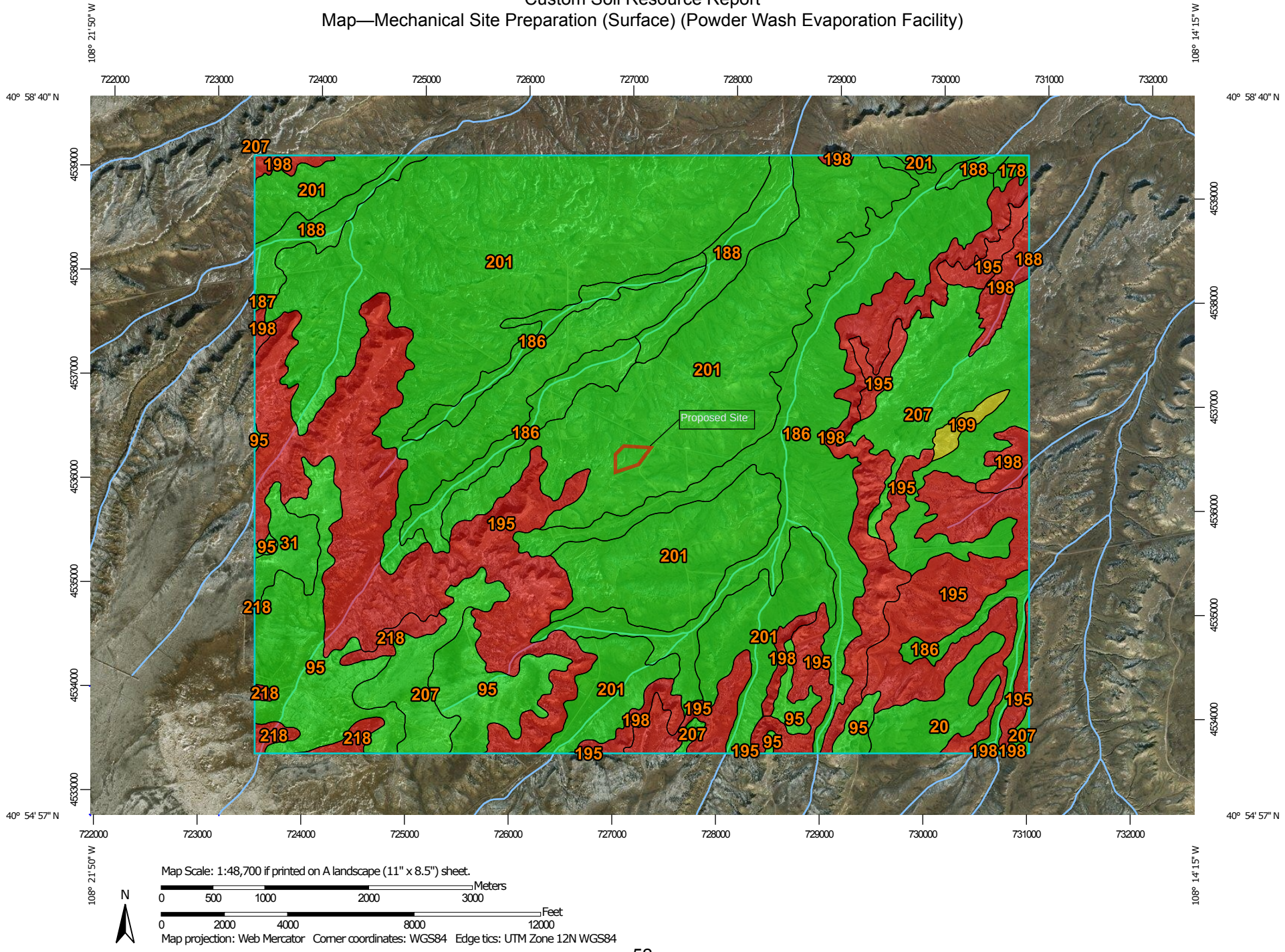
The ratings are both verbal and numerical. Rating class terms indicate the degree to which the soils are suited to this aspect of forestland management. The soils are described as "well suited," "poorly suited," or "unsuited" to this management activity. "Well suited" indicates that the soil has features that are favorable for the specified kind of site preparation and has no limitations. Good performance can be expected, and little or no maintenance is needed. "Poorly suited" indicates that the soil has one or more properties that are unfavorable for the specified kind of site preparation. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. "Unsuited" indicates that the expected performance of the soil is unacceptable for the specified kind of site preparation or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Mechanical Site Preparation (Surface) (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Unsuited
- Poorly suited
- Well suited
- Not rated or not available

Soil Rating Lines

- Unsuited
- Poorly suited
- Well suited
- Not rated or not available

Soil Rating Points

- Unsuited
- Poorly suited
- Well suited
- 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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Tables—Mechanical Site Preparation (Surface) (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Well suited	Brownsto (50%)		160.2	1.5%
			Castee (30%)			
31	Castee loam, 3 to 12 percent slopes	Well suited	Castee (90%)		94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	Well suited	Haterton (60%)		725.4	6.8%
			Piezon (30%)			
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Well suited	Simanni (50%)		19.1	0.2%
			Ruedloff (40%)			
186	Talamantes loam, 0 to 6 percent slopes	Well suited	Talamantes (85%)		1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Well suited	Talamantes (90%)		4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	Well suited	Talamantes, saline (85%)		305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	Unsuited	Torriorthents (95%)	Restrictive layer (1.00)	2,053.1	19.3%
				Slope (0.50)		
				Rock fragments (0.50)		
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	Unsuited	Torriorthents (60%)	Slope (1.00)	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	Poorly suited	Torriorthents (60%)	Slope (0.50)	35.2	0.3%
			Torripsamments (30%)	Slope (0.50)		
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Well suited	Tresano (35%)		4,299.3	40.4%
			Hiatha (30%)			
			Kandaly (15%)			
207	Vermillion-Langspring complex, 3 to	Well suited	Vermillion (40%)		807.0	7.6%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	25 percent slopes		Langspring (35%)			
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	Unsuited	Yellowwash (50%)	Restrictive layer (1.00)	90.0	0.8%
Totals for Area of Interest					**10,638.3**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Well suited	7,828.8	73.6%
Unsuited	2,774.3	26.1%
Poorly suited	35.2	0.3%
Totals for Area of Interest	**10,638.3**	**100.0%**

Rating Options—Mechanical Site Preparation (Surface) (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by

this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Mechanical Site Preparation (Deep) (Powder Wash Evaporation Facility)

The ratings in this interpretation indicate the suitability for the use of deep soil tillage equipment during site preparation in forested areas. The ratings are based on slope, depth to a restrictive layer, rock fragments on or below the surface, depth to a water table, and ponding. The part of the soil from the surface to a depth of about 3 feet is considered in the ratings.

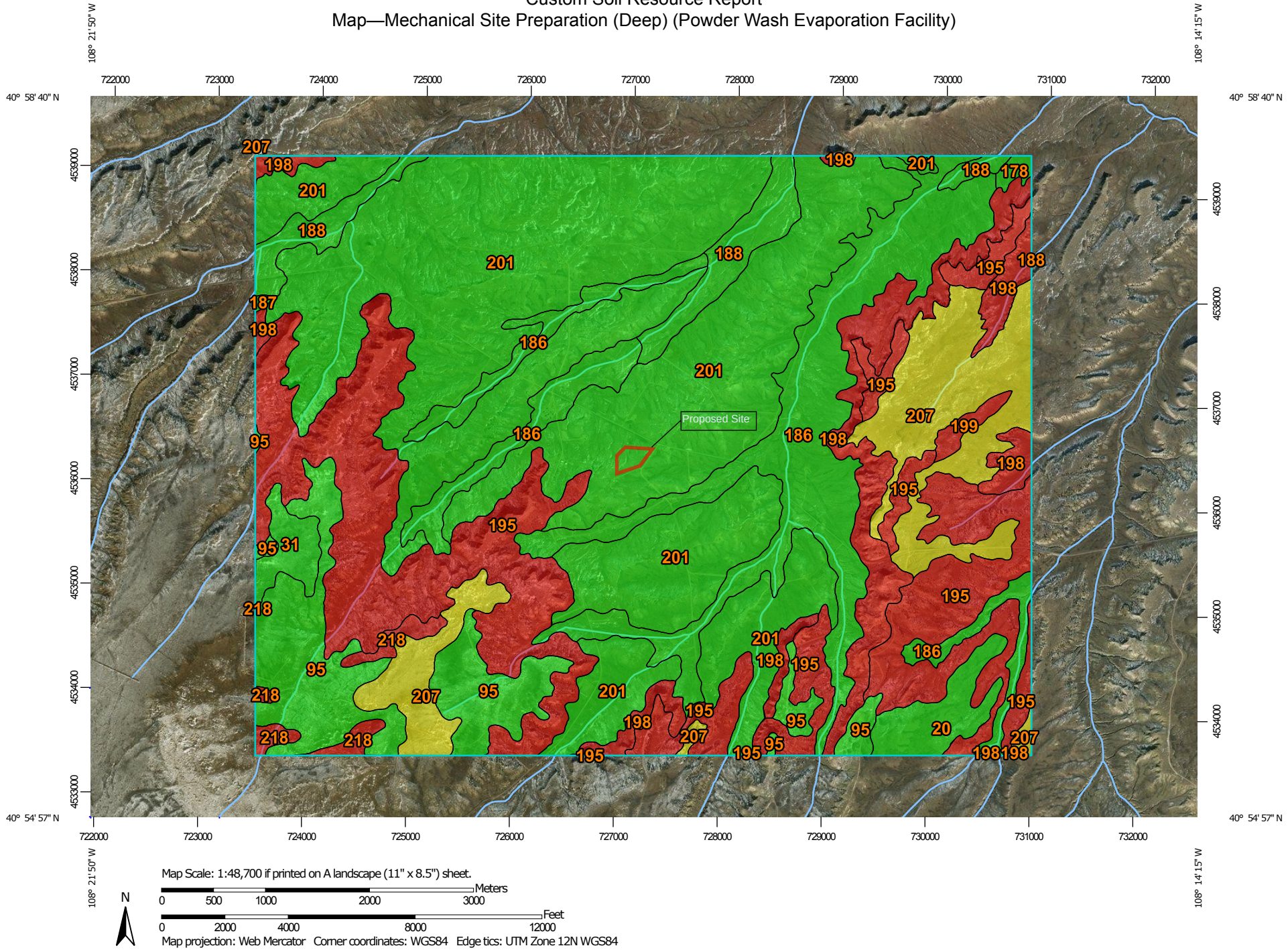
The ratings are both verbal and numerical. Rating class terms indicate the degree to which the soils are suited to this aspect of forestland management. The soils are described as "well suited," "poorly suited," or "unsuited" to this management activity. "Well suited" indicates that the soil has features that are favorable for the specified kind of site preparation and has no limitations. Good performance can be expected, and little or no maintenance is needed. "Poorly suited" indicates that the soil has one or more properties that are unfavorable for the specified kind of site preparation. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. "Unsuited" indicates that the expected performance of the soil is unacceptable for the specified kind of site preparation or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Mechanical Site Preparation (Deep) (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Unsuited

Poorly suited

Well suited

Not rated or not available

Soil Rating Lines

Unsuited

Poorly suited

Well suited

Not rated or not available

Soil Rating Points

Unsuited

Poorly suited

Well suited

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Tables—Mechanical Site Preparation (Deep) (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Well suited	Brownsto (50%)		160.2	1.5%
			Castee (30%)			
31	Castee loam, 3 to 12 percent slopes	Well suited	Castee (90%)		94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	Well suited	Haterton (60%)		725.4	6.8%
			Piezon (30%)			
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Well suited	Simanni (50%)		19.1	0.2%
			Ruedloff (40%)			
186	Talamantes loam, 0 to 6 percent slopes	Well suited	Talamantes (85%)		1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Well suited	Talamantes (90%)		4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	Well suited	Talamantes, saline (85%)		305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	Unsuited	Torriorthents (95%)	Restrictive layer (1.00)	2,053.1	19.3%
				Slope (0.50)		
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	Unsuited	Torriorthents (60%)	Slope (1.00)	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	Unsuited	Torriorthents (60%)	Restrictive layer (1.00)	35.2	0.3%
				Slope (0.50)		
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Well suited	Tresano (35%)		4,299.3	40.4%
			Hiatha (30%)			
			Kandaly (15%)			
207	Vermillion-Langspring complex, 3 to 25 percent slopes	Poorly suited	Vermillion (40%)	Restrictive layer (0.50)	807.0	7.6%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	Unsuited	Yellowwash (50%)	Restrictive layer (1.00)	90.0	0.8%
Totals for Area of Interest					**10,638.3**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Well suited	7,021.8	66.0%
Unsuited	2,809.5	26.4%
Poorly suited	807.0	7.6%
Totals for Area of Interest	**10,638.3**	**100.0%**

Rating Options—Mechanical Site Preparation (Deep) (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Water Management

Water Management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Excavated Ponds (Aquifer-Fed) (Powder Wash Evaporation Facility)

Excavated ponds (aquifer-fed) are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, saturated hydraulic conductivity (Ksat) of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

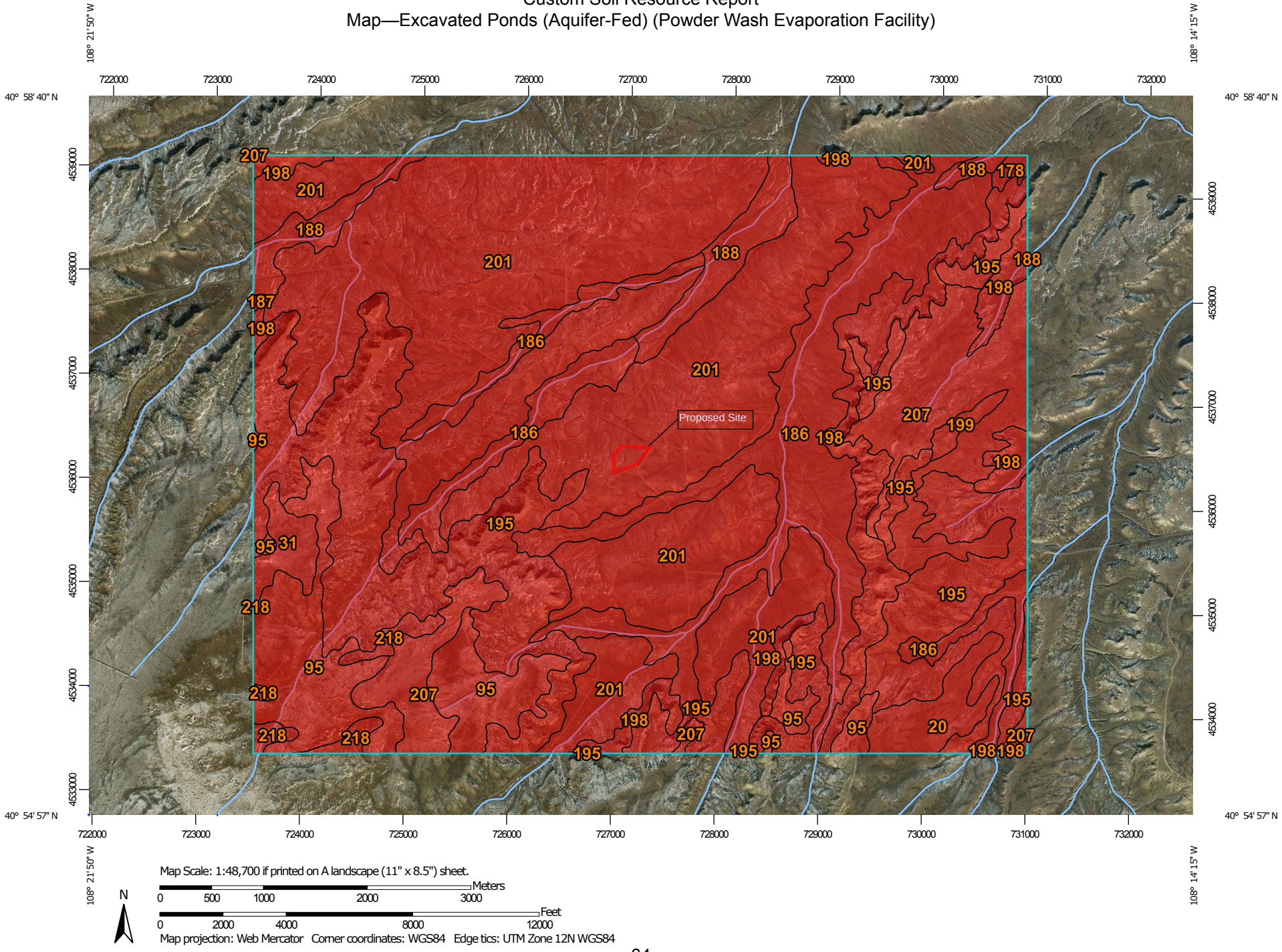
Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is

shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Excavated Ponds (Aquifer-Fed) (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Tables—Excavated Ponds (Aquifer-Fed) (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Very limited	Brownsto (50%)	Depth to water (1.00)	160.2	1.5%
			Castee (30%)	Depth to water (1.00)		
31	Castee loam, 3 to 12 percent slopes	Very limited	Castee (90%)	Depth to water (1.00)	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	Very limited	Haterton (60%)	Depth to water (1.00)	725.4	6.8%
			Piezon (30%)	Depth to water (1.00)		
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Very limited	Simanni (50%)	Depth to water (1.00)	19.1	0.2%
			Ruedloff (40%)	Depth to water (1.00)		
186	Talamantes loam, 0 to 6 percent slopes	Very limited	Talamantes (85%)	Depth to water (1.00)	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Very limited	Talamantes (90%)	Depth to water (1.00)	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	Very limited	Talamantes, saline (85%)	Depth to water (1.00)	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	Very limited	Torriorthents (95%)	Depth to water (1.00)	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	Very limited	Torriorthents (60%)	Depth to water (1.00)	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	Very limited	Torriorthents (60%)	Depth to water (1.00)	35.2	0.3%
			Torripsamments (30%)	Depth to water (1.00)		
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Very limited	Tresano (35%)	Depth to water (1.00)	4,299.3	40.4%
			Hiatha (30%)	Depth to water (1.00)		
			Kandaly (15%)	Depth to water (1.00)		
207	Vermillion-Langspring complex, 3 to	Very limited	Vermillion (40%)	Depth to water (1.00)	807.0	7.6%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	25 percent slopes		Langspring (35%)	Depth to water (1.00)		
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	Very limited	Yellowwash (50%)	Depth to water (1.00)	90.0	0.8%
			Piezon (35%)	Depth to water (1.00)		
Totals for Area of Interest					**10,638.3**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	10,638.3	100.0%
Totals for Area of Interest	**10,638.3**	**100.0%**

Rating Options—Excavated Ponds (Aquifer-Fed) (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Pond Reservoir Areas (Powder Wash Evaporation Facility)

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

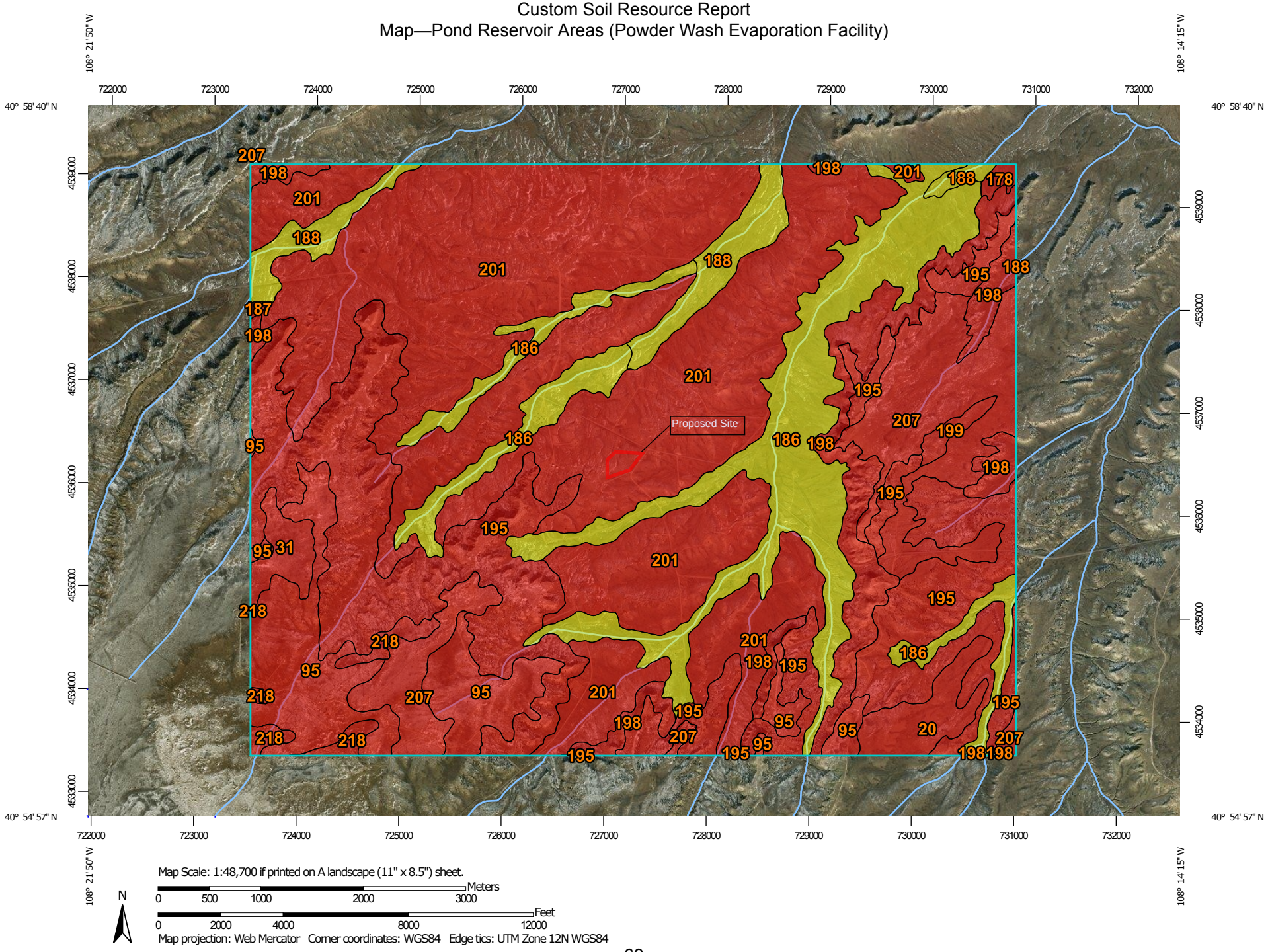
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Pond Reservoir Areas (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Tables—Pond Reservoir Areas (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Very limited	Brownsto (50%)	Slope (1.00)	160.2	1.5%
				Seepage (0.72)		
			Castee (30%)	Seepage (1.00)		
				Slope (1.00)		
31	Castee loam, 3 to 12 percent slopes	Very limited	Castee (90%)	Seepage (1.00)	94.4	0.9%
				Slope (1.00)		
95	Haterton-Piezon complex, 3 to 12 percent slopes	Very limited	Haterton (60%)	Slope (1.00)	725.4	6.8%
				Depth to bedrock (0.62)		
				Seepage (0.04)		
			Piezon (30%)	Slope (1.00)		
				Seepage (0.72)		
				Depth to bedrock (0.34)		
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Very limited	Simanni (50%)	Seepage (1.00)	19.1	0.2%
				Slope (0.68)		
			Ruedloff (40%)	Seepage (1.00)		
				Slope (0.68)		
186	Talamantes loam, 0 to 6 percent slopes	Somewhat limited	Talamantes (85%)	Seepage (0.72)	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Very limited	Talamantes (90%)	Slope (1.00)	4.4	0.0%
				Seepage (0.72)		
188	Talamantes loam, saline, 0 to 8 percent slopes	Somewhat limited	Talamantes, saline (85%)	Seepage (0.72)	305.9	2.9%
				Slope (0.08)		
195	Torriorthents, 12 to 25 percent slopes	Very limited	Torriorthents (95%)	Slope (1.00)	2,053.1	19.3%
				Depth to bedrock (1.00)		
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	Very limited	Torriorthents (60%)	Slope (1.00)	631.1	5.9%
				Depth to bedrock (0.90)		
			Rock outcrop, shale (40%)	Slope (1.00)		
				Depth to bedrock (1.00)		
199	Torriorthents-Torripsamments complex, 12	Very limited	Torriorthents (60%)	Slope (1.00)	35.2	0.3%
				Depth to bedrock (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	to 40 percent slopes		Torripsamments (30%)	Seepage (1.00)		
				Slope (1.00)		
				Depth to bedrock (0.95)		
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Very limited	Hiatha (30%)	Slope (1.00)	4,299.3	40.4%
				Depth to bedrock (0.69)		
			Kandaly (15%)	Seepage (1.00)		
				Slope (0.92)		
207	Vermillion-Langspring complex, 3 to 25 percent slopes	Very limited	Vermillion (40%)	Slope (1.00)	807.0	7.6%
				Depth to bedrock (0.91)		
				Seepage (0.72)		
			Langspring (35%)	Slope (1.00)		
				Seepage (0.72)		
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	Very limited	Yellowwash (50%)	Depth to bedrock (1.00)	90.0	0.8%
				Slope (1.00)		
			Piezon (35%)	Slope (1.00)		
				Seepage (0.72)		
				Depth to bedrock (0.12)		
Totals for Area of Interest					**10,638.3**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	8,919.4	83.8%
Somewhat limited	1,718.9	16.2%
Totals for Area of Interest	**10,638.3**	**100.0%**

Rating Options—Pond Reservoir Areas (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the

map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

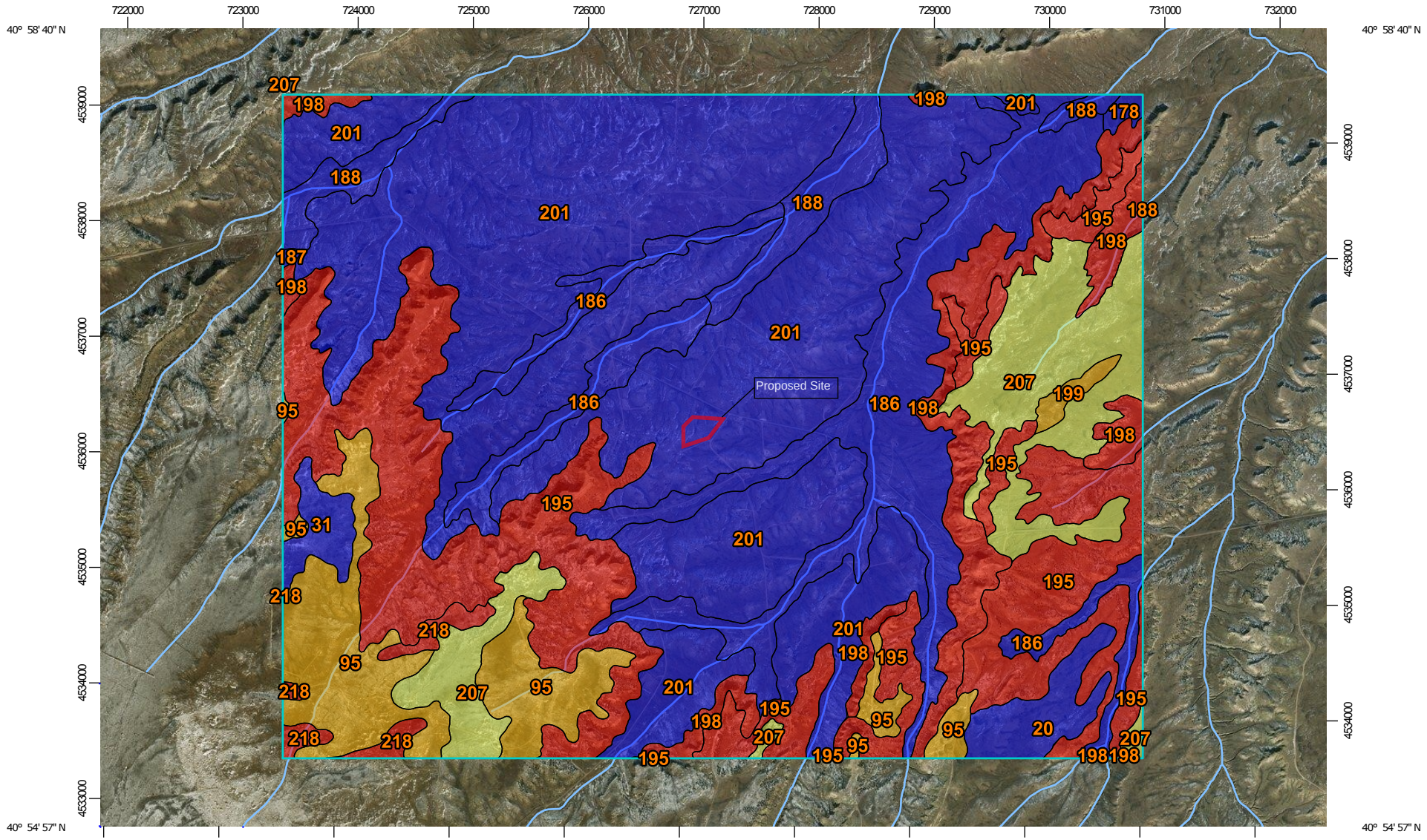
Depth to Any Soil Restrictive Layer (Powder Wash Evaporation Facility)

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to any type of restrictive layer that is described for each map unit. If more than one type of restrictive layer is described for an individual soil type, the depth to the shallowest one is presented. If no restrictive layer is described in a map unit, it is represented by the "> 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Any Soil Restrictive Layer (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Depth to Any Soil Restrictive Layer (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	>200	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	>200	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	41	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	>200	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	>200	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	>200	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	>200	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	20	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	20	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	38	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	>200	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	71	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	25	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Depth to Any Soil Restrictive Layer (Powder Wash Evaporation Facility)

Units of Measure: centimeters

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie. The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

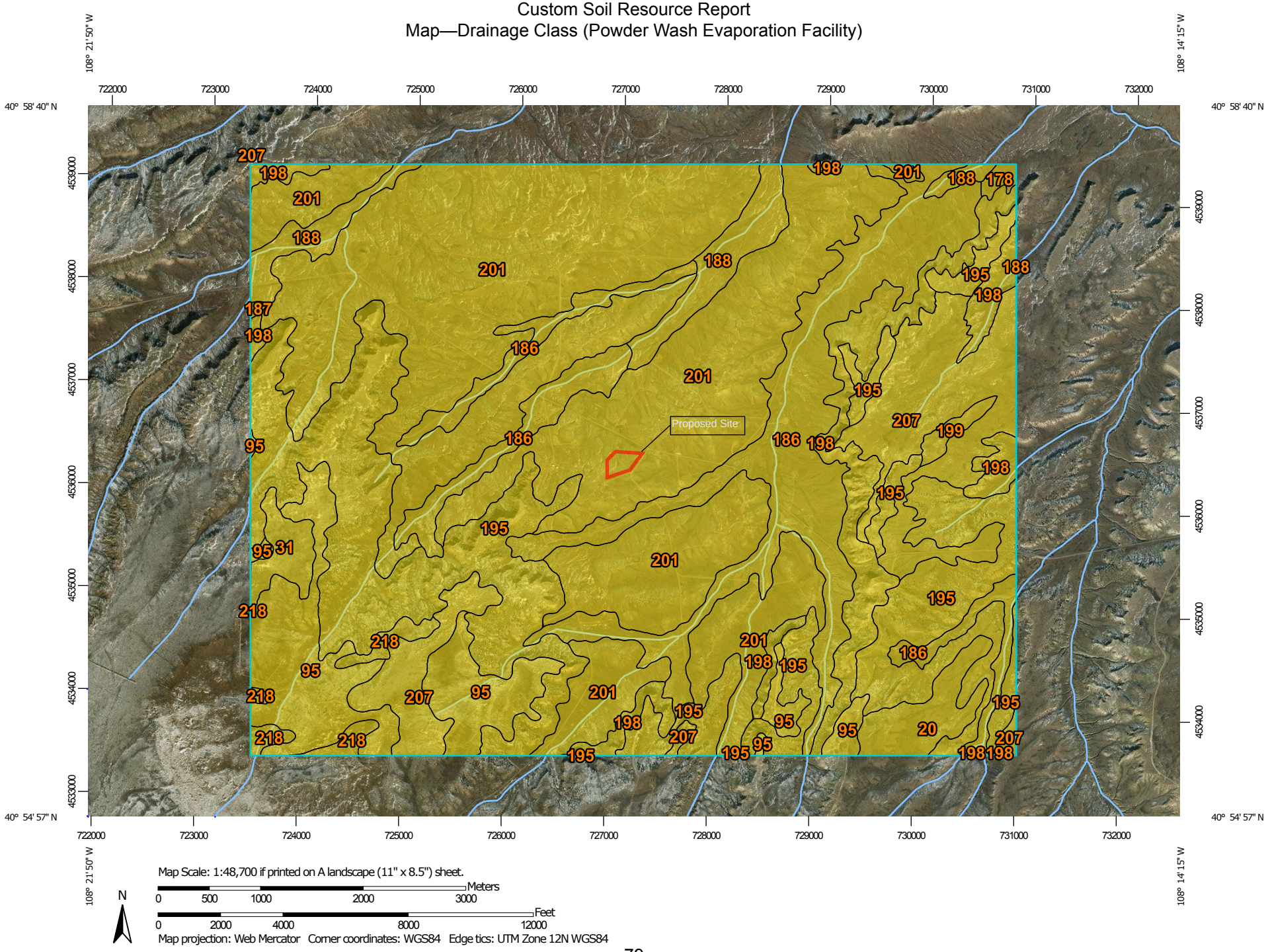
Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Drainage Class (Powder Wash Evaporation Facility)

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Custom Soil Resource Report
Map—Drainage Class (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- 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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Drainage Class (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	Well drained	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	Well drained	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	Well drained	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	Well drained	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	Well drained	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	Well drained	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	Well drained	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	Well drained	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	Well drained	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	Well drained	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	Well drained	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	Well drained	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	Well drained	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Drainage Class (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Hydrologic Soil Group (Powder Wash Evaporation Facility)

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.

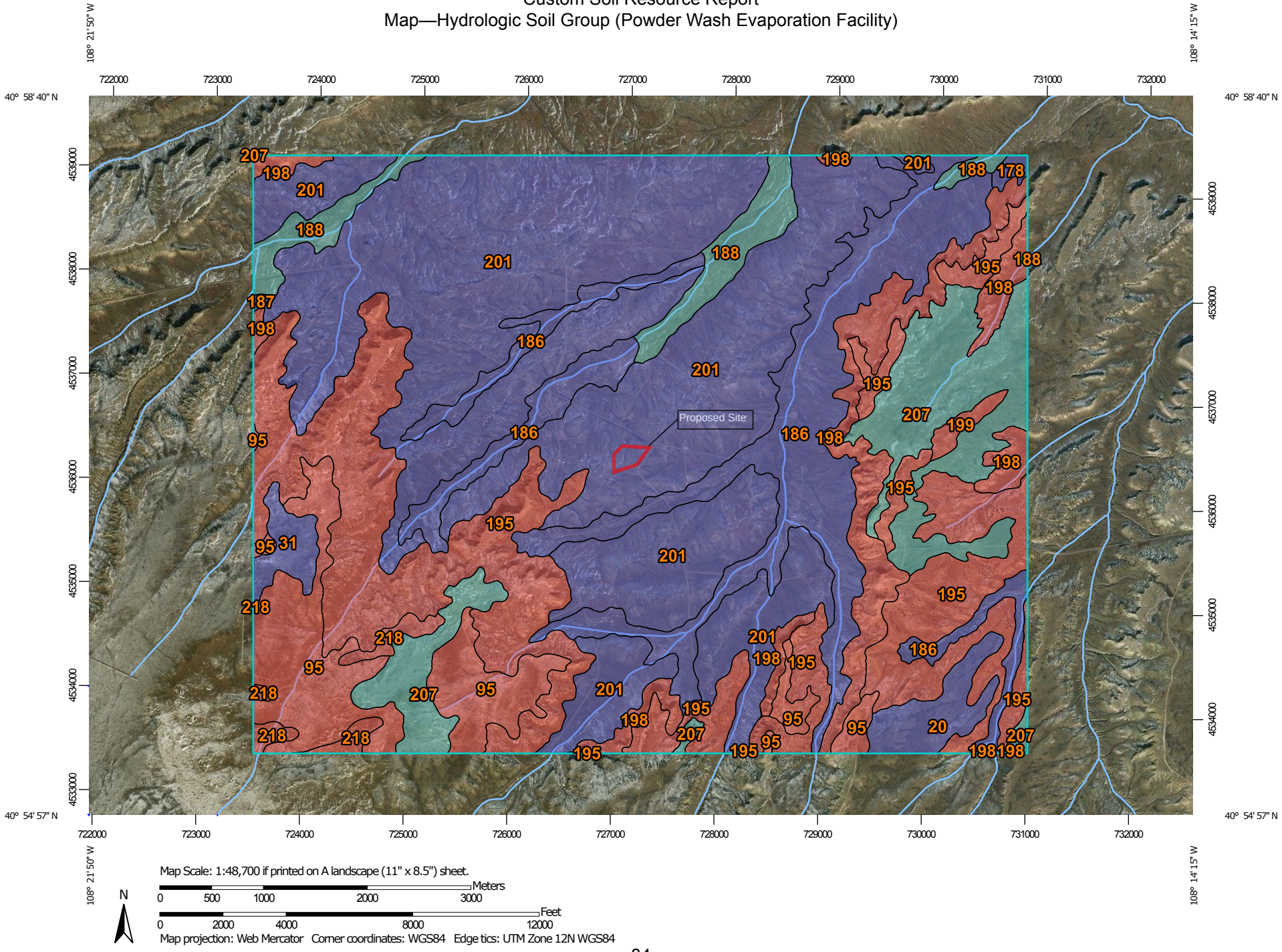
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group (Powder Wash Evaporation Facility)



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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Hydrologic Soil Group (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	B	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	B	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	D	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	B	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	B	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	B	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	C	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	D	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	D	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	D	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	B	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	C	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	D	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Hydrologic Soil Group (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

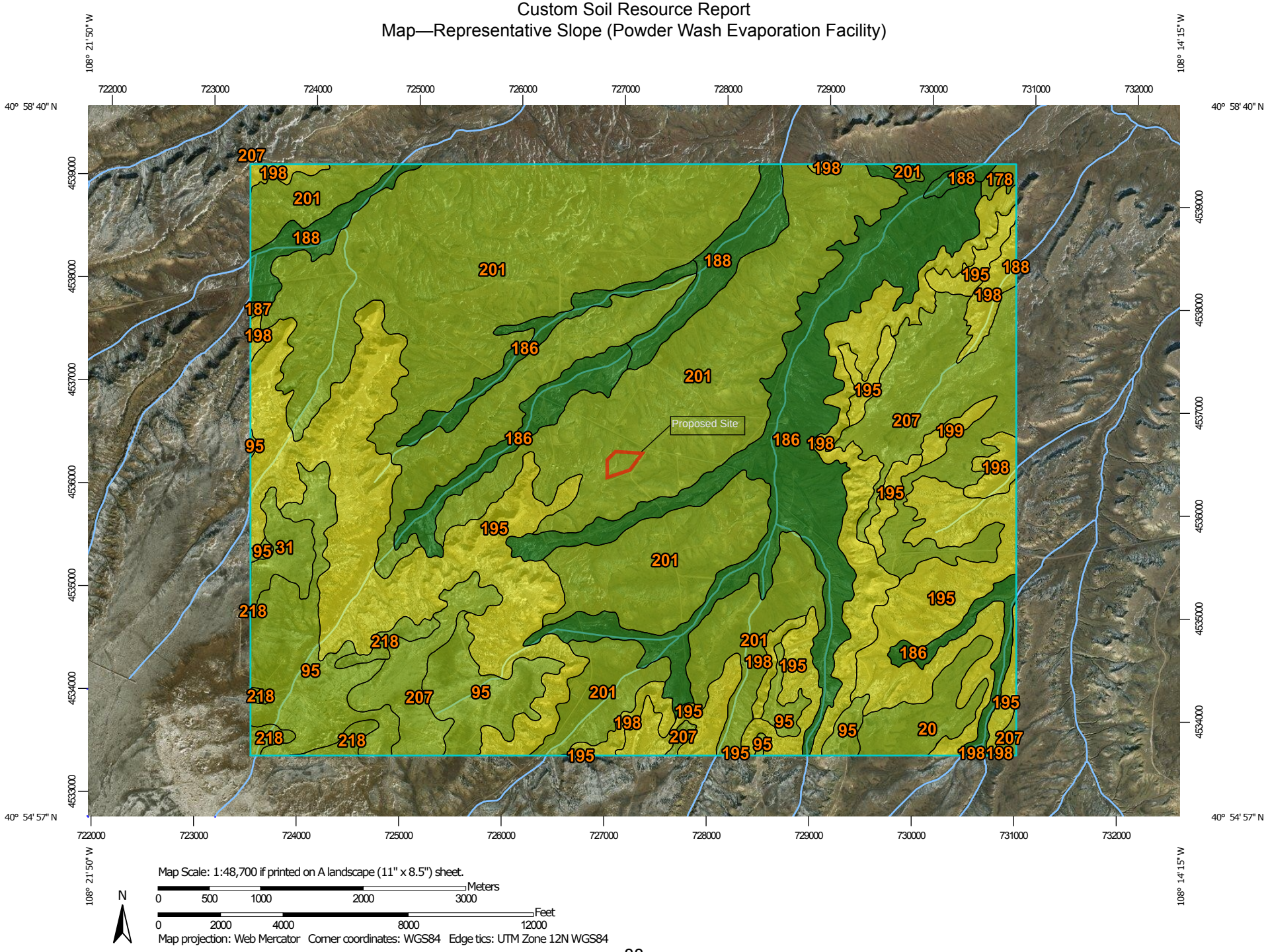
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Representative Slope (Powder Wash Evaporation Facility)

Slope gradient is the difference in elevation between two points, expressed as a percentage of the distance between those points.

The slope gradient is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Representative Slope (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- 60 - 100
- 45 - 60
- 15 - 45
- 5 - 15
- 0 - 5
- Not rated or not available

Soil Rating Lines

- 60 - 100
- 45 - 60
- 15 - 45
- 5 - 15
- 0 - 5
- Not rated or not available

Soil Rating Points

- 60 - 100
- 45 - 60
- 15 - 45
- 5 - 15
- 0 - 5
- 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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Representative Slope (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	14.0	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	8.0	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	8.0	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	6.0	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	3.0	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	11.0	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	4.0	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	19.0	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	40.0	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	26.0	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	7.0	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	14.0	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	10.0	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Representative Slope (Powder Wash Evaporation Facility)

Units of Measure: percent

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie. The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Unified Soil Classification (Surface) (Powder Wash Evaporation Facility)

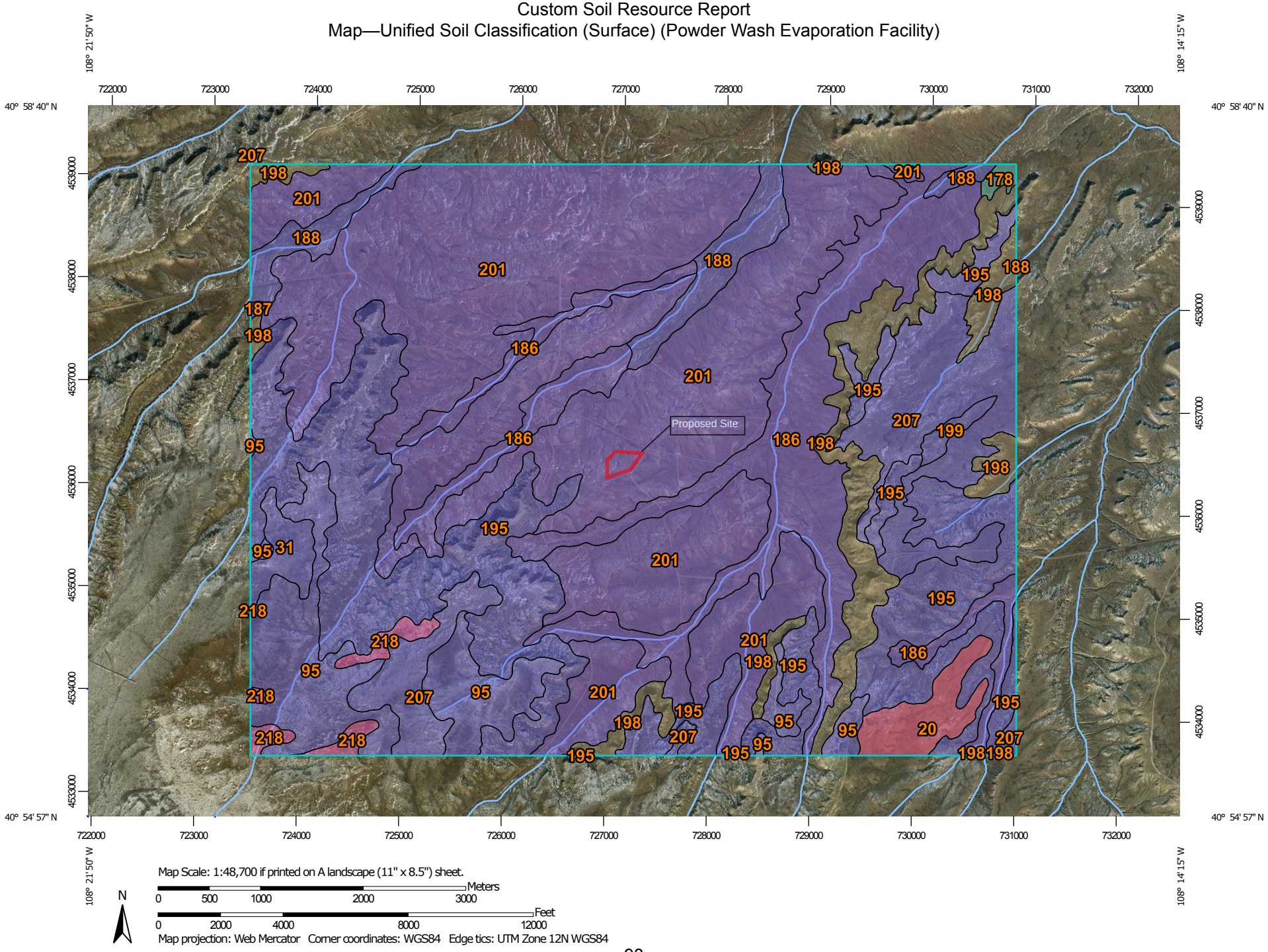
The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system

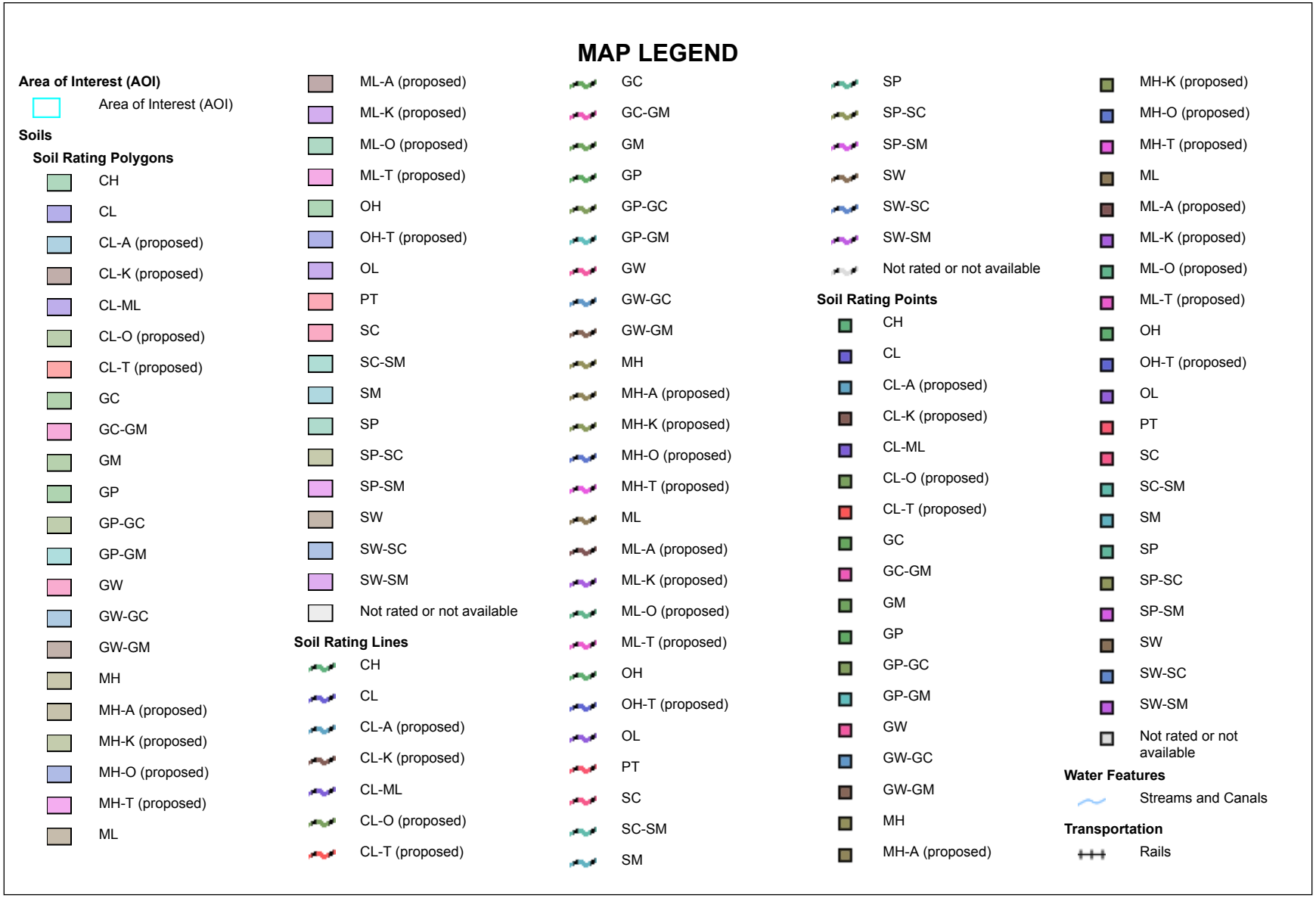
and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Custom Soil Resource Report
Map—Unified Soil Classification (Surface) (Powder Wash Evaporation Facility)




MAP LEGEND
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Rating Polygons
CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available
Soil Rating Lines
CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available
Soil Rating Points
CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available
Water Features
Streams and Canals
Transportation
Rails

MAP INFORMATION

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Unified Soil Classification (Surface) (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	SC	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	CL	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	CL	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	SC-SM	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	CL-ML	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	CL-ML	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	CL	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	CL	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	ML	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	CL	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	CL-ML	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	CL	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	GC-GM	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Unified Soil Classification (Surface) (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

Water Features

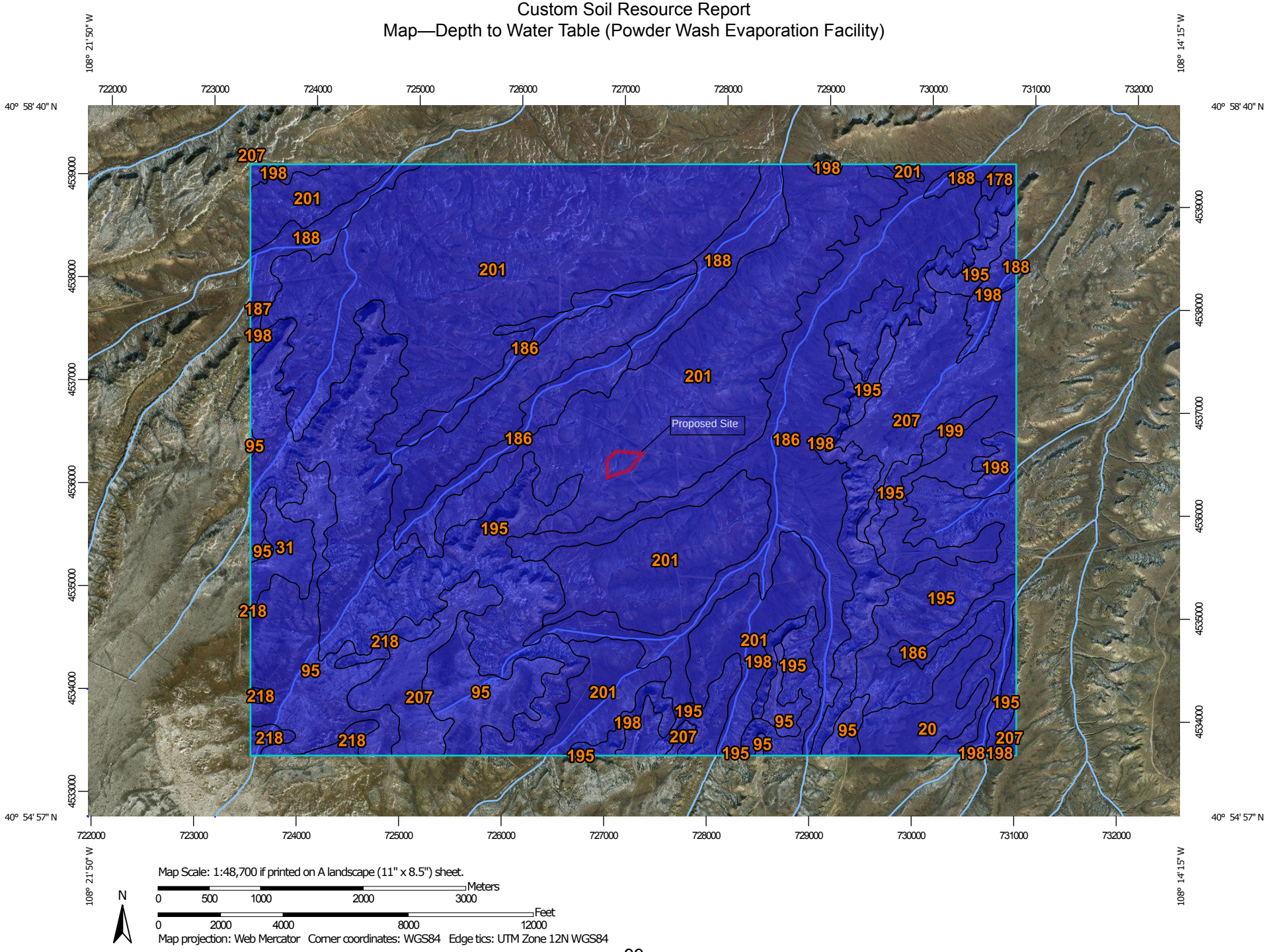
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table (Powder Wash Evaporation Facility)

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Water Table (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Depth to Water Table (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	>200	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	>200	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	>200	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	>200	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	>200	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	>200	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	>200	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	>200	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	>200	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	>200	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	>200	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	>200	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	>200	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Depth to Water Table (Powder Wash Evaporation Facility)

Units of Measure: centimeters

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie. The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Beginning Month: January

Ending Month: December

Flooding Frequency Class (Powder Wash Evaporation Facility)

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.

"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.

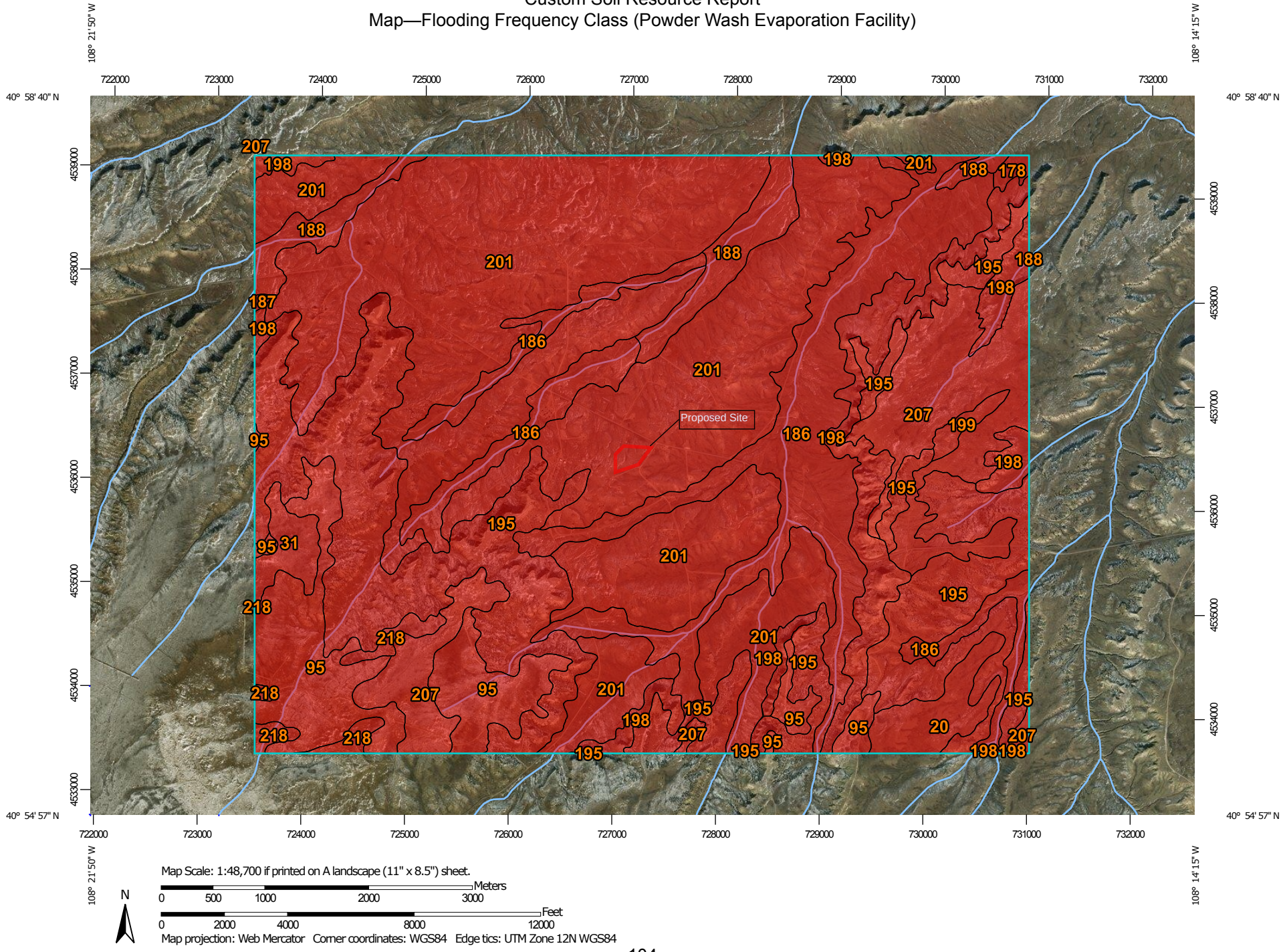
"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.

"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.

"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.

"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

Custom Soil Resource Report
Map—Flooding Frequency Class (Powder Wash Evaporation Facility)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- Not rated or not available

Soil Rating Lines
- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- Not rated or not available

Soil Rating Points
- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- 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 1:31,700.

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: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 7, 2012—Oct 17, 2016

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.

Table—Flooding Frequency Class (Powder Wash Evaporation Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20	Brownsto-Castee complex, 3 to 25 percent slopes	None	160.2	1.5%
31	Castee loam, 3 to 12 percent slopes	None	94.4	0.9%
95	Haterton-Piezon complex, 3 to 12 percent slopes	None	725.4	6.8%
178	Simanni-Ruedloff complex, 1 to 10 percent slopes	None	19.1	0.2%
186	Talamantes loam, 0 to 6 percent slopes	None	1,413.0	13.3%
187	Talamantes loam, 6 to 15 percent slopes	None	4.4	0.0%
188	Talamantes loam, saline, 0 to 8 percent slopes	None	305.9	2.9%
195	Torriorthents, 12 to 25 percent slopes	None	2,053.1	19.3%
198	Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes	None	631.1	5.9%
199	Torriorthents-Torripsamments complex, 12 to 40 percent slopes	None	35.2	0.3%
201	Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes	None	4,299.3	40.4%
207	Vermillion-Langspring complex, 3 to 25 percent slopes	None	807.0	7.6%
218	Yellowwash-Piezon complex, 5 to 15 percent slopes	None	90.0	0.8%
Totals for Area of Interest			**10,638.3**	**100.0%**

Rating Options—Flooding Frequency Class (Powder Wash Evaporation Facility)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: More Frequent

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Beginning Month: January

Ending Month: December

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Building Site Development

This folder contains a collection of tabular reports that present soil interpretations related to building site development. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Roads and Streets, Shallow Excavations, and Lawns and Landscaping (Powder Wash Evaporation Facility)

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Roads and Streets, Shallow Excavations, and Lawns and Landscaping (Powder Wash Evaporation Facility)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation.

The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
20—Brownsto-Castee complex, 3 to 25 percent slopes							
Brownsto	50	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.96	Slope	0.96	Slope	0.96
		Low exchange capacity	0.50			Dusty	0.19
		Dusty	0.19			Unstable excavation walls	0.01
		Gravel content	0.18				
		Droughty	0.02				
Castee	30	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.96	Slope	0.96	Slope	0.96
		Low exchange capacity	0.50			Dusty	0.18
		Dusty	0.18			Unstable excavation walls	0.01
Moderately deep soils over sandstone bedrock	20	Not rated		Not rated		Not rated	
31—Castee loam, 3 to 12 percent slopes							
Castee	90	Somewhat limited		Not limited		Somewhat limited	
		Low exchange capacity	0.50			Dusty	0.18
		Dusty	0.18			Unstable excavation walls	0.01
Brownsto	10	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
95—Haterton-Piezon complex, 3 to 12 percent slopes							
Haterton	60	Very limited		Somewhat limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Droughty	0.98			Dusty	0.29
		Low exchange capacity	0.50			Unstable excavation walls	0.01
		Dusty	0.29				
Piezon	30	Somewhat limited		Not limited		Somewhat limited	
		Depth to bedrock	0.95			Depth to soft bedrock	0.95
		Dusty	0.29			Dusty	0.29
						Unstable excavation walls	0.01
Fenster	5	Not rated		Not rated		Not rated	
Thenipel	5	Not rated		Not rated		Not rated	
178—Simanni-Ruedloff complex, 1 to 10 percent slopes							
Simanni	50	Somewhat limited		Not limited		Somewhat limited	
		Low exchange capacity	0.75			Dusty	0.06
		Dusty	0.06			Unstable excavation walls	0.01
Ruedloff	40	Somewhat limited		Not limited		Somewhat limited	
		Low exchange capacity	0.75			Unstable excavation walls	0.04
		Too sandy	0.50			Dusty	0.01
		Droughty	0.21				
		Dusty	0.01				
Kandaly	5	Not rated		Not rated		Not rated	
Tresano	5	Not rated		Not rated		Not rated	
186—Talamantes loam, 0 to 6 percent slopes							
Talamantes	85	Somewhat limited		Not limited		Somewhat limited	
		Dusty	0.31			Dusty	0.31
						Unstable excavation walls	0.01
Coarse textured soils	8	Not rated		Not rated		Not rated	
Debone	7	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
187—Talamantes loam, 6 to 15 percent slopes							
Talamantes	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.37	Slope	0.37	Slope	0.37
		Dusty	0.31			Dusty	0.31
						Unstable excavation walls	0.01
Coarse textured soils	10	Not rated		Not rated		Not rated	
188—Talamantes loam, saline, 0 to 8 percent slopes							
Talamantes, saline	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Salinity	0.50	Low strength	0.46	Dusty	0.46
		Dusty	0.46			Unstable excavation walls	0.01
Clayey soils	10	Not rated		Not rated		Not rated	
Quealman	5	Not rated		Not rated		Not rated	
195—Torriorthents, 12 to 25 percent slopes							
Torriorthents	95	Very limited		Very limited		Very limited	
		Droughty	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Depth to bedrock	1.00	Low strength	1.00	Slope	1.00
		Large stones content	1.00	Slope	1.00	Large stones	0.54
		Low exchange capacity	0.50	Large stones	0.54	Dusty	0.26
Rock outcrop	3	Not rated		Not rated		Not rated	
Badland	2	Not rated		Not rated		Not rated	
198—Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes							
Torriorthents	60	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Depth to soft bedrock	1.00
		Droughty	1.00	Depth to soft bedrock	1.00	Slope	1.00
		Depth to bedrock	1.00	Low strength	1.00	Dusty	0.48
		Salinity	1.00			Unstable excavation walls	0.01
		Dusty	0.48				
Rock outcrop, shale	40	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
199—Torriorthents-Torripsamments complex, 12 to 40 percent slopes							
Torriorthents	60	Very limited		Very limited		Very limited	
		Slope	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to bedrock	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Droughty	0.99	Slope	1.00	Slope	1.00
		Dusty	0.35	Frost action	0.50	Dusty	0.35
				Shrink-swell	0.50	Unstable excavation walls	0.01
Torripsamments	30	Very limited		Very limited		Very limited	
		Droughty	1.00	Slope	1.00	Depth to hard bedrock	1.00
		Slope	1.00	Depth to hard bedrock	0.79	Slope	1.00
		Depth to bedrock	0.80			Depth to soft bedrock	0.79
		Low exchange capacity	0.75			Unstable excavation walls	0.42
		Too sandy	0.50				
Ruedloff	4	Not rated		Not rated		Not rated	
Rock river	3	Not rated		Not rated		Not rated	
Ryan park	3	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes							
Tresano	35	Somewhat limited		Not limited		Somewhat limited	
		Dusty	0.33			Dusty	0.33
						Unstable excavation walls	0.01
Hiatha	30	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Shrink-swell	1.00	Depth to soft bedrock	1.00
		Too clayey	1.00	Depth to soft bedrock	1.00	Slope	0.84
		Droughty	0.98	Low strength	1.00	Unstable excavation walls	0.51
		Slope	0.84	Slope	0.84	Dusty	0.48
		Dusty	0.48				
Kandaly	15	Very limited		Not limited		Somewhat limited	
		Low exchange capacity	1.00			Unstable excavation walls	0.35
		Droughty	0.91				
Badlands	4	Not rated		Not rated		Not rated	
Moderately deep sandy loamy soils	4	Not rated		Not rated		Not rated	
Ruedloff	4	Not rated		Not rated		Not rated	
Shallow sandy soils	4	Not rated		Not rated		Not rated	
Simanni	4	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
207—Vermillion-Langspring complex, 3 to 25 percent slopes							
Vermillion	40	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.96	Slope	0.96	Depth to hard bedrock	1.00
		Depth to bedrock	0.65	Depth to hard bedrock	0.64	Slope	0.96
		Dusty	0.29			Dusty	0.29
		Droughty	0.22			Unstable excavation walls	0.01
Langspring	35	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.96	Slope	0.96	Slope	0.96
		Low exchange capacity	0.50	Frost action	0.50	Dusty	0.13
		Dusty	0.13			Unstable excavation walls	0.01
Moderately deep soils over soft shale	9	Not rated		Not rated		Not rated	
Deep gravelly soils	8	Not rated		Not rated		Not rated	
Fenster	8	Not rated		Not rated		Not rated	
218—Yellowwash-Piezon complex, 5 to 15 percent slopes							
Yellowwash	50	Very limited		Very limited		Very limited	
		Droughty	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to bedrock	1.00	Low strength	1.00	Dusty	0.24
		Salinity	1.00	Slope	0.16	Slope	0.16
		Gravel content	0.41			Unstable excavation walls	0.01
		Dusty	0.24				
Piezon	35	Somewhat limited		Somewhat limited		Somewhat limited	
		Depth to bedrock	0.46	Slope	0.16	Depth to soft bedrock	0.46
		Dusty	0.24			Dusty	0.24
		Slope	0.16			Slope	0.16
						Unstable excavation walls	0.01
Deep soils	15	Not rated		Not rated		Not rated	

Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Taxonomic Classification of the Soils (Powder Wash Evaporation Facility)

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. This table shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalfs (*Ud*, meaning humid, plus *alfs*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-

size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic Hapludalfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

References:
Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.
Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. (The soils in a given survey area may have been classified according to earlier editions of this publication.)

Report—Taxonomic Classification of the Soils (Powder Wash Evaporation Facility)

[An asterisk by the soil name indicates a taxadjunct to the series]

Taxonomic Classification of the Soils–Moffat County Area, Colorado	
Soil name	**Family or higher taxonomic classification**
Badland	
Badlands	
Brownsto	
Brownsto	Loamy-skeletal, mixed Borollic Calciorthids
Castee	Coarse-loamy, carbonatic Borollic Calciorthids
Clayey soils	
Coarse textured soils	
Debone	
Deep gravelly soils	
Deep soils	
Fenster	
Haterton	Loamy, mixed (calcareous), frigid, shallow Typic Torriorthents
Hiatha	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Torriorthents
Kandaly	
Kandaly	Mixed, frigid Typic Torripsamments
Langspring	Fine-loamy, mixed, frigid Typic Calciorthids
Moderately deep sandy loamy soils	
Moderately deep soils over sandstone bedrock	
Moderately deep soils over soft shale	
Piezon	Fine-loamy, mixed Borollic Calciorthids
Quealman	
Rock outcrop	

Taxonomic Classification of the Soils–Moffat County Area, Colorado	
Soil name	**Family or higher taxonomic classification**
Rock outcrop	
Rock River	
Ruedloff	
Ruedloff	Coarse-loamy, mixed, frigid Typic Haplargids
Ryan Park	
Shallow sandy soils	
Simanni	
Simanni	Fine-loamy, mixed, frigid Typic Haplargids
Talamantes	Fine-loamy, mixed (calcareous), frigid Typic Torriorthents
Thenipel	
Torriorthents	Torriorthents
Torripsamments	Torripsamments
Tresano	
Tresano	Fine-loamy, mixed, frigid Typic Haplargids
Vermillion	Loamy-skeletal, mixed, frigid Typic Calciorthids
Yellowwash	Loamy, mixed (calcareous), frigid Lithic Ustic Torriorthents

Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Chemical Soil Properties (Powder Wash Evaporation Facility)

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Chemical Soil Properties–Moffat County Area, Colorado								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
20—Brownsto-Castee complex, 3 to 25 percent slopes								
Brownsto	0-3	5.0-15	—	7.9-8.4	1-5	0	0.0-2.0	0
	3-14	5.0-20	—	7.9-8.4	1-10	0	0.0-2.0	0
	14-29	5.0-15	—	8.5-9.0	15-40	0	0.0-2.0	0-1
	29-60	5.0-15	—	7.9-8.4	5-35	0	2.0-4.0	0-1
Castee	0-2	5.0-15	—	7.9-8.4	0-10	0	0	0
	2-32	5.0-10	—	7.9-8.4	25-55	0	0.0-2.0	0
	32-53	5.0-10	—	7.9-8.4	25-55	0	0.0-2.0	0
	53-60	5.0-10	—	7.9-8.4	20-50	0	2.0-4.0	0-5
Moderately deep soils over sandstone bedrock	—	—	—	—	—	—	—	—
31—Castee loam, 3 to 12 percent slopes								
Castee	0-2	5.0-15	—	7.4-8.4	0-10	0	0	0
	2-32	5.0-10	—	7.9-8.4	20-50	0	0.0-2.0	0
	32-53	5.0-10	—	7.9-8.4	20-50	0	0.0-2.0	0
	53-60	5.0-10	—	7.9-8.4	20-50	0	2.0-4.0	0-5
Brownsto	—	—	—	—	—	—	—	—

Chemical Soil Properties–Moffat County Area, Colorado								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
95—Haterton-Piezon complex, 3 to 12 percent slopes								
Haterton	0-2	10-15	—	7.9-9.0	5-15	0	2.0-4.0	3-10
	2-16	10-15	—	7.9-9.0	5-15	0-5	2.0-4.0	3-10
	16-20	—	—	—	—	—	—	—
Piezon	0-2	10-20	—	7.9-8.4	5-10	0	0	0
	2-13	10-15	—	7.9-8.4	15-25	0	0.0-2.0	0
	13-23	10-15	—	7.9-8.4	15-25	0	0.0-2.0	0
	23-27	—	—	—	—	—	—	—
Fenster	—	—	—	—	—	—	—	—
Thenipel	—	—	—	—	—	—	—	—
178—Simanni-Ruedloff complex, 1 to 10 percent slopes								
Simanni	0-10	5.0-10	—	7.4-8.4	0-1	0	0	0
	10-22	5.0-10	—	7.4-8.4	0-1	0	0	0
	22-33	5.0-10	—	7.9-9.0	3-10	0	0.0-2.0	0
	33-60	5.0-10	—	7.9-9.0	3-10	0	0.0-2.0	0
Ruedloff	0-2	5.0-10	—	7.4-7.8	1-5	0	0	0
	2-24	5.0-10	—	7.4-8.4	0-5	0	0	0
	24-60	1.0-5.0	—	7.9-8.4	5-10	0	0.0-2.0	0
Kandaly	—	—	—	—	—	—	—	—
Tresano	—	—	—	—	—	—	—	—

Chemical Soil Properties–Moffat County Area, Colorado								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
186—Talamantes loam, 0 to 6 percent slopes								
Talamantes	0-3	10-20	—	7.4-8.4	2-5	0	0.0-2.0	1-3
	3-48	10-25	—	7.4-9.0	2-5	0	0.0-2.0	2-4
	48-60	10-20	—	7.4-9.0	2-5	0-1	0.0-2.0	1-3
Coarse textured soils	—	—	—	—	—	—	—	—
Debone	—	—	—	—	—	—	—	—
187—Talamantes loam, 6 to 15 percent slopes								
Talamantes	0-3	10-20	—	7.4-8.4	2-5	0	0.0-2.0	1-3
	3-48	10-25	—	7.4-9.0	2-5	0	0.0-2.0	2-4
	48-60	10-20	—	7.4-8.4	2-5	0-1	0.0-2.0	1-3
Coarse textured soils	—	—	—	—	—	—	—	—
188—Talamantes loam, saline, 0 to 8 percent slopes								
Talamantes, saline	0-3	10-25	—	7.9-8.4	2-5	0-1	4.0-8.0	3-5
	3-24	10-25	—	7.9-9.0	2-5	5-10	8.0-16.0	3-8
	24-60	10-25	—	7.9-9.0	2-5	5-10	8.0-16.0	3-8
Clayey soils	—	—	—	—	—	—	—	—
Quealman	—	—	—	—	—	—	—	—
195—Torriorthents, 12 to 25 percent slopes								
Torriorthents	0-8	5.0-20	—	7.9-9.0	3-10	0-5	0.0-4.0	3-10
	8-12	—	—	—	—	—	—	—
Rock outcrop	—	—	—	—	—	—	—	—
Badland	—	—	—	—	—	—	—	—

Chemical Soil Properties–Moffat County Area, Colorado								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
198—Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes								
Torriorthents	0-8	15-30	—	7.4-8.4	3-10	2-10	4.0-16.0	3-10
	8-12	—	—	—	—	—	—	—
Rock outcrop, shale	0-60	—	—	—	—	—	0	—
199—Torriorthents-Torripsamments complex, 12 to 40 percent slopes								
Torriorthents	0-2	15-20	—	7.9-8.4	1-5	0	0	0
	2-15	10-25	—	7.9-8.4	3-10	0	0	0
	15-19	—	—	—	—	—	—	—
Torripsamments	0-4	1.0-5.0	—	6.6-7.8	0-2	0-1	0.0-2.0	0-1
	4-26	1.0-10	—	6.6-8.4	0-2	0-1	0.0-2.0	0-1
	26-30	—	—	—	—	—	—	—
Ruedloff	—	—	—	—	—	—	—	—
Rock river	—	—	—	—	—	—	—	—
Ryan park	—	—	—	—	—	—	—	—

Chemical Soil Properties–Moffat County Area, Colorado								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes								
Tresano	0-2	5.0-15	—	7.4-8.4	0	0	0	0
	2-28	10-20	—	7.4-8.4	0-10	0	0	0
	28-60	5.0-15	—	7.9-9.0	5-10	0	0.0-2.0	0
Hiatha	0-2	25-35	—	7.9-8.4	1-5	0	0.0-2.0	0
	2-14	25-35	—	7.9-9.0	1-5	0-2	0.0-2.0	3-7
	14-18	—	—	—	—	—	—	—
Kandaly	0-3	0.0-5.0	—	7.9-8.4	1-5	0	0	0-10
	3-60	0.0-5.0	—	7.9-8.4	1-5	0	0.0-2.0	0-10
Badlands	—	—	—	—	—	—	—	—
Moderately deep sandy loamy soils	—	—	—	—	—	—	—	—
Ruedloff	—	—	—	—	—	—	—	—
Shallow sandy soils	—	—	—	—	—	—	—	—
Simanni	—	—	—	—	—	—	—	—

Chemical Soil Properties–Moffat County Area, Colorado								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
207—Vermillion-Langspring complex, 3 to 25 percent slopes								
Vermillion	0-3	5.0-15	—	7.9-8.4	1-3	0	0	0-1
	3-23	10-20	—	7.9-9.0	15-40	0	0.0-4.0	1-2
	23-28	10-20	—	7.9-9.0	15-40	0	0.0-4.0	1-2
	28-32	—	—	—	—	—	—	—
Langspring	0-3	10-15	—	7.9-8.4	5-10	0	0	0
	3-17	10-15	—	8.5-9.0	15-40	0	0.0-2.0	2-5
	17-60	10-15	—	7.9-9.0	10-20	0-2	0.0-4.0	0-3
Moderately deep soils over soft shale	—	—	—	—	—	—	—	—
Deep gravelly soils	—	—	—	—	—	—	—	—
Fenster	—	—	—	—	—	—	—	—
218—Yellowwash-Piezon complex, 5 to 15 percent slopes								
Yellowwash	0-2	10-20	—	7.9-8.4	3-10	0	2.0-16.0	0
	2-10	10-15	—	7.9-8.4	3-10	0	2.0-16.0	0
	10-14	—	—	—	—	—	—	—
Piezon	0-4	10-20	—	7.9-8.4	5-10	0	0	0
	4-30	10-15	—	7.9-8.4	15-25	0	0.0-2.0	0
	30-34	—	—	—	—	—	—	—
Deep soils	—	—	—	—	—	—	—	—

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (Powder Wash Evaporation Facility)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less

than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
20—Brownsto-Castee complex, 3 to 25 percent slopes														
Brownsto	0-3	-43-	-40-	15-18- 20	1.15-1.20-1.25	4.23-9.17-14.11	0.12-0.13-0.14	0.0- 1.5- 2.9	0.5- 1.3-2.0	.20	.32	5	6	48
	3-14	-41-	-37-	18-22- 25	1.20-1.25-1.30	4.23-9.17-14.11	0.12-0.13-0.14	0.0- 1.5- 2.9	0.5- 0.8-1.0	.20	.37			
	14-29	-41-	-37-	18-22- 25	1.25-1.30-1.35	4.23-9.17-14.11	0.06-0.08-0.10	0.0- 1.5- 2.9	0.0- 0.3-0.5	.15	.37			
	29-60	-67-	-15-	15-19- 22	1.25-1.30-1.35	4.23-9.17-14.11	0.05-0.07-0.09	0.0- 1.5- 2.9	0.0- 0.3-0.5	.10	.20			
Castee	0-2	-44-	-41-	12-15- 18	1.25-1.33-1.40	4.23-9.17-14.11	0.14-0.16-0.17	0.0- 1.5- 2.9	0.5- 1.3-2.0	.37	.37	2	4L	86
	2-32	-44-	-41-	12-15- 18	1.25-1.30-1.35	4.23-9.17-14.11	0.13-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.43	.43			
	32-53	-44-	-41-	12-15- 18	1.25-1.30-1.35	4.23-9.17-14.11	0.09-0.11-0.12	0.0- 1.5- 2.9	0.0- 0.3-0.5	.20	.43			
	53-60	-68-	-20-	10-13- 15	1.35-1.40-1.45	14.11-28.22-42.34	0.07-0.09-0.10	0.0- 1.5- 2.9	0.0- 0.3-0.5	.10	.24			
Moderately deep soils over sandstone bedrock	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
31—Castee loam, 3 to 12 percent slopes														
Castee	0-2	-44-	-41-	12-15- 18	1.25-1.33-1.40	4.23-9.17-14.11	0.14-0.16-0.17	0.0- 1.5- 2.9	0.5- 1.3-2.0	.37	.37	2	4L	86
	2-32	-44-	-41-	12-15- 18	1.25-1.30-1.35	4.23-9.17-14.11	0.13-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.43	.43			
	32-53	-44-	-41-	12-15- 18	1.25-1.30-1.35	4.23-9.17-14.11	0.09-0.11-0.12	0.0- 1.5- 2.9	0.0- 0.3-0.5	.20	.43			
	53-60	-68-	-20-	10-13- 15	1.35-1.40-1.45	14.11-28.22-42.34	0.07-0.09-0.10	0.0- 1.5- 2.9	0.0- 0.3-0.5	.10	.24			
Brownsto	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
95—Haterton-Piezon complex, 3 to 12 percent slopes														
Haterton	0-2	-40-	-38-	18-23- 27	1.15-1.23-1.30	4.23-9.17-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.5- 0.8-1.0	.37	.37	2	4L	86
	2-16	-40-	-38-	18-23- 27	1.25-1.30-1.35	4.23-9.17-14.11	0.10-0.13-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.20	.37			
	16-20	—	—	—	—	1.41-2.82-4.23	—	—	—					
Piezon	0-2	-40-	-38-	18-23- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	1.0- 1.5-2.0	.28	.28	3	4L	86
	2-13	-40-	-38-	18-23- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.16-0.18-0.19	0.0- 1.5- 2.9	0.5- 0.8-1.0	.37	.37			
	13-23	-40-	-38-	18-23- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.15-0.17-0.19	0.0- 1.5- 2.9	0.0- 0.3-0.5	.20	.37			
	23-27	—	—	—	—	0.42-7.26-14.11	—	—	—					
Fenster	—	—	—	—	—	—	—	—	—					
Thenipel	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
178—Simanni-Ruedloff complex, 1 to 10 percent slopes														
Simanni	0-10	-68-	-19-	10-13- 15	1.30-1.33-1.35	14.11-28.22-42.34	0.09-0.11-0.12	0.0- 1.5- 2.9	0.5- 0.8-1.0	.17	.17	5	3	86
	10-22	-60-	-18-	20-23- 25	1.25-1.28-1.30	4.23-9.17-14.11	0.13-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.24	.24			
	22-33	-66-	-19-	12-15- 18	1.35-1.38-1.40	14.11-28.22-42.34	0.09-0.11-0.12	0.0- 1.5- 2.9	0.0- 0.3-0.5	.20	.20			
	33-60	-83-	-11-	3- 7- 10	1.45-1.48-1.50	42.34-91.74-141.14	0.03-0.05-0.06	0.0- 1.5- 2.9	0.0- 0.3-0.5	.15	.15			
Ruedloff	0-2	-82-	-11-	5- 8- 10	1.40-1.45-1.50	42.34-91.74-141.14	0.06-0.07-0.08	0.0- 1.5- 2.9	0.5- 0.8-1.0	.10	.10	5	2	134
	2-24	-67-	-19-	10-14- 18	1.35-1.40-1.45	14.11-28.22-42.34	0.09-0.11-0.12	0.0- 1.5- 2.9	0.0- 0.3-0.5	.20	.20			
	24-60	-84-	-11-	3- 6- 8	1.55-1.58-1.60	42.34-91.74-141.14	0.03-0.05-0.07	0.0- 1.5- 2.9	0.0- 0.3-0.5	.15	.15			
Kandaly	—	—	—	—	—	—	—	—	—					
Tresano	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
186—Talamantes loam, 0 to 6 percent slopes														
Talamantes	0-3	-40-	-38-	18-23- 27	1.25-1.30-1.35	4.23-9.17-14.11	0.14-0.16-0.18	0.0- 1.5- 2.9	0.0- 0.5-1.0	.37	.37	5	6	48
	3-48	-38-	-36-	18-27- 35	1.20-1.23-1.25	1.41-7.76-14.11	0.16-0.18-0.19	0.0- 1.5- 2.9	0.0- 0.5-1.0	.32	.32			
	48-60	-67-	-15-	18-18- 27	1.25-1.30-1.35	4.23-9.17-14.11	0.13-0.15-0.17	0.0- 1.5- 2.9	0.0- 0.5-1.0	.20	.20			
Coarse textured soils	—	—	—	—	—	—	—	—	—					
Debone	—	—	—	—	—	—	—	—	—					
187—Talamantes loam, 6 to 15 percent slopes														
Talamantes	0-3	-40-	-38-	18-23- 27	1.25-1.30-1.35	4.23-9.17-14.11	0.14-0.16-0.18	0.0- 1.5- 2.9	0.0- 0.5-1.0	.37	.37	5	6	48
	3-48	-38-	-36-	18-27- 35	1.20-1.23-1.25	1.41-7.76-14.11	0.16-0.18-0.19	0.0- 1.5- 2.9	0.0- 0.5-1.0	.32	.32			
	48-60	-67-	-15-	15-18- 27	1.25-1.30-1.35	4.23-9.17-14.11	0.13-0.15-0.17	0.0- 1.5- 2.9	0.0- 0.5-1.0	.20	.20			
Coarse textured soils	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
188—Talamantes loam, saline, 0 to 8 percent slopes														
Talamantes, saline	0-3	-39-	-37-	20-24- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.13-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.5-1.0	.37	.37	5	6	48
	3-24	-35-	-34-	28-31- 34	1.25-1.30-1.35	1.41-2.82-4.23	0.12-0.14-0.16	3.0- 4.5- 5.9	0.0- 0.5-1.0	.32	.32			
	24-60	-39-	-37-	20-24- 28	1.25-1.30-1.35	4.23-9.17-14.11	0.13-0.14-0.14	0.0- 1.5- 2.9	0.0- 0.5-1.0	.37	.37			
Clayey soils	—	—	—	—	—	—	—	—	—					
Quealman	—	—	—	—	—	—	—	—	—					
195—Torriorthents, 12 to 25 percent slopes														
Torriorthents	0-8	-43-	-39-	10-19- 27	1.40-1.50-1.60	4.23-23.28-42.34	0.10-0.12-0.14	0.0- 1.5- 2.9	0.5- 0.8-1.0	.20	.37	2	4L	86
	8-12	—	—	—	—	0.42-7.26-14.11	—	—	—					
Rock outcrop	—	—	—	—	—	—	—	—	—					
Badland	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
198—Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes														
Torriorthents	0-8	-18-	-49-	27-34- 40	1.30-1.40-1.50	0.42-2.32-4.23	0.07-0.10-0.12	3.0- 4.5- 5.9	0.5- 0.8-1.0	.32	.32	2	4L	86
	8-12	—	—	—	—	0.42-7.26-14.11	—	—	—					
Rock outcrop, shale	0-60	—	—	0- 0- 0	—	0.00-0.00-0.00	0.00-0.00-0.00	—	—				8	0

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
199—Torriorthents-Torripsamments complex, 12 to 40 percent slopes														
Torriorthents	0-2	-34-	-32-	27-34- 40	1.25-1.33-1.40	1.41-7.76-14.11	0.17-0.19-0.20	3.0- 4.5- 5.9	0.5- 0.8-1.0	.24	.24	3	4L	86
	2-15	-30-	-30-	15-40- 45	1.15-1.25-1.35	1.41-7.76-14.11	0.10-0.13-0.16	3.0- 4.5- 5.9	0.0- 0.3-0.5	.32	.32			
	15-19	—	—	—	—	0.42-7.26-14.11	—	—	—					
Torripsamments	0-4	-94-	- 1-	2- 5- 7	1.45-1.53-1.60	42.34-91.74-141.14	0.05-0.07-0.08	0.0- 1.5- 2.9	0.5- 0.8-1.0	.17	.17	2	1	310
	4-26	-84-	- 9-	2- 7- 12	1.45-1.50-1.55	42.34-91.74-141.14	0.04-0.05-0.06	0.0- 1.5- 2.9	0.5- 0.8-1.0	.17	.17			
	26-30	—	—	—	—	0.42-0.92-1.41	—	—	—					
Ruedloff	—	—	—	—	—	—	—	—	—					
Rock river	—	—	—	—	—	—	—	—	—					
Ryan park	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes														
Tresano	0-2	-42-	-37-	18-21- 24	1.25-1.33-1.40	4.23-9.17-14.11	0.14-0.16-0.18	0.0- 1.5- 2.9	0.5- 0.8-1.0	.32	.32	5	6	48
	2-28	-34-	-38-	20-28- 30	1.25-1.30-1.35	4.23-9.17-14.11	0.15-0.17-0.19	0.0- 1.5- 2.9	0.0- 0.3-0.5	.32	.32			
	28-60	-43-	-38-	16-19- 22	1.30-1.35-1.40	4.23-9.17-14.11	0.11-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.37	.37			
Hiatha	0-2	- 7-	-48-	40-45- 50	1.15-1.20-1.25	1.41-2.82-4.23	0.16-0.17-0.18	6.0- 7.5- 8.9	0.0- 0.3-0.5	.32	.32	2	4	86
	2-14	- 7-	-48-	40-45- 50	1.20-1.25-1.30	0.01-0.22-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.0- 0.3-0.5	.37	.37			
	14-18	—	—	—	—	0.42-0.92-1.41	—	—	—					
Kandaly	0-3	-79-	-17-	0- 5- 10	1.45-1.50-1.55	42.34-91.74-141.14	0.06-0.07-0.08	0.0- 1.5- 2.9	0.0- 0.3-0.5	.15	.15	5	2	134
	3-60	-80-	-17-	0- 4- 7	1.45-1.53-1.60	42.34-91.74-141.14	0.05-0.06-0.07	0.0- 1.5- 2.9	0.0- 0.3-0.5	.24	.24			
Badlands	—	—	—	—	—	—	—	—	—					
Moderately deep sandy loamy soils	—	—	—	—	—	—	—	—	—					
Ruedloff	—	—	—	—	—	—	—	—	—					
Shallow sandy soils	—	—	—	—	—	—	—	—	—					
Simanni	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
207—Vermillion-Langspring complex, 3 to 25 percent slopes														
Vermillion	0-3	-42-	-38-	15-20- 25	1.25-1.30-1.35	4.23-9.17-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.5- 0.8-1.0	.32	.32	2	6	48
	3-23	-39-	-37-	18-24- 30	1.30-1.35-1.40	4.23-9.17-14.11	0.10-0.12-0.13	0.0- 1.5- 2.9	0.5- 0.8-1.0	.17	.32			
	23-28	-39-	-37-	18-24- 30	1.30-1.35-1.40	4.23-9.17-14.11	0.07-0.08-0.09	0.0- 1.5- 2.9	0.5- 0.8-1.0	.10	.37			
	28-32	—	—	—	—	0.42-0.92-1.41	—	—	—					
Langspring	0-3	-40-	-38-	18-23- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.14-0.16-0.17	0.0- 1.5- 2.9	0.5- 0.8-1.0	.37	.37	5	4L	86
	3-17	-60-	-18-	18-23- 27	1.20-1.25-1.30	4.23-9.17-14.11	0.13-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.24	.24			
	17-60	-58-	-18-	18-24- 30	1.25-1.30-1.35	4.23-9.17-14.11	0.13-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.3-0.5	.24	.24			
Moderately deep soils over soft shale	—	—	—	—	—	—	—	—	—					
Deep gravelly soils	—	—	—	—	—	—	—	—	—					
Fenster	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Moffat County Area, Colorado														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
218—Yellowwash-Piezon complex, 5 to 15 percent slopes														
Yellowwash	0-2	-39-	-37-	20-24- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.10-0.13-0.15	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.20	.43	1	5	56
	2-10	-39-	-37-	20-24- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.10-0.14-0.18	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.20	.43			
	10-14	—	—	—	—	0.00-0.00-0.00	—	—	—					
Piezon	0-4	-40-	-38-	18-23- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.28	.28	3	4L	86
	4-30	-40-	-38-	18-23- 27	1.25-1.33-1.40	4.23-9.17-14.11	0.16-0.18-0.19	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.37	.37			
	30-34	—	—	—	—	0.42-7.26-14.11	—	—	—					
Deep soils	—	—	—	—	—	—	—	—	—					

Soil Qualities and Features

This folder contains tabular reports that present various soil qualities and features. The reports (tables) include all selected map units and components for each map unit. Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Soil Features (Powder Wash Evaporation Facility)

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to

corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Features–Moffat County Area, Colorado									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
		In	*In*		*In*	*In*			
20—Brownsto-Castee complex, 3 to 25 percent slopes									
Brownsto		—	—		0	—	Low	Moderate	Moderate
Castee		—	—		0	—	Low	Moderate	Moderate
Moderately deep soils over sandstone bedrock	Lithic bedrock	20-30-40	—		—	—			
31—Castee loam, 3 to 12 percent slopes									
Castee		—	—		0	—	Low	Moderate	Moderate
Brownsto		—	—		—	—			
95—Haterton-Piezon complex, 3 to 12 percent slopes									
Haterton	Paralithic bedrock	7- 16-20	—	Weakly cemented	0	—	Low	Moderate	Moderate
Piezon	Paralithic bedrock	20-23-40	—	Weakly cemented	0	—	Low	Moderate	Low
Fenster		—	—		—	—			
Thenipel		—	—		—	—			

Soil Features–Moffat County Area, Colorado									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
178—Simanni-Ruedloff complex, 1 to 10 percent slopes									
Simanni		—	—		0	—	Low	Moderate	Low
Ruedloff		—	—		0	—	Low	Moderate	Low
Kandaly		—	—		—	—			
Tresano		—	—		—	—			
186—Talamantes loam, 0 to 6 percent slopes									
Talamantes		—	—		0	—	Low	Moderate	Low
Coarse textured soils		—	—		—	—			
Debone		—	—		—	—			
187—Talamantes loam, 6 to 15 percent slopes									
Talamantes		—	—		0	—	Low	Moderate	Low
Coarse textured soils		—	—		—	—			
188—Talamantes loam, saline, 0 to 8 percent slopes									
Talamantes, saline		—	—		0	—	Low	High	High
Clayey soils		—	—		—	—			
Quealman		—	—		—	—			

Soil Features–Moffat County Area, Colorado									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
195—Torriorthents, 12 to 25 percent slopes									
Torriorthents	Paralithic bedrock	4- 8-30	—	Weakly cemented	0	—	Low	High	High
	Lithic bedrock	4- 8-30	—	Indurated	0	—	Low	High	High
Rock outcrop		—	—		—	—			
Badland		—	—		—	—			
198—Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes									
Torriorthents	Paralithic bedrock	4- 8-30	—	Weakly cemented	0	—	Low	High	High
Rock outcrop, shale	Paralithic bedrock	0	—	Weakly cemented	0	—	None		
199—Torriorthents-Torripsamments complex, 12 to 40 percent slopes									
Torriorthents	Paralithic bedrock	4- 15-30	—	Weakly cemented	0	—	Moderate	Moderate	Low
	Lithic bedrock	4- 15-30	—	Indurated	0	—	Moderate	Moderate	Low
Torripsamments	Lithic bedrock	20-26-80	—	Indurated	0	—	Low	Moderate	Low
	Paralithic bedrock	20-26-80	—	Weakly cemented	0	—	Low	Moderate	Low
Ruedloff		—	—		—	—			
Rock river		—	—		—	—			
Ryan park		—	—		—	—			

Soil Features–Moffat County Area, Colorado									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes									
Tresano		—	—		0	—	Low	Moderate	Low
Hiatha	Paralithic bedrock	10-14-20	—	Weakly cemented	0	—	Low	High	Low
Kandaly		—	—		0	—	Low	Moderate	Low
Badlands		—	—		—	—			
Moderately deep sandy loamy soils	Lithic bedrock	20-30-40	—		—	—			
Ruedloff		—	—		—	—			
Shallow sandy soils	Lithic bedrock	10-15-20	—		—	—			
Simanni		—	—		—	—			
207—Vermillion-Langspring complex, 3 to 25 percent slopes									
Vermillion	Lithic bedrock	20-28-40	—	Indurated	0	—	Low	Moderate	Moderate
Langspring		—	—		0	—	Moderate	Moderate	Moderate
Moderately deep soils over soft shale	Paralithic bedrock	20-30-40	—		—	—			
Deep gravelly soils		—	—		—	—			
Fenster		—	—		—	—			

Soil Features–Moffat County Area, Colorado									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
218—Yellowwash-Piezon complex, 5 to 15 percent slopes									
Yellowwash	Lithic bedrock	7- 10-20	—	Indurated	0	—	Low	High	High
Piezon	Paralithic bedrock	20-30-40	—	Weakly cemented	0	—	Low	Moderate	Low
Deep soils		—	—		—	—			

Water Management

This folder contains a collection of tabular reports that present soil interpretations related to water management. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Water management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Ponds and Embankments (Powder Wash Evaporation Facility)

This table gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, Ksat of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Ponds and Embankments (Powder Wash Evaporation Facility)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Ponds and Embankments–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Embankments, dikes, and levees		Aquifer-fed excavated ponds		Pond reservoir areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
20—Brownsto-Castee complex, 3 to 25 percent slopes							
Brownsto	50	Somewhat limited		Very limited		Very limited	
		Seepage	0.35	Depth to water	1.00	Slope	1.00
		Dusty	0.19			Seepage	0.72
Castee	30	Somewhat limited		Very limited		Very limited	
		Dusty	0.18	Depth to water	1.00	Seepage	1.00
						Slope	1.00
Moderately deep soils over sandstone bedrock	20	Not rated		Not rated		Not rated	
31—Castee loam, 3 to 12 percent slopes							
Castee	90	Somewhat limited		Very limited		Very limited	
		Dusty	0.18	Depth to water	1.00	Seepage	1.00
						Slope	1.00
Brownsto	10	Not rated		Not rated		Not rated	
95—Haterton-Piezon complex, 3 to 12 percent slopes							
Haterton	60	Very limited		Very limited		Very limited	
		Thin layer	1.00	Depth to water	1.00	Slope	1.00
		Piping	1.00			Depth to bedrock	0.62
		Dusty	0.29			Seepage	0.04
Piezon	30	Somewhat limited		Very limited		Very limited	
		Thin layer	0.99	Depth to water	1.00	Slope	1.00
		Piping	0.50			Seepage	0.72
		Dusty	0.29			Depth to bedrock	0.34
Fenster	5	Not rated		Not rated		Not rated	
Thenipel	5	Not rated		Not rated		Not rated	

Ponds and Embankments–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Embankments, dikes, and levees		Aquifer-fed excavated ponds		Pond reservoir areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
178—Simanni-Ruedloff complex, 1 to 10 percent slopes							
Simanni	50	Very limited		Very limited		Very limited	
		Piping	1.00	Depth to water	1.00	Seepage	1.00
		Seepage	0.43			Slope	0.68
		Dusty	0.06				
Ruedloff	40	Very limited		Very limited		Very limited	
		Piping	1.00	Depth to water	1.00	Seepage	1.00
		Seepage	0.58			Slope	0.68
		Dusty	0.01				
Kandaly	5	Not rated		Not rated		Not rated	
Tresano	5	Not rated		Not rated		Not rated	
186—Talamantes loam, 0 to 6 percent slopes							
Talamantes	85	Somewhat limited		Very limited		Somewhat limited	
		Piping	0.50	Depth to water	1.00	Seepage	0.72
		Dusty	0.31				
Coarse textured soils	8	Not rated		Not rated		Not rated	
Debone	7	Not rated		Not rated		Not rated	
187—Talamantes loam, 6 to 15 percent slopes							
Talamantes	90	Somewhat limited		Very limited		Very limited	
		Piping	0.50	Depth to water	1.00	Slope	1.00
		Dusty	0.31			Seepage	0.72
Coarse textured soils	10	Not rated		Not rated		Not rated	
188—Talamantes loam, saline, 0 to 8 percent slopes							
Talamantes, saline	85	Somewhat limited		Very limited		Somewhat limited	
		Piping	0.60	Depth to water	1.00	Seepage	0.72
		Salinity	0.50			Slope	0.08
		Dusty	0.46				
Clayey soils	10	Not rated		Not rated		Not rated	
Quealman	5	Not rated		Not rated		Not rated	

Ponds and Embankments–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Embankments, dikes, and levees		Aquifer-fed excavated ponds		Pond reservoir areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
195—Torriorthents, 12 to 25 percent slopes							
Torriorthents	95	Very limited		Very limited		Very limited	
		Thin layer	1.00	Depth to water	1.00	Slope	1.00
		Large stones	0.54			Depth to bedrock	1.00
		Dusty	0.26				
		Piping	0.22				
Rock outcrop	3	Not rated		Not rated		Not rated	
Badland	2	Not rated		Not rated		Not rated	
198—Torriorthents-Rock outcrop, shale complex, 30 to 75 percent slopes							
Torriorthents	60	Very limited		Very limited		Very limited	
		Thin layer	1.00	Depth to water	1.00	Slope	1.00
		Dusty	0.48			Depth to bedrock	0.90
		Piping	0.22				
		Salinity	0.13				
Rock outcrop, shale	40	Not rated		Not rated		Very limited	
						Slope	1.00
						Depth to bedrock	1.00
199—Torriorthents-Torripsamments complex, 12 to 40 percent slopes							
Torriorthents	60	Very limited		Very limited		Very limited	
		Thin layer	1.00	Depth to water	1.00	Slope	1.00
		Piping	0.50			Depth to bedrock	1.00
		Dusty	0.35				
Torripsamments	30	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to water	1.00	Seepage	1.00
		Thin layer	0.95			Slope	1.00
						Depth to bedrock	0.95
Ruedloff	4	Not rated		Not rated		Not rated	
Rock river	3	Not rated		Not rated		Not rated	
Ryan park	3	Not rated		Not rated		Not rated	

Ponds and Embankments–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Embankments, dikes, and levees		Aquifer-fed excavated ponds		Pond reservoir areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes							
Tresano	35	Very limited		Very limited		Somewhat limited	
		Piping	1.00	Depth to water	1.00	Slope	0.92
		Dusty	0.33			Seepage	0.72
Hiatha	30	Very limited		Very limited		Very limited	
		Thin layer	1.00	Depth to water	1.00	Slope	1.00
		Dusty	0.48			Depth to bedrock	0.69
		Hard to pack	0.03				
Kandaly	15	Very limited		Very limited		Very limited	
		Piping	1.00	Depth to water	1.00	Seepage	1.00
		Seepage	0.75			Slope	0.92
Badlands	4	Not rated		Not rated		Not rated	
Moderately deep sandy loamy soils	4	Not rated		Not rated		Not rated	
Ruedloff	4	Not rated		Not rated		Not rated	
Shallow sandy soils	4	Not rated		Not rated		Not rated	
Simanni	4	Not rated		Not rated		Not rated	
207—Vermillion-Langspring complex, 3 to 25 percent slopes							
Vermillion	40	Somewhat limited		Very limited		Very limited	
		Thin layer	0.91	Depth to water	1.00	Slope	1.00
		Dusty	0.29			Depth to bedrock	0.91
						Seepage	0.72
Langspring	35	Somewhat limited		Very limited		Very limited	
		Piping	0.50	Depth to water	1.00	Slope	1.00
		Dusty	0.13			Seepage	0.72
Moderately deep soils over soft shale	9	Not rated		Not rated		Not rated	
Deep gravelly soils	8	Not rated		Not rated		Not rated	
Fenster	8	Not rated		Not rated		Not rated	

Ponds and Embankments–Moffat County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Embankments, dikes, and levees		Aquifer-fed excavated ponds		Pond reservoir areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
218—Yellowwash-Piezon complex, 5 to 15 percent slopes							
Yellowwash	50	Very limited		Very limited		Very limited	
		Thin layer	1.00	Depth to water	1.00	Depth to bedrock	1.00
		Dusty	0.24			Slope	1.00
		Salinity	0.03				
Piezon	35	Somewhat limited		Very limited		Very limited	
		Thin layer	0.87	Depth to water	1.00	Slope	1.00
		Piping	0.50			Seepage	0.72
		Dusty	0.24			Depth to bedrock	0.12
Deep soils	15	Not rated		Not rated		Not rated	

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: “National Soil Survey Handbook.”

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology)

from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left

behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can

occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and

promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1
Moderate: 13-30:1
Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field

generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

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Dominion Energy®

Rule 908.b(8)
Operating Plan

Wexpro Company®

Powder Wash Evaporation Facility

WEXPRO COMPANY
POWDER WASH EVAPORATION FACILITY
OPERATING PLAN

A. Description

The Powder Wash Evaporation Facility (Facility) will receive and evaporate produced water recovered from gas wells owned and operated by Wexpro Company in the Powder Wash Unit, Ace Unit, and Jacks Draw Unit located in Moffat County, Colorado. The wells that will be contributing water to this facility are currently producing from the Wasatch, Fort Union, and Lance formations. Produced water will be transported via truck to the Facility.

Prior to transport of the produced water, gas will be separated through a dehy/separator located on each individual well facility and stored in a produced water tank. A tank truck will load from the designated produced water tank and haul the produced water to the Powder Wash Evaporation Facility.

Wexpro Company will be taking all precautions to avoid any Hydro-Carbons entering the evaporation pond. Initial Separation of Gas, Condensate and Produced Water occurs at the well location through a separation process. **Initial** Separation of Gas, Condensate and Produced Water occurs at the well location by interrupting the gas flow with pressure cuts, heat and forcing retention time in a three phase separator where the liquids and vapors are allowed to naturally separate from each other. Once the liquids have naturally separated and somewhat stabilize inside the vessel, mechanically controlled valves open at specifically set parameters allowing water to be dumped through piping to the water tank and condensate dumped through piping to the condensate tank. Once the liquids have entered the specified tanks, a **second** point of much more efficient natural separation takes place which is manually interfered with to move water and condensate to their appropriate tankage via pump truck transferring. The produced water would then be hauled, by trucks within the Powder Wash, Jacks Draw, and Ace field to the evaporation facility where the water truck driver connects hoses equipped with camlock fittings to a pump skid, engages the skids electrically driven offload pump which pumps the contents of the truck through a series of filters, to a skimmer tank which would serve as a **third** point of separation to extract any potential hydrocarbons. From the tanks, the produced water is transferred to a lined and netted skim pit, which would be approximately 100' x 58', this skim pit would serve as a **fourth** point of separation to separate any potential hydrocarbons. Any remaining hydrocarbons will be skimmed off the skim pit and put back into the skim tank. The produced water would then be transferred to the evaporation pond, which would be approximately 300' x 300'. The produced water is then pumped from the pond to Barracuda Wastewater evaporators where the water is forced through a stainless steel manifold with 30 spray nozzles specifically designed to allow longer float times maximizing evaporation. The evaporators will be electronically controlled to operate only during specific weather conditions related to humidity, wind speed and temperature with intent of minimizing or eliminating overspray.

The current flow rate into the facility is anticipated to be approximately 5,200 barrels per month (BPM) at mass intake. If Wexpro Company begins active drilling in the area, the throughput will increase initially and then decline over the life of the wells. The maximum working capacity of the facility is approximately 150,000 barrels (bbls). Water levels in the pond will be monitored with a fluid level monitor to track fluctuation and to assure a minimum of two feet of freeboard in the ponds at all times.

B. Dust and Moisture Control

The primary dust control measure used at the facility will be to apply water to the access road and facility site as needed to control dust during operation. However, dust control is typically not needed in this area. Water will be taken from one of the following water sources:

1. Power Wash Deep Well #1 – SE NW 29-12N-97W
    - CDPHE Permit #67436F
2. Powder Wash Camp Water Source Wells – NE NE 5-11N-97W
    a. Musser 2 Water Well – CDPHE Permit #35879F
    b. Musser 3 Water Well – CDPHE Permit #35880F

Wexpro Company has incorporated this facility into its existing spill prevention, control, and countermeasure plan (SPCC) to prevent the discharge of petroleum products from the storage tanks. The current authorization number is COR03I332. The off load produced water storage tanks will be surrounded by a steel secondary containment of sufficient capacity to contain 110% of the largest storage tank. Wexpro Company will comply will all appropriate Colorado Division of Oil and Public Safety standards associated with storage tanks and tank batteries. Refer to Wexpro Company's Emergency Response Plan for specific emergency response procedures. (Attachment ERP in the Contingency Plan)

Wexpro Company intends to use engineered controls from allowing any misting from blowing outside of the lined pit itself, as any misting outside of the lined pit (including the 30' fire lane) will be considered a Spill/Release. Wexpro Company will install a doppler radar system that will detect wind speed, direction, and humidity. Control limits are set to avoid overspray. When levels reach a certain criteria the evaporators will automatically shut off.

C. Sampling

Wexpro Company proposes to continue to use the existing water well known as Musser 2 Water Well, at Powder Wash Camp, located west of the facility, to monitor water quality. Water samples will be collected from the permitted Musser Water Well #2, as it is the only water well being used for domestic purposes within a 2 mile radius. Groundwater samples that have recently been collected and analyzed will be used to establish baseline quality conditions. Musser 2 water well analysis results from 2013 through 2018 are included as attachment A-14 in Figures. Analytical parameters will be selected based on the proposed waste streams handled in the evaporation facility and will include all major cations and anions, total dissolved solids, iron, nitrates, nitrites, and, pH, and specific conductance. Testing will be conducted twice a year and results will be provided to the COGCC within 3 months of collecting samples. Results of the monitoring program will be included in Wexpro's annual 900 Series facility report to the Director of the COGCC.

D. Inspection and Maintenance

A daily visual inspection will be conducted of the evaporation pond, a daily check will also be completed of the Bird Avert System. The daily check of the Bird Avert System will consist of the following:

- Checking the computer system for any alarms or malfunctions,
- The complete Bird Avert System will be manually activated to insure the system is operating.

These daily visual and Bird Avert System checks of the facility will be recorded in a log book kept on location, where upon request, will be available to any authorized governing agency.

The facility's fluid levels and leak detection will be monitored in person on a daily basis. Incremental markers will be located on the liner and will be visible. The water level will be monitored to ensure a minimum of two feet of freeboard in the ponds at all times. A leak detection system will be installed as follows:

The skim pit and evaporation pond will be lined with a 4 part HDPE liner system, which will also include a leak detection system. (Sheet 4 of the engineered drawings).

1. Primary Liner, 60 mil min. HDPE.
2. 200 Mil GSE Hypernet Geonet or Approved Equal.
3. Secondary Liner, 60 mil min. HDPE.
4. Geotextile Fabric or Bedding Material Under Bottom Liner.

The skim pit will be netted with 1" or less size holes. The leak detection system will consist of the following:

- 4 Part HDPE Liner System, with leak detection for both Skim Pit and Evaporation Pond.
- Primary liner is 60 mil min. HDPE.
- 200 Mil GSE Hypernet Geonet or Approved Equal.
- Secondary liner, 60 mil min. HDPE.
- Geotextile Fabric or Bedding Material under bottom liner.

The Pond will be constructed with a pyramid shaped bottom and extended excavation at each corner where monitoring wells will be installed and checked by operations personnel on a daily basis for early detection of liner breach.

Initially all monitor wells (one at the skim pond and two at the evaporation pond) will be gauged daily until water has covered the entire pond; then they will be gauged weekly.

The observation sump will consist of PVC pipe stand with a solid bottom and a rodent proof lid. The observation sump will also have an invert 2 feet lower than the pipe invert elevation. The leak detection system and observation sump are detailed on Sheet 4 of the engineered drawings.

When water is pumped to the facility, the water supervisor will be informed of the intention to pump and will be given the anticipated time, expected duration and quantity. Once authorization to pump has been given by the water supervisor, personnel experienced in produced water management will walk the entire surface system and inspect all fittings and valves to ensure they are all in good working condition and in proper alignment for water receipt at the facility. Verification will be communicated to all parties involved that pumping operations can commence. The water truck driver connects hoses equipped with camlock fittings to a pump skid, engages the skids electrically driven offload pump which pumps the contents of the truck through a series of filters. The pump system will be put on line and onsite flow volumes will be confirmed. All valves will be placed in proper alignment before and after the job. After pumping operations commence, verification that water flow has been established will be reported back to the pumping crew. All volumes will be cross checked after completion of the job to ensure anticipated water volumes were pumped. Metering records of all jobs including date, location, time and quantity will be kept and reported to proper personnel.

During normal operations, daily inspections will be performed by a Wexpro Company field operator or designated representative. During the daily inspection, the operator will perform the activities detailed in the "Powder Wash Evaporation Log", (Appendix A). Adherence to the criteria on the checklist will involve visual inspections of the facility, equipment and tanks, an assessment of the pond level while also looking for any sheen, visual inspection of stormwater BMP's, skim pit netting, wildlife fencing, and performance of general housekeeping activities. The field operator will ensure that all equipment is working properly and document the inspection. If any irregularities are noted during the inspection, a supervisor will be notified and if required an appropriate response plan will be coordinated to resolve any issues.

Pond water will be sampled weekly and results will be provided upon request. Leak detection testing on piping, sampling from test wells, sampling of monitoring springs and additional equipment inspections will occur. These items are detailed on the "Powder Wash Evaporation Log" (Appendix A). Based on inspection results, Wexpro Company will determine if the facility will need to be drained and given a full inspection. The schedule of inspections may be modified by the COGCC as part of the State's approval process, but otherwise will take place on a daily and weekly basis. All checklists will be revised, as necessary, to keep with current regulatory requirements.

E. Emergency Response

To ensure a safe and timely response to emergency situation, Wexpro Company provides all field personnel with contact information for the Moffat County Sheriff's Department, the Craig, Colorado fire department, and emergency medical service providers. Wexpro Company will provide local emergency response agencies with a detailed map showing the location of the facility, providing detailed directions and GPS coordinates to facilitate a timely response. Wexpro Company's Emergency Response Plan has been include as an attachment. A helicopter landing site has been established and is located at N 40^{0}57.086′, W -108^{0}18.634′. In the case of injuries or medical problems that are not life threatening, the injured person would either be transported from the facility in a company or contractor vehicle to the nearest medical center for treatment, or transported by ambulance; depending on circumstances.

Smoking on-site and open fires will not be permitted at the facility. All vegetation will be cleared from the site during construction, reducing the risk of wildfires.

F. Record Keeping

As stated above, typical operation of the facility will include transferring water to the facility from existing well pads by truck. It will be the responsibility of the field operator to manage daily inputs to the facility. All evaporation pond facility operations will fall under the control of Wexpro's production and field operations group.

All records of the site inspections will be filled in manually, signed by the responsible operator, and scanned into an electronic record keeping system for access by all management personnel. Wexpro Company will manually record the facility operation parameters as well as generate electronic tracking to maintain a safe operational facility.

G. Site Security

The site is located in a rural and remote area of Moffat County north of Craig, Colorado.

The facility is fenced to prevent access to the pond area by wildlife or domestic animals. A manually locking gate will be located at the entrance of the facility and will remain open during daily operations. One cattle guard will be in place to keep area wildlife and domestic animals from entering the open gate. All wildlife that may inadvertently become trapped by the fencing will be immediately reported to the Colorado Division of Parks and Wildlife.

H. Hours of Operation

The facility will operate 24 hours a day during spring, fall, and summer months for evaporation. The evaporation devices will be inactive during winter months, however, the facility will continue to operate. Contractors will be onsite during offloading of produced water between the hours of 7:00 A.M. and 5:00 P.M. and for field personnel to complete daily visual inspections.

I. Noise and Odor Mitigation

Wexpro Company does not anticipate any noise or odor issues with the facility. Noise impacts will be controlled through the implementation of industry best management practices and requirements under any regulatory permits. The facility will adhere to Moffat County, COGCC, CRS, and BLM criteria for Industrial/Agricultural/Rural zones. Impacts associated with odor will be mitigated by adherence to the Colorado Department of Public Health and Environment (CDPHE) Air Quality permitting.

J. Final Disposition of Waste

If the accumulation of fluid in the evaporation pond exceeds the working capacity, it will be transported to a licensed disposal facility or permitted injection well. All existing wells are currently authorized for disposal at Wexpro's F Wilson 21 Disposal Facility, Hiawatha, CO. Accumulated sediment wastes and solids from the "sludge tank" will be transported to a licensed disposal facility once a year. Any testing of the material will be completed at the direction of the disposal facility.

K. Leak Detection Actions and Annual Reporting

If inspection of the leak detection system determines fluids are accumulating in the "containment area" as a result of a leak, the pond will be emptied to a point where the leak detection system is no longer detecting fluids. All liquids will be disposed of according to the appropriate local, state, and federal regulations and approvals. If a leak is identified, it will be reported to the BLM and COGCC immediately for review and input. Any evidence of contamination to groundwater will be reported immediately. All leaks will be managed in accordance to COGCC Rule 906, Environmental Protection Agency's SPCC regulations and BLM Onshore Order 7 and NTL-3A, Reporting of Undesirable Events.

Wexpro Company will submit an annual 900 Series facility report summarizing operations, including the volume of produced water disposed of at the facility and the test results of all spring and monitoring well samples.

Wexpro Company will submit all test results from monitoring wells and springs within three months of collecting the samples. Results of the monitoring program will also be included in Wexpro's annual 900 Series report to the Director.

L. Facility Closure

When the facility is deemed to be at the end of its useful life, it will be closed according to local, state, and federal regulatory requirements for disposal of wastes in place at the time. All accumulated wastes will be disposed of according to applicable regulatory requirements.

Methods for disposal of the accumulated wastes could include transport to a licensed facility, land farming or burial; depending on the chemical constituents of the materials, analyzed through sampling.

Wexpro Company will submit a Form 4 Sundry Notice to the COGCC for approval prior to commencing closure of the facility. All documentation will be simultaneously reported to the BLM. Wexpro Company will collect unevaporated pit water samples and analyze them for compliance with Table 910-1 concentration levels.

APPENDIX A
Inspection Checklist

POWDER WASH EVAPORATION LOG

MONTH/YEAR:_____

Date	EOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Computer System Ok (Alarms/Malfunctions)																																
Manually Activated Birds																																
Visually Inspected Pond (For Birds/Oil/Fencing Secure)																																
Visual Confirmation of Incremental Markers on Liner for Pond Depth																																
MW 1 Gauge (Weekly) Skimmer Pit (RP 18'0")																																
MW 2 Gauge North West Pond 1 (RP 25'0")																																
MW 3 Gauge North East Pond 1 (RP 24'1/2")																																
MW 4 Gauge South West Pond 1 (RP 24'3")																																
MW 5 Gauge South East Pond 1 (RP 24'9")																																
Weekly Water Samples Taken																																
Heat Trace Temp.																																
Electric (E) or Pneumatic (P) Pump On																																
Fuel Gas Usage																																
MW 6 Gauge North West Pond 2 (RP 24'5-1/2")																																
MW 7 Gauge North East Pond 2 (RP 24'0")																																
MW 8 Gauge South West Pond 2 (RP 23'6-1/4")																																
MW 9 Gauge South East Pond 2 (RP 23'5-1/4")																																
Operator Initials																																

Note: Pond 2 monitor wells will be gauged monthly until water has covered the entire pond, then they'll be gauged weekly.

Remarks:_____

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Dominion Energy®

Groundwater and Surface Water Monitoring Sampling Analysis Plan Rule 908.b(9-10)

Wexpro Company®

Powder Wash Evaporation Facility

WEXPRO COMPANY
POWDER WASH EVAPORATION FACILITY
GROUNDWATER SAMPLING AND ANALYSIS PLAN

I. Introduction

This groundwater sampling and analysis plan is intended for use on the Wexpro Company Powder Wash Evaporation Facility that is located in the NWNW1/4 of Section 4, Township 11 North, Range 97 West, Moffat County, Colorado. This SAP will be utilized to monitor the quality of ground water, and to assure quality and consistency in data collection. The following is intended to be accomplished by using this SAP:

- Collection of groundwater samples from wells, springs, and seeps;
- Collection of groundwater data;
- Documentation of data collection activities;
- Decontamination procedures; and
- Analytical Program and Quality Assurance.

II. Field Data Collection Activities

Groundwater sampling locations will be selected by using the United States Geological Survey (USGS) online database at http://co.water.usgs.gov/; the Colorado Oil & Gas Conservation Commission GIS mapping tool at http://cogcc.state.co.s/maps.html#/gisonline or by utilizing data through the USGS National Hydrography Dataset for Colorado; which can be found at: http://nhd.usgs.gov.

Water source means a water well that is registered with Colorado Division of Water Resources, permitted or adjudicated springs, or monitor wells installed for the purpose of complying with groundwater baseline sampling and monitoring requirements.

Wexpro Company will utilize a third party contractor or properly trained field personnel to ensure that appropriate procedures will be followed and applied to the collection of groundwater samples from domestic and irrigation water supply wells. Field measurements and field tests will be conducted by using appropriate equipment according to manufacturer's specifications. Requirement of the third party contractor or trained field personnel will include but are not limited to:

- Record all information so that it can be easily transferred and interpreted by those not familiar with the field collection activities.
- Utilize field data sheets to record all data collection activities and ensure that all sheets are legible when copied. Field data sheets should be transferred to an electronic format. These data sheets should address the following information:
    - Name of individual(s) on site and the task being performed;
    - Place for those individuals to initial;
    - Equipment used for the activity;
    - Equipment calibration records;
    - Daily weather conditions (temperature, wind condition, precipitation);
    - Location and time of sampling;
    - List any individual(s) (including any visitors, member of the general public, and landowners) present during the sampling activities.

The following procedures will apply to the collection of groundwater samples from domestic and irrigation water supply wells.

- Well owner approval will be obtained prior to any sampling.
- Prior to sampling, the well should be purged for at least 15 minutes, and an average flow rate should be measured.
- Samples collected from domestic wells should be collected directly from the wellhead tap or other sampling port located upstream of any water treatment system or holding tank used for the water supply system. Samples will be collected only if they can be collected without disturbing or removing any down-hole pump or wiring.
- Samples collected from domestic wells will follow the protocols established by the state engineer's office.
- The individual collecting the sample should wear disposable gloves to prevent cross contamination of the samples and/or water supply. The gloves should be changed following the collection of each sample from each sample location.
- Sample vials/jars should be given a distinct ID including the sample location or well number and labeled with the requested analysis, date, time, and initials of the sampler.
- Samples should be placed in clean, non-preserved samples containers and will be filled with zero head space and all samples will be put on ice immediately to be received by the analyzing lab at a temperature of between 0-6°C.

The following procedures will apply to the collection of groundwater samples from sources such as seeps and springs.

- Landowner/water rights owner approval will be obtained prior to any sampling.
- If possible, a flow rate measurement should be obtained at the time of sampling.
- Samples should be obtained using an appropriate water collection device as determined by site conditions. In some cases it may be necessary to collect samples at a site down gradient of a spring or seep in order to have the flow required to fill the sample containers.
- The individual collecting the sample should wear disposable gloves to prevent cross contamination of the samples and/or water supply. The gloves should be changed following the collection of each sample from each sample location.
- Vials will be filled with zero head space and all samples will be put on ice to be received by the analyzing lab at a temperature of between 0-6°C.

Samples will be analyzed using standard methods appropriate for detecting the target analyte. Analysis of samples will be performed by a laboratory that maintains state or national accreditation programs. Detection limits should be equal to or less than the concentrations in COGCC Table 910-1.

Analyte	Initial Baseline	Subsequent Sampling	Concentration Level
Benzene	X	X	5 ug
Toluene	X	X	560 to 1,000 ug
Ethylbenzene	X	X	700 ug
Xylenes (Total)	X	X	1,400 to 10,000 ug
Total Dissolved Solids (TDS)	X	X	<1.25x background
Chlorides	X	X	<1.25x background
Sulfates	X	X	<1.25x background

Liquid hydrocarbons including condensate and oil	X	X	Below detection level

All sample collection equipment will be thoroughly cleaned prior to initiation of sampling activities and between use at each site.

Personal protective equipment (PPE) will be worn whenever hazardous or unknown substances are encountered during sampling activities. PPE to be used includes, but is not limited to Tyvek body suits, safety glasses or face shields, respiratory protective equipment, and rubber gloves and boots.

III. GROUND WATER MONITORING SELECTION

a. Water Wells
   i. Samples will be collected from water wells known to Wexpro Company or registered with the Colorado State Engineer within a 1 mile radius of the Powder Wash Evaporation Facility. Reference the Geologic and Hydrologic Assessment included in this submittal for the location and description of water wells within a 1 miles radius.
   ii. Water will be analyzed to establish a baseline water quality prior to the initial use of the facility.
   iii. If access cannot be obtained for the purpose of collecting water samples; Wexpro Company will notify the Director of the wells for which access could not be obtained and sampling of that well(s) will not be required.
   iv. Copies of all test results will be provided to the Director and to the water well owner within three months of collecting the samples. Lab results will be submitted to the Director in an electronic deliverable format.

b. Site-specific Monitoring Wells
   i. Wexpro Company will be utilizing a dual liner leak detection system in addition to installing two observation sumps on the evaporation pond and one observation sump on the skim pit. Wexpro Company feels this alternative method offers equivalent protection of public health, safety, and welfare, including the environment and wildlife resources.

c. Surface Water Monitoring
   i. Wexpro Company will use reasonable good faith efforts for the purpose of collecting water samples. If access cannot be obtained, Wexpro Company will notify the Director of the surface water for which access was not obtained and sampling of that specific surface water by the operator will not be required.

IV. Contingency Plan

a. Wexpro Company has provided a contingency plan included in this submittal. The plan describes the emergency response operations, 24-hour contact information, and an outline of responsibilities.

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Rule 908.b(11)
Contingency Plan

Wexpro Company®

Powder Wash Evaporation Facility (PWEF)

POWDER WASH EVAPORATION FACILITY
CONTINGENCY PLAN
January 25, 2018
Section 4, T11N, R97W
MOFFAT COUNTY, COLORADO

Section 1.0
INTRODUCTION

1.1 Purpose
Wexpro Company is fully committed to taking all possible precautions, from the offloading of the produced water and multi-step separation processes, with the associated tank containment, load line valves being located within those tank containments, etc., to the 4 part HDPE liner system, with the included leak detection system. Wexpro Company has prepared this Emergency Response Plan (ERP) to enable a coordinated and efficient response by Wexpro Company in the event of an emergency. This ERP details the notification and response procedures by which any such emergency shall be handled.

1.2 Applicability
An accident, disaster, spill, or unintentional release into the environment may cause a variation of reporting requirements. Reporting requirements will vary depending upon the unique emergency situation. This procedure provides guidance for fulfilling the requirements of Wexpro Company or their designated representative.

Section 2.0
RESPONSE ORGANIZATION AND COORDINATION

2.1. Wexpro Company Organization
The reporting of spills or accidents is the responsibility of the initial responder. Training and awareness and of this procedure by all potential responders is critical to ensure proper implementation. Copies of this plan will be maintained in the Wexpro Company Powder Wash field office, the Rock Springs District office, and in the possession of emergency response staff; and will be updated as needed. Should an extreme emergency occur, Wexpro Company has an EHS team that would be contacted and onsite. The *Emergency Notification Contact List* and *Emergency Response Procedures* have been incorporated into Appendix A-1 of this document.

2.2 Response Training
All employees operating the facility will receive training in the event an emergency should ever occur. Annual refresher training will occur with all field personnel. Response procedures and materials will be evaluated annually and any changes incorporated within a revised Emergency Response document. Revised procedures will be distributed to all applicable personnel, contractors, BLM, COGCC and Moffat County representatives.

2.3 Documentation

Appropriate oral and/or written notification will be made based upon the situation and reporting requirements. On-site personnel should immediately address corrective action and/or countermeasures.

A written record of all pertinent information given to each applicable Agency and the Agency's response will be retained by a Wexpro Company designated representative. The information will include:

- Name, address, and location of the facility;
- Name, title and phone number of the person reporting the incident, the responsible party and the contact person;
- Legal location of the facility (section, township and range); and/or offsite location;
- Type of emergency;
- Injuries with identification of the injured party;
- Substance/material spilled, and volume/quantity of the spill;
- Detailed description of response, containment, and remedial efforts, including disposal or treatment alternatives;
- Bodies of water involved, potential threat to ground and/or surface water, and the extent of actual and potential pollution;
- A chronological timeline of all events including: a complete description of circumstances causing the emergency, release, or spill, actions taken, and applicable explanations;
- Any spill or release of a hazardous waste;
- A description and estimate of any third party damages;
- Procedures, methods and precautions stabled to prevent a similar re-occurrence; and
- Other relevant information pertaining to the specific emergency.

Section 3.0
INITIAL RESPONSE ACTIONS

There are several best management practices that can be utilized to minimize the threat to human health and the environment when an emergency or spill of hazardous substances is first detected. The following measures should be considered as general guidelines and may not apply to all circumstances.

3.1 Initial Contact

If an emergency or spill endangers the health or welfare of the public immediately refer to the *Emergency Notification Contact List.* When making these initial notifications personnel should attempt to provide, at a minimum the following details:

- Name of caller and a call-back number;

- Location and description of the incident;
- Extent of injuries and assessed damages; and
- Type of material involved including any hazard information.

3.2 Human Safety

Only trained personnel should approach a fire or spill. First responders should:

- Approach the scene cautiously;
- Identify any hazards and injuries;
- Avoid entering a hazardous area or come into contact with any spilled material;
- Avoid inhalation of gases, fumes, vapors, and smoke. Do not assume that gases and vapors are harmless.
- Secure the site. Contact law enforcement authorities, if necessary, to keep the public away from the incident site.
- Decide on site entry. Only enter the area when wearing appropriate PPE and with proper safety equipment.
- Identify and remove all ignition sources without endangering life;
- Make appropriate contacts utilizing the Emergency Notification Contact List.

3.3 Hazard Identification

First responders should refer to the Orange Emergency Response Guidebook for the various hazardous material guidelines or the appropriate MSDS/SDS sheet pertaining to a specific hazardous material. Do not attempt to take any action beyond your level of training and without the proper PPE. Refer to *Emergency Response Procedures* (appendix).

3.4 Mitigation Measures

Trained personnel should take action to control any ongoing hazards, shut off the source of any spill or discharge, and contain and mitigate the spill.

3.4.1 Discovery of Small Leaks through the "Leak Detection System"

If there were a small leak detected through the "Leak Detection System", there are companies equipped to fix these leaks, while the holding ponds are full of produced water.

If a failure occurred with the holding pond, the produced water would be hauled to one of the following produced water disposal sites by truck. The haul route will be over county, state and lease roads in Colorado and Wyoming. All wells within the Powder Wash, Ace, and Jacks Draw field, currently have BLM, and appropriate state agency approval to take produced water to:

a. Kinney 6, Produced Water Evaporation Facility.
    i. This produced water evaporation facility is located roughly 26 miles from the PWEF. *Wexpro Company Operated Facility.*
b. Legends Disposal Well.
    i. This produced water injection well is located roughly 39 miles from the PWEF.

c. F. Wilson 21 Disposal Well.
    i. This produced water injection well is located roughly 19 miles from the PWEF. *Wexpro Company Operated Facility.*
d. Great Divide Disposal Facility.
    i. This produced water evaporation facility is located roughly 13 miles from the PWEF.

3.4.2 Containment and Recovery of Spills on Land

In the event of a major berm failure where large amounts of produced water left the facility, a visual inspection of nearby streams, waterways, ditches, and natural gullies should occur on foot to determine the extent, if any, of migration and impacted pathways.

The appropriate surface owner should be notified prior to any construction activities. Containment facilities should be constructed if any impacts are identified; provided verbal approval has been obtained. Spills on hard (frozen) surfaces can be deflected into constructed ditches or ponds by utilizing sandbag barriers. To prevent the released product from entering into the subsurface or leaching into ground water, a liner should be used to line any ditch, earthen dam or pit used to divert water.

An attempt would be made to recover produced water using a hydrovac truck and the water would be returned to storage when possible. Any contaminated soil would be analyzed per COGCC Table 910-1 requirements, potentially treated and possibly removed and managed/disposed of in accordance with applicable regulations in a manner approved by an Environmental Coordinator. Any supplies or equipment depleted or destroyed as a result of the discharge or subsequent response activities will be replaced as soon as possible. Wexpro's General Manager, Regulatory Compliance Coordinator or designated representative will be informed of the cleanup activities and obtain approval for the disposition of all materials. Where required, contaminated soil and water, and contaminated materials used in the response will be sent to an approved facility for disposal in compliance with the Clean Water Act, the Resource Conservation and Recovery Act and amendments, applicable state regulations, and as approved by an Environmental Coordinator.

3.4.3 Containment of Spills in Shallow Water

The type of containment selected will depend on site-specific conditions and materials readily available. Typically, spill booms are utilized to contain and capture product as long as the water is deep enough to allow free flow of water under the boom.

Wexpro Company will follow the procedures outlined in the attached Dominion Energy "Spill Prevention Control and Countermeasure Plan", (Appendix A-2).

3.4.4 Containment of Spills in Deep Water

There is not a deep surface water source within 10 miles of the facility. However, should a potential breach occur, causing contamination in deep water, standard industry practices would be implemented. A containment boom is the best method of confining a spill to deep water. In the event that contaminates reach a flowing stream or river the boom would be placed at an angle to the shoreline in order to channel the product to shore. The greater the velocity of flow, the greater the angle should be on the boom. Skimmer pits would be dug at the downstream end of the boom in order to retrieve the product. A hydrovac truck would then be utilized to remove the product from the skimmer pit and haul it to a commercial facility for disposal.

Product trapped in containment devices will typically be sucked up using a hydrovac truck and hauled to a commercial disposal facility.

3.5 Response Materials

Field personnel will be properly trained on the use and location of all response equipment.

a. Contact list and phone numbers for the facility response coordinator (the Field Forman) are maintained in Wexpro's "Emergency Response Plan", (Appendix B). Cleanup contractors and phone numbers for each area are maintained on site.
b. In the event a major catastrophe, certain federal, state and local notification and reporting requirements become effective, as well as notification of the appropriate regulatory agencies. All agency notifications will be made by Wexpro's General Manager, Regulatory Compliance Coordinator, or designated representative.
c. Signs will be located at the facility, with emergency contact phone numbers, if others outside of Wexpro Company noticed a problem.
d. Wexpro Company has general agreements with multiple water hauling/trucking companies in the local area, if produced water ever needed to be transferred immediately, multiple companies could quickly respond.

APPENDIX A-1
Wexpro Company Emergency Response Plan

WEXPRO COMPANY EMERGENCY RESPONSE PLAN

Revised – 09/05/13

TABLE OF CONTENTS

ATTACHMENTS

1. STATEMENT OF POLICY

- Company natural gas emergencies and emergency conditions will occur in varying degrees. Some emergencies may be relatively minor and require minimal attention. However, major emergencies may require the actions and combined efforts of many employees and outside personnel. Actions taken during an emergency must be based on the particular situation. This plan will not describe in detail the specific actions to be taken in emergency situations. It will establish general guidelines, procedures and actions to minimize hazards to life and property during an emergency.

Employees are expected to understand the following priorities when dealing with emergencies (descending order of importance):

- Public and Employee safety
- Protecting property
- Environmental concerns
- Customer inconvenience
- Public relations
- Economic Considerations

2. SCOPE

- The Emergency Response Plan is issued to encompass Wexpro Company employees in remote field locations, field offices, plants, production facilities and various company properties. In the event of an emergency, this Emergency Response Plan will be activated. Wexpro employees are to take the necessary actions required to safeguard Company personnel and the public.

3. OBJECTIVE

- The Wexpro Emergency Response Plan is intended to provide a practical, organized and pre-planned method for responding to emergencies and to establish consistent on-site priorities. Whenever possible, Company personnel will take immediate action to minimize the effects of an emergency.

The Plan's objectives are to:

- Protect the life and health of Company employees and the community.
- Protect the environment.

- Protect Company and community property.
- Prevent or minimize the disruption of business and public services.

An accurate, effective and safe response to emergency situations is critical to these objectives. While the above objectives are important, protecting life will always remain the first and highest priority.

An effective and viable Emergency Response Plan is recognized as a necessary tool to guide an appropriate response. Wexpro Company is determined to ensure that all company operations have and maintain such a plan.

Although this plan addresses several types of emergency situations which may occur, it recognizes that flexibility and the use of company personnel's knowledge and experience is critical to the safe resolution of emergencies. Response actions outlined in this plan provide a framework which are to be put into operation, while promoting quick, decisive actions and protecting the safety of employees, contract personnel and the public.

Wexpro managers and all employees are responsible for implementing the Emergency Response Plan (ERP). Environmental and Safety Services (E&SS) is responsible for working with the Wexpro managers to ensure that the items outlined in this plan meet applicable OSHA, regulatory and safety standards.

At no time should Wexpro Company personnel assume an unreasonable risk, or assign or instruct another individual to perform an unsafe act while responding to or in an emergency situation.

An unreasonable risk exists when:

- The task exceeds the physical abilities of an individual.
- The individual is not properly trained to complete the task.
- The individual does not have adequate experience to complete the task.
- The individual does not have the proper protective clothing or safety equipment to complete the task.
- When company written standard operating practices prohibit attempting the task.
- If the task is immediately hazardous to the life, health or wellbeing of the individual.

4. HOW TO USE THIS PLAN

The Table of Contents refers the user to the sections or page numbers for quick reference. Once the desired section is located, written instructions provide the necessary information for that section and item; this makes it easier and faster to find critical information while under pressure.

Three types of special information are conveyed through highlighted notes within the plan. The signal words "DANGER", "CAUTION" and "NOTE" carry special meaning.

DANGER: Indicates important information or data that could result in death or serious injury to the individuals responding to an emergency.

CAUTION: Indicates important information or data that emergency responders should be aware of, in order to safely perform their duties.

NOTE: Includes important operational information that helps explain why a particular recommendation in the plan should be followed. Notes usually convey real world and practical operating information to the user.

PLAN RECOMMENDATIONS

Wexpro managers, supervisors, foremen, field and support personnel must familiarize themselves with the Emergency Response plan, at least annually with documentation to be placed in the Self Inspection Program book for each area or field.

- The Emergency response Plan must be distributed to and made readily available to all company personnel and any individual or company that may be impacted or will be able to lend assistance or aid in the event of an emergency.
- Upon discovery that an emergency exists, ALL company personnel are authorized and expected to activate the Emergency Response Plan.
- Contacts with local, state or federal officials regarding environmental, health or safety matters are to be reported immediately to company Management and Environmental and Safety Services personnel.

DISTRIBUTION

Copies of the Emergency Response Plan must be widely distributed to company offices, field offices, field personnel, support staff and emergency responders. The Emergency Response Plan is not confidential, controlled and no distribution list is required or maintained since the goal of the company is to inform as many employees, responders and emergency services as possible of the Wexpro Emergency Response Plan.

FOR ASSISTANCE

For additional copies of Wexpro's Emergency Response Plan contact the Administrative Assistant to the General Manager or the E&SS Department. For further assistance please contact a member of the E&SS staff, Wexpro District Manager(s) or the General Manager.

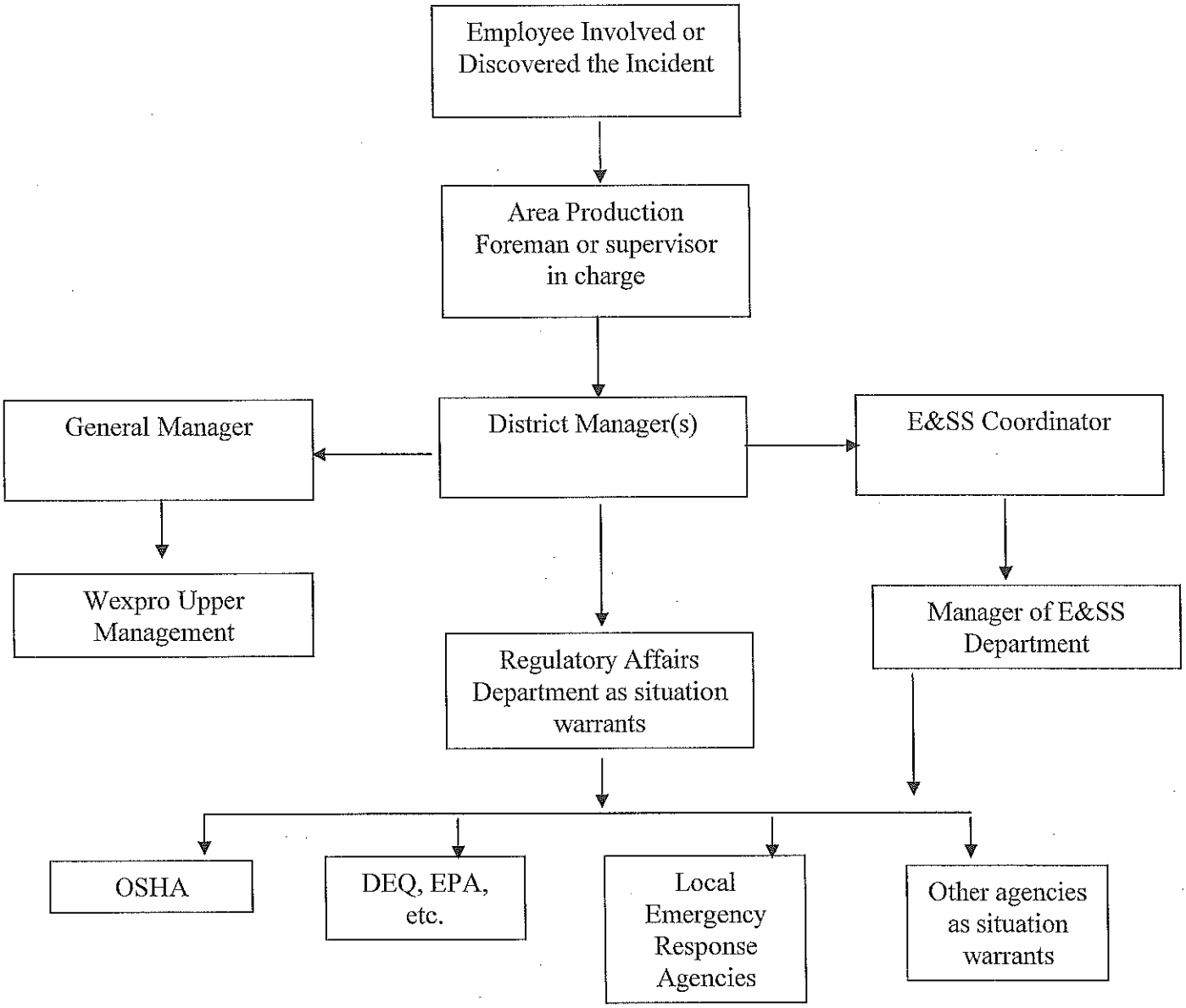
5. REPORTING REQUIREMENTS/NOTIFICATION PROCEDURES

- The General Manager or District Managers are to verbally notify the appropriate Environmental and Safety Services Coordinator immediately (or as soon as practical) of any environmental or safety related incident.
- The Environmental and Safety Services Coordinator will determine the necessity for further agency notification, reporting requirements and determine any further response or remediation efforts.
- Completion of forms is secondary to securing the safety of personnel and operations.
- Reports should be completed as soon as reasonably possible, normally within 2 days after the occurrence of the incident.

- Assure personnel are informed of notification and reporting requirements.
- All company personnel should be encouraged to check for and report unsafe conditions, issues falling under the Hazardous Awareness Program, accidents (no matter of the nature or severity, leaks and spills during their normal work activities.
- Assure the following guidelines are followed for reporting these incidents:

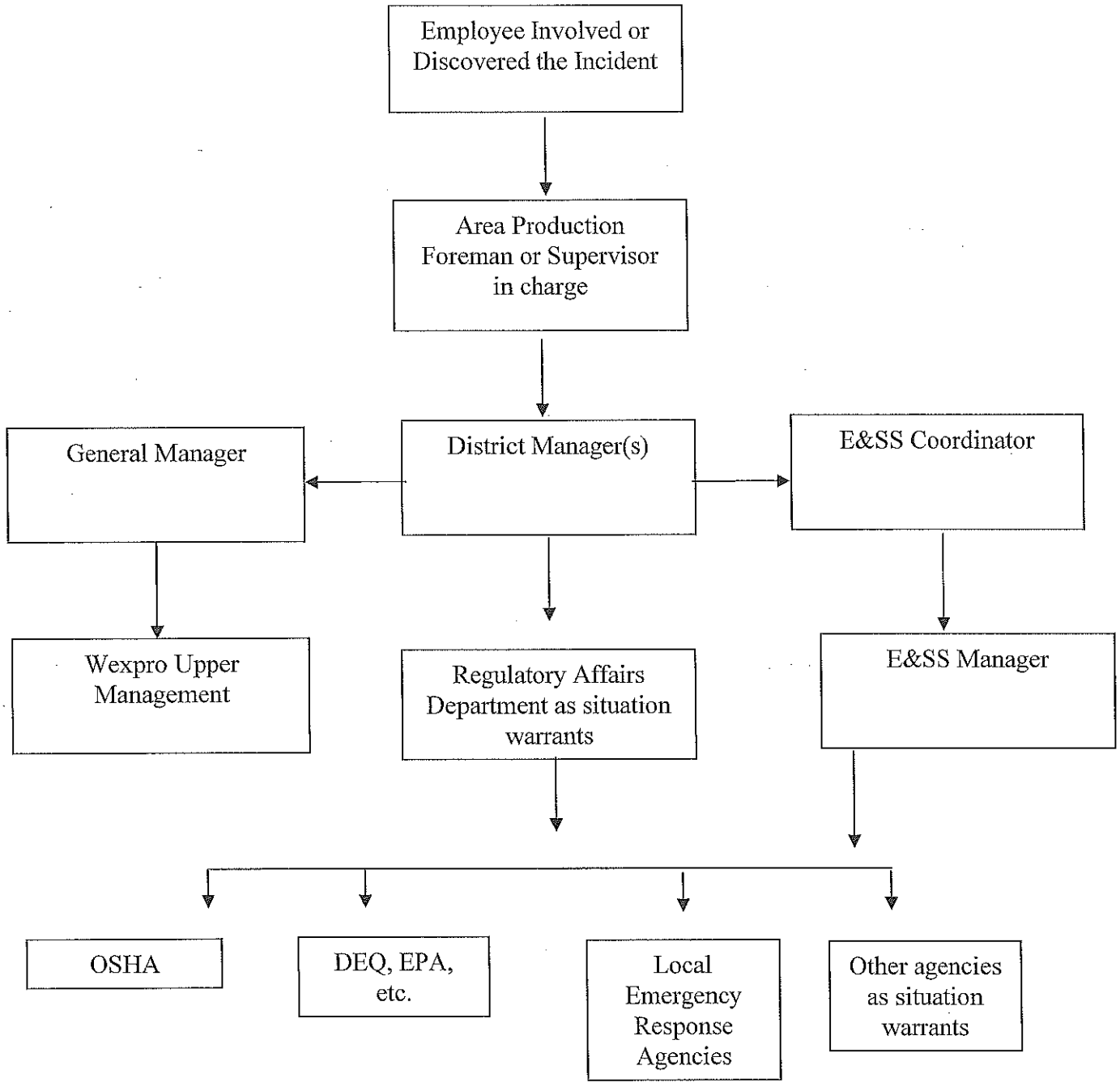
CRITERIA	VOLUME	REPORT REQUIREMENTS (dependent on situation)	DISTRIBUTION
Any Employee Injury	NA	Verbal to E&SS Coordinator • Minor Injury Report • Form 54002 Supervisors Report of Occupational Injury • Wyoming Report of Injury	Originals to E&SS Coordinator Cc: Wexpro District Manager
Any Non-Employee Injury	NA	Verbal to E&SS Coordinator • Form 54003 Report of Damage, Loss or Injury	Originals to E&SS Coordinator Cc: Wexpro District Manager
Damage, Loss or Theft (i.e. fire)	NA	Verbal to E&SS Coordinator • Form 54003 Report of Damage, Loss or Injury	Originals to E&SS Coordinator Cc: Wexpro District Manager
Vehicle Accidents	NA	Verbal to E&SS Coordinator • Form 54003 Report of Damage, Loss or Injury	Originals to E&SS Coordinator Cc: Wexpro District Manager
Hydrocarbon, Produced Water or any Chemical Spill	Greater than 1 Gallon	Verbal to E&SS Coordinator • Environmental Incident Report 54033	Originals to E&SS Coordinator Cc: Wexpro District Manager

VERBAL NOTIFICATION PROCEDURE
For Immediate Notification of Incident



NOTE: In the event of an emergency call up the supervisory ladder until you reach someone!!!

WRITTEN REPORTS



NOTE: In the event of an emergency call up the supervisory ladder until you reach someone!!!

6. ONSITE PRIORITIES

6.1 Protect Life (Do not risk your own or anyone's life) ---- THIS IS PRIORITY NO. 1

- Evacuate all personnel, contractor and public to a safe rendezvous point, as necessary.
- Provide safe rescue of personnel (don air packs as required before rescues in an H2S or potentially hazardous environment).
- Call emergency medical services (ambulance, sheriff etc.); provide necessary first aid (as training allows).
- Transport injured (if remote location, meet ambulance, or call for Air Medical Services (See Section 12), or drive victim to the emergency room, clinic or doctor (See Section 11), etc.

6.2 Safely Mitigate the Circumstances (Do not risk your own or anyone's life)
For example, if possible:

- Shut off hazardous energy sources.
- Close valve(s) to limit spill or release.
- Control ignition sources.
- Extinguish small fires.
- Call fire department, sheriff, etc. as necessary.

6.3 Communications

- Let supervision and E&SS staff know about the incident so they can provide any assistance.
- Keep calling up until you reach someone.
- Keep lines of communication open.
- Make notes of activity, communications and actions taken as time permits.

7. EMERGENCY RESPONSE BASICS

- Protect human life, including the public, contractor personnel, yourself and fellow employees.
- Protect company equipment.
- Protect the environment.
- Assess the situation without endangering yourself.
- Contact supervision and report the situation.
- State the facts of the situation as you know them.

- Ask for assistance such as medical, fire or other emergency services as you deem the situation requires.
- Wait for back up.
- An emergency situation will be directed over the radio or cell phone and you may be asked to respond or stand-by.
- Emergency services may need to be directed to our staging area or location so they do not become lost in the field or on the way to the site of the emergency.
- Prevent the situation from expanding, affecting other property or getting out of control.

8. DUTIES AND RESPONSIBILITIES

8.1 PRODUCTION FOREMAN/FIELD SUPERVISION

- STAY CALM – your immediate recognition of and effective response to an emergency situation can save lives, minimize loss and maximize efforts to investigate and solve the problem, preventing reoccurrence.
- Try to calm the employees, reassure them that you will help.
- Keep communication lines open.
- Collect data on the event and any injuries.
- Obtain as much detail about the incident as possible.
- Notify your supervision/District Manager.
- Go to the scene, if feasible, appropriate and if your services are not required in your current position.
- Secure the site, (See Section 10).
- For Media involvement, (See Section 18).
- Evaluate for:

    a. What happened?
    b. Where it happened?
    c. Whom it happened to?
    d. When it happened?
    e. How it happened?
    f. Extent of damage?
    g. What aid is needed?
    h. What resources are needed for search and rescue?

- What else could happen?

    a. Types of chemical on-site?
    b. Potential of fire, explosion, release of hazardous substances?
    c. Safety of personnel on-site relative to the hazardous areas?

d. Potential for danger to off-site population and environment?

- File reports as applicable.

8.2 GENERAL MANAGER/DISTRICT MANAGERS

- STAY CALM – your immediate recognition of and effective response to an emergency situation can save lives, minimize loss and maximize efforts to investigate and solve the problem, preventing reoccurrence.
- Try to calm the employees, reassure them that you will help.
- Keep communication lines open.
- Collect data on the event and any injuries.
- Notify the General Manager.
- Notify the E&SS Coordinator.
- Go to the scene if situation warrants.
- For Media involvement, (See Section 18).
- Investigate, evaluate and report, as appropriate.

8.3 UPPER MANAGEMENT

- STAY CALM – your immediate recognition of and effective response to an emergency situation can save lives, minimize loss and maximize efforts to investigate and solve the problem, preventing reoccurrence.
- Assess the emergency.
- Direct efforts to lessen its impact and ensure that on-site priorities are being handled.
- Execute the Emergency Response Plan for incidents that have escalated beyond the facility's or field's response capabilities.
- Ensure that resources are allocated to meet the on-site priorities.
- Request operational and technical support services, needed.
- Notify the President/CEO, or his designated alternate.
- Evaluate and document the emergency response.
- Assist in the post evaluation of the emergency response and help develop revisions to the Emergency response Plan procedures to prevent a reoccurrence and improve future responses, as deemed necessary.

8.4 COMPANY OFFICER(s), PRESIDENT/CEO

- Stay calm.
- Assess the emergency.
- Estimate its magnitude and impact on the company.

- Assist the responsible General Manager in an emergency in executing the Emergency Response Plan for incidents that have escalated beyond the field or local Managers response capabilities.
- Ensure that resources are allocated to meet on-site priorities.
- If needed develop methods and or procedures to contain the emergency and lessen its impact.
- Serve as the communication link with Questar Corporation upper management.

8.5 Environmental and Safety Services

- Obtain pertinent information concerning the emergency.
- Evaluate the situation from a regulatory agency viewpoint. Advise management of any safety and or environmental concerns and or regulatory requirements.
- Assist management and field personnel as necessary, in the mobilization of industry support services.
- Confirm that Management has been notified and apprised of the situation and are kept abreast of changes as they arise.
- Evaluate the situation from a regulatory/government agency viewpoint. As the situation warrants, consult with the Legal Department and Regulatory Affairs for recommendations, regulatory and legal input.
- Notify the appropriate regulatory and governmental agencies.
- Advise the field and local Managers and the General Manager, whether notification to any Federal, State or Local agency is required and/or has been made.
- Communicate any agency instructions or request for further action or information to the General Manager and Regulatory Affairs Department (as applicable).
- Determine the need for gathering personal exposure and/or environmental data or samples, offer recommendations as necessary.
- Assist Emergency Response personnel, as necessary, in directing post emergency procedures, verify appropriate actions have been taken and that all accidents and/or incidents are reported and investigated.

9. HAZARDOUS MATERIALS SAFETY INFORMATION

a. FIRST RESPONDER(s)

- Refer to the ORANGE EMERGENCY RESPONSE GUIDEBOOK for the various hazardous material guidelines or to the appropriate MSDS/SDS for the hazardous materials involved,

- After determining the appropriate Guide, read the entire page before initializing any action.
- DO NOT attempt to take any action beyond your level of training or without the appropriate safety equipment and PPE. Know and respect what you are capable of safely doing.
- DO NOT hesitate to call for help. To wait for help is often the correct course of action.
- Be part of the solution not part of the problem.

NOTE: Remember: On-site safety must be maintained!

- APPROACH CAUTIOUSLY. Resist the urge to rush in; you cannot help others until you know what you are faced with, how to handle the situation and have the proper safety equipment and PPE. Be aware of wind direction and approach from the up wind side in the event of a hazardous release.
- IDENTIFY THE HAZARD(S). Placards, container labels, shipping papers and/or other knowledgeable persons are all valuable information sources. Evaluate all of them and then consult the recommended Guide before placing yourself or others at risk.

NOTE: Remember the Emergency Response Guidebook provides only the most important information in relation to a family or class of hazardous chemicals or materials. For more in-depth information consult the appropriate MSDS/SDS for the materials being handled.

- SECURE THE SITE. Without entering the immediate hazard area, do what you can to isolate the area and assure the safety of others and the environment.
- DECIDE ON SITE ENTRY. Any effort you make to rescue persons, protect property or the environment must be weighed against the possibility that you could become part of the problem. Enter the area only when wearing appropriate PPE and with the appropriate safety equipment.
- ABOVE ALL—DO NOT walk into or touch spilled material. Avoid inhalation of fumes, smoke and/vapors, even though no hazardous materials are known to be involved. DO NOT assume that gases or vapors are harmless because of lack of smell, odorless gases or vapors may be harmful!

10. SITE SECURITY

There are several reasons for securing the site:

- Minimize danger or further injury, loss or damage.
- Control outside involvement.
- Preservation of the facts and evidence for a complete and accurate investigation.
- Secure the area from on-lookers, media, unauthorized and unnecessary personnel; utilize local law enforcement personnel, if necessary.
- Access should be limited to only appropriate and necessary personnel. Do not let employees, contractors, media or the public who want to look at what happened wander on or around the site. If in doubt, restrict access and only allow access as required and deemed necessary.
- Cooperate with law enforcement officials; they have an obligation to protect the public. They will also help to secure the scene, if you request their help.
- Do not allow removal of any equipment, materials or any item that was on site at the time of the incident, it is all considered evidence and may be crucial to the review and investigation of the incident. If, due to some unusual circumstance an item must be removed do not allow it to be altered or destroyed, know exactly where it is to be located and whose control it will be under.
- If any unauthorized person(s) refuses to honor the access limitations and enters the secured area, inform them (preferably in the presence of a witness) that they are trespassing and demand they leave. If they do not leave immediately, telephone the local law enforcement authority and ask for them to remove the trespasser, notify both the trespasser and the authorities that Wexpro will press charges.

11. SERIOUS INJURY OR MEDICAL EMERGENCY

11.1 URGENT CARE & DOT FACILITIES WY & CO

- Evanston – Dr. Nowicki – 190 Arrowhead Dr. – 307-783-8123
- Kemmerer – Lincoln Medical Clinic – 711 Onyx St. 307-877-4496
- Lyman – IHC Health Center Bridger Valley – 107 North Main St. – 307-787-3313
- Rock Springs – Big Horn Urgent Care & Occupational Medicine – 1453 A Dewar Dr. – 307-382-2466
- Rifle – Grand River Hospital District – 501 Airport Rd. – 970-625-1100

- First Responder
- Approach the scene with care.
- Protect yourself as a rescuer.
- Evaluate the scene for:
    a. Need for Personal Protective Equipment (e.g. air pack, FRC)
    b. Lack of oxygen (confined space or gaseous atmosphere)
    c. Electrical hazards
    d. Chemical hazards
    e. Fire or explosion hazards
    f. Walking/trip hazards
    g. Traffic hazards
    h. Any other potential hazards
- Call for Emergency Medical Services (EMS).
- Assess the condition of the victim(s).
- DO NOT move victim(s) unless there is an immediate threat or imminent danger.
- Administer First Aid as appropriate and as your training permits.
- Do not leave victim(s) until assistance arrives.
- Call for other assistance or back up as needed.
- Initiate Notification Procedure – notify your supervisor or other company personnel for additional assistance, as the situation requires.
- If an EMS unit is called, the following information should be relayed to the dispatcher:
    a. Describe the incident
    b. Location of the incident with directions to the site
    c. Number of people injured
    d. Type(s) and extent of injuries if known
    e. Condition of the Patient(s) if known (e.g. breathing, conscious, bleeding, broken arms, legs etc.)
    f. Whether rescue equipment is needed to extricate or transport the victim(s)
- If the road is impassible or if the patient(s) injuries are severe, an Air Medical Evacuation should be considered (See Section 12). Company personnel are justified and authorized to request an Air Medical Evacuation if one of the following situations exist:
    a. Medical assistance is unavailable or significantly delayed
    b. The victim(s) have serious life threatening injuries
    c. In the event of serious burns

NOTE: There are Air Medical Evacuation Services available to all of Wexpro's operational areas (See Section 12).

- Secure information of the extent of the victim(s) injuries and determine the name and location of the hospital where the victim is being transported.
- Notification of a victim(s) family member should be considered.

12. AIR MEDICAL EVACUATION

If a medical emergency should occur at a remote location, it could take several hours for Emergency Medical Services personnel to reach the injured party(s), possibly costing lives. A remedy for this is to provide medical services by helicopter in the event of a life threatening emergency.

Due to the remote location of some of Wexpro's well sites, the patient may have to be transported from the accident scene by ambulance then transferred to an Air Medical Helicopter.

12.1 TO CALL AN AIR MEDICAL HELICOPTER

A medical helicopter can be requested by calling 911 or the Emergency Dispatch numbers listed on the Landing Zone information located on Pages 20 and 21. When making this call, be prepared to provide the following information to the emergency dispatcher:

- State that this is a life threatening situation and that you are in need of an air medical evacuation.
- Name and title.
- Company name.
- Phone number where you can be reached if the dispatcher or emergency responders need to call back.
- The longitude and latitude to your location or nearest emergency landing zone, See Landing Zone Information, Pages 20 & 21.
- The number of life threatening injuries.
- The nature of the injury(s).
- The weather conditions at your location or landing zone.
- Help to determine, establish, secure and layout a landing zone.
- If additional responders are needed (fire, ground, ambulance, law enforcement etc.), provide driving directions to location.

12.2 Selecting a Suitable Landing Zone (LZ).

If an injury victim(s) requires Air Medical Evacuation, company personnel may work with emergency response personnel to provide a suitable landing zone. The LZ should be:

- Large enough to land a helicopter safely.
- On flat and firm ground in an open space.
- Free of:
    a. Overhead power lines, derricks towers, trees etc.
    b. Debris (i.e. sticks, brush, large rocks, stumps, gravel, trash etc.) that may be blow up into the rotor system during landing and takeoff.

- Wind Direction
  Consider the wind direction. Helicopters land and take off into the wind. Is the approach and departure path free of obstructions? If there are obstructions, notify the helicopter crew/dispatcher when initial notification is made.
- Marking the Landing Zone
  Mark the touchdown area with five (5) lights/flares (one in each corner and one indicating wind direction).

NOTE: Helicopters can also land on improved roads or parking areas adjacent to plants or facilities.

NOTE: Wexpro has established and maintains a number of landing zones throughout its operational areas, see Pages 20 and 21 for detailed listing.

Appropriate size of LZ (touchdown area)
• Small Helicopter – 60' X 60' • Medium Helicopter – 75' X 75' • Large Helicopter – 120' X 120'
Note: For night landings the LZ (touchdown area) should be increased:
• Small Helicopter – 100' X 100' • Medium Helicopter – 125' X 125' • Large Helicopter – 200' X 200'

CAUTION: The landing zone should be clear of people, vehicles, and obstructions, such as trees, poles and overhead wires. Keep in mind that power and guide wires cannot be seen from the air.

NOTE: Due to the remoteness of some company locations, the patient may need to be transported from the accident scene and then transferred to the Air Medical Helicopter.

CAUTION: Keep non-emergency personnel at least 200' from the touchdown area. Keep emergency service personnel at least 100' away. If available, have fire equipment standing by. Assure that everyone who will be working near the helicopter wears eye and

ear protection. If hard hats are worn, they must have chin straps and must be securely fastened (no loose hats blowing up thru the rotors). If at all possible, wet down the touchdown area if it is extremely dusty. When the helicopter has landed do not allow anyone to approach the aircraft. Watch the pilot from the front of the helicopter for his hand signals.

DANGER: During nighttime landings, do not direct spot lights into the air or at the approaching helicopter. Lights should be directed downward to illuminate the Landing Zone for the pilot. White lights directed at the helicopter ruin the pilot's night vision and can temporarily blind him. Red lights however are very helpful in finding accident locations and do not affect the pilot's night vision. The following general safety rules apply:

12.3 GENERAL HELICOPTER SAFETY RULES

Helicopters provide a unique service that is not typical to any other vehicle. Extreme caution must be used at all times when in or around a helicopter or its landing zone.

- The pilot is in charge of the helicopter, the passengers and the landing zone. Always follow his/her instructions.
- The landing zone should always be clear while the helicopter is landing, loading or lifting off.
- Wait for a direct command or signal from the pilot before approaching or departing the helicopter. The helicopter must be firmly of the ground before boarding or disembarking.
- Always stay in the pilots view when approaching of leaving.
- Always approach a helicopter from the FRONT.

DANGER: Never approach a helicopter from behind or walk under the tail boom or rotor.

- Stay in a low, bent over position when approaching or departing from an idling helicopter.
- When walking towards or away from a helicopter, make sure you keep a tight grip on anything being carried or unsecured materials.
- Be prepared to assist the helicopter crew, as needed.
- Notify the pilot of any magnetic or hazardous materials which are being placed on board.
- Medical helicopter crews normally do not carry protective clothing or breathing apparatus to protect them from hazardous vapors or materials. The helicopter crew must be notified when initially called if any hazardous materials or vapors are present at the scene.

- If the patients' clothing is contaminated, advise the crew prior to placing them into the helicopter.
- When explosive, flammable or poisonous gases/vapors or chemicals in danger of exploding or burning are on site, helicopter landing zones must be prepared UPWIND, and at least one mile from the site and never in a low lying area.
- When the helicopter is ready for take-off keep the departure path clear of obstructions. In case of an emergency, the departure path could be needed by the pilot to execute an emergency landing.

NOTE: These guidelines do not address all safety considerations involved with aircraft operation. Always exercise extreme caution and sound judgment.
NOTE: Secure information on the extent of the patient's injuries, name and location of the hospital where the patient if being transported and estimated time or arrival. Communicate this information to the next level of management.

LANDING ZONE INFORMATION

EAST DISTRICT

Moffat County, CO Emergency Dispatch: 970-824-6501

Sweetwater County, WY Emergency Dispatch: 307-872-3870

NAME	GPS AT SIGN	ELEVATION	COUNTY & STATE	OBSTRUCTION CLEARENCES (Name, Height, GPS in Degrees and Decimal minutes)	Cell Phone Service
Canyon Creek Office	N 41 DEG. 03.476' W 108 Deg. 45.829'	7157'	Sweetwater, WY	Gas Plant Stacks, 2 each 150' High N 41 Deg. 03.497', W 108 Deg. 45.694' Pipeline Marker 6' High N 41 Deg. 03.444', W 108 Deg. 45.842'	Good
Hiawatha Deep 1	N 40 Deg. 59.495' W 108 Deg. 37.400'	7093'	Moffat, CO	Pipeline Markers – 6' High N 40 Deg. 59.492', W 108 Deg. 37.402' Well Equipment – 25' High N 40 Deg. 59.522'. W 108 Deg. 37.367'	Good
Hiawatha Office	N 40 Deg. 59.966' W 108 Deg. 36.724'	7143'	Moffat, CO	Fence – 100' S, 4' High N 40 Deg. 59.959', W 108 Deg. 36.726' Tank – 150' S, 25' High N 40 Deg. 59.961', W 108 Deg. 36.725' Power Lines – 150' SW, 30' High N 40 Deg. 59.940', W 108 Deg. 36.684'	Good
Kinney Unit 13-1	N 41 Deg. 06.242' W 108 Deg. 36.436'	7294'	Sweetwater, WY	None	Fair
North Baxter Station	N 41 Deg. 38.523' W 109 Deg. 06.826'	6422'	Sweetwater, WY	Power Lines Running North – South, 30' High N 41 Deg. 38.513', W 109 Deg. 06.886' Power Lines Running East – West, 30' High N 41 Deg. 38.511', W 109 Deg. 06.821'	Excellent
South Baxter Camp	N 41 Deg. 22.070' W 109 Deg. 07.274'	7198'	Sweetwater, WY	QPC Sign – 6' High N 41 Deg. 22.068', W 109 Deg. 07.298' Dumpster – 6' High N 41 Deg. 22.072', W 109 Deg. 07.307' Power Line – 30' High N 41 Deg. 22.074', W 109 Deg. 07.364' Pine Trees – 50' High N 41 Deg. 22.053', W 109 Deg. 07.298'	Fair
Powder Wash Station	N 40 Deg. 57.097' W 108 Deg. 18.665'	6451'	Moffat, CO	Pipeline Marker – 4' High N 40 Deg. 57.086, W 108 Deg. 18.634' Power Line & Gas Plant – East to West, 30' High N 40 Deg. 57.065, W 108 Deg. 18.714' Dumpster – 6' High N 40 Deg. 57.065, W 108 Deg. 18.684'	Fair/Poor

LANDING ZONE INFORMATION

WEST DISTRICT

Lincoln County, WY Emergency Dispatch: 307-877-3971
Sweetwater County, WY Emergency Dispatch: 307-872-3870
Sublette County, WY Emergency Dispatch: 307-367-4378 Ext. 6
Uinta County WY, Emergency Dispatch: 307-783-1000

NAME	GPS AT SIGN	ELEVATION	COUNTY & STATE	OBSTRUCTION CLEARENCES (Name, Height, GPS in Degrees and Decimal minutes)	Cell Phone Service
Bruff 1	N 41 Deg. 3.465' W 110 Deg. 3.250'	6391'	Lincoln, WY	Dry Hole Marker – 6' High N 41 Deg. 36.484, W 110 Deg. 3.280'	Good
Bruff 18	N 41 Deg. 32.282' W 110 Deg. 4.914'	6377'	Uinta, WY	None	Excellent
Butcher Knife Plant	N 41 Deg. 13.882' W 110 Deg. 4.993'	6958'	Uinta, WY	None	Poor
Church Buttes 2	N 41 Deg. 26.665' W 110 Deg. 2.231'	6782'	Sweetwater, WY	Pipe Line Marker – 6' High N 41 Deg. 26.700', W 110 Deg. 2.533'	Excellent
Church Buttes 31	N 41 Deg. 20.905' W 110 Deg. 0.779'	7068'	Uinta, WY	None	Poor
Church Buttes 42	N 41 Deg. 28.882' W 110 Deg. 0.014'	6744'	Sweetwater, WY	None	Excellent
Church Buttes 65	N 41 Deg. 27.025' W 110 Deg. 5.245'	6718'	Uinta, WY	None	Excellent
Church Buttes Plant (OLD)	N 41 Deg. 24.941' W 110 Deg. 4.511	6979'	Uinta, WY	Cedar Tree – 10' High N 41Deg. 25.144', W 110 deg. 4.893'	Excellent
Dry Piney Camp	N 42 Deg. 20.999' W 110' 20.694'	7758'	Sublette, WY	Power line – 30' High N 42 Deg. 20.850', W 110 Deg. 20.617'	Good
Emigrant Trail Plant	N 41 Deg. 23.733' W 110 Deg. 5.333'	7097'	Uinta, WY	Power Line – Running East to West, 30' High N 41 Deg. 23.750', W 110 Deg. 5.333'	Excellent
Moxa – Eakin Station	N 41 Deg. 26.448' W 110 Deg. 14.552'	6619'	Uinta, WY	Pipeline Marker – 6' High N 41 Deg. 26.448', W 110 Deg. 14.552'	Excellent
Moxtop 6-1	N 41 Deg. 44.298' W 110 Deg. 6.091'	6590'	Lincoln, WY	None	Good
Owens 18-4	N 41 Deg. 27.066' W 110 Deg. 6.846'	6700'	Uinta, WY	None	Excellent
Pando 32-6	N 41 Deg. 29.900' W 110 deg. 5.705'	6660'	Uinta, WY	None	Excellent

13. FIRE /EXPLOSION

13.1 FIRST REPONDER

- Sound fire alarm, if appropriate.
- Call the Fire Department and /or Sheriff's Department.
- Notify supervision (initiate Notification Procedure, See Section 5).
- Evaluate the situation for Personal Protective Equipment and safety equipment needs
- Activate emergency flares, alarms and /or Emergency Shut Downs as needed. If it is safe, attempt to shut in any fuel gas sources, but only if possible in a safe manner.
- If the fire cannot be quickly controlled with portable fire extinguishers, evacuate the area.
- DO NOT enter any enclosed structure to isolate equipment if a fire inside of a structure is beyond the incipient stage.
- Secure the site (See Section 10)

CAUTION: Gases and flammable liquids are EXTREMELY FLAMMABLE.

- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.
- Vapors may travel to a source of ignition and flash back.
- Cylinders exposed to a fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when exposed to extreme heat.
- Ruptured cylinders may act in a rocket-like manner.

13.2 EVACUATION

- Evacuate up wind whenever possible.
- Follow any posted evacuation routes to designated rendezvous points, if appropriate.
- The senior on-site Company employee will account for all Company and contract personnel at the site.
- DO NOT leave the rendezvous point without indicating your destination to and the approval of the on-site senior employee.

14. SPILL OR LEAK OF HAZARDOUS MATERIALS RELEASE – WELL BLOWOUT

14.1 FIRST RESPONDER

- Determine if an emergency condition exists, indicated by:
    a. Abnormal operating parameters.
    b. Equipment malfunction or failure.
    c. The release of liquids, vapors, natural gas or H2S.
- Notify the Production Foreman or on site supervision (initiate Notification Procedures, See Section 5).
- Approach the scene with caution, evaluate for:
    a. Identify the leaking material, container.
    b. Need for Personal Protective Equipment or other safety equipment.
    c. Potential for H2S release.
    d. Lack of oxygen (confined space or gaseous atmosphere).
    e. Combustible/flammable atmospheres (fire/explosion potential).
    f. Electrical Hazards.
    g. Any other hazard not listed above.
- Don any required PPE and safety equipment.
- If potentially harmful levels of flammable vapors or gas is present:
    a. Evacuate the site immediately.
    b. Secure the site; keep unauthorized and non-essential company personnel away from the site.
- If it is safe:
    a. Alert other personnel as needed and as appropriate.
    b. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in the immediate area. Turn off ignition pilot lights, don't use telephones or other electronic instruments; do not start vehicles, shut off all electricity appropriate.
    c. Stop the leak. Attempt to shut in the source or reduce the spill size by remotely closing the appropriate valves, reduce operating pressures or rotating a leaking container so that the hole is above the liquid level in the container.
    d. DO NOT touch or walk through spilled materials.
    e. STOP any filling or transfer operations.
    f. Assess the situation to the best of your ability for:
        - Specific material released.
        - Volume released.

- Pressure reading(s).
- Conditions – time, weather, climate, location, (e.g. tank numbers etc.).
- History, if known.
- Potential losses – lives, property, environment.

g. Initiate containment, if possible.

- If unable to control the spill or leak, determine which direction the hazardous materials are moving.
- Determine if Company personnel, contract personnel or local residents need to be evacuated.
- Secure the site. Keep unauthorized personnel out. (See Section 10).
- Notify the Foreman , or next level of authority, and provide any updates:

a. Verification of the specific material released.
b. Approximate volume (size) released.
c. Potential losses – lives, property, environment.
d. Conditions – time, weather, climate, location (e.g. tank numbers etc.).
e. Direction of vapors/gas cloud movement.
f. Direction of spill flow.
g. Pressure reading(s).
h. History, if known.

DANGER: DO NOT enter any enclosed structure to isolate equipment without donning the appropriate PPE and monitoring the atmosphere for physical and health related hazards.

14.2 EVACUATION

- If the spill is beyond the control capability of local Company personnel, evacuate the area.
- Evacuate UP WIND when possible.
- Follow any posted evacuation routes to designated rendezvous points, if appropriate.
- Rendezvous at least 500 feet from the hazard area.

NOTE: Control rooms are not considered to be safe havens and should not be used as a rendezvous point unless it is located greater than 500 feet up wind of the hazard area.

- The senior on-site Company employee will account for all Company and contract personnel at the site.

- DO NOT leave the rendezvous point without indicating your destination and upon approval of the on-site senior employee.

15. TORNADOS

General:
Upon notification of a tornado watch or alert, the foreman will designate an employee to listen to U.S. Weather Service bulletins on the radio, television (if available), or other means available, to alert him/her of weather changes. If a tornado has been sighted, tornado sirens are activated, or the office is located within the area given by the U.S. Weather Service, personnel must take shelter as follows:

- Office
  - Seek tornado shelter or underground structure, if available and conveniently located near the office.
  - Employees in outer offices should shut their office doors to protect against flying glass and debris.
  - All employees should proceed to designated interior hallways and stand until danger has passed.
  - During the storm, contact should be maintained with the U.S. Weather Service by listening to local weather and news broadcasts.
- Field
  - If a tornado is sighted from afar, travel at right angles away from it.
  - If the tornado is upon you, place yourself face down in a low area such as a ditch or culvert if you cannot get indoors to a safe shelter.
  - During the storm, contact should be maintained with the U.S. Weather Service by listening to local weather and news broadcasts.
- Assessment
  - Account for all employees.
  - Summon emergency aid and services as needed.
  - Initiate the Notification Procedure (See Section 5).

16. MISSING EMPLOYEES

General:
Although most incidents of this type usually culminate in an insignificant incident resulting from miscommunication, each such incident shall be taken seriously and treated accordingly.

This section of the plan is to be used as a guide by all supervisors/employees for missing employee incidents and/or incidents involving company travel by commercial aircraft, etc. for the following situations:

- Employee is reported missing by co-worker(s), friends, or family.
- Company receives notification of missing plane by civil authorities or co-workers.
- Unexplained disappearance or leave of absence not shortly resolved.

- Production Foreman or Field Supervisor
  - Survey appropriate co-workers and supervisors as to the last known whereabouts of the individual and his/her last job assignment.
  - Confirm travel itinerary with secretary or travel agent.
  - Contact agencies to determine flight status, i.e. weather delays, detours, other down time due to mechanical problems, etc.
  - Notify General Manager/District Manager (initiate Notification Procedure, See Section 5).
- General Manager/District Manager(s)
  - Assess the situation with the appropriate foreman/supervisor.
  - Determine and estimate the amount of time missing.
  - Determine resources necessary to initiate a search, as appropriate and necessary.
  - Determine resources available to make family contact (supervisor, co-worker, friend, police, hospitals, etc.).
  - Initiate a search.
  - Contact outside agencies as necessary to assist search (sheriff, police, etc.).
  - Contact family, as appropriate.
  - Notify the General Manager.
- Evaluation
  - Once found, action depends on condition of the employee and the circumstances.
  - If appropriate, ensure on-scene priorities.
  - Notify authorities and/or the family, as appropriate.
  - Communicate up.

17. BOMB THREATS

General:
Bomb threats must be a taken seriously. If the caller is familiar with the building or facility and specific about the location of the bomb, the call should be regarded with a high degree of

urgency.

17.1 Receiving the threat

Bomb threats may be received by telephone; written or in an electronic format; through third parties such as the media; or by actual discovery of an explosive device. If you receive a bomb threat, observe the following procedure:

- Immediately begin filling out the Bomb Threat Report form.
- Let the caller talk. Do not interrupt or cut them off.
- Listen carefully for and make note of any back ground noise, speech impediments, accents or any other items which stand out no matter how small or seemingly insignificant.
- Ask the caller what time the bomb is set to go off.
- Ask the caller why they are threatening the Company.
- Ask the caller about the exact location of the bomb.
- Keep the caller on the telephone as long as possible.
- Signal another employee to initiate the Notification Procedure (See Section 5) and call authorities.
- Start preparations for the evacuation of all personnel from the building.
- In the event someone makes a bomb threat in person, report this to a company officer or appropriate company manager.

DANGER: DO NOT TOUCH ANY SUSPICIOUS OBJECT OR PACKAGE!!!!

17.2 Credible Bomb Threat

When the threat is determined to be credible, this Emergency Response Plan will be activated.

- Alert the appropriate authorities.
- Evacuate all personnel to a safe distance and to a predetermined rendezvous area.
- Establish a security perimeter at a distance compatible with the evacuation distance to prevent unauthorized entry.
- Notify appropriate Company personnel (See Section 5).

17.3 Wellheads and Pipelines

In addition to the above action items, if a wellhead or pipeline is the target of the bomb threat, the following steps will be followed:

- Take steps to shut in and isolate the specific well(s) targeted, including any pressurized vessels.
- If possible take the necessary steps to isolate and/or depressurize the targeted pipelines, including any pressurized vessels.

17.4 EVACUATION

Determine if and when an evacuation will be initiated beyond the original threatened areas:

- Determine what additional areas will be evacuated.
- Instruct Company personnel to assemble in the pre-determined assembly area for control and accountability.
- Confirm that all designated areas have been evacuated.

17.5 SEARCH

Only a Military Explosives Ordinance Disposal Team or Police Bomb Squad will be permitted to conduct the search, removal of explosive device and clear the building for occupancy

17.6 DAMAGE CONTROL

- As buildings are evacuated, open all windows and doors to minimize potential blast damage.
- Shut down all utility services in the target area, (i.e. natural gas and electrical service) to prevent any additional damage or problems that may result from an explosion.

17.7 DISPOSAL

DANAGER!!!! Never attempt to disarm an explosive device or package suspected to contain an explosive device. Bombs may be designed to explode when the package is tampered with. In the event that a bomb or explosive device is located, only a qualified Bomb Disposal Technician shall attempt to disarm or neutralize the device.

BOMB THREAT REPORT
Security

BOM

Wexpro Company

Instructions: Be calm, be courteous. Listen, do not interrupt the caller. Take notes to complete this form.

Person Receiving Call and Extension	Time	Date	Phone # shown on Caller ID

Exact Words of Caller

Pretend difficulty with hearing. Keep caller talking. If caller seems agreeable to further conversation, ask questions like:

When will it go off?	Certain hour	Time Remaining
Where is it located?	Building	Area
What kind of bomb?	How do you know?	
How do you know so much about the bomb?		
What is your name and address:		

Caller's Identity

Sex: ☐ Male ☐ Female ☐ Adult ☐ Juvenile	Approximate Age (Years)

Origin of Call

☐ Local ☐ Long distance ☐ Booth	Internal? (From what building?)

Voice Characteristics		Speech		Language	
☐ Loud	☐ Soft	☐ Fast	☐ Slow	☐ Excellent	☐ Good
☐ High Pitch	☐ Deep	☐ Distinct	☐ Distorted	☐ Fair	☐ Poor
☐ Raspy	☐ Pleasant	☐ Stutter	☐ Nasal	☐ Foul	☐ Other
☐ Intoxicated	☐ Other	☐ Slurred	☐ Lisp		

Accent		Manner		Background Noises	
☐ Local	☐ Not Local	☐ Calm	☐ Angry	☐ Factory Machines	
☐ Foreign	☐ Race	☐ Rational	☐ Irrational	☐ Office Machines	
		☐ Coherent	☐ Incoherent	☐ Party Atmosphere	
		☐ Deliberate	☐ Emotional	☐ Trains	☐ Bedlam
		☐ Righteous	☐ Laughing	☐ Animals	☐ Music
				☐ Quiet	☐ Voices
				☐ Airplanes	☐ Traffic
				☐ Mixed	

ACTION TO TAKE IMMEDIATELY AFTER CALL: Call Questar Emergency Line (801) 324-1911. Complete this form to remember details of the threat.

Security Officer	Supervisor	Case No. (Security Use Only)

18. RESPONSE TO THE MEDIA

Emergency incidents that involve loss of life, serious injuries, well blowouts, spills or explosions are matters of broad public interest and therefore constitute significant news. In addition to reporting the news, members of the media can play an important role in transmitting emergency information to the public.

A proper response to the media is essential to protect and advance the public's perception of the company as a good corporate citizen with timely and accurate reporting of its emergency response activities to the news media, and in turn to the general public. The Company recognizes that the news media may have a legitimate interest in certain events. It is the Company's objective to assure that all media statements show that the Company's response to the emergency was appropriate and all statements reassure the public that the Company is taking, or has taken, the appropriate emergency response actions.

18.1 MEDIA COMMUNICATION GUIDELINES

Follow these guidelines should you receive news media inquiries immediately following an accident or emergency and are pressured into responding to media inquiries. Only respond to the media if a corporate or company spokesperson is unavailable.

When responding to the media:

- It is important to be calm and courteous; communicate that you are concerned and want to be helpful.
- Respond as soon as possible.
- Always tell the truth, do not comment if you do not know.
- Don't volunteer information.
- Never speculate.
- Never say "no comment".
- Never go off the record.

- Do not provide names of those involved.

DO respond clearly and accurately to questions about:

- What happened?
- Where it happened.
- When it happened (date and time only).
- Number of known injured, taken to hospital, (no names).
- What equipment or facilities were affected?
- Factual assessment of current situation (express concern for suffering and damages, credit emergency response, state intent to investigate).

DO NOT speculate and DO NOT try to answer questions about:

- Monetary estimates of damage.
- Insurance coverage.
- Possible cause.
- Blame or responsibility.
- Anything that might imply Company liability, fault or negligence.
- DO NOT comment on or confirm any dead or give out names of injured or dead.

AND, FINALLY

- If in doubt, leave it out!! If you don't know the answer to a question, say you or someone else will try to find out and get back to them as soon as possible.
- Nothing is off the record: assume and expect that everything you say will be quoted.
- Keep a log of whom you have spoken to (include name(s), organization and all contact information) and all facts you have released.
- Keep management and the corporate communications representative informed of all media contact.
- If you are referring calls to a corporate communications spokesperson, take a name and telephone number and promise a prompt response.

ON THE SCENE STATEMENT

So what should you say if cornered and pressured by the media?

My name is:

_____

And I am

(title):_____

with: (company name):_____

At approximately: _____:_____ AM/PM (time)

On (date):_____ the company experienced a:

_____ (briefly characterize the event: fire, explosion, spill etc.)

At the company's: _____ (facility, plant or well-site).

We are not aware of any injuries. (If unsure, state: "Injuries, if any have not been determined at this time.")

The company is responding to the incident. Personnel and resources are being directed regarding proper handling of the situation in the safest and most effective manner possible. It is the Company's intent to cooperate with the media by providing information as it becomes available. However, the company asks for your cooperation and understanding that the priorities at this time are the safety and welfare of our employees, the public and the containment and control of the incident to minimize its impact.

I or another designated company representative will keep the media updated as more information becomes available.

APPENDIX A-2
Powder Wash Area Spill Prevention Control and Countermeasure Plan

Dominion Energy®

Powder Wash Area
Spill Prevention Control and Countermeasure Plan

Moffat County, Colorado

Revised: February 2018

Dominion Energy Wexpro

SPCC PLAN
Powder Wash Area
Dominion Energy Wexpro

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LIST OF APPENDICES

1.0 *MANAGEMENT APPROVAL AND ENGINEERING CERTIFICATION*

Management approval has been extended at a level with authority to commit the necessary resources to implement this Spill Prevention Control and Countermeasure (SPCC) Plan. Pursuant to §112.7, this is the written commitment of Dominion Energy Wexpro (Wexpro), a fully-owned Dominion Energy Questar Corporation (Dominion Energy) subsidiary, to provide the manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful to human health and the environment. This plan will be implemented as described herein, and the plan will be physically maintained at the field office responsible for this production field.

_____ _____

Signature, Authorized Facility Representative Date

Kasey Werkele

Name (Printed)

Director – Operations

Title

Pursuant to §112.3(d) and by means of this SPCC certification, I attest that: (i) I am familiar with the requirements of the SPCC Rule (40 CFR Part 112); (ii) my authorized agent has visited and examined the facility; (iii) the Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of the SPCC Rule; (iv) procedures for required inspections and testing have been established; and (v) the Plan is adequate for the facility.

_____ _____

Signature, Professional Engineer Date

Mark E. Stewart

Printed Name of Professional Engineer

Registration No. 39742 State: Colorado

2.0 INTRODUCTION

The Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, authorized the establishment of procedures, methods, equipment, and other requirements for the prevention and/or containment of discharges of liquid hydrocarbons and hazardous substances. In response to this authorization, the Environmental Protection Agency (EPA) issued Oil Pollution Prevention Regulations for Non-Transportation Related Facilities under Title 40 of the Code of Federal Regulations (CFR), Part 112 and specifically outlined requirements for the preparation of Spill Prevention, Control, and Countermeasure (SPCC) plans. The overall objective of this plan is to prevent spills and control runoff from the facility.

The following sections of this Plan are presented in the sequence of Part 112. The rule number applicable to each SPCC Plan section is included with the section title to facilitate easy navigation by field personnel.

SPCC Plan Administration Requirements (§112.3, 112.4, 112.5) are covered in Section 4. Facility-specific details associated with General Requirements for SPCC plans (§112.7) are covered in Section 5. Facility-specific details associated the requirements for onshore petroleum oil production facilities (§112.9) are covered in Section 6.

The following SPCC Plan requirements are not applicable to this facility's Plan, including:

- Requirements for Onshore [non-production] Facilities (§112.8)
- Requirements for Onshore Oil Drilling and Workover Facilities (§112.10), (Note: Drilling and completion contractors need to have their own SPCC plans in accordance with §112.10)
- Requirements for Offshore Oil Drilling, Production and Workover Facilities (§112.11)

3.0 GENERAL APPLICABILITY: §112.1

The Oil Pollution Prevention Regulations (40 CFR Part 112) require preparation of an SPCC Plan for facilities that have discharged or could reasonably be expected to discharge liquid hydrocarbons. Specifically, §112.1(d)(2)(ii) requires an SPCC Plan to be developed for facilities where the aggregate storage capacity is greater than 1,320 gallons (considering only containers with a capacity of 55 gallons or greater). Because most of the facilities within the Powder Wash Area maintains above ground storage capacity greater than 1,320 gallons, an SPCC Plan is required.

The purpose of this Plan is to identify sources of liquid hydrocarbons in the Powder Wash Area and outline procedures to prevent the discharge of liquid hydrocarbons. 'Discharge,' and other SPCC Plan terms, are further defined in Appendix A.

All facilities regulated under 40 CFR Part 112 must conduct an initial screening to determine whether a discharge of liquid hydrocarbons from the facility could reasonably be expected to cause substantial harm requiring the development of a Facility Response Plan (FRP) under §112.20. There are no facilities within the Powder Wash Area that transfer oil over water to or from vessels, and there are no facilities within the Powder Wash Area with total oil storage capacity greater than or equal to 1 million gallons. Therefore, none of the facilities within the Powder Wash Area can reasonably be expected to cause substantial harm to the environment. In accordance with 40CFR 112.20(e), the "Certification of the Applicability of The Substantial Harm Criteria" has been completed and is maintained in Appendix B of this plan. Because submittal of an FRP is not required, this SPCC Plan provides clear information and procedures for responding to discharges.

A discharge of liquid hydrocarbons entails any quantity of hydrocarbon that results in a violation of applicable water quality standards or that causes creation of a sheen, film or discoloration of the water surface or any shoreline or causes a sludge or emulsion to be deposited beneath the water surface or on any shoreline.

4.0 SPCC PLAN ADMINISTRATION: §112.3, §112.4, AND §112.5

4.1 REQUIREMENT TO PREPARE: §112.3

This SPCC Plan was prepared to comply with the revised rule (40 CFR Part 112) that became effective on August 16, 2002. The original plan was prepared prior to August 17, 2005 and was fully implemented prior to February 18, 2006. The plan has since been revised and implemented to comply with subsequent requirements.

A complete updated copy of this SPCC Plan will be maintained at Dominion Energy's Powder Wash Field Office. During normal working hours at the facility, the Plan will be available to authorized representatives of local, state, or federal governing agencies for on-site review. A copy will be submitted if requested.

4.2 AMENDMENT BY REGULATORY AGENCY: §112.4

Wexpro will submit a report to the EPA Regional Administrator (RA) within 60 days whenever either of these two events occurs (refer to the definition of a discharge in Appendix A):

a. more than 1,000 gallons (24 bbls) of liquid hydrocarbons have been discharged in a single incident, or

b. more than 42 gallons (1 bbl) of liquid hydrocarbons have been discharged in each of two incidents within any 12-month period.

The report will contain the following information (§112.7(a)(4)):

- The exact location and phone number
- date and time of discharge
- material discharged
- estimated total quantity discharged
- source of the discharge
- description of all affected media
- cause of the discharge
- any injuries or damages
- actions taken to stop, remove and mitigate the effects of the discharge

- whether an evacuation may be needed
- names of individuals and organizations who have also been contacted

Copies of the incident report will also be forwarded to the representative/ case manager designated by the Colorado Department of Public Health and Environment (CDPHE) emergency response coordinator. Should the RA subsequently propose by certified mail or personal delivery that this SPCC Plan be amended in accordance with §112.4(e), Wexpro will:

- Submit arguments and supporting information in response to the proposed amendments within 30 days; or
- Amend this SPCC Plan within 30 days and implement the amended Plan within six-months, unless otherwise authorized by the RA.

4.3 SPCC PLAN AMENDMENT BY OWNER/OPERATOR: §112.5

When there is a change in facility design, construction, operation, or maintenance that materially affects its potential for a discharge, Wexpro will amend this SPCC Plan within six months of the change and implement the amended Plan within six months of its completion. Technical changes to the Tank Volumes table or other parts of the Plan will be made under the direction of a Professional Engineer and will be certified by a Professional Engineer on an annual basis.

Wexpro will also review this Plan at least once every five years from the date of the last review. As a result of the review, the Plan will be amended within six months of the review if more effective prevention and control technology has been field-proven at the time of the review to significantly reduce the likelihood of a discharge. The amended Plan will be implemented within six months of its completion. The designated person accountable for spill prevention at the facility, the Operations Manager, (see Section 5.1) will document completion of each five-year review, sign a statement as to whether the Plan will be amended and record the results in Appendix C.

5.0 SPCC PLAN GENERAL REQUIREMENTS: §112.7

This section presents the facility-specific details that §112.7 requires for SPCC Plans.

5.1 GENERAL FACILITY INFORMATION

Wexpro operates the natural gas field, gathering lines and compressor station located approximately 80 miles southeast of the town of Rock Springs, Wyoming in Moffat County, Colorado. The Standard Industrial Classification (SIC) code that best describes the activities conducted at the field is 1311 – Crude Petroleum and Natural Gas – Natural Gas Production.

Facility Type:	Onshore (oil or) natural gas production facility
Facility Name:	Powder Wash Area
Production Field Location:	General: Approximately 80 miles southeast of the town of Rock Springs, Wyoming, in Moffat County, Colorado. Directions: Visitors must check in at Field Office to be escorted to production field location. Locations: Township 11N, Range 97W, Sections 3-6, 8-10, 15 Township 12N, Range 97W, Sections 20-22, 27-34
Field Office Driving Directions:	Directions: From Rock Springs, Wyoming, travel 50 miles south on Highway 430. Turn east on county road for approximately 30 miles.
Foreman:	Jon Lison
Mailing Address:	Wexpro Company P.O. Box 458

	2221 Westgate Rock Springs, WY 82902
Telephone:	(307) 352-7481 (office) (307) 705-2329 (cell)
Operations Manager:	Kasey Werkele
Mailing Address:	Wexpro Company P.O. Box 458 2221 Westgate Rock Springs, WY 82902
Telephone:	(307) 352-7506 (office)

Affected Waters: Various dry washes lead to Powder Wash, the nearest intermittent flowing stream, a distance of approximately ½ mile. The nearest steady flowing stream is the Little Snake River, a distance of approximately 15 miles.

5.2 *GENERAL FACILITY DESCRIPTION*

The location of the Powder Wash Area is depicted on Figure 1. The Powder Wash Area is roughly bounded by the Powder Wash Quadrangle border on the east and the Beaver Slide Draw on the West and the Wyoming Border on the north. It is located in an arid climate with a 25-year 24-hour precipitation of approximately 2.5 inches(source: NOAA Atlas 2, Volume III).

The Powder Wash Area produces gas condensate, natural gas, produced water, or any combination thereof during the course of normal daily operation. The produced fluids (gas and liquids) are separated at the surface in pressurized vessels. The gas stream is then sold into gas sales lines and the liquids are sent to centralized tank batteries via pipelines. A tank battery consists of a series of liquid storage tanks that operate at atmospheric conditions. Condensate is separated from produced water in the above process. Condensate is sold at the tank battery to purchasers who take custody of the condensate and remove it at the site by tank truck. Produced water is trucked from facility tankage to a permitted off-site disposal facility.

5.3 *SPCC PLAN CONFORMANCE AND DEVIATIONS: §112.7(a)(1) AND (2)*

This Powder Wash Area SPCC Plan conforms with and does not deviate from the requirements of 40 CFR 112.7.

5.4 FACILITY LAYOUT: §112.7(a)(3)

Liquid hydrocarbon storage, handling facilities and containment devices in the Powder Wash Area are as described below:

1. **Storage Tanks**. The majority of the storage tanks contain produced water or condensate from the natural gas production process. A complete list of the storage tanks in the Powder Wash Area, including the tank capacities and their contents, is provided in Table D-1 in Appendix D.

   Site security drawings that depict tank locations and secondary containment structures for each area are kept in a binder at the field office. Predicted flow directions for spills that occur outside secondary containment are also shown on the site security drawings.

   Condensate Loading. Condensate from the natural gas production process is periodically transferred from the storage tanks into tank trucks and removed from the facility by a contractor. The transfer operations are supervised by the truck driver to mitigate and/or minimize the potential for releases.

5.5 LIQUID HYDROCARBON STORAGE CAPACITY: §112.7(a)(3)(ii)

A summary of the containers, their capacities and their contents addressed in this Plan is provided in Appendix D.

5.6 DISCHARGE PREVENTION MEASURES: §112.7(a)(3)(ii)

Wexpro relies on a number of measures to aid in the prevention of a discharge from liquid storage containers at this facility. Descriptions of these measures are provided below:

- Routine inspections and maintenance of the tanks, piping and containment structures is performed by trained personnel. All facilities are visited on a daily frequent (usually daily) basis. Tank contents are gauged weekly at which time a review of the containment structures are conducted. Any spill would be detected quickly and before it could get offsite or impact waterways or groundwater.

- Transfer of condensate and other liquid hydrocarbons to tank trucks is continuously monitored.

- The facility maintains written standard operating procedures to prevent potential liquid hydrocarbon releases due to leaks and spills, equipment failures, ruptures and overflows

5.7 *DISCHARGE OR DRAINAGE CONTROLS: §112.7(a)(3)(iii)*

Liquid hydrocarbons stored in the Powder Wash Area are noncorrosive materials and are compatible with the materials with which the respective storage containers and containment structures are constructed. Because the containment structures provide adequate protection against discharges, no drainage controls are required (see additional discussion in Section 5.14).

5.8 *COUNTERMEASURES FOR DISCHARGE DISCOVERY, RESPONSE, AND CLEANUP: §112.7(a)(3)(iv)*

Spill prevention and control structures have been installed around the tanks at each liquid storage site to contain most spills that could occur. Routine inspections, operating practices such as preventive maintenance and personnel training minimize the likelihood or impact of a major liquid hydrocarbons release. However, should a release occur that could impact navigable waters, Wexpro has established an emergency organization with the authority and training to mobilize personnel, utilize emergency response equipment, and coordinate with outside assistance to contain and clean-up the release. An electronic copy of the Emergency Response Plan is available to all Wexpro personnel. This organization also has the responsibility to notify Wexpro management, and safety and environmental personnel according to this SPCC Plan. These individuals in turn will notify the appropriate regulatory agencies as required by applicable federal, state, and local regulations.

5.9 *RECOVERED MATERIALS DISPOSAL: §112.7(a)(3)(v)*

For reportable discharges:

Recovered liquid hydrocarbons will be returned to storage when possible. Contaminated soil will be removed and temporarily stored on plastic sheeting, characterized using material safety data sheets, analyses, or other available information, and managed/disposed of in accordance with applicable regulations in a manner approved by an Environmental and Safety Coordinator. Any supplies or equipment depleted or destroyed as a result of the discharge or subsequent response activities will be replaced as soon as possible. The Operations Manager will be informed of the cleanup activities and obtain approval for the disposition of all materials.

Contaminated soil and water, and contaminated materials used in the response will be sent to an approved facility for disposal in compliance with the Clean Water Act, the Resource Conservation and Recovery Act and amendments, applicable state regulations, and as approved by an Environmental and Safety Coordinator.

For non-reportable discharges:

Petroleum contaminated soil will be cleaned up in accordance with the CDPHE Solid and Hazardous Waste Division's Solid Waste Guidelines.

5.10 CONTACT LIST AND NOTIFICATION PHONE NUMBERS: §112.7(a)(3)(vi)

Contact list and phone numbers for the facility response coordinator (the Field Foreman) are found in Section 5.1 of this plan. Cleanup contractors and phone numbers for each area are maintained on site.

In the event of a discharge, certain federal, state and local notification and reporting requirements become effective. 40 CFR Part 110 defines a reportable spill as any discharge of oil products (liquid hydrocarbons) that:

1. Violates applicable water quality standards, or which may directly or indirectly, by means of surface or subsurface routes, enter any navigable waters.

2. Causes a film or sheen upon or discoloration of the surface waters or adjoining shoreline, or causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

If a reportable discharge of liquid hydrocarbons occurs, the emergency and cleanup procedures described in this Plan will need to be implemented, as well as notification of the appropriate regulatory agencies. All agency notifications will be made by Wexpro's Operations Manager, Regulatory Compliance Coordinator, or designated representative. The following agencies will require notification in the event of a reportable discharge, as defined above: (8-20.5-208 CRS and 7 CCR 1101-14 Article 4).

- National Response Center (NRC)
  U.S. Coast Guard, Washington, D.C.
  24-Hour: (800) 424-8802

- Local Fire Department

If the Powder Wash Area has a "discharge" of more than 1,000 gallons or two "discharges" of liquid hydrocarbons in harmful quantities in any 12-month period into or upon the navigable waters of the United States, then Wexpro must submit a spill report to the EPA Regional Administrator at the following address within 60 days of the triggering discharge:

- EPA Regional Administrator
  U.S. Environmental Protection Agency, Region VIII
  999 18th Street, Suite 500
  Denver, Colorado 80202-2405

COLORADO

Petroleum releases of 25 gallons or more from regulated aboveground and underground fuel storage tanks must be verbally reported to the State Oil Inspector within 24 hours (after-hours contact CDPHE Environmental Release and Incident Reporting Line). Any release that may impact waters of the state must be reported immediately to CDPHE (25-8-601 CRS).

- Division of Oil and Public Safety
  (303) 318-8547 (weekdays)
  (877) 518-5608 (evenings and weekends)

- CDPHE
  (303) 756-4455

In addition, spills or releases of E&P waste or produced fluids that exceed 1 barrel, outside of secondary containment, or exceeds 5 barrels, within secondary containment, shall be verbally reported to the Colorado Oil and Gas Conservation Commission within 24 hours of discovery. (OGCC Rule 906).

- State of Colorado
  Oil and Gas Conservation Commission
  (303) 894-2100

A written report describing the spill must be submitted to the OGCC on the Spill/Release Report Form 19 within 10 days of discovery of the spill. This form is provided as Appendix E.

- State of Colorado
  Oil and Gas Conservation Commission
  1120 Lincoln Street, Suite 801
  Denver, CO 80203

In addition to these reporting requirements, the Bureau of Land Management (BLM) will be notified if the release occurs on BLM land. Agency notification will be performed only by the Operations Manager, Regulatory Compliance Coordinator, or designated representative.

Official statements to the EPA or other regulatory agencies may be made only by the Operations Manager, Regulatory Compliance Coordinator, or designated representative.

5.11 REPORTING NOTIFICATION PROCEDURES: §112.7(a)(4)

The Operations Manager will keep a daily log of activities during the spill event, including the quantity of liquid hydrocarbons spilled, recovered and disposed, itemized expenditures, general assessment of environmental damage, and any other notable events that may occur during the spill and subsequent response activities. The Operations Manager will keep updated on the progress, cost of the cleanup, recovery and disposal of all liquid hydrocarbons and contaminated materials, supplies and equipment. Dominion Energy's Environmental Incident (Spill Report) form is provided as Appendix F.

5.12 SPILL RESPONSE PROCEDURES: §112.7(a)(5)

Spill response activities and reporting will be conducted in accordance with the procedures outlined in Wexpro's Emergency Response Plan. A complete and up-to-date copy of the entire plan is available to Wexpro personnel electronically. A copy of the procedures associated with Spill or Leak of Hazardous Materials Release - Well Blowout (Section 14.0 of the Emergency Response Plan) are provided as Appendix G of this SPCC Plan.

5.13 DISCHARGE ANALYSIS: §112.7(B)

Surface water runoff flow directions are indicated for each location on the site security drawings provided. Surface water runoff may eventually drain to tributary streams and ephemeral channels of the Little Snake River.

Pursuant to §112.7(b) predictions of the direction and total quantity of material that could be discharged at the facility are summarized on the site security diagrams. In accordance with regulatory guidance, the plan addresses potential worst-case discharges and discharge pathways without considering any physical systems in place to prevent and contain releases of oil at the unit.

5.14 SPILL CONTAINMENT: §112.7(c)

All containers used for liquid hydrocarbon storage are designed and constructed using materials compatible with the products being stored and conditions of storage such as temperature and pressure. The storage containers are located within secondary containment areas capable of containing the contents of the largest container in each containment area plus sufficient freeboard. The containment structures have no drains or outlets. Spills must be removed by pumps or vacuum trucks.

Newly installed secondary containment structures are lined with polyethylene liners. Older containment structures do not have a liner but instead are constructed of hardpacked native soil with earthen berms. These unlined containment areas allow very limited permeation of spills into the soil.[1] Soil permeability studies, conducted by the Environmental Department have confirmed that the soils in the bottoms and sides of the earthern berm containment areas are sufficiently impervious to contain spilled contents. The hydraulic conductivity measured during the studies was approximately 5 inches/day in the Powder Wash area. Identification of the spill and cleanup will take place prior to waterway/groundwater impacts even in worst case scenarios.

The tanks are periodically manually gauged. At locations with more than one condensate tank, the tanks are equipped with equalizing lines between the containers. If one condensate tank were to be overfilled, the condensate overfill would flow to the adjacent condensate tank.

All aboveground valves and piping are subject to regular examination by the field operator during his scheduled rounds. Pipe supports are designed to minimize abrasion and corrosion and allow for expansion and contraction. All pipe is made of steel.

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[1] Soil permeability studies, conducted by the Environmental Department, have confirmed that the soils in the bottoms and sides of the earthern berm containment areas are sufficiently impervious to contain spilled contents. The hydraulic conductivity measured during the studies was approximately 5 inches/day in the Powder Wash area.

Short runs of underground piping are present at each production site, from the well head to the production equipment and from the production equipment to the storage tanks. Integrity tests are performed immediately upon new well hookup. Should any leaks develop, field operators would immediately recognize the same and take corrective measures.

Short runs of aboveground piping do not have secondary containment between compressor buildings and the secondary containment around the lube oil tanks. Likewise, pressurized Separators generally do not have secondary containment. Secondary containment is considered impractical for these applications. A Contingency Plan is included in Appendix I: 1) Where possible, the valve(s) near the tank and within secondary containment will remain in the closed position until oil flow is required and operations personnel are onsite to monitor activities. 2) Any spill is anticipated to remain onsite and will be quickly cleaned up, using appropriate procedures as specified in the Emergency Response Plan. 3) Regular visual inspection and periodic integrity and leak testing will be conducted on the piping.

5.15 SPILL CONTAINMENT EXCEPTIONS: §112.7(d)

Except as noted below, this requirement is not applicable because this SPCC Plan does not deviate from the requirements of §§112.7(c), 112.7(h)(1), 112.8(c)(2), 112.8(c)(11), 112.9(c)(2), 112.10(c), 112.12(c)(2), 112.12(c)(11), 112.13(c)(2), and 112.14(c).

5.16 INSPECTIONS, TESTS, AND RECORDS: §112.7(e)

The facility is subject to periodic informal visual inspections by the field operators. These inspections include observation of production site drainage, bulk storage containers, transfer operations, and security. Specific items inspected include storage containers, secondary containment, pumps, valves, flanges, pipes, and other equipment. Any sign of deterioration or leakage is immediately investigated and corrective action is performed.

A record of formal yearly inspections, signed by the appropriate supervisor or inspector, shall be retained on site or included in a copy of the SPCC Plan maintained at Wexpro's Powder Wash Field Office. The inspection forms are located in Appendix I, however §112.7(e) allows for other inspections and tests conducted as part of the usual and customary business practices to suffice for SPCC. These records shall be maintained for a minimum of three years after each inspection.

5.17 *PERSONNEL TRAINING AND DISCHARGE PREVENTION PROCEDURES: §112.7(f)*

Wexpro maintains a training program on spill prevention and response procedures. Operators are instructed in the proper operation and maintenance of equipment to prevent the discharge of oil and applicable pollution control laws, rules and regulations. Spill prevention briefings are conducted at least annually to assure adequate understanding of the SPCC Plan. Such briefings include a thorough review of each section of the SPCC Plan and highlight and describe known spill events or failures, prevention of spills, spill-reporting requirements, and recently developed precautionary measures.

A record of the briefing content and attendance, signed by the appropriate supervisor or instructor, shall be made as part of the SPCC Plan. The training record forms are included in Appendix J.

5.18 *SECURITY: §112.7(g)*

This is an onshore oil production facility and the requirements contained in §112.7(g) are not applicable.

5.19 *TANK TRUCK LOADING/UNLOADING: §112.7(h)*

The condensate is periodically transferred from the storage tanks into tanker trucks and removed from the unit by a contractor. New and used oil is periodically transferred to or from storage containers by tanker trucks at the compressor station. The drivers remain with the trucks during transfer operations to monitor the transfer; inspect outlets, connections, and valves on the tanker truck before and after the transfer; and make adjustments as necessary. Actions to contain and report any spills resulting from the truck loading/unloading would be immediate.

5.20 *BRITTLE FRACTURE ANALYSIS OF CONTAINERS: §112.7(i)*

This production facility has no field-constructed aboveground containers; therefore this requirement is not applicable.

5.21 *APPLICABLE REQUIREMENTS: §112.7(j)*

Sections 5 and 6 of this Plan provide detailed discussions of conformance with the applicable requirements and other effective discharge prevention and containment procedures used at the facility. CDPHE spill notification procedures and OGCC spill notification procedures have been incorporated within this Plan where applicable.

6.0 REQUIREMENTS FOR PRODUCTION FACILITIES: §112.9

As previously indicated in Section 5.3, this SPCC Plan conforms with and does not deviate from the requirements of 40 CFR 112.7. This section presents facility-specific details associated with the requirements for production facilities outlined in §112.9.

6.1 PRODUCTION FACILITY DRAINAGE: §112.9(b)

Secondary containment for the storage tanks is provided by the earthen berms or metal containment structures (Sioux containment). The secondary containment for the tanks is of sufficient size to contain the contents of the largest tank (plus sufficient freeboard) in each containment area should a failure occur. There are no drains or release valves in the secondary containment walls. Any liquid collected inside the secondary containment area will be pumped out. Precipitation that falls inside the containment areas is generally allowed to evaporate, though in rare circumstance it may be discharged to grade if the precipitation does not contain a sheen or other contaminants and the discharge is documented as outlined in Appendix J.

The production sites are subject to periodic informal visual inspections by the field operators. These inspections include observation of production site drainage, bulk storage tanks, transfer operations, and security. Specific items inspected include storage tanks, secondary containment, pumps, valves, flanges, pipes, and other equipment. Any sign of deterioration or leakage is immediately investigated and corrective action is performed.

6.2 BULK STORAGE CONTAINERS: §112.9(c)

Liquid hydrocarbons stored at the facility are compatible with the materials of which the storage containers and containment structures are constructed. Piping, valves, and other appurtenances are also constructed of materials compatible with the oils and associated storage conditions with which they are in contact.

Appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in §112.1(b) is provided for the facility's tank batteries, containers and separation and treating facility installations sufficient to contain the capacity of the single largest container plus sufficient freeboard.

The production sites within the facility are subject to periodic informal visual inspections by the field operators. These inspections include observation of production site drainage, bulk storage tanks, transfer operations, and security. Specific items inspected include storage tanks, secondary containment, pumps, valves, flanges, pipes, foundations and support for each container and other equipment. Any sign of deterioration or leakage is immediately investigated and corrective action is performed.

A record of formal yearly inspections, signed by the appropriate supervisor or inspector, shall be retained on site or included in a copy of the SPCC Plan maintained at Wexpro's Powder Wash Field Office. The inspection forms are located in Appendix H. These records shall be maintained for a minimum of three years after each inspection.

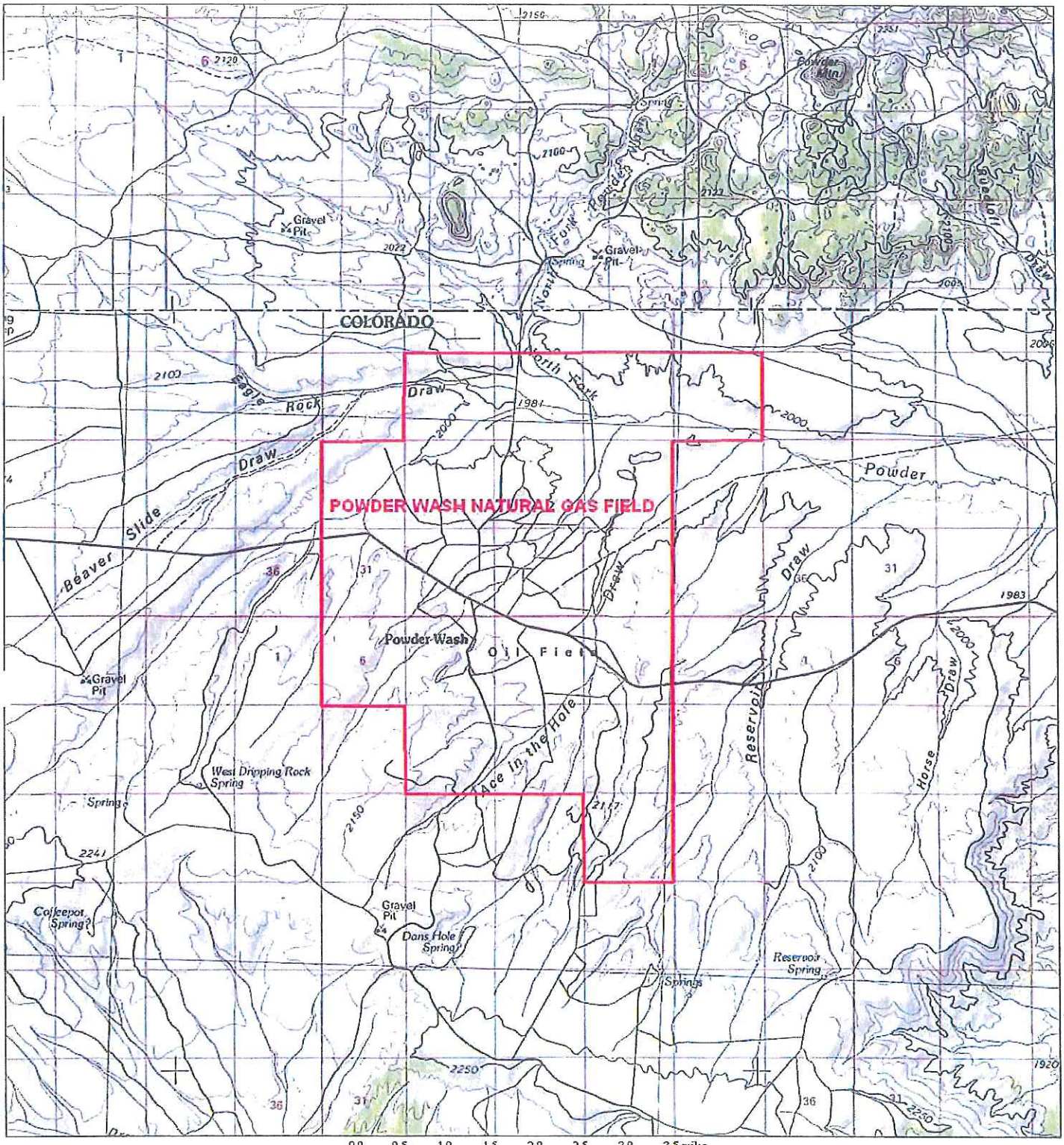
The tanks are periodically gauged manually. At locations with more than one condensate tank, the tanks are equipped with equalizing lines between the tanks. If one condensate tank were to be overfilled, the condensate overfill would flow to the adjacent condensate tank.

6.3 FACILITY TRANSFER OPERATIONS: §112.9(d)

All aboveground valves and piping are subject to regular examination by the field operators during their scheduled rounds. Pipe supports are designed to minimize abrasion and corrosion and allow for expansion and contraction. All pipe is made of steel.

Short runs of underground piping are present at each production site, from the wellhead to the production equipment and from the production equipment to the storage tanks. The contingency plan requirement is met with Wexpro's Emergency Response Plan as referenced in section 5.12 of this plan and procedures discussed in section 5.14. Flowline Maintenance program procedures and requirements are covered in sections 5.6 – 5.10, 5.12, 5.16, 5.17 and 6.2. The program includes periodic informal visual inspections by the field operators. Should any leaks develop, field operators would immediately recognize the same and take corrective measures. Corrective action to be taken includes immediate repair, clean-up and proper disposal of discharges associated with the flowlines.

Figure 1
Site Location Map



Map created with TOPO!© ©2003 National Geographic (www.nationalgeographic.com/topo)

Note: USGS 7.5–Minute Quadrangle Map
Powder Wash, Colorado dated 1973

N

FIGURE 1: SITE MAP
POWDER WASH NATURAL GAS FIELD

Project Mngr: JCG	Terracon	Project No.:	A9077002
Designed By:		Scale:	AS SHOWN
Checked By: SACC	1509 Elk Street Rock Springs, Wyoming 82901	Date:	May 2007
Approved By: SACC		Drawn By:	JCG
File Name: A9077002/Topo		Figure No.:	2

Appendix A
SPCC Plan Definitions

For the purposes of this SPCC Plan:

Bulk storage container means any container used to store oil. These containers are used for purposes including, but not limited to, the storage of oil prior to use, while being used, or prior to further distribution in commerce. Oil-filled electrical, operating, or manufacturing equipment is not a bulk storage container.

Completely buried tank means any container completely below grade and covered with earth, sand, gravel, asphalt, or other material. Containers in vaults, bunkered tanks, or partially buried tanks are considered aboveground storage containers for purposes of this part.

Condensate means a liquid obtained by the condensation of a vapor or gas, which in the case of a gas production field contains water and liquid hydrocarbons.

Discharge includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of oil that:

(a) Violate applicable water quality standards; or

(b) Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

Facility means any mobile or fixed building, structure, installation, equipment, pipe, or pipeline used in well drilling operations, production, refining, storage, gathering, processing, transfer, distribution, and waste treatment, as described in Appendix A to this part. The boundaries of a facility depend on several site-specific factors, including, but not limited to, the ownership or operation of buildings, structures, and equipment on the same site and the types of activity at the site.

Liquid Hydrocarbons means oil of any kind or in any form, including, but not limited to: petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil.

Navigable waters means the waters of the United States, including the territorial seas.

(1) The term includes:

(i) All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters subject to the ebb and flow of the tide;

(ii) All interstate waters, including interstate wetlands;

(iii) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters:

(A) That are or could be used by interstate or foreign travelers for recreational or other purposes; or

(B) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or,

(C) That are or could be used for industrial purposes by industries in interstate commerce;

(iv) All impoundments of waters otherwise defined as waters of the United States under this section;

(v) Tributaries of waters identified in paragraphs (1)(i) through (iv) of this definition;

(vi) The territorial sea; and

(vii) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraph (1) of this definition.

(2) Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (CWA) (other than cooling ponds which also meet the criteria of this definition) are not waters of the United States. Navigable waters do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with EPA.

Oil means oil of any kind or in any form, including, but not limited to: fats, oils, or greases of animal, fish, or marine mammal origin, vegetable oils, including oils from seeds, nuts, fruits, or kernels; and, other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil.

Onshore facility means any facility of any kind located in, on, or under any land within the United States, other than submerged lands.

Owner or operator means any person owning or operating an onshore facility or an offshore facility, and in the case of any abandoned offshore facility, the person who owned or operated or maintained the facility immediately prior to such abandonment.

Petroleum oil means petroleum in any form, including but not limited to crude oil, fuel oil, mineral oil, sludge, oil refuse, and refined products.

Production facility means all structures (including but not limited to wells, platforms, or storage facilities), piping (including but not limited to flowlines or gathering lines), or equipment (including but not limited to workover equipment, separation equipment, or auxiliary non-transportation-related equipment) used in the production, extraction, recovery, lifting, stabilization, separation or treating of oil, or associated storage or measurement, and located in a single geographical oil or gas field operated by a single operator.

Sheen means an iridescent appearance on the surface of water.

Sludge means an aggregate of oil or oil and other matter of any kind in any form other than dredged spoil having a combined specific gravity equivalent to or greater than water.

Spill Prevention, Control, and Countermeasure Plan; SPCC Plan, or Plan means the document required by §112.3 that details the equipment, workforce, procedures, and steps to prevent, control, and provide adequate countermeasures to a discharge.

Storage capacity of a container means the shell capacity of the container.

Appendix B
Certification of Substantial Harm Determination

ATTACHMENT C-II-CERTIFICATION OF THE APPLICABILITY OF THE SUBSTANTIAL HARM CRITERIA

FACILITY NAME: Powder Wash Area

FACILITY ADDRESS: Moffatt County, CO

1. Does the facility have an oil storage capacity that is greater than or equal to 42,000 gallons and conduct operations that include over-water transfers to or from vessels?
   ☐Yes
   ☑No *proceed to questions below*

2. Does the facility have an oil storage capacity greater than or equal to one million gallons **and** does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation with any aboveground storage area.
   ☐Yes
   ☑No *proceed to next question*

3. Does the facility have an oil storage capacity greater than or equal to one million gallons **and** is the facility located at a distance (as calculated using the appropriate formula in Attachment C–III to this appendix or a comparable formula 1) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (see Appendix E to this part, section 13, for availability) and the applicable Area Contingency Plan.
   ☐Yes
   ☑No *proceed to next question*

4. Does the facility have an oil storage capacity greater than or equal to one million gallons **and** is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula[1] such that a discharge from the facility would shut down a public drinking water intake[2]?
   ☐Yes
   ☑No *proceed to next question*

5. Does the facility have an oil storage capacity greater than or equal to one million gallons **and** has the facility experienced a reportable oil discharge in an amount greater than or equal to 10,000 gallons within the last 5 years?
   ☐Yes
   ☑No *proceed to next question*

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Signature _____

Name (please type or print) Mark Stewart

Title Supervisor - Environmental

Date 1/5/2018

Footnotes:

1. If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.
2. For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).

Appendix C
Five Year Review Record

Five-Year Review Record

In accordance with §112.5(b), this SPCC Plan has been reviewed to determine if more effective prevention and control technology is available to significantly reduce the likelihood of a discharge.

Pursuant to §112.5(b) and by means of this certification, I attest that I have completed a review and evaluation of this SPCC Plan for Wexpro, and as a result

☐ Will

☑ Will Not

amend the Plan. Technical amendments to the Plan have been certified by a Professional Engineer.

_____ _____

Signature, Authorized Facility Representative Date

_____

Name (Printed)

_____

Title

Appendix D
Tank Volumes

Updated 1/18/2018

Table D-1
Wexpro Company
Powder Wash Area

Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
Powder Wash														
Government #1	297	400				Condensate	577	577	dirt	4/12/11	36	30	3	577
	2105	200				Water/Oil	246	248	dirt		24	24	2.4	246
Government #2	357	400				Oil	1314	1749.0	elliptical Sioux containment , no sioux match	4/27/11	52	63	3	1374
	356	400		12	60.4	Water/Oil								
N Side Compressor Plant/PW Plant	429	400				Condensate	433	433	adequate, <10% ok 24hr/25year data (dirt)	4/10/08	30	27	3	433
	119	300		12	40.3	oil	665	705	dirt		60	33	2	705
	352	400				oil								
	267	300				water/oil	433	433	dirt		45	27	2	433
Central Staging Facility	732	400				Fresh Water	899	893	containment not required dirt	4/27/11	63	48	1.67	899
Filling Station		95	4000			Gasoline	172		Double wall tank inside square Sioux contnmnt	10/16/14	19.67	19.67	2.5	172
		1	55			solvent			contained		3	3	1	1.6029
J.A. Lee #1	339	400				Condensate	842	841	dirt	4/21/10	45	35	3	842
	2212	200				blowdown/water	249	249	(Proposed - round Sioux)		30		2.08	249
Mountain Fuel #20-1	271	400				Condensate	833	833	dirt	4/27/11	40	39	3	833
							516	516	pit #1		23	21	6	516
Hal Stewart #1	2399	200				blowdown/water	249	249	round sioux	9/13/12	30		2.08	249
	379	400				Condensate	481	481	dirt		30	30	3	481

Updated 1/18/2018

Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume without displacement (bbl)
Hal W Stewart #2	438	400				Condensate	570	570	dirt	2/25/13	64	25	2	570
	2194	210				Water/Oil	303	303	dirt		34	20	2.5	303
Hal Stewart #5	2102	400				blowdown/water	572	595	elliptical sioux containment	8/31/09	27	55	2.75	627
	2103	400		12	55.4	Condensate								
Ha Stewart #6	2347	400				blowdown/water	572	595	elliptical sioux containment	4/27/11	27	55	2.75	627
	2348	400		12	55.4	Condensate								
State #1	2627	400		12		Condensate								
	2628	400		12		Condensate								
State #2	2629	400		12		Condensate								
		400		12		Condensate								
State #21-16	2630	400		12		Condensate								
	2631	400		12		produced water								
Chapman #1	2623	400		12		Condensate								
	2624	400		12		Condensate								
Chapman #2	2626	400		12		Condensate								
	2625	400		12		Condensate								
Carl Allen														
Carl Allen #2	2142	200				blowdown	249	249	Round Sioux	8/31/09	30		2.08	249
Carl Allen #4	605	400				blowdown/water	481	481	dirt	4/27/11	36	25	3	481
						pit #1	778	778	dirt		28	26	6	778
Carl Allen Well #6	329	400				Condensate	497	497	dirt	4/27/11	31	30	3	497
	868	400				Water	673	288	West side berm missing, flow to pit #1 (dirt)		27	20	3	289
						pit #1					24	18	5	385
Carl Allen #7	1091	400				Condensate	561	561	dirt	4/27/11	35	30	3	561
	2143	200				blowdown/water	249	262	Round Sioux		30		2.08	249
Carl Allen #8	291	400				Condensate	517	517	dirt berm	8/21/12	44	33	2	517

Updated 1/18/2018

Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
~~Carl Allen #8~~						pit #1	750	750			27	26	6	750
Carl Allen #9	808	400				Condensate	477	517	dirt	8/31/09	44	33	2	517
	809	400		12	40.3	Water								
						pit #1	570	570			20	20	8	570
Carl Allen #11	1092	400				condensate	539	454	dirt	11/10/14	56	26	2.08	539
	2214	200				blowdown	249	249	Round Sioux		30		2.08	249

Updated 1/18/2018

Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
Carl Allen #16	698	400				condensate?	659	658	dirt	4/27/11	43	43	2	659
						pit #2	38	39			6	6	6	38
	2191	200				blowdown/water	249	262	Round Sioux		30		2.08	249
Carl Allen #19	353	400				Condensate	635	635	dirt	11/18/11	36	33	3	635
	2190	200				blowdown/water	249	262	Round Sioux		30		2.08	249
Carl Allen #20	301	400				Condensate	505	505	dirt	5/25/11	30	27	3.5	505
	2144	300				blowdown/water	472	558	elliptical sioux - no sioux match		25	36	3.75	472
Carl Allen #22	1475	400				Condensate	484	534	dirt	2/25/13	50	24	2.5	534
	2192	210		12	50.3	blowdown/water								
Carl Allen #23	1702	400				Condensate	664	664	dirt	4/27/11	35.5	35	3	664
	2193	200				Oil/Water	599	599	dirt		34	33	3	599
Carl Allen #25	2047	400				condensate	787	595	elliptical sioux	2/10/15	27	55	3.75	862
	2048	400		12	75.5	blowdown/water								
		12	500			knockout tank								
Carl Allen #26	2026	400				Condensate	551	793	elliptical sioux, no sioux match	1/10/15	27	55	3	623
	2027	400		12	60.4	blowdown/water								
		12	500			knockout tank								
Carl Allen #27	2132	400				condensate	572	595	elliptical sioux	8/31/09	27	55	2.75	627
	2133	400		12	55.4	blowdown/water								
Carl Allen #28	2186	400				condensate	572	595	elliptical sioux	8/31/09	27	55	2.75	627
	2187	400		12	55.4	blowdown/water								
Carl Allen #29	2130	400				condensate	572	595	elliptical sioux	11/10/14	27	55	2.75	627
	2131	400		12	55.4	blowdown/water								
Pad Well #2 (Carl Allen 30 & 31)	2382	400				Condensate	710	686	elliptical sioux - no sioux match	4/27/11	36	55	3	830
	2383	400		12	60.4	Condensate								
	2384	400		12	60.4	blowdown/water								
Carl Allen #32	2342	400				blowdown/water	572	595	elliptical sioux	11/18/11	27	55	2.75	627
	2343	400		12	55.4	Condensate								

Updated 1/18/2018

Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
Carl Allen #33	2351	400				Condensate	572	595	elliptical sioux	11/12/09	27	55	2.75	627
	2352	400		12	55.4	blowdown/water								
Carl Allen #34	2344	400				blowdown/water	572	595	elliptical sioux	4/27/11	27	55	2.75	627
	2345	400		12	55.4	Condensate								
Pad Well #1 (Carl Allen 35, 36 and BW Musser 32,36&37)	2378	400				blowdown/water	686	686	elliptical sioux	4/27/11	36	55	2.75	797
	2377	400		12	55.4	Condensate								
	2376	400		12	55.4	Condensate								
		12	500			Condensate			round tub		7		2	14
Carl Allen 40, 41 Pad	2558	400				blowdown/water	698		elliptical sioux - no sioux match	no date	36	55	3	830
	2561	400		12	60.4	Condensate								
	2562	400		12	60.4	Condensate								
		12	500			knockout tank								
J.C. Donnell														
J.C. Donnell #1	338	400				Condensate	514	654	round sioux-no sioux match	8/31/09	35		3	514
	2146	200				blowdown/water	249	262	Round Sioux		30		2.08	249
J.C. Donnell #3	2338	200				blowdown/water	249	262	round sioux	8/31/09	30		2.08	249
J.C. Donnell #5	234	300				Condensate	513	513	dirt	8/31/09	32	30	3	513
	2197	200				Oil/Water	484	484	dirt		34	32	2.5	484
			500			alcohol			ncd					
J.C. Donnell #7 P&Ad 2014 tanks removed								1307	dirt	6/18/14	72	34	3	1308
							192	192	pit #1		15	12	6	192
J.C. Donnell #9	114	300				Condensate	393	393	round sioux-no match	8/31/09	36		2.17	393
						pit #1	426	426			26	23	4	426
J.C. Donnell #10	423	400				Condensate	692	692	dirt	4/27/11	36	36	3	692
	2298	200				blowdown/water	249	262	round sioux		30		2.08	249

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Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
J.C. Donnell #11	315	400				Condensate	454	444	dirt	4/27/11	42	27	2.25	454
	2215	200				blowdown/water	249	249	round sioux		30		2.08	249
J.C. Donnell #12	340	400				Condensate	462	461	dirt	4/27/11	36	36	2	462
	2148	200				blowdown/water	249	249	round sioux		30		2.08	249
J.C. Donnell #14-29	341	400				Condensate	833	833	dirt	6/18/14	40	39	3	833
	2198	210				blowdown/water	484	484	dirt		34	32	2.5	484
J.C. Donnell #14	2172	400				Condensate	572	595	elliptical sioux	4/27/11	27	55	2.75	627
	2179	400		12	55.4	blowdown/water								
JC Donnell #15	2304	400				Oil/Water	596	589	elliptical Sioux - no match	2/10/15	30	56	3	705
	2305	400		12	60.4	Oil/Water								
	2306	400		12	60.4	blowdown/water								
		12	500			knockout tank								
J.C. Donnell #16	2174	400				Condensate	572	595	elliptical sioux	6/18/14	27	55	2.75	627
	2181	400		12	55.4	blowdown/water								
J.C. Donnell #18	2353	400				condensate	572	595	elliptical sioux	4/27/11	27	55	2.75	627
	2354	400		12	55.4	blowdown/water								
B.W. Musser														
Musser Compressor	299	400				Condensate	476		dirt	no date	33	27	3	476
BW Musser #1			500			diesel			ncd	4/27/11				
B.W. Musser #6	359	400				Condensate	733	793	dirt	5/16/11	55	27	3	793
	1746	400		12	60.4	Condensate								
	2136	200				blowdown/water	476	475	dirt		33	27	3	476
			500			diesel			ncd					
BW Musser #10	292	400				Condensate	572	595	elliptical Sioux	4/26/10	27	55	2.75	627
	2337	200		12	55.4	blowdown/water								
BW Musser #11	232	300				Condensate	396	396	dirt	4/13/11	28	26.5	3	396
	2137	210				Oil/Water	249	249	round sioux		30		2.08	249
BW Musser #13	314	400				Condensate	964	963	dirt	8/31/09	44	41	3	964
	2195	200				blowdown/water	249	249	round sioux		30		2.08	249

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Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
BW Musser #14	236	300				Condensate	705	705	dirt	4/27/11	40	33	3	705
	2400	200				blowdown/water	249	249	round sioux		30		2.08	249
						pit #1	541	541	dirt		23	22	6	541
BW Musser #15	2178	400				Condensate	578	638	elliptical Sioux -need ht. on ssd	2/10/15	36	45	3	638
	2185	200		12	60.4	blowdown/water								
BW Musser #16	313	400				Condensate	423	423	dirt	2/16/15	33	24	3	423
	2524	200				blowdown/water	249		round Sioux add containment dimensions to drawing		30		2.08	249
BW Musser #18	842	400				Water	558	557	dirt	3/24/11	36	29	3	558
	2401	400				blowdown/water			sioux containment					
	332	400				Condensate			dirt		52	31	3	861
						pit #2					6	6	8	51
BW Musser #19	333	400				Condensate	808	808	dirt	8/31/09	55	33	2.5	808
	2139	210				blowdown/water	542	542	dirt		35	29	3	542
BW Musser #20	363	400				Condensate	596	596	dirt	4/27/11	36	31	3	596
	2140	200				blowdown/water	249	249	round sioux		30		2.08	249
BW Musser #21	360	400				Condensate	521	520	dirt	3/24/11	39	31	2.42	521
	2402	400				blowdown/water			elliptical sioux					
						pit #1	337	336			18	21	5	337
BW Musser #22	437	400				Condensate	992	712	dirt	7/14/14	58	32	3	992
	2466	200				blowdown/water	249		round sioux		30		2.08	249
			300			Diesel			containment					
BW Musser #23	1860	400				Condensate	616	856.0	elliptical Sioux-no match	8/17/10	30	56.67	2.83	673
	1861	400		12	57.0	blowdown/water								
BW Musser #24	1946	400				Condensate	800	856.0	dirt	4/27/11	56.67	30	2.83	857
	1947	400		12	57.0	blowdown/water								
BW Musser #25	1999	400				Condensate	780	993.0	elliptical Sioux-no match	11/17/14	31	48	3.75	780

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Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
BW Musser #26R	2106	400				Condensate	583	589	elliptical sioux	4/21/10	36	45	2.75	638
	2105	400		12	55.4	blowdown/water								
BW Musser #27	2188	400				Condensate	572	595	elliptical sioux	4/27/11	27	55	2.75	627
	2189	400?		12	55.4	blowdown/water								
BW Musser #28	2287	400				Oil/Water	584	589	elliptical Sioux - no match	4/13/11	30	56	3	705
	2288	400		12	60.4	Oil/Water								
	2289	400		12	60.4	blowdown/water								
BW Musser #29	2177	400				Condensate	572	595	elliptical sioux	4/27/11	27	55	2.75	627
	2184	400		12	55.4	blowdown/water								
Pad Well #3 (Musser 34, 42 and Govt. 15, 16 & 17)	2473	400				condensate	649		elliptical Sioux - no match	1/22/15	36	55	3	830
	2474	400		12	60.4	Condensate								
	2475	400		12	60.4	Condensate								
	2476	400		12	60.4	?								
		12	500			condensate			need containment dimensions					
		12	500			diesel	14		verify dimensions		6.33	7.17	1.75	14
Pad Well #4 (Musser 35, 72 & 73)	2463	400				Condensate	710	686	elliptical Sioux-no match	8/21/12	36	55	3	830
	2464	400		12	60.4	Condensate								
	2465	400		12	60.4	blowdown/water								
Pad Well #5 (Musser 31, 38, 39 & Carl Allen 37)	2556	400				blowdown/water	710		elliptical Sioux-no match	2/4/15	36	55	3	830
	2557	400		12	60.4	Condensate								
	2558	400		12	60.4	Condensate								
Jacks Draw														
Jacks Draw #2	358	400				Condensate	481	481	dirt	11/18/11	30	30	3	481
	2299	200				blowdown/water	249	262	round sioux		30		2.08	249
Jacks Draw #3	841	400				Condensate	461	460	dirt	4/27/11	47	33	1.67	461
	2300	200				blowdown/water	249	262	round sioux		30		2.08	249

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Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
Jacks Draw #5	275	400				Condensate	457	600	round sioux	4/27/11	30		3.75	457
	867	400				Water	519	518	dirt		37	35	2.25	519
	2145	200				blowdown/water	249	334	round sioux		30		2.08	249
			500			diesel			containment					
Jacks Draw #8	241	300				Condensate	442	442	dirt	8/31/09	36	23	3	442
							205	205	pit #1		12	12	8	205
Jacks Draw #9	1625	300				blowdown/water	573	705	elliptical Sioux	2/25/13	27	55	2.67	627
	2006	240		12	53.8	condensate								
Jacks Draw #16	Well P&Ad in July 2014. All equipment removed									7/14/14				
Jacks Draw #17	1863	400				Condensate	800	856	dirt	4/26/11	56.67	30	2.83	857
	1864	400		12	57.0	blowdown/water								
Jacks Draw 18 & 20 Pad	2535					blowdown/water	698		elliptical Sioux-no match	1/10/145	36	55	3	830
	2539	400		12	60.4	Condensate								
	2540	400		12	60.396	Condensate								
		12	500			knockout tank								
Ace														
Ace #1	Well P&Ad in July 2014. All equipment removed									7/15/14				
Ace #2										9/18/14				
	2613	200				blowdown/water	269		round sioux		27		2.75	269
	173	300				Condensate	508	507	dirt		38	25	3	508
Ace #3	120	300				Condensate	514	514	dirt	4/27/11	37	26	3	514
							274	273	pit #1		16	16	6	274
								29	pit #2		10	8		
Ace #7	302	400				Condensate	476	476	dirt	10/11/11	33	27	3	476
	2135	200				blowdown/water	249	249	round sioux		30		2.08	249

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Well Name	Tank Number	Tank Size (bbls)	Tank Size (gals)	Tank Diameter (ft)	Displacement Volume (bbls)	Tank Contents	Net Containment Volume (bbls)	Net Containment Volume on Site Facility Diagram	Remarks	Site Security Diagram Date	Width or diameter (ft)	Length (ft)	Height (ft)	Volume -without displacement (bbl)
Ace#10	2011	400				Condensate	572	595	elliptical sioux	4/26/11	27	55	2.75	627
	2012	400		12	55.4	blowdown/water								
Ace #11	2100	400				blowdown/water	560	595	elliptical sioux	1/10/15	27	55	2.75	627
	2101	400		12	55.4	oil								
		12	500			knockout tank								
			500			diesel		585 gall	containment					
Ace #12	2070	400				Condensate	572	595	elliptical Sioux	4/26/11	27	55	2.75	627
	2071	400		12	55.4	blowdown/water								
Ace #13	2127	400				blowdown/water	572	595	elliptical Sioux	4/7/15	27	55	2.75	627
	2126	400		12	55.4	Condensate								

sfd: site facility diagram ncd: need containment dimensions

Pursuant to §112.3(d) and by means of this SPCC certification, I attest that: (i) I am familiar with the requirements of the SPCC Rule (40 CFR Part 112); (ii) My authorized agent has visited and examined the requirements of the facility and the tank table has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of the SPCC Rule, the containments are adequate.

Signature of Professional Engineer

Printed Name of Professional Engineer

Date

Powder Wash Separators

Well Name	MAOP (psi)	Size		Manufacture	Manuf. Date (YYYY)	Serial No.
		Length/Diameter	Volume (gallons)			
Ace # 2	1000	7'-6 x 20"	122.4	PEC	1970	602
Ace # 3	125	90" x 30"	275.4	Olman Heath	1980	31310
Ace # 10	1000	7'-6 x 20"	122.4	J.W. Williams	2005	14879
Ace # 11	400	90" x 24"	176.2	Cimarron Tank Co	1985	T-6095
Ace # 12	1000	7'-6 x 20"	122.4	NATCO	2006	EL2G358E03-01
Ace # 13	1440	90" x 24"	176.2	Hanover	2007	106123
B.W. Musser # 10	1000	6' x16"	62.7	Entertek	1993	42560
B.W. Musser # 11	1000	7'-6 x 20"	122.4	PEC	1965	064
B.W. Musser # 23	1000	8' x16"	83.6	Olman Heath	2005	300151
B.W. Musser # 24	1000	7'-6 x 20"	122.4	J.W. Williams	2005	14876
B.W. Musser # 26R	1440	8' x 24"	188.0	NATCO	2007	EL9G58801-04
B.W. Musser # 27	1000	8'-4" x 33"	370.1	Civic	2005	23
B.W. Musser # 28	1000	6' x 36"	317.2	Pesco	2005	221240
B.W. Musser # 29	1000	7'-6 x 20"	122.4	J.W. Williams	2008	24051-7
B.W.Musser #31	1000	90" x 20"	138.7	J.W. Williams	2011	22045
B.W. Musser # 32	1000	7'-6 x 20"	122.4	Natco	2009	EL2H448B04-01
B.W. Musser # 36	1000	7'-6 x 20"	122.4	NATCO	2009	EL2H448A04-01
B.W. Musser # 37	1000	90" x 20"	122.4	Natco	2009	EL2H448A03-01
B.W.Musser 38	1000	90" x 20"	122.4	J.W. Williams	2011	22050
B.W.Musser39	1000	90" x 20"	122.4	J.W. Williams	2012	22052
B.W. Musser # 34	1000	16' x 36"	846.0	ocess Equipment & Serv	7/4/1905	223078
B.W. Musser # 42	1000	16' x 36"	846.0	ocess Equipment & Serv	7/4/1905	223077
B.W. Musser # 72	1000	10' x 20"	163.2	ocess Equipment & Serv	2011	207699
B.W. Musser # 73	1000	10' x 20"	163.2	ocess Equipment & Serv	2011	207734
Carl Allen # 2	1000	7'-6" x 24"	176.2	PEC	1972	740
Carl Allen # 8	1440	7'-6" x 24"	176.2	National Tank	2006	EL9G48001-01
Carl Allen # 22	1800	90" x 24"	199.7	NATCO	1967	IH 30-4946
Carl Allen # 23	1000	90" x 16"	88.8	PESCO	1984	201042
Carl Allen # 25	1000	7'-6 x 24"	176.2	National	2006	EL-2C358F13-01
Carl Allen # 26	1000	20' x 8'	52.2	NATCO	2006	2G359C22-01
Carl Allen # 27	1440	20' x 8'-6"	29.4	Hanover	2007	6119
Carl Allen # 28	1000	7'-6 x 20"	122.4	PE&F	2007	6120
Carl Allen # 29	1440	8'-6 x 20"	138.7	P.E. & F.	2007	06125
Carl Allen # 30	1000	10' x 20"	163.2	PESCO	2010	207524
Carl Allen # 31	1000	10' x 20"	163.2	PESCO	2010	207530
Carl Allen # 32	1000	7'-6 x 20"	122.4	JW Williams	2008	24051-4
Carl Allen # 33	1000	7'-6 x 24"	176.2	National Tank Company	2009	EL2H447B22-01
Carl Allen # 34	1000	7'-6 x 24"	176.2	JW Williams	200	24051-6
Carl Allen # 35	1000	7'-6 x 24"	176.2	PESCO	2009	207490
Carl Allen # 36	1000	7'-6 x 24"	176.2	Natco	2009	EL2H448B03-01
Carl Allen #37	1000	90" x 24"	199.7	J.W. Williams	2011	22047
Carl Allen #40	1000	7'-6" x 20"	122.4	JW Williams	2011	21996
Carl Allen #41	1000	7'-6" x 20"	122.4	JW Williams	2011	21991
Hal Stewart # 1	1000	7'-6" x 16"	78.3	Sivalls	1991	60485
Hal Stewart # 5	1000	7'-6 x 24"	176.2	National	2006	EL-2C358F03-01
Hal Stewart # 6	1000	7'-6" x 24"	176.2	J.W. Williams	2008	24051-5
J.C. Donnell # 14	1000	7'-6" x 24"	176.2	J.W. Williams	2008	24051-2
J.C. Donnell # 15	250	15' x 36"	793.1	National	1981	23380
J.C. Donnell # 16	1000	36" x 24"	70.5	Hanover	2007	06121
J.C.Donnell # 17	1000	5' x 20"	81.6	J.W. Williams	1971	699
J.C. Donnell # 18	1000	7'-6" x 24"	176.2	NATCO	2009	EL2H447D22-01
Jack's Draw # 2	1000	7'-6" x 24"	176.2	J.W. Williams	1991	905-4
Jack's Draw # 3	1000	7'-6" x 24"	176.2	PEC	1975	1092
Jack's Draw # 5	1000	8'-3" x 16"	86.2	Olman Heath	1982	33154
Jack's Draw # 8	1000	6'6" x 16"	67.9	PEC	1967	20962
Jack's Draw # 9	1100	9' x 16"	94.0	JW Williams	6/13/1905	2859
Jack's Draw # 17	1000	6' x 24"	141.0	Olman Heath	2005	300150
Jacks Draw # 18	1000	7'-6" x 20"	122.4	J.W. Williams	2011	21982
Jacks Draw # 19	1000	8' x 16"	83.6	CVIC	2011	680
Jacks Draw # 20	1000	7'-6" x 20"	122.4	J.W. Williams	2011	21976
Government #17	325	10' x 36"	528.7	American Tank	1980	5497
PW Statel #21-16	720	8' x 20"	130.6	Pessco	2000	2058689
PW Chapman #1	375	7'-6" x 16"	78.3	CD&V	1979	147-N

Powder Wash Dehy Vent Tubs

Dehy Vent Tubs	Size (gallons)
Ace 1	420
Carl Allen 17	420
Jacks Draw 2	420
Jacks Draw 3	420
Jacks Draw 8	420
Jacks Draw 9	420
Jacks Draw 13	420
Chapman 1	420

Appendix E
Colorado Oil and Gas Conservation Committee
Spill Report Form

FORM
19
Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109

FOR OGCC USE ONLY

Spill report taken by:

FACILITY ID:

SPILL/RELEASE REPORT

This form is to be submitted by the party responsible for the oil and gas spill or release. Any spill or release which may impact waters of the State must be reported as soon as practicable; any spill over 20 bbls must be reported within 24 hours and all spills over five bbls must be reported within ten days. Submit a Site Investigation and Remediation Workplan (Form 27) when requested by the Director.

OPERATOR INFORMATION

Name of Operator: _____ OGCC Operator No: _____

Address: _____

City: _____ State: _____ Zip: _____

Contact Person: _____

Phone Numbers

No: _____

Fax: _____

E-Mail: _____

DESCRIPTION OF SPILL OR RELEASE

Date of Incident: _____ Facility Name & No.: _____

Type of Facility (well, tank battery, flow line, pit): _____

Well Name and Number: _____

API Number: _____

County: _____

QtrQtr: _____ Section: _____

Township: _____ Range: _____

Meridian: _____

Specify volume spilled and recovered (in bbls) for the following materials:

Oil spilled: _____ Oil recov'd: _____ Water spilled: _____ Water recov'd: _____ Other spilled: _____ Other recov'd: _____

Ground Water impacted? ☐ Yes ☐ No Surface Water impacted? ☐ Yes ☐ No

Contained within berm? ☐ Yes ☐ No Area and vertical extent of spill: _____ x _____

Current land use: _____ Weather conditions: _____

Soil/geology description: _____

IF LESS THAN A MILE, report distance **IN FEET** to nearest.... Surface water: _____ wetlands: _____ buildings: _____

Livestock: _____ water wells: _____ Depth to shallowest ground water: _____

Cause of spill (e.g., equipment failure, human error, etc.): _____ Detailed description of the spill/release incident:

CORRECTIVE ACTION

Describe immediate response (how stopped, contained and recovered):

Describe any emergency pits constructed:

How was the extent of contamination determined:

Further remediation activities proposed (attach separate sheet if needed):

Describe measures taken to prevent problem from reoccurring:

OTHER NOTIFICATIONS

List the parties and agencies notified (County, BLM, EPA, DOT, Local Emergency Planning Coordinator or other).

Date	Agency	Contact	Phone	Response

Spill/Release Tracking No: _____

Appendix F
Dominion Energy's Environmental Incident (Spill Report) Form

ENVIRONMENTAL INCIDENT REPORT

COMPANY: ☐QGC ☐QPC ☐QES ☐WEX

FACILITY NAME			
DATE AND TIME OF OCCURRENCE	DATE AND TIME OF DISCOVERY	DATE AND TIME REPORTED TO ESS	NAME OF ESS EMPLOYEE REPORTED TO

LOCATION

STATE	COUNTY	SUBSECTION (E.G. SE/4 OF SW/4)	SECTION	TOWNSHIP	RANGE	MERIDIAN

INCLUDE ANY MAPS AND/OR DIAGRAMS AS NECESSARY.

SURFACE OWNERSHIP

PRIVATE (LIST OWNER):		FEDERAL (SPECIFY AGENCY AND POINT OF CONTACT):
STATE (SPECIFY AGENCY AND POINT OF CONTACT):		TRIBAL (POINT OF CONTACT):
LEASE NUMBER:	API WELL NUMBER:	UNIT NAME OR C.A. NUMBER:

TYPE OF INCIDENT

(CHECK ALL APPROPRIATE BOXES)

☐ BLOWOUT	☐ FIRE	☐ INJURY	☐ FATALITY	☐ PROPERTY DAMAGE	☐ GAS VENTING (AMOUNT)
SPILL (INDICATE TYPE AND QUANTITY)					
☐ HAZARDOUS SUBSTANCE		☐ NON-HAZARDOUS SUBSTANCE			
☐ CONDENSATE	☐ PROD. WATER	☐ SALTWATER	☐ METHANOL	☐ GLYCOL	☐ ANTIFREEZE
☐ CRUDE OIL	☐ ENGINE OIL	☐ USED OIL	☒ OTHER (SPECIFY):		
VOLUME DISCHARGED OR CONSUMED:			VOLUME RECOVERED:		
DIRECTION OF FLOW:			DISTANCE TRAVELED:		
☐ ON LAND	☐ CONTAINED & CONTROLLED		☐ WITHIN FACILITY DIKE		☐ OFF-SITE
☐ ON WATER	☐ UNCONTAINED/UNCONTROLLED		☐ WITHIN FACILITY, OUT OF DIKE		
NAME OF NEAREST LAKE OR STREAM:			DISTANCE TO NEAREST LAKE OR STREAM:		

Appendix G
Spill or Leak of Hazardous Materials Release - Well Blowout Procedures *(taken from Wexpro's Emergency Management Plan)*

14. SPILL OR LEAK OF HAZARDOUS MATERIALS RELEASE – WELL BLOWOUT

14.1 FIRST RESPONDER

- Determine if an emergency condition exists, indicated by:
    a. Abnormal operating parameters.
    b. Equipment malfunction or failure.
    c. The release of liquids, vapors, natural gas or H2S.
- Notify the Production Foreman or on site supervision (initiate Notification Procedures, See Section 5).
- Approach the scene with caution, evaluate for:
    a. Identify the leaking material, container.
    b. Need for Personal Protective Equipment or other safety equipment.
    c. Potential for H2S release.
    d. Lack of oxygen (confined space or gaseous atmosphere).
    e. Combustible/flammable atmospheres (fire/explosion potential).
    f. Electrical Hazards.
    g. Any other hazard not listed above.
- Don any required PPE and safety equipment.
- If potentially harmful levels of flammable vapors or gas is present:
    a. Evacuate the site immediately.
    b. Secure the site; keep unauthorized and non-essential company personnel away from the site.
- If it is safe:
    a. Alert other personnel as needed and as appropriate.
    b. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in the immediate area). Turn off ignition pilot lights, don't use telephones or other electronic instruments; do not start vehicles, shut off all electricity as appropriate.
    c. Stop the leak. Attempt to shut in the source or reduce the spill size by remotely closing the appropriate valves, reduce operating pressures or rotating a leaking container so that the hole is above the liquid level in the container.
    d. DO NOT touch or walk through spilled materials.
    e. STOP any filling or transfer operations.
    f. Assess the situation to the best of your ability for:
        - Specific material released.
        - Volume released.
        - Pressure reading(s).
        - Conditions – time, weather, climate, location, (e.g. tank numbers etc.).
        - History, if known.
        - Potential losses – lives, property, environment.
    g. Initiate containment, if possible.
- If unable to control the spill or leak, determine which direction the hazardous materials are moving.
- Determine if Company personnel, contract personnel or local residents need to be evacuated.
- Secure the site. Keep unauthorized personnel out. (See Section 10).

- Notify the Foreman , or next level of authority, and provide any updates:
    a. Verification of the specific material released.
    b. Approximate volume (size) released.
    c. Potential losses – lives, property, environment.
    d. Conditions – time, weather, climate, location (e.g. tank numbers etc.).
    e. Direction of vapors/gas cloud movement.
    f. Direction of spill flow.
    g. Pressure reading(s).
    h. History, if known.

DANGER: DO NOT enter any enclosed structure to isolate equipment without donning the appropriate PPE and monitoring the atmosphere for physical and health related hazards.

14.2 EVACUATION

- If the spill is beyond the control capability of local Company personnel, evacuate the area.
- Evacuate UP WIND when possible.
- Follow any posted evacuation routes to designated rendezvous points, if appropriate.
- Rendezvous at least 500 feet from the hazard area.

NOTE: Control rooms are not considered to be safe havens and should not be used as a rendezvous point unless it is located greater than 500 feet up wind of the hazard area.

- The senior on-site Company employee will account for all Company and contract personnel at the site.
- DO NOT leave the rendezvous point without indicating your destination and upon approval of the on-site senior employee.

Appendix H
Annual Inspection Form

Date: ______________

Wexpro Annual Storage Tank Inspection

TANK DESCRIPTION	TANK No.	SIZE (bbls)	SIZE (gals)	TANK and FOUNDATION IN GOOD COND?	FIREWALL		Piping,valves & sealing devices good?	SITE SECURITY PLAN	FLAME ARRESTOR			DRAIN LINE & SUMP COND OKAY?	INSPEC. BY
					IN GOOD COND?	SIZE			COND OKAY?		DATE LAST TESTED		
									TK #1	TK #2			
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	
				Y / N	Y / N		Y / N	Y / N	Y / N / NA	Y / N / NA		Y / N	

N = No Y = Yes NA = Not Applicable
Explain any N (No) or unsatisfactory items on the back of this form.

Appendix I
Oil Spill Contingency Plan

Spill Prevention Control and Countermeasure (SPCC) Contingency Plan

Response Actions

PERSON DISCOVERING THE SPILL
• Notify Responsible Supervisor

RESPONSIBLE SUPERVISOR
• Assume role of On-Scene Incident Commander • Evaluate health and safety hazards and review Safety Data Sheets (SDS). SDSs for materials used by Wexpro are available from the company SDS database via the company intranet. • If safe, direct source control **(Figure 1)** • If safe, direct deployment of company response equipment • Notify local management • Complete Environmental Incident Report form **(Appendix F)** • Mobilize spill response contractors (if needed) **(Figure 2)** • Document response actions • Notify required agencies **(Figure 2)** • Complete the Dominion Environmental Incident Report Form on the Dominion Online Forms Database

SPILL RESPONSE ORGANIZATION (OIL SPILL REMOVAL ORGANIZATIONS – OSRO)
• Spill Response Contractors/OSROs will be required to respond to spills of oils and chemicals that are too large for Wexpro personnel; in particular, Spill Response Contractors will be relied upon to remediate oil and chemical spills that have escaped the property and for any spill that reaches navigable waterways. OSROs shall provide all the necessary absorbents, booms, and oil/chemical recovery equipment and materials to expedite cleanup of any size release that Wexpro's onsite supervisor determines to be too large or beyond the training expertise of his/her employees.

STATE ENVIRONMENTAL AGENCIES
• The Colorado State Oil Inspector and/or The Colorado Department of Public Health and Environment (CDPHE) will be called as appropriate if a reportable release occurs. Wexpro will cooperate with State Agencies that may come to the facility in response to oil/chemical releases. Typically State Agencies will assess the incident to determine if the facility operator/owner is providing an adequate response effort and may advise the owner/operator on additional assessment, environmental sampling, and/or reporting that they require to ensure a proper cleanup is achieved and the state's natural resources are protected.

FEDERAL ENVIRONMENTAL AGENCIES

- The US EPA and other Federal Agencies may defer site reconnaissance and investigations to the State Agencies having jurisdiction in the area where the facility is located. However, in the event of a large scale oil or chemical release that is potentially or actively affecting major waterways that flow across state boundaries or onto federal game-lands/properties, EPA and other Federal Agencies may send representatives to evaluate the cleanup/response efforts and potentially, as determined necessary, take control of the response.

LOCAL AGENCIES

- Fire: local Fire Departments shall be called out to provide firefighting support for those fires too large for Wexpro personnel to control.
- Police: local Police Departments shall be called to assist in traffic control during large scale oil/chemical cleanups. Also, police will be called to investigate reports of vandalism/break-ins that may have resulted in environmental incidents.
- EMS: Emergence Medical Services shall be called to respond to injuries sustained during environmental and other emergencies and shall be relied upon to provide first aid treatment to stabilize injuries and then to provide transportation to a hospital or other medical treatment facility.

Spill Prevention Control and Countermeasure (SPCC) Contingency Plan

Response Resources

**This information is required for those facilities that are required to have a Part 109 Contingency Plan.

MAXIMUM ANTICIPATED OIL DISCHARGE
• 16,800 Gallons

EQUIPMENT, MATERIALS, AND SUPPLIES REQUIRED
• Hand tools, communications equipment, firefighting and personnel protective equipment, and other spill response resources are kept onsite, on company vehicles, or at nearby offices. The amount of sorbent material routinely kept is sufficient for small spills. For the worst case oil spill of 16,800 gallons from the largest oil contained onsite, it would take approximately 840 bags of the standard oil absorbent mats (at approximately 20 gallons of oil absorbency per bag) to absorb this amount of oil. Rather than responding by using this amount of absorbent pads or equivalent combinations of other absorbent mats, socks, etc., which require time to soak up the spilled material and result in greater volumes of spill cleanup materials to dispose of, these larger spills will be addressed by bringing in heavy equipment such as at least one backhoe or skid-steer loader to construct temporary ditching and/or berming for spill containment, and then using one or more vacuum trucks, as needed, to collect the spilled material that has been contained. Wexpro's first attempt will be to mobilize its own equipment to the site. If it is not available, Wexpro will contact one of its pre-approved Environmental Response Contractors to respond and bring these additional resources. Vacuum trucks are typically provided by one of the response contractors. Additional temporary storage containers may also be provided by the response contractor.

HAND TOOLS			
TYPE	QUANTITY	STORAGE LOCATION	OPERATIONAL STATUS
Shovels, rakes, etc.	Varies	Central Facility, company vehicles	Active

COMMUNICATIONS EQUIPMENT			
TYPE	QUANTITY	STORAGE LOCATION	OPERATIONAL STATUS
Two-way radio	Varies	Company vehicles	Active
Telephone	Varies	Employee cell phones	Active

FIRE FIGHTING AND PERSONNEL PROTECTIVE EQUIPMENT			
TYPE	QUANTITY	STORAGE LOCATION	OPERATIONAL STATUS
Portable fire extinguisher	Varies	Company vehicles, operations buildings	Active

OTHER			
TYPE	QUANTITY	STORAGE LOCATION	OPERATIONAL STATUS
First aid supplies	Varies	Company vehicles, operations buildings	Active
Eye wash equipment	Varies	Operations buildings	Active

FACILITY RESPONSE TEAM, COMMUNICATIONS, CONTRACTORS, CONTRACTOR EQUIPMENT, AND LABOR

- The Facility Response Team (Figure 2) includes site personnel as well as other company support personnel that may be involved in spill cleanup, reporting, and follow-up activities.
- For facilities requiring a Part 109 Contingency Plan, the responsible supervisor or other designated individual for the site will be trained to serve as the oil discharge response coordinator, and will have the responsibility for directing and coordinating response operations, including requesting assistance from state and federal authorities depending on the severity of the discharge.
- The responsible supervisor will ensure that other site personnel are adequately trained for their role in initial response.
- A central coordination center will be set up onsite as needed or at the nearest local office.
- In the event of an oil spill that is too large for facility personnel to manage, or if the spill reaches a waterway, the responsible supervisor will call an oil spill response contractor to assist with cleanup.
- Wexpro's primary response contractors are provided in Figure 2.

FIGURE 1 – SPILL MITIGATION PROCEDURES

This section provides general guidance for spill mitigation. Each situation is unique and must be treated according to the circumstance present. In every situation, personnel safety must be assessed as the first priority. The potential for ignition and/or toxic exposure must be promptly evaluated.

TYPE	MITIGATION PROCEDURE
Failure of Transfer Equipment	1. Personnel safety is the first priority. Evacuate nonessential personnel or personnel at high risk. 2. Terminate transfer operations and close block valves. 3. Drain product into containment areas if possible. 4. Eliminate sources of vapor cloud ignition by shutting down all engines and motors.
Tank Overfill/Failure	1. Personnel safety is the first priority. Evacuate nonessential personnel or personnel at high risk. 2. Shut down or divert source of incoming flow to tank. 3. Transfer fluid to another tank with adequate storage capacity if possible. 4. Shut down source of vapor cloud ignition by shutting down all engines and motors. 5. Ensure that dike discharge valves are closed. 6. Monitor diked containment area for leaks and potential capacity limitations. 7. Begin transferring spilled product to another tank as soon as possible.
Piping Rupture/Leak (under pressure and no pressure)	1. Personnel safety is the first priority. Evacuate nonessential personnel or personnel at high risk. 2. Shut down pumps. Close the closest block valves on each side of the rupture. 3. Drain the line back into contained areas if possible. Alert nearby personnel of potential safety hazards. 4. Shut down source of vapor cloud ignition by shutting down all engines and motors. 5. If piping is leaking and under pressure, relieve pressure by draining into a containment area or back to a tank if possible. Then repair line according to established procedures.
Fire/Explosion	1. Personnel safety is the first priority. Evacuate nonessential personnel or personnel at high risk. 2. Notify local fire and police departments. 3. Attempt to extinguish fire if it is in incipient (early) stage. 4. Shut down transfer or pumping operation. Attempt to divert or stop flow of product to the hazardous area if it can be done safely. 5. Eliminate sources of vapor cloud ignition by shutting down all engines and motors. 6. Control fire before taking steps to contain spill.
Manifold Failure	1. Personnel safety is the first priority. Evacuate nonessential personnel or personnel at high risk.

	2. Terminate transfer operations immediately. 3. Isolate the damaged area by closing block valves on both sides of the leak/rupture. 4. Shut down source of vapor cloud ignition by shutting down all engines and motors. 5. Drain fluids back into containment areas if possible.

FIGURE 2 – NOTIFICATIONS AND TELEPHONE NUMBERS

FACILITY RESPONSE TEAM	
NAME/TITLE	PHONE NUMBER
Jon Lison Supervisor Production Foreman	307-352-7481 (Office) 307-705-2329 (Cell)
Thomas Fryer District Manager	307-352-7572 (Office) 307-438-3920 (Cell)
Kasey Werkele Director of Operations	307-352-7506 (Office) 307-371-1733 (Cell)
Sheenia Stuart Environmental Health and Safety Coordinator	307-352-7501 (Office) 307-389-2919 (Cell) 801-324-4400 (Dispatch)

SPILL CONTRACTORS	
NAME/ADDRESS	PHONE NUMBER
Clean Harbors 2150 North 470 East Tooele, UT 84074	435-843-4840 (Main) 800-645-8265 (Emergency Response)

FEDERAL AGENCIES	
NAME/ADDRESS	PHONE NUMBER
EPA Regional Administrator U.S. Environmental Protection Agency, Region VIII 999 18th Street, Suite 500 Denver, CO 80202-2405	303-312-6312
National Response Center U.S. Coast Guard Washington, D.C.	800-424-8802

STATE AGENCIES	
NAME/ADDRESS	PHONE NUMBER
Colorado State Oil Inspector	303-318-8547 877-518-5608 (Spill Hotline)
Colorado Department of Public Health and Environment	303-756-4455
State of Colorado Oil and Gas Conservation Commission 1120 Lincoln Street, Suite 801 Denver, CO 80203	303-894-2100

Appendix J
Example Training Records

SPILL PREVENTION CONTROL AND COUNTERMEASURE (SPCC) PLAN
WEXPRO
POWDER WASH AREA

TRAINING RECORD

INSTRUCTOR'S NAME: _____ DATE: _____

Describe the SPCC Training topics presented and list the participants. Sign the training record form and maintain the completed form in **Appendix I** of the SPCC Plan.

The training included a discussion of each section of the SPCC Plan and highlighted known spill events, malfunctioning components, and recently developed precautionary measures. Other topics and/or discussion items included:		
Instructor's signature:		
Participant's Name: **PRINT**	Participant's Job Function:	Employee ID:

Appendix K
Secondary Containment Observation and Record of Discharge Form

SECONDARY CONTAINMENT OBSERVATION AND RECORD OF DISCHARGE

Important: Before *any* rain water or snow melt within the secondary containment area is manually released, fill out this observation form completely.

Discussion: Inspect the contents of the secondary containment, if any oil is evident *do not* discharge to grade; let the contents evaporate. If evaporation is not feasible, pump or vacuum the contents into a metal or plastic drum/container; label the container appropriately with the date and contents. Dispose of it correctly (refer to the facility Environmental Management Plan or call your EHS representative).

Date/Time:
Reason for discharge:

Tank Id and/or description of primary containment vessel:

Weather observations (temperature, wind, sky conditions):

Does the water have sheen? Yes ☑ No ☐

Does the water have an odor? Yes ☑ No ☐

Visible oil contamination in water? Yes ☑ No ☐

➔If "Yes" to any of the above questions the water cannot be discharged to grade and must be pumped or vacuumed out and removed of correctly, consult your EHS representative.

Employee (print):	Employee Id #:

Employee Signature:_____

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Dominion Energy

Preliminary Closure Plan
Rule 908.g (1) A

Wexpro Company®

Powder Wash Evaporation Facility

WEXPRO COMPANY
POWDER WASH EVAPORATION FACILITY
PRELIMINARY CLOSURE PLAN

INTERIM RECLAMATION

During construction, a site will be selected for the spoils from the construction of the pad and pond. All woody vegetation and the top six inches of topsoil will be removed and stockpiled separately.

The spoils will be evenly distributed on the portions of the site not needed for production, and the areas re-contoured to match the surrounding terrain.

Once re-contouring has occurred, the location will be ripped and left with a rough surface. Topsoil will be spread on all reclaimed areas of disturbance and will be reseeded with a Surface Owner approved seed mix.

Remaining spoils and topsoil will be stockpiled on the location. Topsoil will be seeded with the seed mix listed below, and when appropriate, utilized on other reclaimed areas in the Powder Wash area.

The site will be added to Wexpro Company's Stormwater Management Plan until vegetation standards have been met.

FINAL RECLAMATION

The pond and skim pit will be drained completely and the liners will be removed and disposed of at a licensed disposal facility.

The soils under the pond and skim pit liners will be tested, per COGCC 900 Series Rule requirements.

After soil analysis is approved and meets COGCC Table 910-1 requirements, available topsoil in areas to be re-contoured will be stripped and stockpiled. Gravel will be removed from location and turnaround and will be re-distributed on designated lease roads. The location will be re-contoured to match the surrounding terrain.

Once re-contouring has occurred, the location will be ripped and left with a rough surface. Topsoil will be spread on all reclaimed areas of disturbance and will be reseeded with a Surface Owner approved seed mix.

The site will be added to Wexpro Company's Stormwater Management Plan until vegetation standards have been met.

SEEDBED PREPARATION

Areas where topsoil has been re-spread will be cross ripped to approximately 3" (or the depth of the topsoil layer), to create natural pockets for accumulation of moisture and help with slope stabilization.

In situations where topsoil quantity or quality is low, soil amendments may be used. If soil amendments are deemed necessary, they will be sundried prior to use.

SEEDING

Once seedbed preparation is completed, seeding will occur. Seeding will be completed before the frost level is too deep for successful seed placement. This will allow for optimal conditions for seed germination.

A seed drill equipped with a regulator will be required and seed will be drilled ¼ - ½ inch deep into the contour, where possible. Where drilling is not possible a rake/broadcast method will be used doubling the seed mixture. Hydro-seeding may also be used.

Seed Mix:
Indian Ricegrass 3 lb/acre pure live seed
Thickspike Wheatgrass 3 lb/acre pure live seed
Rosanna Western Wheatgrass ½ lb/acre pure live seed
Squirreltail Bottlebrush ½ lb/acre pure live seed

Scarlet Globemallow ½ lb/acre pure live seed
Winterfat 2 lb/acre pure live seed
Shadscale Saltbush 1 lb/acre pure live seed
Gardners Saltbush 3 lb/acre pure live seed
Wyoming Big Sagebrush 1 lb/acre pure live seed

Preliminary Closure Plan
Rule 908.g (1) B

Wexpro Company®

Dominion Energy

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458
Rock Springs, WY 82902-0458

Powder Wash Evaporation Facility

Project Information

Wexpro Company has prepared a reclamation cost estimate for the proposed Powder Wash Evaporation Facility that will traverse across Bureau of Land Management administered land location in: Section 4, T11N, and R97W. The disturbance footprint of the location will cover an approximate 4.97 acres.

The following estimate is prepared with the understanding that the production equipment will have been previously removed from well pad. Liners from both the Evaporation and Skim ponds will be removed and disposed of at a licensed facility. The soils under the liner will be tester per Table 910-1. Available topsoil will be stripped and stockpiled, areas will be re-contoured to match the surrounding terrain, all areas of disturbance will be ripped to 18" centers, topsoil will be respread, after topsoil has been spread evenly the area will be cross ripped to 3" (or depth of the topsoil layer) and the ground that is disturbed by these activities will be re-contoured to match existing conditions and revegetated with a native seed mix.

Construction estimates provided by Terry R. Pitt Construction.

CONSTRUCTION ITEM	APPROXIMATE QUANTITY	COST
Mob/Demob- Scraper, Dozer & Blade	1	$3000.00
Removal & Disposal of Pit Liners (Evaporation Pond)	1 @ 300' x 300'	$43,000.00
Removal & Disposal of Pit Liners (Skim Pit)	1 @ 200' x 50'	$18,000.00
Table 910-1 Soil Analysis for Evaporation Pond and Skim Pit	10 samples (5 samples per pit)	$20,000.00
Topsoil removal, re-contouring, topsoil spreading, ripping	149.10 hours	$25,446.40
Re-Seeding of Disturbance	4.97 acres	$8,926.96
	Subtotal=	$118,373.36
10% contingency		$11,837.33
Bond (3%)		$3,551.20
Contractor Profit (10%)		$11,837.33
ED&C (8%)		$9,469.86
BLM Admin Cost (10%)		$11,837.33
BLM Indirect Cost (21.8%)		$25,805.39
	Total=	$192,711.80

Thank you,

April Stegall
Reclamation Agent

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Dominion Energy®

Other Permits and Consultations
Rule 908.h

Wexpro Company®

Powder Wash Evaporation Facility

INDEX

Other Permits & Consultations

I-1
Colorado Fish & Wildlife Conservation Office
Letter regarding Bird Avert System

Wexpro Company®

Wexpro Company
2221 Westgate (82901)
P. O. Box 458
Rock Springs, WY 82902-0458
Tel 307-352-7506 • Fax 307-352-7575
Kasey.Werkele@Dominionenergy.com

Kasey Werkele
Director of Operations

January 24, 2018

Colorado Fish and Wildlife Conservation Office
Denver Federal Center
PO Box 25486
Denver, CO 80225-0486

To Whom It May Concern:

Wexpro Company is in the planning and permitting stages of a produced water disposal pond in our Powder Wash field located in Moffat County, Colorado. The pond will hold approximately 150,000 barrels of produced water at maximum capacity.

Wexpro Company is proposing the Peregrine Falcon Bird Avert system in lieu of netting. Wexpro Company currently utilizes the Bird Avert System on three of our produced water evaporation facilities located in Wyoming. The system was highly recommended by Paul Brown with the U.S. Fish and Wildlife Service in Lander, Wyoming and has proven to be successful over the last five years.

There are several components that make this system effective. Over a quick two second period, the system has a Furuno radar that captures images upon software command and acts as a mediator between the computer software and the radar. The Bird Avert software requests images from the radar and scans them for moving objects of sufficient size to be birds. Once birds are detected, the software issues a firing command over a radio link to the remote mechanized falcon unit(s). The controller units in-turn fire their associated hazing device(s); sound, light, and motion. The oversized plastic falcons have a five-foot wingspan that violently flap their wings, high-intensity strobe lights come on, and the sound of a falcon screaming plays through the speaker system.

I have enclosed photos of the mechanized falcon, system trailer and plat of proposed facility location for reference.

In addition, Wexpro Company will fence the facility to exclude wildlife from entering the water pond facilities. Fencing will consist of a minimum seven foot high chain link fence that will prohibit deer, elk, livestock and wild horses from entering. In addition, the fence will have a secondary perimeter fence wrapped around from

ground-level to prevent small mammals from entering. Fence support structures will be placed in close proximity to be sufficiently anchored into the ground so that the fence will not sag or waver and will withstand the pressure of a large animal pushing against it.

Wexpro Company is committed to regular monitoring. A daily visual inspection will be conducted of the evaporation pond, and a daily check will also be completed of the Bird Avert system. The daily check of the Bird Avert System will consist of the following:

1. Checking the computer system for any alarms or malfunctions, and
2. The complete Bird Avert System will be manually activated to insure the system is operating.
3. Checking perimeter fence integrity.

These daily visual and Bird Avert System checks of the evaporation facility will be recorded in a log book kept on location, where upon request, will be available at any time to governing agencies.

Should the produced water evaporation pond become completely frozen, we won't have the Bird Avert System in operation and we won't do the daily manual activation of the system. However, we will continue to do the daily visual inspections of the facility. When open water appears on the pond, the Bird Avert System will be put back in operation.

The Bird Avert System uses technology that eliminates a very high percentage of foreseeable and preventable bird mortalities by preventing birds from landing on the water disposal pond.

Installing netting that spans the width and length of the pond will have logistical implications. Along with maintaining conventional netting is not cost effective and birds can become tangled in the netting and must be extricated by hand, posing substantial risk to birds and employees.

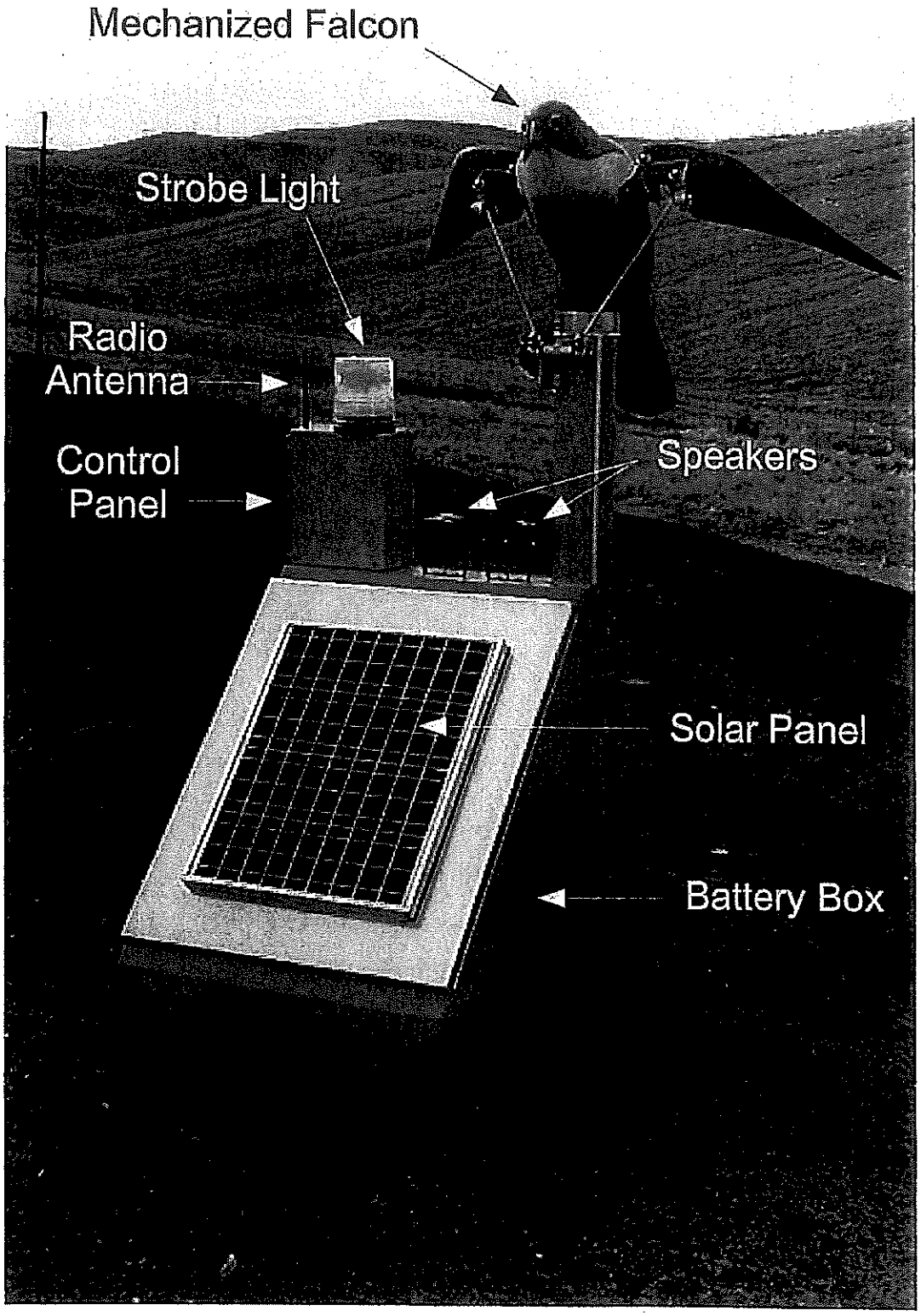
Additional information on the Bird Avert system can be found at www.birdavert.com.

Wexpro appreciates and welcomes your comments on this project. Please contact me with any questions.

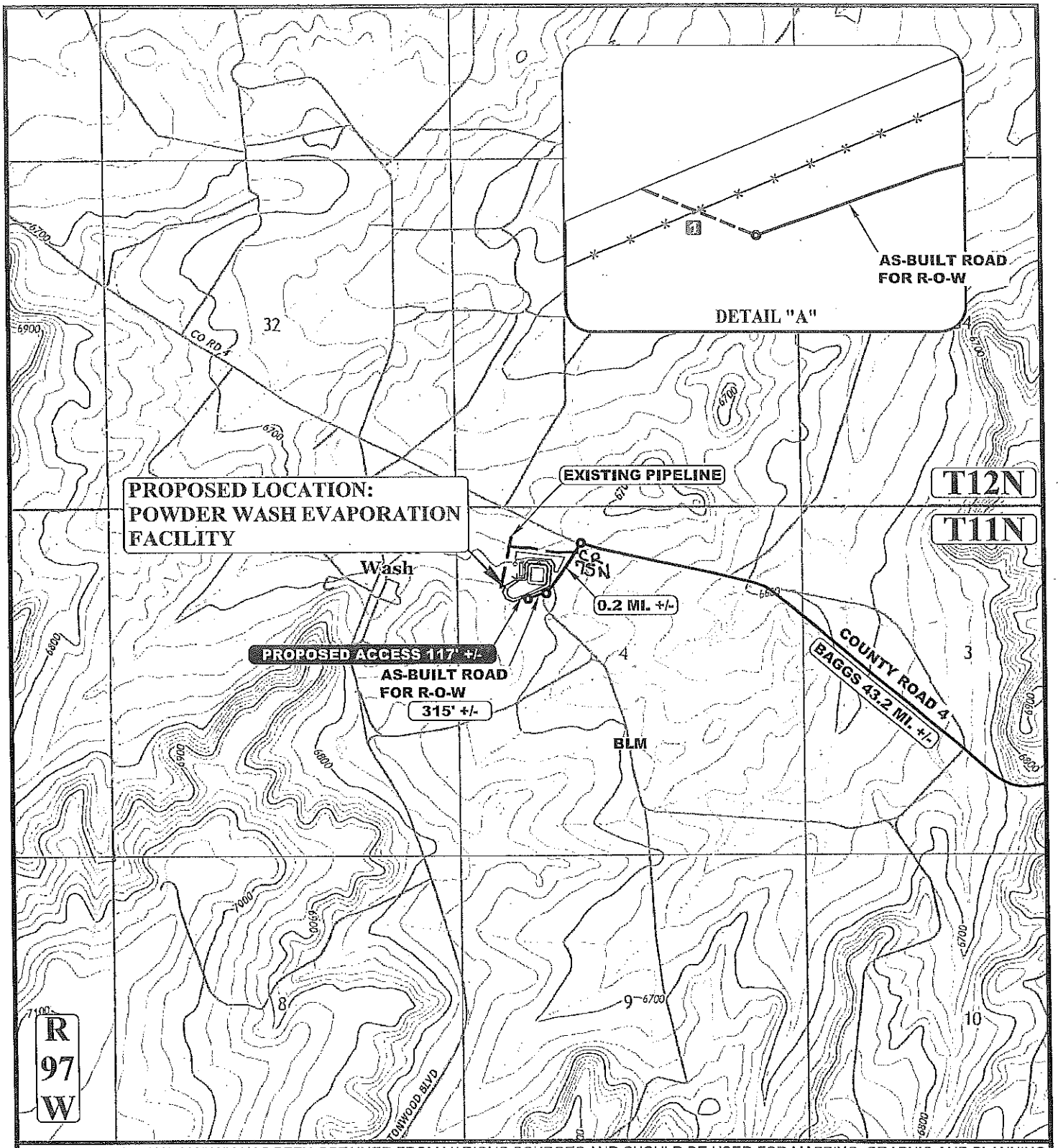
Sincerely,

Kasey Werkele
Director of Operations

Enc. (3)


Mechanized Falcon
Strobe Light
Radio Antenna
Control Panel
Speakers
Solar Panel
Battery Box

BIRDAVERT
Peregrine Systems
www.birdavert.com



NOTE: PARCEL DATA SHOWN HAS BEEN OBTAINED FROM VARIOUS SOURCES AND SHOULD BE USED FOR MAPPING, GRAPHIC AND PLANNING PURPOSES ONLY. NO WARRANTY IS MADE BY UINTAH ENGINEERING AND LAND SURVEYING (UELS) FOR ACCURACY OF THE PARCEL DATA.

LEGEND:

- EXISTING ROAD
- PROPOSED ROAD
- EXISTING PIPELINE
- PROPOSED FENCE
- INSTALL CATTLE GUARD

N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 24,000
ACCESS ROAD MAP			TOPO B

UINTAH ENGINEERING & LAND SURVEYING

UELS, LLC
Corporate Office * 85 South 200 East
Vernal, UT 84078 * (435) 789-1017

I-2
CDPHE – Construction Permit Application

Dominion Energy Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060
DominionEnergy.com

February 13, 2018

Colorado Department of Public Health & Environment
Air Pollution Control Division, APCD-SS-B1
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

RE: Powder Wash Evaporation Facility Construction Permit Application

Dear Air Pollution Control Division (APCD):

The Wexpro Company (Wexpro) is submitting a construction permit application for the Powder Wash Evaporation Facility. Please find Attachment G of the application for a facility process description, site diagram, and engineering site designs. At the facility, one source is APEN-required and permit-required. All other sources are below the APEN reporting threshold of two tons per year and therefore, exempt from Regulation 3, Part A. Please find Attachments C and F of the application for the individual and facility-wide emissions calculations.

The permit-required source at the facility is a generator-engine. The Caterpillar G3406 TA engine is a natural gas-fired engine with a site-rating of 268 horsepower. Form APCD-201 is enclosed to request a General Permit (GP02) for the reciprocating internal combustion engine.

Please find the enclosed check for $1,652.90 to cover the filing fees and general permit registration fee associated with this submittal. If you should have any questions, please contact the permit contact, Dani Baldwin at (801) 324-3062 or Dani.Baldwin@dominionenergy.com.

Sincerely,

Amanda B. Tornabene
Director, Environmental Services (Air Program and Gas Infrastructure Group)

Enclosed: Powder Wash Evaporation Facility Permit Application

Form APCD-

Colorado Department of Public Health and Environment
Air Pollution Control Division

Colorado Department of Public Health and Environment

Oil & Gas Industry
Construction Permit Application Completeness Checklist

Ver. November 29, 2012

Company Name: Wexpro Company

Source Name: Powder Wash Evaporation Facility

Date: 2/13/18

	Yes	No
Are you requesting a facility wide permit for multiple emissions points?	☐	☒

In order to have a complete application, the following attachments must be provided, unless stated otherwise. If application is incomplete, it will be returned to sender and filing fees will not be refunded.

Attachment	Application Element	Applicant	APCD
A	APEN Filing Fees	☒	☐
B	Air Pollutant Emission Notice(s) (APENs) & Application(s) for Construction Permit(s) – **APCD Form Series 200**	☒	☐
C	Emissions Calculations and Supporting Documentation	☒	☐
D	Company Contact Information - **Form APCD-101**	☒	☐
E	Ambient Air Impact Analysis ☐ Check here if source emits only VOC (Attachment E not required)	☒	☐
F	Facility Emissions Inventory – **Form APCD-102** ☐ Check here if single emissions point source (Attachment F not required)	☒	☐
G	Process description, flow diagram and plot plan of emissions unit and/or facility ☐ Check here if single emissions point source (Attachment G not required)	☒	☐
H	Operating & Maintenance (O&M) Plan – **APCD Form Series 300** ☒ Check here if true minor emissions source or application is for a general permit (Attachment H not required)	☐	☐
I	Regulatory Analysis ☐ Check here to request APCD to complete regulatory analysis (Attachment I not required)	☒	☐
J	Colorado Oil and Gas Conservation Commission (COGCC) 805 Series Rule Requirements– **Form APCD-105** ☒ Check here if source is not subject to COGCC 805 Series requirements (Attachment J not required)	☐	☐

Send **Complete** Application to: **Colorado Department of Public Health & Environment**
APCD-SS-B1
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Check box if facility is an existing Title V source: ☐ Send an additional application copy
Check box if refined modeling analysis included: ☐ Send an additional application copy
Check box if application is for major NA NSR or PSD permit: ☐ Send eight (8) total application copies

Attachment A

APEN Filing Fee

(Check Enclosed)

Attachment B

APENs & Applications for Construction Permits

Enclosed:

Engine APEN - Form APCD-201

Reciprocating Internal Combustion Engine APEN – Form APCD-201

Air Pollutant Emission Notice (APEN) and Application for Construction Permit

All sections of this APEN and application must be completed for both new and existing facilities, including APEN updates. An application with missing information may be determined incomplete and may be returned or result in longer application processing times. *You may be charged an additional APEN fee if the APEN is filled out incorrectly or is missing information and requires re-submittal.*

This APEN is to be used for reciprocating internal combustion engines (RICE). If your engine is a diesel compression ignition engine or your emission unit does not fall into the RICE category, there may be a more specific APEN for your source (e.g. diesel compression ignition engine, mining operations, asphalt plant, crusher, screen, etc.). In addition, the General APEN (Form APCD-200) is available if the specialty APEN options will not satisfy your reporting needs. A list of all available APEN forms can be found on the Air Pollution Control Division (APCD) website at: www.colorado.gov/cdphe/apcd.

This emission notice is valid for five (5) years. Submission of a revised APEN is required 30 days prior to expiration of the five-year term, or when a reportable change is made (significant emissions increase, increase production, new equipment, change in fuel type, etc). See Regulation No. 3, Part A, II.C. for revised APEN requirements.

Permit Number: _____ **AIRS ID Number:** ___ / ___ / _____

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 1 - Administrative Information

Company Name[1]: Wexpro Company

Site Name: Powder Wash Evaporation Facility

Site Location: NW 1/4 of Section 4, T11N, R97W, 6th P.M.

Site Location County: Moffat

NAICS or SIC Code: 1311

Mailing Address: *(Include Zip Code)* P.O. Box 45360
Salt Lake City, Utah 84145

Permit Contact: Dani Baldwin

Phone Number: 801-324-3062

Portable Source Home Base: N/A

E-Mail Address[2]: Dani.Baldwin@dominionenergy.com

[1] Use the full, legal company name registered with the Colorado Secretary of State. This is the company name that will appear on all documents issued by the APCD. Any changes will require additional paperwork.

[2] Permits, exemption letters, and any processing invoices will be issued by APCD via e-mail to the address provided.

Permit Number: _____ AIRS ID Number: ___/___/___

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 2 - Requested Action

☑ NEW permit OR newly-reported emission source *(check one below)*

☐ STATIONARY source ☐ PORTABLE source

☐ Request coverage under a Construction Permit

☑ Request coverage under General Permit GP02[3] *(Natural Gas Only)*

If General Permit coverage is requested, the General Permit registration fee of $1,500.00 must be submitted along with the APEN Filing fee.

- OR -

☐ MODIFICATION to existing permit *(check each box below that applies)*

☐ Change fuel or equipment ☐ Change company name ☐ Add point to existing permit

☐ Change permit limit ☐ Transfer of ownership[4] ☐ Other *(describe below)*

- OR -

☐ APEN submittal for update only *(Blank APENs will not be accepted)*

- ADDITIONAL PERMIT ACTIONS -

☐ APEN submittal for permit-exempt/grandfathered source

☐ Notification of Alternate Operating Scenario (AOS) permanent replacement[5]

Additional Info & Notes: _____

[3] Only one engine may be reported per APEN for GP02 coverage. Coverage under GP02 is voluntary.

[4] For transfer of ownership, a completed Transfer of Ownership Certification Form (Form APCD-104) must be submitted.

[5] This does not apply to General Permit GP02, as it does not contain a provision for AOS *permanent* replacements.

Section 3 - General Information

Does this engine have a Company Equipment Identification No. (*e.g. ENG-1, Engine 3, etc*)? No

If yes, provide the Company Equipment Identification No. _____

General description of equipment and purpose: Engine is for power generation.

For *existing* sources, operation began on: _____

For *new or reconstructed* sources, the projected start-up date is: 9/1/2018

Will this equipment be operated in any NAAQS nonattainment area? (http://www.colorado.gov/cdphe/attainment) ☐ Yes ☑ No

Normal Hours of Source Operation: 24 hours/day 7 days/week 52 weeks/year

Seasonal use percentage: Dec-Feb: 25 Mar-May: 25 June-Aug: 25 Sept-Nov: 25

Permit Number: _____ AIRS ID Number: ___ / ___ / _____

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 4 - Engine Information

Engine Function: ☑ Primary and/or Peaking ☐ Emergency Back-up ☐ Compression ☐ Pump ☐ Water Pump ☐ Other: _____

What is the maximum number of hours this engine will be used for emergency back-up power? 0 hours/year

Engine Make: Caterpillar Engine Model: G3406 TA Serial Number[6]: CTS00734

What is the maximum designed horsepower rating? 301 hp What is the engine displacement? 14.6 l/cyl

What is the maximum manufacturer's site-rating? 268 hp 200 kW

What is the engine Brake Specific Fuel Consumption at 100% Load? 7,329 BTU/hp-hr

Engine Features:

Cycle Type: ☐ 2-Stroke ☑ 4-Stroke Combustion: ☐ Lean Burn ☑ Rich Burn

Ignition Source: ☑ Spark ☐ Compression Aspiration: ☐ Natural ☑ Turbocharged

Is this engine equipped with an Air/Fuel ratio controller (AFRC)? ☑ Yes ☐ No

If yes, what type of AFRC is in use? ☑ O_2 Sensor (mV) ☐ NO_X Sensor (ppm) ☐ Other:

Is this engine equipped with a Low-NO_X design? ☑ Yes ☐ No

Engine Dates:

What is the manufactured date of this engine? April 2011

What date was this engine ordered? This engine will be moved from another Wexpro facility to the Powder Wash Evaporation Facility.

What is the date this engine was first located to Colorado? June 2012

What is the date this engine was first placed in service/operation? Projected date is 9/1/2018

What is the date this engine commenced construction? N/A

What is the date this engine was last reconstructed or modified? N/A

Is this APEN reporting an AOS replacement engine? ☐ Yes ☑ No

If yes, provide the make, model, and serial number of the *old* engine below:

Engine Make: _____ Engine Model: _____ Serial Number: _____

[6] The serial number must be submitted if coverage under GP02 is requested.

Permit Number: _____ AIRS ID Number: ___/___/___

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 5 - Stack Information

Geographical Coordinates (Latitude/Longitude or UTM)
40.94668/ -108.30170

Operator Stack ID No.	Discharge Height Above Ground Level (Feet)	Temp. (°F)	Flow Rate (ACFM)	Velocity (ft/sec)
	15	977	1,424	120.9

Indicate the direction of the Stack outlet: *(check one)*

☐ Upward ☐ Downward ☑ Upward with obstructing raincap

☐ Horizontal ☐ Other (*describe*): _____

Indicate the stack opening and size: *(check one)*

☑ Circular Interior stack diameter (*inches*): 6

☐ Square/Rectangle Interior stack diameter (*inches*): _____ Interior stack depth (*inches*): _____

☐ Other (*describe*): _____

Section 6 - Fuel Data and Throughput Information

Fuel Use Rate @ 100% Load (SCF/hour)	Actual Annual Fuel Use (MMSCF/year)	Requested Annual Permit Limit[7] (MMSCF/year)
2,398		21.01

From what year is the *actual annual amount*? _____

Indicate the type of fuel used[8]:

☑ Pipeline Natural Gas (*assumed fuel heating value of 1,020 BTU/scf*)

☐ Field Natural Gas Heating value: _____ BTU/scf

☐ Propane (*assumed fuel heating value of 2,300 BTU/scf*)

☐ Landfill Gas Heating Value: _____ BTU/scf

☐ Other (*describe*): _____ Heating Value (*give units*): _____

[7] Requested values will become permit limitations. Requested limit(s) should consider future process growth.

[8] If fuel heating value is different than the listed assumed value, provide this information in the "Other" field.

Permit Number: _____ AIRS ID Number: ___ / ___ / _____

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 7 - Emissions Inventory Information

Attach all emission calculations and emission factor documentation to this APEN form. The APCD website has a *Natural Gas Fired Engines Calculator* available to assist with emission calculations.

Is any emission control equipment or practice used to reduce emissions? ☑ Yes ☐ No

If yes, describe the control equipment AND state the overall control efficiency (% reduction):

Pollutant	Primary Control Equipment Description	Overall Requested Control Efficiency *(% reduction in emissions)*
TSP (PM)		
PM_{10}		
$PM_{2.5}$		
SO_X		
NO_X	EMIT Technologies - Catalyst	95
VOC	EMIT Technologies - Catalyst	88
CO		
Other:	Formaldehyde (HCHO) - EMIT Technologies - Catalyst	76

Use the following tables to report criteria and non-criteria pollutant emissions from source:
(Use the data reported in Section 6 to calculate these emissions.)

From what year is the following reported *actual annual emissions* data? N/A

Criteria Pollutant Emissions Inventory							
Pollutant	Emission Factor			Actual Annual Emissions[9]		Requested Annual Permit Emission Limit(s)[7]	
	Uncontrolled Basis	Units	Source (AP-42, Mfg. etc)	Uncontrolled Emissions *(Tons/year)*	Controlled Emissions *(Tons/year)*	Uncontrolled Emissions *(Tons/year)*	Controlled Emissions *(Tons/year)*
TSP (PM)	0.0095	lb/MMBtu	AP-42 Table 3.2-3			0.08	
PM_{10}	0.0095	lb/MMBtu	AP-42 Table 3.2-3			0.08	
$PM_{2.5}$	0.0095	lb/MMBtu	AP-42 Table 3.2-3			0.08	
SO_X	0.00059	lb/MMBtu	AP-42 Table 3.2-3			0.005	
NO_X	19.7	g/bhp-hr	Vendor Data			51.0	5.2
VOC	4.2	g/bhp-hr	Vendor Data			10.9	2.6
CO	1	g/bhp-hr	Vendor Data			2.6	10.3

Does the emissions source have any uncontrolled actual emissions of non-criteria pollutants (e.g. HAP - hazardous air pollutant) equal to or greater than 250 lbs/year? ☐ Yes ☑ No

If yes, please use the following table to report the non-criteria pollutant (HAP) emissions from source:

Non-Criteria Reportable Pollutant Emissions Inventory						
Chemical Name	Chemical Abstract Service (CAS) Number	Emission Factor			Actual Annual Emissions[9]	
		Uncontrolled Basis	Units	Source (AP-42, Mfg. etc)	Uncontrolled Emissions *(Pounds/year)*	Controlled Emissions *(Pounds/year)*
Formaldehyde	50000	0.0205	lb/MMBtu	AP-42 Table 3.2-3		
Acetaldehyde	75070	0.00279	lb/MMBtu	AP-42 Table 3.2-3		
Acrolein	107028	0.00263	lb/MMBtu	AP-42 Table 3.2-3		
Benzene	71432	0.00158	lb/MMBtu	AP-42 Table 3.2-3		
Other:						

[7] Requested values will become permit limitations. Requested limit(s) should consider future process growth.

[9] Annual emissions fees will be based on actual controlled emissions reported. If source has not yet started operating, leave blank.

Permit Number: _____ AIRS ID Number: ___/___/___

[Leave blank unless APCD has already assigned a permit # and AIRS ID]

Section 8 - Applicant Certification

I hereby certify that all information contained herein and information submitted with this application is complete, true and correct. If this is a registration for coverage under general permit GP02, I further certify that this source is and will be operated in full compliance with each condition of general permit GP02.

By B Rasmussen 2/13/18

Signature of Legally Authorized Person (not a vendor or consultant) Date

Brady Rasmussen Wexpro Vice President & General Manager

Name (please print) Title

Check the appropriate box to request a copy of the:

- ☐ Draft permit prior to issuance
- ☐ Draft permit prior to public notice

(Checking any of these boxes may result in an increased fee and/or processing time)

This emission notice is valid for five (5) years. Submission of a revised APEN is required 30 days prior to expiration of the five-year term, or when a reportable change is made (significant emissions increase, increase production, new equipment, change in fuel type, etc). See Regulation No. 3, Part A, II.C. for revised APEN requirements.

Send this form along with $152.90 and the General Permit registration fee of $1,500, if applicable to:

Colorado Department of Public Health and Environment
Air Pollution Control Division
APCD-SS-B1
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Make check payable to:
Colorado Department of Public Health and Environment

Telephone: (303) 692-3150

For more information or assistance call:

Small Business Assistance Program
(303) 692-3175 or (303) 692-3148

Or visit the APCD website at:

https://www.colorado.gov/cdphe/apcd

Attachment C

Emissions Calculations & Supporting Documentation

Table 1. Summary of Uncontrolled Facility Emissions

Source	Criteria Pollutant Emissions (tons per year)						Hazardous Air Pollutants (HAPs) (pounds per year)								
	Nitrogen Oxides (NO_x)	Carbon Monoxide (CO)	Sulfur Dioxide (SO_2)	Particular Matter (PM)	Total Organic Compound (TOC)	Volatile Organic Compounds (VOCs)	Benzene	n-Hexane	Toluene	Ethylbenzene	Xylene	2,2,4-Trimethylpentane	Formaldehyde (HCHO)	Acetaldehyde	Acrolein
Generator-Engine	51.0	2.6	0.005	0.08	N/A	10.9	27.2	Not Applicable (N/A)					352.6	48.0	45.2
(1) Produced Water (Skimmer Tank)	N/A					0.5	4.4	12.8	N/A						
(4) Produced Water Tanks															
(1) Condensate Tank															
Tank Truck Loadout						0.4	1.2	10.8	N/A						
Fugitive Emissions						0.02	0.8	0.9	0.8	0.7	0.7	0	N/A		
(6) Tank Heaters	1.3	1.1	0.01	0.10	0.1	0.02	0.05	46.4	0.09	N/A			1.93	N/A	
Total Potential Uncontrolled Emissions	52.2	3.7	0.01	0.2	0.1	11.7	34	71	0.9	0.7	0.7	0	355	48	45

Table 2. Summary of Controlled Facility Emissions

Source	Criteria Pollutant Emissions (tons per year)						Hazardous Air Pollutants (HAPs) (pounds per year)								
	NO_x	CO	SO_2	PM	TOC	VOC	Benzene	n-Hexane	Toluene	Ethylbenzene	Xylene	2,2,4-Trimethylpentane	Formaldehyde (HCHO)	Acetaldehyde	Acrolein
Generator-Engine	5.2	10.3	0.005	0.08	N/A	2.6	27.2	Not Applicable (N/A)					84.6	48.0	45.2
(1) Produced Water (Skimmer Tank)	N/A					0.5	4.4	12.8	N/A						
(4) Produced Water Tanks															
(1) Condensate Tank															
Tank Truck Loadout						0.4	1.2	10.8	N/A						
Fugitive Emissions						0.02	0.8	0.9	0.8	0.7	0.7	0	N/A		
(6) Tank Heaters	1.3	1.1	0.01	0.10	0.1	0.02	0.05	46.4	0.09	N/A			1.93	N/A	
Total Potential Controlled Emissions	6.5	11.4	0.01	0.2	0.1	3.4	34	71	0.9	0.7	0.7	0	87	48	45

Notes:

1) Form APCD-102 is attached as a summary of the total facility-wide emissions.

2) Tables 3 through 8 provide additional emissions calculations information.

Table 3. Summary of Emission Sources and Corresponding Emission Factors

Source	AIRS ID or Exempt	Description	Type	Potential Annual Operations	Emissions Factors [1,2]								
					NO_x	CO	SO_2	PM_{10} / $PM_{2.5}$	TOC	VOC	Benzene	n-Hexane	Toluene	Formaldehyde
APEN / Permitted Sources														
Generator-Engine	Proposed	268 hp	Natural Gas	8,760 hr/yr	Please see the attached Table 4 for the emission calculations and supporting documentation.									
APEN Exempt - Insignificant Sources														
(1) Produced Water (Skimmer Tank)	Exempt	440 bbl	Produced Water	60,000 bbl/yr	Please see the attached EPA Tanks 4.0d documentation for the working and breathing emission calculations. [3,4]									
(4) Produced Water Tanks	Exempt	400 bbl, each	Produced Water	57,000 bbl/yr										
(1) Condensate Tank	Exempt	400 bbl	Condensate	3,000 bbl/yr										
Tank Truck Loadout	Exempt	Loadout	Condensate	3,000 bbl/yr	N/A					0.236 lb/bbl	4.18E-04 lb/bbl	3.61E-03 lb/bbl	N/A	
Fugitive Emissions	Exempt	Components	Natural Gas	8,760 hr/yr, each	Please see the attached Tables 5 and 6 for the emission calculations and supporting documentation.									
(6) Tank Heaters	Exempt	0.5 MMBtu/hr, each	Natural Gas	8,760 hr/yr, each	100 lb/MMscf	84 lb/MMscf	0.6 lb/MMscf	7.6 lb/MMscf	11 lb/MMscf	5.5 lb/MMscf	2.1E-03 lb/MMscf	1.8 lb/MMscf	3.4E-03 lb/MMscf	0.075 lb/MMscf

Notes:
1) Emissions factors listed for the heaters are Environmental Protection Agency's (EPA's) AP-42 factors from Tables 1.4-1 and 1.4-2.
2) For the condensate tank loadout operations, emission factors listed are Colorado's APCD-approved Moffat County factors.
3) For the tank emissions, EPA Tanks 4.0d was used to calculated emissions from the total estimated skimmed hydrocarbon (e.g., condensate) volume from the produced water delivered to the facility. The condensate is skimmed into the on-site condensate tank.
4) Benzene and n-Hexane emissions calculated using the assumed percentages, as used for VOC, using the Colorado's APCD-approved Moffat County factors percentages.
5) For the tank heaters, the assumed high heat value (HHV) of the facility fuel gas is 1,020 Btu/scf.
6) Additional table acronyms:

pound (lb)
barrel (bbl)
Hour (hr)
Year (yr)
Million British Thermal Unit (MMBtu)
Standard cubic feet (scf)

Table 4. Caterpillar G3406 TA Engine - Summary of Potential Emissions

	Uncontrolled Basis		Controlled Basis				
Pollutant	Emission Factors	Emission Factor Source	Emission Factors	Emission Factor Source [2]	Potential Annual Hours of Operation	Potential Uncontrolled Emissions (tpy)	Potential Controlled Emissions (tpy)
TSP (PM)	0.0095 lb/MMBtu	EPA AP-42 Table 3.2-3	N/A		8,760	0.08	0.08
PM_{10}	0.0095 lb/MMBtu	EPA AP-42 Table 3.2-3			8,760	0.08	0.08
$PM_{2.5}$	0.0095 lb/MMBtu	EPA AP-42 Table 3.2-3			8,760	0.08	0.08
SO_X	0.00059 lb/MMBtu	EPA AP-42 Table 3.2-3			8,760	0.005	0.005
NO_X	19.7 g/hp-hr	Manufacturer Specification Data	2.0 g/hp-hr	Regulation 7, Table 2	8,760	51.0	5.2
CO	1.0 g/hp-hr	Manufacturer Specification Data	4.0 g/hp-hr	Regulation 7, Table 2	8,760	2.6	10.3
VOC	4.2 g/bhp-hr	Manufacturer Specification Data	1.0 g/bhp-hr	Regulation 7, Table 2	8,760	10.9	2.6
Formaldehyde	0.0205 lb/MMBtu	EPA AP-42 Table 3.2-3	0.005 lb/MMBtu	EMIT Technologies Catalyst Data	8,760	0.18	0.04
Acetaldehyde	0.00279 lb/MMBtu	EPA AP-42 Table 3.2-3	N/A		8,760	0.02	0.02
Acrolein	0.00263 lb/MMBtu	EPA AP-42 Table 3.2-3			8,760	0.02	0.02
Benzene	0.00158 lb/MMBtu	EPA AP-42 Table 3.2-3			8,760	0.01	0.01
					Total Potential Engine Emissions	64.9	18.5

Notes:

1) Maximum manufacturer rating of the engine is 301 horsepower (hp) at 100 percent load. Using the vendor's Altitude Deration Factors of 0.89, the maximum site-specific rating is 268 hp at 7,000 feet above sea level and 100 degrees Fahrenheit.

2) For NO_X, CO and VOC, controlled emission factors are from Colorado's APCD Regulation 7, Table 2. The catalyst vendor provided the formaldehyde emissions reduction (i.e., 76 percent).

3) The heat rate provided by the engine vendor is 7,329 British Thermal Unit (Btu) per hp-hour (hr) at 100 percent load.

4) Per the EPA's AP-42 Table 3.2-3, the PM_{10} (filterable) emissions is equal to the $PM_{2.5}$ (filterable) emissions.

5) Additional table conversions and acronyms:

Million British Thermal Unit (MMBtu)
tons per year (tpy)
1 pound (lb) equals 453.592 gram (g)
2,000 lb equals 1 ton

Table 5. Fugitive Emissions - Summary of Equipment Service Category TOC Emissions

Component Type	Emission Factors[2] (kg/hr/component)				Quantity of Each Component Type[3]				Total TOC Emissions (tpy)			
	Gas	Heavy Oil	Light Oil	Water/Light Oil	Gas	Heavy Oil	Light Oil	Water/Light Oil	Gas	Heavy Oil	Light Oil	Water/Light Oil
Connectors	1.0E-05	7.5E-06	9.7E-06	1.0E-05	86	0	1	1	8.3E-03	0	9.4E-05	9.7E-05
Flanges	5.7E-06	3.9E-07	2.4E-06	2.8E-06	1	0	0	0	5.5E-05	0	0.0E+00	0
Open-ended Lines	1.5E-05	7.2E-06	1.4E-05	3.5E-06	0	0	0	0	0	0	0	0
Pump Seals	3.5E-04	N/A	5.1E-04	2.4E-05	0	0	0	0	0.0E+00	N/A	0	0
Valves	2.5E-05	8.4E-06	1.9E-05	9.7E-06	18	0	4	3	4.3E-03	0	7.3E-04	2.8E-04
Other[1]	1.2E-04	3.2E-05	1.1E-04	5.9E-05	11	0	9	0	1.3E-02	0	9.6E-03	0
								Total Potential TOC Emissions	0.03	0	0.01	3.8E-04

Notes:
1) Other equipment type includes compressors, pressure relief valves, diaphragms, drains, dump arms, hatches, instruments, meters, polished rods, and vents.
2) Emission factors from Table 2-8 of the 1995 EPA Protocol for Equipment Leaks Emission Estimates (i.e., less than 10,000 ppmv). Factors are defined as total organic compound (TOC) emission rates.
3) The component count is estimated based on a site-specific count for a "Like Kind" facility.
4) Heavy oil is defined as less than 20 API gravity. Light oil is defined as greater than 20 API gravity.
5) Conversions and assumptions:
1 ton equals 907,185 kilogram (kg)
Total annual operations equal 8,760 hours per year

Table 6. Fugitive Emissions - Summary of Potential Emissions

HAPs	Weight Fraction (wt %)				Total Potential Fugitive Emissions (lb/yr)				Total Potential Fugitive Emissions (tpy)			
	Gas	Heavy Oil	Light Oil	Water/Light Oil	Gas	Heavy Oil	Light Oil	Water/Light Oil	Gas	Heavy Oil	Light Oil	Water/Light Oil
VOC	0.18	0	1.0	1.0	9.1	0	20.8	0.8	4.5E-03	0	1.0E-02	3.8E-04
Benzene	1.1E-03	0	3.3E-02	3.3E-02	0.1	0	0.7	0.0	2.8E-05	0	3.4E-04	1.2E-05
Toluene	1.3E-03	0	3.3E-02	3.3E-02	0.1	0	0.7	0.0	3.3E-05	0	3.4E-04	1.2E-05
Ethylbenzene	0	0	3.3E-02	3.3E-02	0.0	0	0.7	0.0	0.E+00	0	3.4E-04	1.2E-05
Xylene	0	0	3.3E-02	3.3E-02	0.0	0	0.7	0.0	0.0E+00	0	3.4E-04	1.2E-05
n-Hexane	3.1E-03	0	3.3E-02	3.3E-02	0.2	0	0.7	0.0	7.9E-05	0	3.4E-04	1.2E-05
				Total Potential Fugitive Emissions	9.4	0	24.2	0.9	0.005	0	0.012	4.4E-04

Notes:
1) The weight fractions are estimated based on a representative samples from a similar facility.

Prepared For:
Danell Baldwin
Dominion Energy

Date: January 31, 2018

APPLICATION INFORMATION

DRIVER

Make:	Caterpillar
Model:	G3406TA
Horsepower:	301
RPM:	1800
Compression Ratio:	10.3
Exhaust Flow Rate:	1424
Exhaust Temperature:	977
Reference:	DM5440-00
Fuel:	Natural Gas
Annual Operating Hours:	8760

UNCONTROLLED EMISSIONS DATA

	g/bhp-hr	lb/hr	Tons/Year
NO_x:	19.70	13.07	57.26
CO:	1.00	0.66	2.91
THC:	4.20	2.79	12.21
NMHC:	0.63	0.42	1.83
NMNEHC:	N/A	N/A	N/A
HCHO:	N/A	N/A	N/A
Oxygen:	4.00%		

CATALYST ELEMENT

Model:	RE-1450-T
Catalyst Type:	NSCR, Standard Precious Metals Group
Substrate Type:	Brazed
Element Size:	Round, 14.5" x 3.5"
Element Quantity:	1

POST CATALYST EMISSIONS DATA

	g/bhp-hr	lb/hr	
NO_x:	< 1.00	0.66	
CO	< 1.00	0.66	
VOC	< 0.50	0.33	
HCHO	< N/A	N/A	>76% Reduction

****POST CATALYST EMISSIONS ARE ONLY GUARANTEED FOR CATALYST ELEMENTS SUPPLIED BY EMIT**

EMIT Technologies, Inc.
2555 Heartland Dr.
Sheridan, WY. 82801

WARRANTY

EMIT Technologies,Inc. warrants that the goods supplied will be free from defects in workmanship by EMIT Technologies, Inc. for a period of one (1) year from date of shipment. EMIT Technologies, Inc. will not be responsible for any defects which result from improper use, neglect, failure to properly maintain or which are attributable to defects, errors or omissions in any drawings, specifications, plans or descriptions, whether written or oral, supplied to EMIT Technologies, Inc. by Buyer.

Catalyst performance using an EMIT Air/Fuel ratio controller is dependent upon properly defined set-points, variable with engine and fuel gas composition. Air/fuel ratio controller performance is guaranteed, but not limited, to fuel gas with an HHV content of 1400 BTU/SCF.

Catalyst performance will be guaranteed for a period of 1 year from installation, or 8760 operating hours, whichever comes first. The catalyst shall be operated with an automatic air/fuel ratio controller. The performance guarantee shall not cover the effects of excessive ash masking due to operation at low load, improper engine maintenance, or inappropriate lubrication oil. The performance guarantee shall not cover the effects of continuous engine misfires (cylinder or ignition) exposing the catalyst to excessive exothermic reaction temperatures.

Unless otherwise stated the exhaust temperature operating range at the converter inlet is 600°F minimum for oxidation catalyst and 750°F for NSCR catalyst and 1250°F maximum.

If a high temperature shut down switch is not installed, thermal deactivation of catalyst at temperatures above 1300 °F is not covered.

The catalyst conversion efficiencies (% reduction) will be guaranteed for engine loads of 50 to 100 percent.

Engine lubrication oil shall contain less than 0.6% ash (by weight) with a maximum allowable specific oil consumption of 0.01 gal/bhp-hr. The maximum ash loading on the catalyst shall be limited to 350 g/m3. Phosphorous and zinc additives are limited to 0.03% (by weight).

The catalyst must not be exposed to the following known poisoning agents, including: iron, nickel, sodium, chromium, arsenic, zinc, lead, phosphorous, silicon, potassium, magnesium, copper, tin, and mercury. Total poison concentrations in the gas are limited to 0.3 ppm.

Shipment - Promised shipping dates are approximate and are not guaranteed and are from the point of manufacture. EMIT Technologies,Inc. will not be liable for any loss, damage or delay in manufacture or delivery resulting from any cause beyond its control including, but not limited to a period equal to the time lost by reason of that delay. All products will be crated as per best practice to prevent any damage during shipment. Unless otherwise specified, Buyer will pay for any special packing and shipping requirements. Acceptance of goods by common carrier constitutes delivery to Buyer. EMIT Technologies,Inc. shall not be responsible for goods damaged or lost in transit.

PAYMENT TERMS AND ADVANCE PAYMENT REQUIREMENT

Terms: Credit is extended to purchaser for net 30 time period. If payment is not received in the net 30 timeframe, interest on the unpaid balance will accrue at a rate of 1.5% per month from the invoice date.

Advance Payment Requirement: Proposals with a project value of $100,000 or greater, and 60 days or greater time to completion, will require an advance payment of 30% of the total value. The advance payment will be invoiced to the customer upon receipt of the customer's purchase order. Advance payment is due 30 days after the date of the invoice. If payment is not received in the net 30 timeframe, interest on the unpaid balance will accrue at teh rate of 1.5% per month from the invoice date. Failure to pay this invoice may delay completion of the project outlined in this proposal.

Order Cancellation Terms: Upon cancellation of an order once submittal of a Purchase Order has occurred, the customer will pay a 25% restocking fee for Catalyst Housings, Catalyst Elements, and Air/Fuel Ratio Controllers; 50% restocking fee for Cooler Top Solutions,Exhaust System Accessories, and other Custom Built Products; 100% of all associated shipping costs incurred by EMIT; 100% of all project expenses incurred by EMIT for Field Services.

G3406 TA GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED:	1800	FUEL:	NATURAL GAS
COMPRESSION RATIO:	10.3:1	FUEL SYSTEM:	LPG IMPCO
AFTERCOOLER (°F):	130		
JACKET WATER (°F):	210	MIN. FUEL PRESS. (psig):	1.5
COOLING SYSTEM:	COMBINED	MIN. METHANE NUMBER:	80
IGNITION SYSTEM:	CDIS	MAX. RATED ALTITUDE (ft):	5000
EXHAUST MANIFOLD:	WET	AT AMBIENT TEMP (°F):	77
COMBUSTION:	STOICH	NOx EMISSION LEVEL:	STD

RATING AND EFFICIENCY	NOTES	LOAD	100%	75%	50%
LHV OF FUEL		btu/scf	919.6	919.6	919.6
ENGINE POWER		bhp	301	226	151
ENGINE EFFICIENCY	(1)	%	34.7	32.7	29.5
THERMAL EFFICIENCY	(5)	%	50.1	52.2	55.5
TOTAL EFFICIENCY	(6)	%	84.8	84.9	85.0

ENGINE DATA					
FUEL CONSUMPTION	(1)	btu/bhp-hr	7329	7782	8637
AIR FLOW	(WET)	lb/hr	2136	1652	1144
AIR FLOW	(WET)	scfm	466	360	250
COMPRESSOR OUT PRESS.		in. Hg (abs)	45.4	42.4	37.5
COMPRESSOR OUT TEMP.		°F	203	177	147
INLET MAN. PRESS.		in. Hg (abs)	41.3	32.6	23.2
INLET MAN. TEMP.	(10)	°F	133	133	132
TIMING	(11)	°BTDC	22	22	22
EXHAUST STACK TEMP.		°F	977	968	957
EXHAUST FLOW (@STACK TEMP)	(WET)	cfm	1424	1086	756
EXHAUST FLOW	(WET)	lb/hr	2246	1740	1209

EMISSIONS					
NOx (as NO2)	(9)	g/bhp-hr	19.7	20.4	18.7
CO	(9)	g/bhp-hr	1	1	1.1
THC	(9)	g/bhp-hr	4.2	4.5	4.7
NMHC	(9)	g/bhp-hr	0.63	0.68	0.71
EXHAUST O2 (DRY)		%	4.0	3.4	2.2
LAMBDA			1.24	1.19	1.12

HEAT BALANCE DATA					
LHV INPUT	(1)	btu/min	36767	29280	21664
HEAT REJ. TO JACKET	(2) (7)	btu/min	11946	10351	8638
HEAT REJ. TO A/C	(3) (8)	btu/min	694	352	94
HEAT REJ. TO ATMOSPHERE	(4)	btu/min	1471	1171	867
HEAT REJ. TO EXH (LHV to 77°F)	(2)	btu/min	9892	7831	5684
HEAT REJ. TO EXH (LHV to 350°F)	(2)	btu/min	6460	4944	3388

CONDITIONS AND DEFINITIONS

ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1 (STD. REF. CONDITIONS OF 25°C, 100 KPA). NO OVERLOAD PERMITTED AT RATING SHOWN. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE.

1) FUEL CONSUMPTION TOLERANCE ACCORDING TO ISO 3046/1. TOLERANCE IS ±5% OF FULL LOAD DATA
2) HEAT REJECTION TO JACKET AND EXHAUST TOLERANCE IS ±10% OF FULL LOAD DATA.
3) HEAT REJECTION TO A/C TOLERANCE IS ±5% OF FULL LOAD DATA.
4) HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ±50% OF FULL LOAD DATA.
5) THERMAL EFFICIENCY: JACKET WATER +EXH. HEAT TO 350°F
6) TOTAL EFFICIENCY: ENGINE EFF. + THERMAL EFF. TOLERANCE IS +/- 10% OF FULL LOAD DATA
7) TOTAL JW HEAT: JACKET HEAT + OIL COOLER HEAT (HEAT RATE BASED ON TREATED WATER)
8) TOTAL A/C HEAT: A/C HEAT x A/C HEAT REJ. FACTOR (HEAT RATE BASED ON TREATED WATER)
9) EMISSION DATA SHOWN ARE NOT TO EXCEED VALUES.
PUBLISHED PART LOAD DATA MAY REQUIRE ENGINE ADJUSTMENT.
10) MEASURED BETWEEN AFTERCOOLER OUTLET AND PLENUM ENTRY.
11) TIMING INDICATED IS FOR USE WITH A MINIMUM FUEL METHANE NUMBER SPECIFIED. CONSULT THE APPROPRIATE FUEL USAGE GUIDE FOR TIMING AT OTHER METHANE NUMBERS.

FUEL USAGE GUIDE

DERATE FACTOR/ENGINE TIMING vs METHANE NUMBER

<30	30	35	40	45	50	55	60	65	70	75	80 to 100
0	0/--	0/--	0/--	0/--	0/--	0/--	0/--	0/--	1.0/19	1.0/22	1.0/22

ALTITUDE DERATION FACTORS

(°F) AMBIENT TEMP	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.00	1.00	1.00	0.98	0.95	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.69
120	1.00	1.00	1.00	1.00	0.96	0.93	0.89	0.86	0.82	0.79	0.76	0.73	0.70
110	1.00	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.80	0.77	0.74	0.71
100	1.00	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.85	0.82	0.79	0.75	0.72
90	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.83	0.80	0.77	0.74
80	1.00	1.00	1.00	1.00	1.00	0.99	0.96	0.92	0.88	0.85	0.81	0.78	0.75
70	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.86	0.83	0.80	0.76
60	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.92	0.88	0.85	0.81	0.78
50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.86	0.83	0.79

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS

(°F) AMBIENT TEMP	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.80	1.96	2.13	2.30	2.47	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64
120	1.63	1.79	1.96	2.12	2.29	2.46	2.46	2.46	2.46	2.46	2.46	2.46	2.46
110	1.47	1.63	1.79	1.95	2.12	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29
100	1.31	1.46	1.62	1.78	1.94	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11
90	1.14	1.29	1.45	1.60	1.76	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
80	1.00	1.12	1.28	1.43	1.59	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
70	1.00	1.00	1.11	1.26	1.41	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57
60	1.00	1.00	1.00	1.08	1.24	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39
50	1.00	1.00	1.00	1.00	1.06	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel and what engine timing to use. Note that deration occurs as the methane number decreases. Methane number is a scale to measure ignition and burning characteristics of various fuels. Representative values are shown below.

Methane	100.00
Ethane	44.00
Propane	34.00
n-Butane	10.00
Hydrogen	0.00

Most dry pipeline natural gas has a methane number of 67 or above. The gas quality should be analyzed to determine the percentage of each constituent and then determine the methane number. Consult the dealer or factory for assistance.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various ambient temperatures and altitudes. Use this information to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

It is important to note that the Altitude/Temperature deration and the Fuel Usage Guide deration are not cumulative, i.e., they are not to be added together. The same is true for the Low Energy Fuel deration (reference the Caterpillar Methane Number Program) and the Fuel Usage Guide deration. However, the Altitude/Temperature deration and Low Energy Fuel deration are cumulative; and they must be added together in the method shown below. To determine the actual power available, take the lowest rating between 1) and 2).

1) (Altitude/Temperature Deration) + (Low Energy Fuel Deration)
2) Fuel Usage Guide Deration

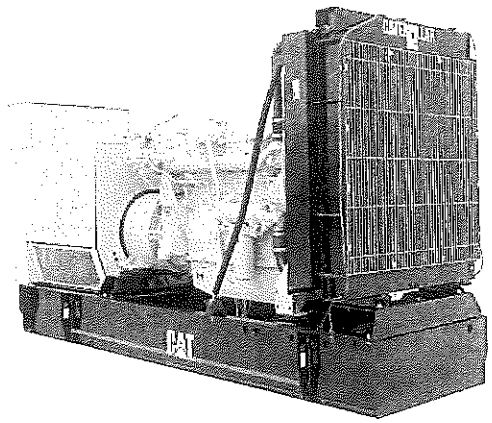
Note: For NA's always add the Low Energy Fuel deration to the Altitude/Temperature deration. For TA engines only add the Low Energy Fuel deration to the Altitude/Temperature deration whenever the Altitude/Temperature deration is less than 1.0 (100%). This will give the actual rating for the engine at the conditions specified.

AFTERCOOLER HEAT REJECTION FACTORS:

Aftercooler heat rejection is given for standard conditions of 77°F and 500 ft altitude. To maintain a constant inlet air manifold temperature, as the ambient air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor to adjust for ambient and altitude conditions. Multiply this factor by the standard aftercooler heat rejection. Failure to properly account for these factors could result in detonation and cause the engine to shut down or fail.

GAS GENERATOR SET

CATERPILLAR®



STANDBY 240 ekW
CONTINUOUS 190 ekW

60 Hz

Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

FEATURES

FULL RANGE OF ATTACHMENTS

- Wide range of bolt-on system expansion attachments, factory designed and tested

SINGLE-SOURCE SUPPLIER

- **Fully Prototype Tested** with certified torsional vibration analysis available

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Caterpillar dealer network
- With over 1,200 dealer outlets operating in 166 countries, you're never far from the Caterpillar part you need.
- 99.5% of parts orders filled within 48 hours. The best product support record in the industry.
- Caterpillar dealer service technicians are trained to service every aspect of your electric power generation system.
- Preventive maintenance agreements
- The Cat Scheduled Oil Sampling (S•O•S℠) program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

CAT® G3406 TA GAS ENGINE

- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Low pressure gas

CAT SR4B GENERATOR

- Designed to match performance and output characteristics of Caterpillar engines
- Optimum winding pitch for minimum total harmonic distortion and maximum efficiency
- Segregated AC/DC, low voltage accessory box provides single point access to accessory connections

CAT CONTROL PANELS

- Two levels of controls, designed to meet individual customer needs:

  EMCP II provides digital monitoring, metering, and protection

  EMCP II+ provides EMCP II features along with full-featured power metering and protective relaying

FACTORY INSTALLED STANDARD & OPTIONAL EQUIPMENT

System	Standard	Optional
Air Inlet	Single element canister type air cleaner Service indicator	
Cooling	Radiator with guard Coolant drain lines with valves Fan and belt guards Caterpillar Coolant Low coolant level sensors	Jacket water coolant heater with shutoff valves Radiator removal
Exhaust	Stainless steel exhaust flex with weld outlet flange	15 dBA muffler
Fuel	Gas pressure regulator Low pressure fuel system Energize To Run (ETR) gas shutoff valve	
Generator	Self excited Class H insulation Class F temperature rise (105° C continuous/130° C standby) VR6 Voltage Regulator, 3-phase sensing, with reactive droop 2:1 Volts/Hz or 1:1 Volts/Hz Bus bar termination Extension box	Permanent magnet excited Digital Voltage Regulator Digital Voltage Regulator with KVAR/PF control Anti-condensation space heater Oversize & premium generators Circuit breakers, UL, 3 pole with shunt trip Multiple breaker capability
Governor	Flo-Tech 68 speed control	Electronic load sharing
Ignition	Digital ignition system	
Control Panels	EMCP II	EMCP II+ Customer Communication Module Local alarm & remote annunciator modules
Lube	Lubricating oil and filter Oil drain line with valve Fumes disposal	Manual sump pump
Mounting	Narrow base Linear vibration isolators between base and engine-generator	
Starting/Charging	35 amp charging alternator 24 volt starting motor Batteries with rack and cables Battery disconnect switch	Battery chargers, 5 & 10 amp Oversize batteries
General		Automatic Transfer Switches (ATS) Floor standing circuit breakers

SPECIFICATIONS

CAT SR4B GENERATOR

Frame 447
Type ..... Self excited, static regulated, brushless
Construction ..... Single bearing, close coupled
Three phase ..... 12 lead reconnectable
Insulation ..... Class H with tropicalization and antiabrasion
IP rating ..... Drip proof 22
Alignment ..... Pilot shaft
Overspeed capability
  Prototype tested 150%
  Production tested 125%
Wave form ..... Less than 5% deviation
Paralleling capability ..... Standard
Voltage regulator ..... 3-phasing sensing with Volts-per-Hertz
Voltage regulation ..... Less than ± 1/2% (steady state)
  Less than ± 1% (no load to full load)
Voltage gain ..... Automatic
Telephone Influence Factor (TIF) ..... Less than 50
Harmonic Distortion (THD) ..... Less than 5%

CAT ENGINE

G3406 TA, 4-stroke-cycle
Bore – mm (in) 137 (5.4)
Stroke – mm (in) 164 (6.5)
Displacement – L (cu in) 14.6 (891)
Compression ratio 10.3:1
Aspiration ..... Turbocharged-Aftercooled
Ignition system ..... Digital ignition
Governor type ..... Woodward Flo-Tech

CAT CONTROL PANEL

24 Volt DC Control
NEMA 1, IP22 enclosure
Electrically dead front
Lockable hinged door
Generator instruments meet ANSI C-39-1
Terminal box mounted
Single location customer connector point

Consult your Caterpillar dealer for available voltages.

STANDBY 240 ekW
CONTINUOUS 190 ekW
60 Hz

CATERPILLAR®

TECHNICAL DATA

Open Generator Set — 1800 rpm/60 Hz/480 Volts			Standby DM5439		Continuous DM5440	
Package Performance						
Power rating	ekW		240		190	
Power rating @ 0.8 PF	kVA		300		238	
Aftercooler temperature	Deg C	Deg F	54	130	54	130
Fuel Consumption						
100% load with fan	N•m³/hr	scf/hr	77	2894	64	2398
75% load with fan	N•m³/hr	scf/hr	61	2291	51	1912
50% load with fan	N•m³/hr	scf/hr	45	1682	37	1418
Cooling System						
Ambient air temperature*	Deg C	Deg F	40	105	40	105
Air flow restriction (system)	kPa	in water	0.12	0.5	0.12	0.5
Air flow (maximum @ rated speed for standard radiator arrangement)	m³/min	cfm	679	23,983	836	29,524
Engine coolant capacity with radiator	L	Gal	57	15	57	15
Jacket water outlet temperature	Deg C	Deg F	99	210	99	210
Exhaust System						
Combustion air inlet flow rate	N•m³/min	scfm	16	572	12	466
Exhaust gas stack temperature	Deg C	Deg F	536	997	525	977
Exhaust gas flow rate	N•m³/min	cfm	16	1749	13	1424
Exhaust flange size (internal diameter)	mm	in	127	5	127	5
Exhaust system backpressure (maximum allowable)	kPa	in water	6.7	27	6.7	27
Heat Rejection						
Low Heat Value (LHV) fuel input	kW	Btu/min	780	44,358	647	36,767
Heat rejection to jacket water (includes oil cooler)	kW	Btu/min	234	13,305	210	11,946
Total heat rejection to exhaust (LHV to 25° C)	kW	Btu/min	217	12,319	174	9892
Heat rejection to exhaust (LHV to 120° C)	kW	Btu/min	167	8180	132	6460
Heat rejection to A/C	kW	Btu/min	25	1395	12	694
Heat rejection to atmosphere from engine	kW	Btu/min	31	1774	26	1471
Heat rejection to atmosphere from generator	kW	Btu/min	20	1162	16	897
Generator						
Motor starting capability @ 30% voltage dip**	kVA		649		649	
Frame			447		447	
Temperature rise	Deg C		130		105	
Emissions* **						
NOx	g/bhp-hr		17.8		19.7	
CO	g/bhp-hr		1.1		1	
HC (total)	g/bhp-hr		3.9		4.2	
HC (non-methane)	g/bhp-hr		0.59		0.63	
Exhaust O_2 (dry)	%		4.0		4.0	

*Ambient capability at 200 m (660 ft) above sea level. For ambient capability at other altitudes, consult your Caterpillar dealer.

**Assumes synchronous driver

***Emissions data measurement is consistent with those described in EPA CFR 40 PART 89 SUBPART D and ISO 8178-1 for measuring HC, CO, CO_2 and NOx. Data shown is based on steady state engine operating conditions of 77° F, 28.43 inches HG and fuel having a LHV of 920 BTU per cubic foot at 30.00 inches HG absolute and 32° F. Not to exceed emission data shown is subject to instrumentation, measurement, facility and engine fuel system adjustments.

RATING DEFINITIONS AND CONDITIONS

Standby — Output available with varying load for the duration of the interruption of the normal source power.

Continuous — Output available without varying load for an unlimited time.

Ratings are based on ISO3046/1 standard reference conditions of 25° C (77° F) and 100 kPa (29.61 in Hg).

Ratings are based on pipeline natural gas having a LHV (low heat value) of 36.2 mJ/N•m³ (920 Btu/cu ft). Variations in altitude, temperature, and gas composition from standard conditions or the use of a three way catalyst may require a reduction in engine horsepower.

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Powder Wash Evaporation Facility
City:	Moffat
State:	Colorado
Company:	Wexpro Company
Type of Tank:	Vertical Fixed Roof Tank
Description:	(4) 400 bbl produced water Tanks, (1) 440 bbl produced water (skimmer Tank), (1) 400 condensate tank - An estimated annual facility throughput of 60,000 bbl/yr of produced water, of that volume, 3,000 bbl/yr of condensate is estimated to be skimmed.

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		19.50
Avg. Liquid Height (ft):		10.00
Volume (gallons):		16,497.58
Turnovers:		5.73
Net Throughput(gal/yr):		94,500.00
Is Tank Heated (y/n):	Y	

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		0.50
Slope (ft/ft) (Cone Roof)		0.08

Breather Vent Settings

Vacuum Settings (psig):		0.00
Pressure Settings (psig)		0.00

Meterological Data used in Emissions Calculations: Denver, Colorado (Avg Atmospheric Pressure = 12.12 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Powder Wash Evaporation Facility - Vertical Fixed Roof Tank
Moffat, Colorado

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	54.11	42.53	65.68	47.65	2.5800	2.0177	3.2135	50.0000			207.00	Option 4: RVP=5

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Powder Wash Evaporation Facility - Vertical Fixed Roof Tank
Moffat, Colorado

Annual Emission Calcaulations	
Standing Losses (lb):	695.6155
Vapor Space Volume (cu ft):	1,149.8229
Vapor Density (lb/cu ft):	0.0232
Vapor Space Expansion Factor:	0.1701
Vented Vapor Saturation Factor:	0.4203
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,149.8229
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.1667
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.1667
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1667
Roof Height (ft):	0.5000
Roof Slope (ft/ft):	0.0800
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0232
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.5600
Daily Avg. Liquid Surface Temp. (deg. R):	513.7800
Daily Average Ambient Temp. (deg. F):	50.2125
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	507.3200
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,568.5833
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1701
Daily Vapor Temperature Range (deg. R):	23.1500
Daily Vapor Pressure Range (psia):	1.1958
Breather Vent Press. Setting Range(psia):	0.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.5600
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.0177
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.2135
Daily Avg. Liquid Surface Temp. (deg R):	513.7800
Daily Min. Liquid Surface Temp. (deg R):	502.2000
Daily Max. Liquid Surface Temp. (deg R):	525.3500
Daily Ambient Temp. Range (deg. R):	27.9417
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.4203
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.5600
Vapor Space Outage (ft):	10.1667

Working Losses (lb):	216.0018
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.5600
Annual Net Throughput (gal/yr.):	94,500,0000
Annual Turnovers:	5.7281
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	16,497.5776
Maximum Liquid Height (ft):	19.5000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	912.6173

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Powder Wash Evaporation Facility - Vertical Fixed Roof Tank
Moffat, Colorado

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	216.00	696.62	912.62

Attachment D

Company Contact Information

Form APCD-

Colorado Department of Public Health and Environment
Air Pollution Control Division

Colorado Department of Public Health and Environment

Company Contact Information Form

Ver. September 10, 2008

Company Name: Wexpro Company

Source Name: Powder Wash Evaporation Facility

Permit Contact[1]:	Dani Baldwin		
Address:	P.O. Box 45360		
	Street		
	Salt Lake City	UT	84145
	City	State	Zip
Phone Number:	801-324-3062		
Fax Number:	801-324-3883		
E-mail:	Dani.Baldwin@dominionenergy.com		

Compliance Contact[2]:	Dani Baldwin		
Address:	P.O. Box 45360		
	Street		
	Salt Lake City	UT	84145
	City	State	Zip
Phone Number:	801-324-3062		
Fax Number:	801-324-3883		
E-mail:	Dani.Baldwin@dominionenergy.com		

Billing Contact: *(Permit Fees)[3]*	Dani Baldwin		
Address:	P.O. Box 45360		
	Street		
	Salt Lake City	UT	84145
	City	State	Zip
Phone Number:	801-324-3062		
Fax Number:	801-324-3883		
E-mail:	Dani.Baldwin@dominionenergy.com		

Billing Contact: *(Annual Fees)[4]*	Dani Baldwin		
Address:	P.O. Box 45360		
	Street		
	Salt Lake City	UT	84145
	City	State	Zip
Phone Number:	801-324-3062		
Fax Number:	801-324-3883		
E-mail:	Dani.Baldwin@dominionenergy.com		

Check how would you like to receive your permit fee invoice?

Mail: ☒ E-mail: ☐ Fax: ☐

Footnotes:

[1] The permit contact should be the point of contact for technical information contained in the permit application. This may be a company representative or a consultant.

[2] The compliance contact should be the point of contact for discussing inspection and compliance at the permitted facility.

[3] The billing contact (Permit fees) should be the point of contact that should receive the invoice for fees associated with processing the permit application & issuing the permit. (Reg. 3, Part A, Section VI.B)

[4] The billing contact (Annual fees) should be the point of contact that should receive the invoices issued on an annual basis for fees associated with actual emissions reported on APENs for the facility. (Reg. 3, Part A, Section VI.C)

Attachment E

Ambient Air Impact Analysis

Not Applicable

Powder Wash Evaporation Facility does not exceed any of the applicable emissions thresholds listed in the table below.

Pollutant	Emissions Threshold[1]	Potential Emissions[2]	Analysis Required
Carbon Monoxide (CO)	100 tpy or 23 lb/hr	11.4 tpy or 2.6 lb/hr	No
Nitrogen Oxides (NO_x)	40 tpy	6.5 tpy	No
Sulfur Dioxide (SO_2)	40 tpy or 27 lb/3-hr	0.02 tpy 0.01 lb/3-hr	No
Particulate Matter (PM)	15 tpy or 82 lb/day	0.18 tpy or 0.99 lb/day	No
Lead (PB)	0.6 tpy or 100 lb/month	0 tpy 0 lb/month	No

1) Emissions threshold criteria from Table 1. Modeling Threshold in Colorado Modeling Guideline for Air Quality Permits.

2) See Attachments C and F for a summary of the calculated emissions from the Powder Wash Evaporation Facility sources. Potential emissions are provided as controlled potential emissions.

Attachment F

Facility Emissions Inventory

Form APCD-102

Colorado Department of Public Health and Environment
Air Pollution Control Division

Facility Wide Emissions Inventory Form

Ver. April, 2015

Company Name: Wexpro Company
Source Name: Powder Wash Evaporation Facility
Source AIRS ID: Proposed

		Uncontrolled Potential to Emit (PTE)																Controlled Potential to Emit (PTE)														
		Criteria (TPY)							HAPs (lbs/yr)									Criteria (TPY)							HAPs (lbs/yr)								
AIRS ID	Equipment Description	TSP	PM10	PM2.5	SO2	NOx	VOC	CO	HCHO	Acetal	Acro	BZ	Tol	EB	Xyl	n-Hex	Meth	224-TMP	TSP	PM10	PM2.5	SO2	NOx	VOC	CO	HCHO	Acetal	Acro	BZ	Tol	EB	Xyl	n-Hex	Meth	224-TMP
Proposed	Caterpillar G3406 TA Engine	0.1	0.1	0.1	0.01	51.0	10.9	2.6	352.6	48.0	45.2	27.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.01	5.1	2.6	10.3	352.6	48.0	45.2	27.2	0.0	0.0	0.0	0.0	0.0	0.0
	Permitted Sources Subtotal =	0.1	0.1	0.1	0.0	51.0	10.9	2.6	353	48	45	27	0	0	0	0	0	0	0.1	0.1	0.1	0.0	5.1	2.6	10.3	353	48	45	27	0	0	0	0	0	0
APEN Only - Permit Exempt Sources																																			
	APEN Only Subtotal =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0
APEN Exempt / Insignificant sources																																			
Exempt	(1) Produced Water (Skimmer) Tank	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0	12.8	0.0	0.0
Exempt	(4) Produced Water Tanks																																		
Exempt	(1) Condensate Tank	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	10.8	0.0	0.0
Exempt	Condensate Tank Truck Loadout	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.8	0.8	0.7	0.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.8	0.8	0.7	0.7	0.9	0.0	0.0
Exempt	Fugitive Emissions	0.10	0.10	0.10	0.01	1.3	0.02	1.1	1.9	0.0	0.0	0.05	0.09	0.0	0.0	46.4	0.0	0.0	0.10	0.10	0.10	0.01	1.3	0.02	1.1	1.9	0.0	0.0	0.05	0.09	0.0	0.0	46.4	0.0	0.0
Exempt	(6) 0.5 MMBtu/hr Tank Heaters																																		
	Insignificant Subtotal =	0.1	0.1	0.1	0.01	1.3	0.9	1.1	2	0	0	6	1	1	1	71	0	0	0.1	0.1	0.1	0.0	1.3	0.9	1.1	2	0	0	6	1	1	1	71	0	0
	Total, All Sources =	0.2	0.2	0.2	0.02	52.3	11.8	3.7	355	48	45	34	1	1	1	71	0	0	0.2	0.2	0.2	0.02	6.5	3.5	11.4	355	48	45	34	1	1	1	71	0	0
	Uncontrolled HAPs Summary (TPY) =								0.18	0.02	0.02	0.02	0.00	0.00	0.00	0.04	0.00	0.00								0.18	0.02	0.02	0.02	0.00	0.00	0.00	0.04	0.00	0.00
	Uncontrolled Total, All HAPs (TPY) =								0.3																	Controlled Total, All HAPs (TPY) =									

Footnotes:
1. This form should be completed to include both existing sources and all proposed new or modifications to existing emissions sources
2. If the emissions source is new then enter "proposed" under the Permit No. and AIRS ID data columns
3. HAP abbreviations include:
   - BZ = Benzene
   - Tol = Toluene
   - EB = Ethylbenzene
   - Xyl = Xylene
   - HCHO = Formaldehyde
   - 224-TMP = 2,2,4-Trimethylpentane
   - Acetal = Acetaldehyde
   - Acro = Acrolein
   - n-Hex = n-Hexane
   - Meth = Methanol
4. APEN Exempt/Insignificant Sources should be included when warranted.

Attachment G

Process Description, Flow Diagram & Plot Plan of Emissions Point and/or Facility

Powder Wash Evaporation Facility Process Description

The Powder Wash Evaporation Facility receives produced water from the surrounding production facilities. The facility estimates the volume of produced water to be 60,000 barrels per year (bbl/yr). An estimated five percent of that volume will be skimmed as a hydrocarbon liquid and sent to the condensate tank on-site. That estimated condensate volume is 3,000 bbl/yr.

The produced water will be trucked to the facility where the liquids are off-loaded at the pump/generator building. The produced water will enter a 440-bbl produced water skimmer tank. From this tank, any hydrocarbons (i.e., condensate) that separate from the produced water will be skimmed and sent to the 400-bbl condensate tank. The produced water in the skimmer tank will be directed to the four 400-bbl tanks. From the produced water tanks, the liquids will be sent to the skimmer pond then eventually to the evaporation pond. Please see the attached facility location and site diagram.

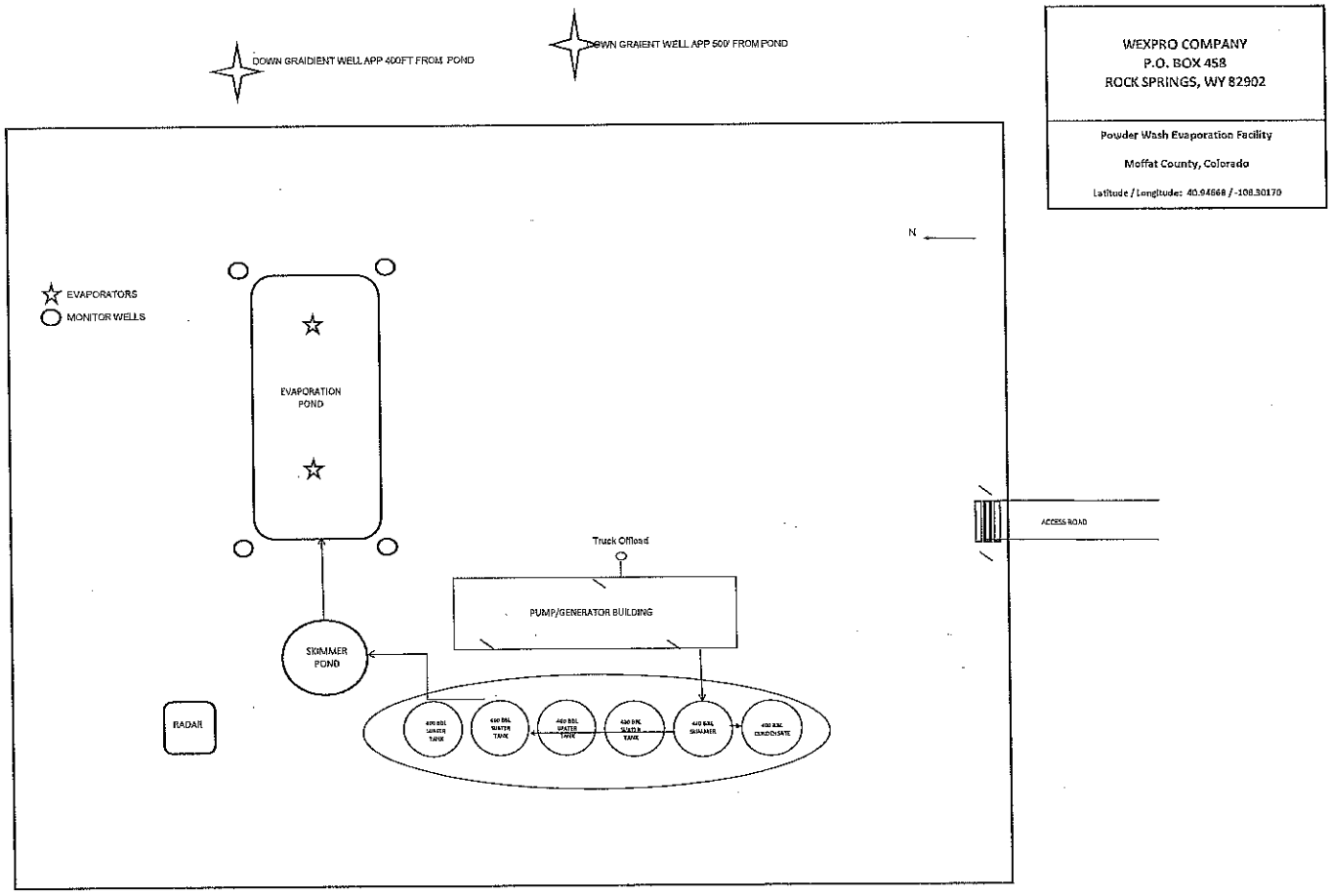
The 268 horsepower natural gas-fired generator-engine will provide power to the facility. The generated power will be used for the pump, building heat and the birds avert system.

Each of six tanks are equipped with a 0.5 million British thermal unit per hour tank heater. The tank heaters operate on natural gas. Typically, these heaters will only operate during the cold weather months.

The hydrocarbon liquids will be stored in the condensate tank on-site. Once adequate volumes of condensate are accumulated, the condensate is loaded into a tank truck and sold.

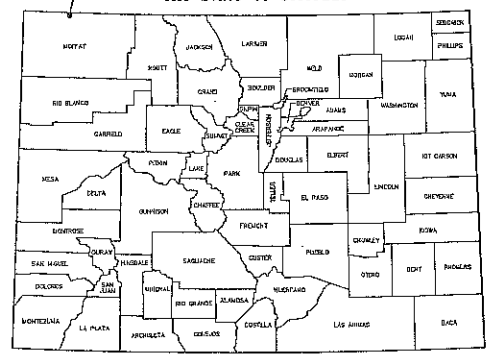
Tank to truck loading emissions occur during the loadout of the condensate from the tank. The loadout is submerge-filled as it is loaded into the truck. As the condensate is pumped into the truck, the fluid displaces the vapors. This displacement causes the vapors to vent from inside the truck to the atmosphere.

There are fugitive emissions associated with the piping connections, valves and controllers. These emissions occur due to the potential seeping of gas from connections, seats and seals.


DOWN GRAIDIENT WELL APP 400FT FROM POND
DOWN GRAIENT WELL APP 500' FROM POND
WEXPRO COMPANY
P.O. BOX 458
ROCK SPRINGS, WY 82902
Powder Wash Evaporation Facility
Moffat County, Colorado
Latitude / Longitude: 40.94668 / -108.30170
N
EVAPORATORS
MONITOR WELLS
EVAPORATION POND
ACCESS ROAD
Truck Offload
PUMP/GENERATOR BUILDING
SKIMMER POND
RADAR
400 BBL WATER TANK
400 BBL WATER TANK
400 BBL WATER TANK
400 BBL WATER TANK
400 BBL SKIMMER
400 BBL CONDENSATE

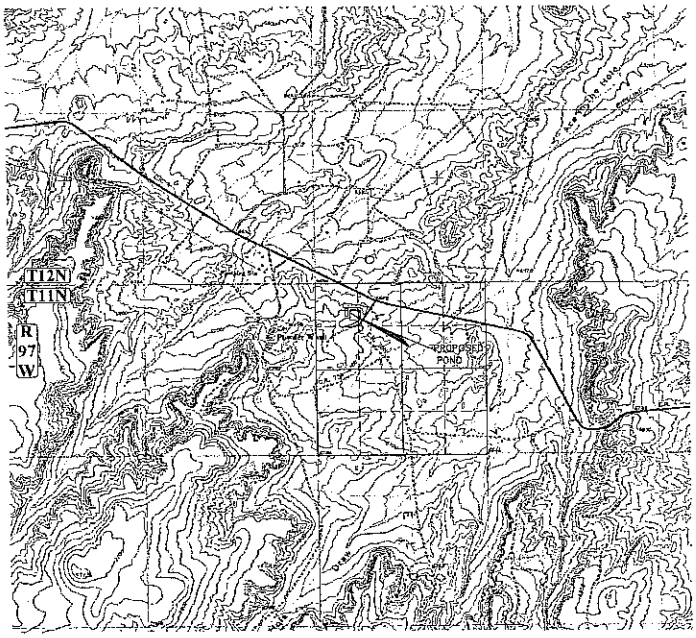
GENERAL VICINITY MAP

The State Of Colorado



NO SCALE

PROPOSED POND LOCATION
SECTION 4, T11N, R97W, 6TH P.M.



SCALE 1"=2000'

CENTER OF POND LOCATION:

LATITUDE: 40° 56' 48.06" N (NAD83)
LONGITUDE: 108° 18' 06.13" W (NAD83)

1038' FROM THE NORTH LINE OF SECTION 4
1229' FROM THE WEST LINE OF SECTION 4

UINTAH ENGINEERING & LAND SURVEYING

CIVIL ENGINEERING AND LAND SURVEYING SERVICES

85 South 200 East, Vernal, UT 84078
Ph: 435.789.1017
www.uintahgroup.com

- SINCE 1964 -

DOMINION ENERGY WEXPRO
POWDER WASH EVAPORATION FACILITY
LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

NO.	DATE SURVEYED	BY	DATE DRAWN	BY	REVISION

RESPONSIBLE ENGINEER:

COLORADO REGISTERED PROFESSIONAL ENGINEER
37502

TITLE SHEET

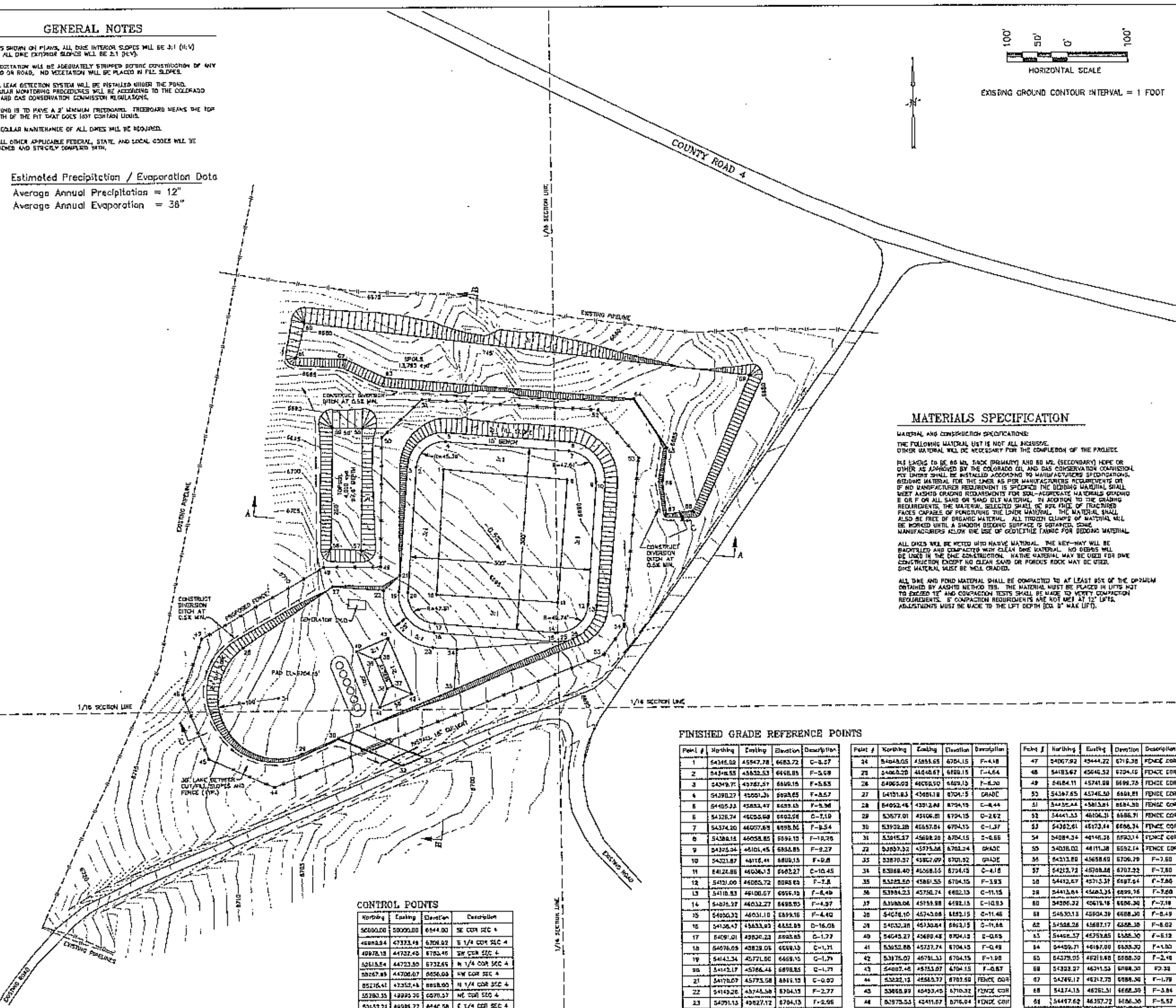
SCALE: NOT TO SCALE	
DRAWN BY: D.G.W.	
DATE DRAWN: 10-12-21	
DELS FILE NO.: W - 211 0	
PROJECT NO. DOM4-19-003	
PRJ#:	33120

SHEET 1

GENERAL NOTES

- AS SHOWN ON PLANS, ALL DIKE INTERIOR SLOPES WILL BE 3:1 (H:V) AND ALL DIKE EXTERIOR SLOPES WILL BE 2:1 (H:V).
- VEGETATION WILL BE ADEQUATELY STRIPPED BEFORE CONSTRUCTION OF ANY POND OR ROAD. NO VEGETATION WILL BE PLACED IN FILL SLOPES.
- A LEAK DETECTION SYSTEM WILL BE INSTALLED UNDER THE POND. REGULAR MONITORING PROCEDURES WILL BE ACCORDING TO THE COLORADO OIL AND GAS CONSERVATION COMMISSION REGULATIONS.
- POND IS TO HAVE A 2' MINIMUM FREEBOARD. FREEBOARD MEANS THE TOP DEPTH OF THE PIT THAT DOES NOT CONTAIN LIQUID.
- REGULAR MAINTENANCE OF ALL DIKES WILL BE REQUIRED.
- ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL CODES WILL BE REVIEWED AND STRICTLY COMPLIED WITH.

Estimated Precipitation / Evaporation Data
Average Annual Precipitation = 12"
Average Annual Evaporation = 36"



MATERIALS SPECIFICATION

MATERIAL AND CONSTRUCTION SPECIFICATIONS:

THE FOLLOWING MATERIAL LIST IS NOT ALL INCLUSIVE. OTHER MATERIAL WILL BE NECESSARY FOR THE COMPLETION OF THE PROJECT.

PIT LINERS TO BE 60 MIL THICK (PRIMARY) AND 60 MIL (SECONDARY) HDPE OR OTHER AS APPROVED BY THE COLORADO OIL AND GAS CONSERVATION COMMISSION. PIT LINERS SHALL BE INSTALLED ACCORDING TO MANUFACTURERS SPECIFICATIONS. BEDDING MATERIAL FOR THE LINER AS PER MANUFACTURERS REQUIREMENTS OR IF NO MANUFACTURER REQUIREMENT IS SPECIFIED THE BEDDING MATERIAL SHALL MEET AASHTO GRADING REQUIREMENTS FOR SOIL-AGGREGATE MATERIALS GRADING E OR F OR ALL SAND OR SAND SILT MATERIAL. IN ADDITION TO THE GRADING REQUIREMENTS, THE MATERIAL SELECTED SHALL BE 80% FREE OF FRACTURED FACES CAPABLE OF PUNCTURING THE LINER MATERIAL. THE MATERIAL SHALL ALSO BE FREE OF ORGANIC MATERIAL. ALL FROZEN CLUMPS OF MATERIAL WILL BE WORKED UNTIL A SMOOTH BEDDING SURFACE IS OBTAINED. SOME MANUFACTURERS ALLOW THE USE OF GEOTEXTILE FABRIC FOR BEDDING MATERIAL.

ALL DIKES WILL BE KEYED INTO NATIVE MATERIAL. THE KEY-WAY WILL BE BACKFILLED AND COMPACTED WITH CLEAN DIKE MATERIAL. NO DEBRIS WILL BE USED IN THE DIKE CONSTRUCTION. NATIVE MATERIAL MAY BE USED FOR DIKE CONSTRUCTION EXCEPT NO CLEAN SAND OR POROUS ROCK MAY BE USED. DIKE MATERIAL MUST BE WELL GRADED.

ALL DIKE AND POND MATERIAL SHALL BE COMPACTED TO AT LEAST 95% OF THE OPTIMUM OBTAINED BY AASHTO METHOD T99. THE MATERIAL MUST BE PLACED IN LIFTS NOT TO EXCEED 12" AND COMPACTION TESTS SHALL BE MADE TO VERIFY COMPACTION REQUIREMENTS. IF COMPACTION REQUIREMENTS ARE NOT MET AT 12" LIFTS, ADJUSTMENTS MUST BE MADE TO THE LIFT DEPTH (EG. 8" MAX LIFT).

CONTROL POINTS

Northing	Easting	Elevation	Description
50000.00	50000.00	6544.00	SE COR SEC 4
46882.94	47373.49	6709.02	S 1/4 COR SEC 4
49972.18	44732.48	6703.46	SW COR SEC 4
52615.54	44723.50	6732.65	W 1/4 COR SEC 4
55267.85	44708.07	6656.05	NW COR SEC 4
55236.48	47352.46	6658.00	N 1/4 COR SEC 4
55280.35	49995.30	6570.57	NE COR SEC 4
55p52.21	49986.72	6540.58	E 1/4 COR SEC 4

FINISHED GRADE REFERENCE POINTS

Point #	Northing	Easting	Elevation	Description
1	54345.02	45547.78	6683.72	C-3.57
2	54346.55	45652.53	6698.85	F-5.68
3	54349.75	45787.57	6699.15	F-5.63
4	54390.27	45881.36	6695.65	F-8.57
5	54405.33	45852.47	6699.15	F-5.56
6	54326.74	46055.60	6602.56	C-7.10
7	54374.20	46057.65	6698.85	F-9.54
8	54380.15	46058.85	6699.15	F-10.28
9	54374.04	46101.45	6688.85	F-9.27
10	54321.87	46116.41	6600.15	F-9.8
11	54124.86	46036.13	6602.27	C-10.45
12	54121.00	46085.72	6085.65	F-7.8
13	54110.53	46100.67	6699.15	F-6.46
14	54075.27	46032.27	6698.85	F-4.97
15	54050.32	46031.10	6699.16	F-4.40
16	54136.47	45633.02	6652.05	C-16.06
17	54091.01	45830.23	6695.65	C-1.77
18	54076.65	45829.05	6658.15	C-1.71
19	54142.34	45771.60	6659.15	C-1.75
20	54142.17	45766.46	6698.85	C-1.73
21	54170.07	45773.58	6655.15	C-0.93
22	54149.26	45748.58	6704.15	F-2.77
23	54091.13	45627.12	6704.13	F-2.96
24	54048.05	45855.65	6704.15	F-4.18
25	54060.70	44040.67	6699.15	F-4.64
26	54065.09	46060.50	6699.15	F-6.20
27	54151.83	45085.18	6704.15	GRADE
28	54052.46	43512.40	6704.15	C-8.44
29	53577.01	45406.81	6704.15	C-2.67
30	53932.28	45657.84	6704.15	C-1.37
31	53915.27	45698.20	6704.15	C-6.66
32	53857.52	45775.84	6702.24	GRADE
33	53870.37	45867.09	6701.92	GRADE
34	53868.40	46068.05	6704.15	C-4.18
35	53223.50	45861.55	6704.15	F-3.93
36	53984.23	45750.74	6602.13	C-11.15
37	53988.08	45755.98	6692.15	C-10.93
38	54026.10	45743.08	6692.15	C-11.46
39	54032.28	45730.84	6692.15	C-11.68
40	54045.27	45680.43	6704.15	C-0.65
41	53952.88	45737.74	6704.15	F-0.49
42	53175.07	45791.33	6704.15	F-1.98
43	54007.48	45753.07	6704.15	F-0.87
44	53232.12	45585.77	6707.50	FENCE COR
45	53868.99	45453.45	6710.32	FENCE COR
46	53975.53	45411.67	6716.04	FENCE COR
47	54067.92	45444.22	6716.38	FENCE COR
48	54183.67	45646.52	6704.66	FENCE COR
49	54184.11	45741.88	6699.78	FENCE COR
50	54367.65	45746.50	6691.85	FENCE COR
51	54432.44	45815.84	6684.56	FENCE COR
52	54441.33	46006.31	6686.71	FENCE COR
53	54362.61	46173.84	6686.34	FENCE COR
54	54084.34	46146.38	6692.14	FENCE COR
55	54038.02	46111.38	6692.14	FENCE COR
56	54213.80	45658.69	6700.79	F-7.60
57	54212.72	45708.44	6707.92	F-7.60
58	54412.67	45713.31	6697.64	F-7.60
59	54415.64	45683.35	6699.76	F-7.60
60	54506.32	45619.16	6686.30	F-7.18
61	54530.13	45604.39	6688.30	F-8.49
62	54508.26	45687.17	6688.30	F-6.02
63	54462.37	45752.65	6688.30	F-6.12
64	54459.71	46167.00	6688.30	F-1.65
65	54379.05	46219.68	6688.30	F-2.48
66	54323.27	46311.53	6688.30	F2.32
67	54269.17	46217.73	6688.30	F-1.79
68	54174.15	46261.31	6682.30	F-3.84
69	54497.62	46357.72	6686.36	F-5.57

UINTAH
ENGINEERING & LAND SURVEYING
CIVIL ENGINEERING AND LAND SURVEYING SERVICES
85 South 200 East, Vernal, UT 84078
Ot 435.789.1017
www.uintahgroup.com
- SINCE 1964 -

DOMINION ENERGY WEXPRO
POWDER WASH EVAPORATION FACILITY
LOCATED IN THE NW 1/4 OF SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

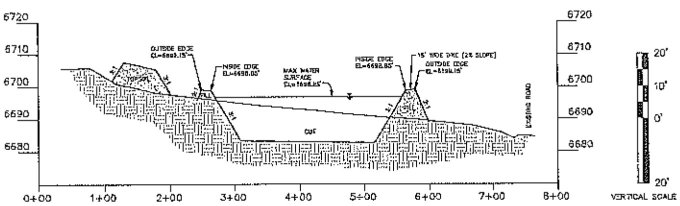
REVISIONS

RESPONSIBLE ENGINEER:
COLORADO REGISTERED PROFESSIONAL ENGINEER 37502

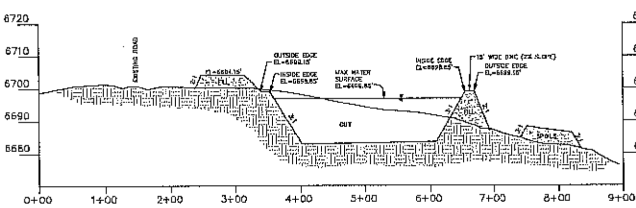
GRADING PLAN

SCALE: 1" = 100'
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W-3 1 1 0
PROJ.NO. DOM04-17-0013
FILE: 33120

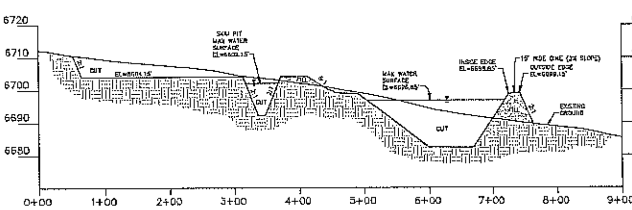
SHEET 2



SECTION "A"



SECTION "B"



SECTION "C"

DISTURBANCE AREA

4.97 ACRES (DISTURBANCE FOOTPRINT)
6.49 ACRES (FENCED AREA)

EARTHWORK APPROXIMATE YARDAGES

RAW CUT = 27,713 CU. YDS.
FILL = 12,652 CU. YDS.
FILL+10% = 13,918 CU. YDS.
EXCESS = 13,793 CU. YDS.

TOP SOIL CUT & STOCKPILE
RAW CUT = 4,011 CU. YDS.
Top soil for area within all areas of new disturbance (6" depth)

EVAPORATION POND VOLUME

POND VOLUME EXCLUDING FREEBOARD
31,195 cyd, 19.34 acre feet, 150,014 BBL

SURFACE AREA AT MAX. LIQUID DEPTH
81,457 SQUARE FEET (1.870 ACRES)

SKIM PIT VOLUME

POND VOLUME EXCLUDING FREEBOARD
849 cyd, 0.53 acre feet, 4,055 BBL

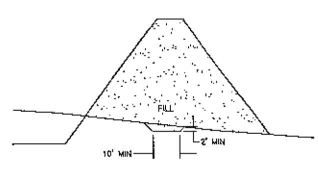
SURFACE AREA AT MAX. LIQUID DEPTH
4,600 SQUARE FEET (0.105 ACRES)

MAXIMUM DAM HEIGHT

TOP OF DIKE ELEVATION (AT CENTERLINE) TO LOWEST NATURAL GROUND = 10.00 FT

DAM LENGTH

PERIMETER OF POND (FILL SECTION)
980 FT



KEY-WAY DETAIL

UINTAH
ENGINEERING & LAND SURVEYING

CIVIL ENGINEERING AND LAND SURVEYING SERVICES

85 South 200 East, Vernal, UT 84078
O: 435.789.1017
www.uintahgroup.com

- SINCE 1964 -

DOMINION ENERGY WEXPRO

POWDER WASH EVAPORATION FACILITY

LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

REVISIONS

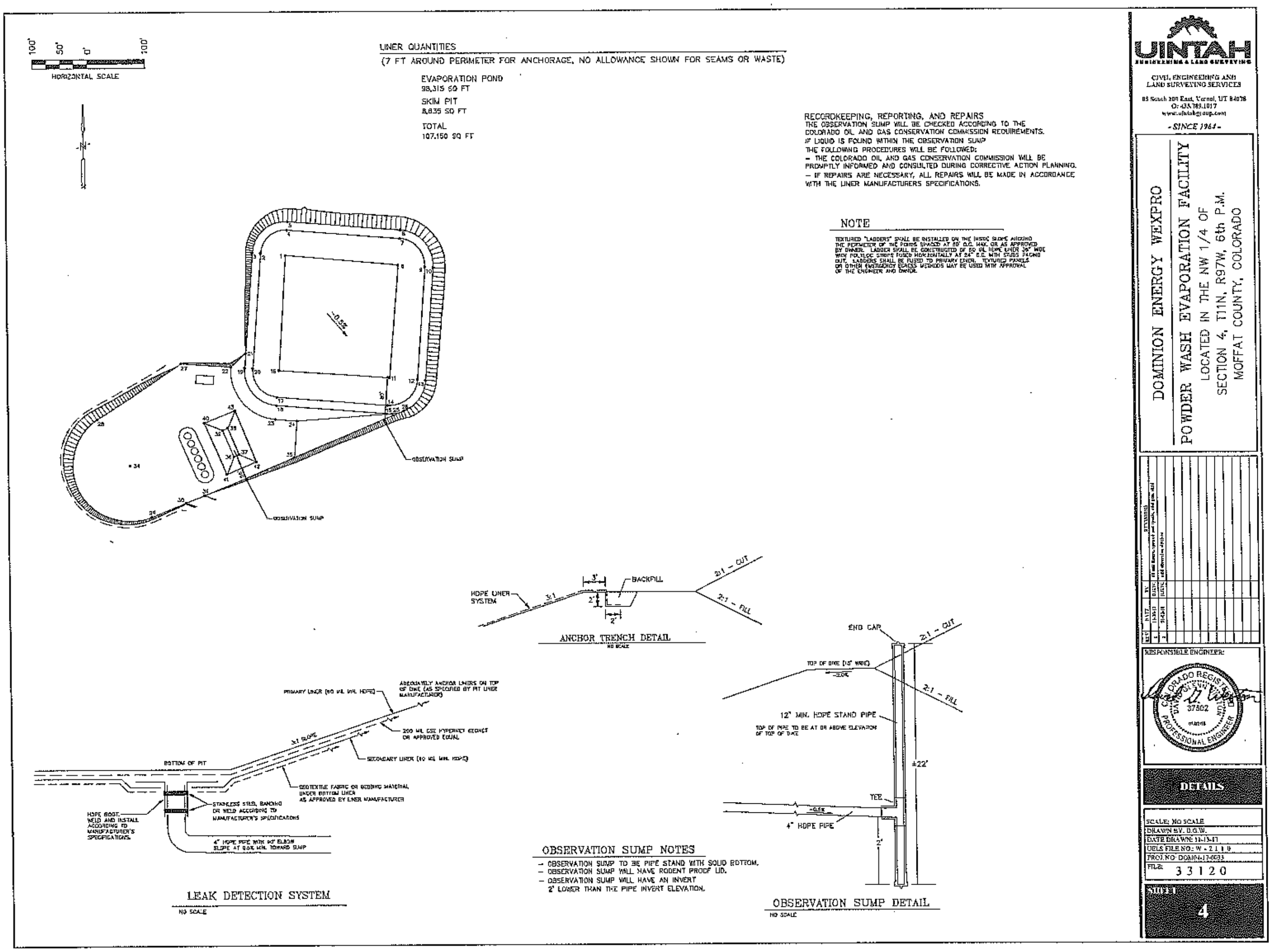
RESPONSIBLE ENGINEER:

COLORADO REGISTERED PROFESSIONAL ENGINEER
DAVID GLENN WIGTON
37502

CROSS SECTIONS

SCALE: AS SHOWN
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W - 2 1 1 0
PROJ. NO: DOM0417-0033
FILE: 33120

SHEET
3


100'
50'
0'
100'
HORIZONTAL SCALE
N
LINER QUANTITIES
(7 FT AROUND PERIMETER FOR ANCHORAGE, NO ALLOWANCE SHOWN FOR SEAMS OR WASTE)
EVAPORATION POND
98,315 SQ FT
SKIM PIT
8,835 SQ FT
TOTAL
107,150 SQ FT
RECORDKEEPING, REPORTING, AND REPAIRS
THE OBSERVATION SUMP WILL BE CHECKED ACCORDING TO THE
COLORADO OIL AND GAS CONSERVATION COMMISSION REQUIREMENTS.
IF LIQUID IS FOUND WITHIN THE OBSERVATION SUMP
THE FOLLOWING PROCEDURES WILL BE FOLLOWED:
– THE COLORADO OIL AND GAS CONSERVATION COMMISSION WILL BE
PROMPTLY INFORMED AND CONSULTED DURING CORRECTIVE ACTION PLANNING.
– IF REPAIRS ARE NECESSARY, ALL REPAIRS WILL BE MADE IN ACCORDANCE
WITH THE LINER MANUFACTURERS SPECIFICATIONS.
NOTE
OBSERVATION SUMP
HDPE LINER SYSTEM
3:1
3'
2'
2'
BACKFILL
2:1 – CUT
2:1 – FILL
ANCHOR TRENCH DETAIL
NO SCALE
PRIMARY LINER (60 MIL MIN. HDPE)
3:1 SLOPE
BOTTOM OF PIT
SECONDARY LINER (60 MIL MIN. HDPE)
HDPE BOOT. WELD AND INSTALL ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
LEAK DETECTION SYSTEM
NO SCALE
OBSERVATION SUMP NOTES
– OBSERVATION SUMP TO BE PIPE STAND WITH SOLID BOTTOM.
– OBSERVATION SUMP WILL HAVE RODENT PROOF LID.
– OBSERVATION SUMP WILL HAVE AN INVERT
2' LOWER THAN THE PIPE INVERT ELEVATION.
END CAP
TOP OF DIKE (15' WIDE)
12" MIN. HDPE STAND PIPE
±22'
TEE
4" HDPE PIPE
2'
OBSERVATION SUMP DETAIL
NO SCALE
UINTAH
CIVIL ENGINEERING AND
LAND SURVEYING SERVICES
- SINCE 1964 -
DOMINION ENERGY WEXPRO
POWDER WASH EVAPORATION FACILITY
LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO
RESPONSIBLE ENGINEER:
COLORADO REGISTERED
PROFESSIONAL ENGINEER
37502
DETAILS
SCALE: NO SCALE
DRAWN BY: D.G.W.
FILE: 33120
SHEET
4

Attachment H

Operating & Maintenance (O&M) Plan

Not Applicable

Source is a True Minor Source or
Applying for a General Permit

Attachment I

Regulatory Analysis

Regulatory Analysis for the Powder Wash Evaporation Facility

This applicability analysis is a general description of equipment and emission sources at the Powder Wash Evaporation Facility operated by the Wexpro Company in Moffat County, Colorado.

Regulation 3, Part A

This facility is located in an attainment area. The individual emission points at this facility with uncontrolled actual emissions of any criteria pollutant less than two tons per year (tpy) are exempt from filing Air Pollution Emission Notices (APEN).

The following are applicable sources that are not APEN-exempt at the Powder Wash Evaporation Facility:

- Reciprocating Internal Combustion Engine (RICE)

The following are applicable sources that are APEN-exempt at the Powder Wash Evaporation Facility:

- Produced Water Tanks
- Condensate Tank
- Tank to Truck Loadout
- Fugitive Sources
- Natural Gas Fired Burners/Heaters

Regulation 3, Part A, Section II

The indirect tank heaters have a design rating less than five million British thermal units and are APEN-exempt under Regulation 3, Part A.II.D.1.k.

Regulation 3, Part B

The condensate truck loading equipment at this facility employs the use of submerged fill loading. Annual loading does not exceed the 16,308 barrels per year threshold. Therefore, tank to truck loadout operations are exempt under Regulation 3, Part B.II.D.1.l.

Regulation 3, Part D

This facility is a minor or synthetic minor stationary source. Therefore, the facility is not subject to Part D.

Regulation 7, Section XII

This facility is not located in the 8-hour Ozone Area and therefore is not subject to Section XII.

Regulation 7, Section XVII

Per Section XVII.F, the facility is not considered a well production facility as defined in Section XVII.A.17. Therefore, the facility is not subject to the requirements in Sections XVII.F.4 and XVII.H.

Uncontrolled actual emissions from the condensate storage tank at this facility are less than six tpy. Therefore, the facility is not subject to air pollution control equipment regulations in Section XVII.C.2.b.

The Caterpillar G3406 TA generator-engine is above 100 horsepower. Therefore, the engine is subject to performance standards under Section XVII, Table 2.

Regulation 7, Section XVIII

This facility is not located in the 8-hour Ozone Control Area and has no high-bleed pneumatic controllers. Therefore, the facility is not subject to Section XVIII.

40 Code of Federal Regulations (CFR) 60 (NSPS) Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ applies to manufacturers, owners and operators of stationary spark ignition (SI) internal combustion engines (ICE). The Caterpillar G3406 TA generator-engine has a model year of April 2011 and therefore is subject to Subpart JJJJ regulations.

40 CFR 60 Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after August 23, 2011, and on or before September 18, 2015

Subpart OOOO applies to certain sources located at facilities within the oil and gas production segment. The Powder Wash Evaporation Facility is not defined as a production facility since the operations are not between the wellhead and the point of custody transfer to the natural gas transmission and storage segment.

40 CFR Part 60 Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015

Subpart OOOOa applies to certain sources located at facilities within the oil and gas production segment. The Powder Wash Evaporation Facility is not defined as a production facility since the

operations are not between the wellhead and the point of custody transfer to the natural gas transmission and storage segment.

40 CFR 63 Subpart HH- National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities

There is no dehydration unit associated with this facility. The working and breathing emissions associated with the storage tanks at this facility are below Subpart HH hazardous air pollutant (HAP) thresholds (i.e., 10 tpy individual HAP, 25 tpy total HAPs). Therefore, this facility is not subject to the requirements of this subpart.

40 CFR 63 Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)

Subpart ZZZZ applies to owners or operators of existing, new or reconstructed engines at area sources of HAP emissions. Therefore, this engine is subject to the applicable requirements under Subpart ZZZZ. However, compliance with 40 CFR 60 Subpart JJJJ meets the requirements of Subpart ZZZZ, as referenced in 40 CFR 63.6590(c)(1).

Attachment J

COGCC 805 Series Requirements

Not Applicable

See Attached Form

Form APCD-

Colorado Department of Public Health and Environment
Air Pollution Control Division

Colorado Oil & Gas Conservation Commission (COGCC)
805 Series Requirements

Ver. March 30, 2015

Company Name: Wexpro Company

Source Name(s): Powder Wash Evaporation Facility

Source AIRS ID(s)[1]: Proposed

PART A –COGCC Applicability to Tanks (Condensate, Crude Oil, and Produced Water)[2]

	Yes	No
1. Are uncontrolled actual emissions of volatile organic compounds (VOCs) 5 tons per year or greater? (Note that for the purposes of Rule 805 "uncontrolled actual emissions" are as defined in Colorado Regulation 3, Part A, Section I.B.46. For new sources, annual projected uncontrolled actual emissions shall be used.)	☐	☒
2. Is the tank located within ¼ mile of a Building Unit[4] or Designated Outside Activity Area[4]?	☐	☒

If answers to both questions are "yes", COGCC Section 805.b.(2).A is applicable to this source.

PART B –COGCC Applicability to Glycol Dehydrators[2]

	Yes	No
1. Are uncontrolled actual emissions of volatile organic compounds (VOCs) 5 tons per year or greater? (Note that for the purposes of Rule 805 "uncontrolled actual emissions" are as defined in Colorado Regulation 3, Part A, Section I.B.46. For new sources, annual projected uncontrolled actual emissions shall be used.)	☐	☐
2. Is the glycol dehydrator located within ¼ mile of a building unit, educational facility, assembly building, hospital, nursing home, board and care facility, jail, or designated outside activity area?	☐	☐

If answers to both questions are "yes", COGCC Section 805.b.(2).B is applicable to this source.

PART C – COGCC Section 805 Series[3]

Crude Oil, Condensate, and Produced Water Tanks - COGCC Section 805.b.(2)A: "*Crude Oil, Condensate, and Produced Water Tanks. All crude oil, condensate, and produced water tanks with uncontrolled actual emissions of volatile organic compounds (VOC) of five (5) tons per year (tpy) or greater, located within 1,320 feet of a Building Unit, or a Designated Outside Activity Area shall use an emission control device capable of achieving 95% control efficiency of VOC and shall obtain a permit as required by Colorado Department of Public Health and Environment, Air Pollution Control Commission Regulation as set forth in 805. b. (1).*"

Glycol Dehydrators - COGCC Section 805.b.(2).B: "*All glycol dehydrators with uncontrolled actual emissions of VOC of five (5) tpy or greater, located within 1,320 feet of a Building Unit , or a*

Designated Outside Activity Area shall use an emission control device capable of achieving 90% control efficiency of VOC and shall obtain a permit as required by Colorado Department of Public Health and Environment, Air Pollution Control Commission Regulation as set forth in 805.b.(1)."

Footnotes:

1 Source Aerometric Information Retrieval System Identification (AIRS ID) refers to the 10-digit ID, made up of county, source, and equipment codes. If an AIRS ID has not been assigned by the APCD, equipment ID(s) provided by the applicant on corresponding Air Pollutant Emission Notices (APENs) may be provided in place of AIRS ID(s). Provide all applicable IDs on this form, as described by the Guidance Document for Form APCD-100.

2 Section A or B may be left blank if the application does not include this type of emission source

3 Section C is provided for general information. The complete 805 series rules may be found at http://cogcc.state.co.us/

4. Definitions of Building Unit and Designated Outside Activity Area are contained in the COGCC Series 100 rule.

I-3
Moffat County Planning Department
Application for Conditional Use

Moffat County Planning Department
221 West Victory Way, Suite 110
Craig, CO 81625
(970) 824-9148

NO. C-_____
Fee: $200.00
Date Paid_____

APPLICATION FOR CONDITIONAL USE

Applicant: Wexpro Company Phone #: 307-352-7514
Email address: Tammy.Fredrickson@dominionenergy.com
Address: P.O. Box 458 Rock Springs, WY 82902
Landowner: Bureau of Land Management Phone #: 970-826-5000
Address: 455 Emerson St. Craig, CO 81625
Agent, if any: Janell Corey Phone #: _____
Address: Powder Wash Evaporation Facility: Section 4, Township 11N, Range 97 West
Acreage: _____ Zoned: _____
Legal Description: Section: 4 Township: 11N Range: 97W Address: _____
Driving Directions: _____

Proposed Use (Describe in Detail): Produced water evaporation pond for wells in the Powder Wash, Ace, and Jacks Draw fields in Moffat County, Colorado.

Proposed Starting Date: 8/01/2018 Proposed Completion Date: October 1, 2018

Attach copies of state and / or federal permit applications, if applicable.
Attach copies of state and / or federal reclamation bonds, if applicable.

Indicate type of water system: Public ( ) Private (X) Existing ( ) None at this location.
Indicate type of sewage system: Public ( ) Private (X) Existing ( ) None at this location.

Indicate any plans for buildings and structures (permanent or temporary) to be located on this land. Include any applicable site plans and elevation plans.
See attached facility drawing.

***See instructions below**

Effective July 1, 2008 it will be the responsibility of the applicant/developer to notify, by certified mail, all mineral estate owners on any "Application for Development." This includes an application for a sketch plan, preliminary plan or final plan for a minor or major subdivision, exemption, conditional use permit, a planned unit development, any applications for zoning or rezoning to a planned unit development that would change or create lot lines where such applications are in anticipation of new surface development or any other similar land use designation that is used by Moffat County. The process is as follows:

Not less than thirty days before the date scheduled for the initial public hearing by a local government on an application for development, the applicant shall send notice, by certified mail, return

receipt requested, or by a nationally recognized overnight courier, to:

A mineral estate owner who either:

(A) Is identified as a mineral estate owner in the county tax assessor's records, if those records are searchable by parcel number or by section, township, and range numbers or other legally sufficient description; or

(B) Has filed in the office of the county clerk and recorder in which the real property is located a request for notification.

Such notice shall contain the time and place of the initial public hearing, the nature of the hearing, the location and legal description by section, township, and range of the property that is the subject of the hearing, the name of the applicant and the local government considering the application for development.

The applicant/developer must certify to the Planning Department that notice has been provided to the mineral estate owner. **See attachment "A".**

Conditional Use Applications are reviewed by the Planning Department and referred to the Planning Commission. The Planning Commission will review the application, hear comments from the Applicant, and give its recommendation to the Board of County Commissioners.

It is required that the applicant, landowner, or agent attend the Planning Commission meeting and recommended that they attend the Board of County Commissioners meeting.

All forms are due to the Planning Department twenty-one (21) days before the Planning Commission meeting. The Planning Commission meets on the first Tuesday of the month. Legal notices are sent by the County to the affected property owners at least fifteen (15) days prior to consideration by the Board of County Commissioners.

Approval of a Conditional Use Application permits a designated use on a site without time limitation, unless specifically noted otherwise. The designated use should be developed on that site within two years of the date of approval of the Conditional Use Application. Failure to develop in the two year period may cause the application to be reconsidered by the Board of County Commissioners. The applicant and/or owner is responsible for ensuring that all applicable property development standards for the zone district are complied with.

The below signing hereby authorizes the Planning Director, to conduct an off-site inspection of the property described when necessary to make an informed evaluation of the proposed conditional use.

Applicant / Agent Signature: _____ **Date:** 3/15/18

Landowner Signature: Lease Attached **Date:** _____
Or copy of lease contract.

INSTRUCTIONS FOR CONDITIONAL USE APPLICATION

Map drawn to scale and Textual information should include:

1. Text - legal description and acreage. This may be obtained at the County Assessor's office.

2. Printout of adjacent landowners' names and addresses. These may be obtained at the County Assessor's office.

3. Map - showing property boundary lines.

4. Map - showing the written names of adjacent landowners (outside of boundary lines). Adjacent landowners' names may be obtained at the County Assessor's office.

5. Map - draw in location of existing residence and out buildings.

6. Map - draw in location of new use, i.e. second residence, new business, etc.

7. Map - draw in location of water wells, existing septic system and proposed new septic system.

8. Map - measure and write in the distance between existing and proposed residences and buildings from each other and from boundary lines of property.

9. Map -draw in and identify all driveway and access roads in and out of property.

The application must provide detailed textual information explaining what the use is and why you are applying for the Conditional Use Permit.

Submitting Application

Application, maps and accompanying textual documents must be turned in to the Planning Department 21 days before the next Planning Commission Meeting. The Planning Commission meets the first Tuesday of each month. The application will be presented to the Planning Commission for their recommendation and then, on the second Tuesday of each month, to the Board of County Commissioners for final approval. A notice of these hearings will be mailed to all adjacent landowners and will be advertised in the Legal Section of the Craig Daily Press.

PLANNING COMMISSION ACTION:

( ) Tabled
( ) Denied, pursuant to the following findings:
( ) Approved, pursuant to the following findings:

_____

_____

_____

_____ _____
Chairman, Planning Commission Date

BOARD OF COUNTY COMMISSIONERS ACTION:

( ) Tabled
( ) Denied, Pursuant to the following findings:
( ) Approved, pursuant to the following findings:

_____

_____

_____

_____ _____
Chairman, Board of County Commissioners Date

ATTACHMENT A

Mineral Right Owner Notification

Effective July 1, 2008 it will be the responsibility of the applicant/developer to notify, by certified mail, all mineral estate owners on any "Application for Development." This includes an application for a sketch plan, a preliminary or final plat for a subdivision, a planned unit development, or any other similar land use designation that is used by a local government.

"Application for development" includes applications for general development plans and special use permits or any applications for zoning or rezoning to a planned unit development that would change or create lot lines where such applications are in anticipation of new surface development.

This does not include amendments to an urban growth boundary, applications for annexation and zoning, applications for zoning or rezoning that will not change or create lot lines, an application for development that is a special use permit for the extraction of construction materials, as that term is defined in section 34-32.5-103, C.R.S., building permit applications, applications for a change of use for an existing structure, applications for boundary adjustments, applications for platting of an additional single lot, applications for lot site plans, or applications with respect to electric lines, crude oil or natural gas pipelines, steam pipelines, chilled and other water pipelines, or appurtenances to said lines or pipelines.

24-65.5-101. Legislative declaration - intent.

The general assembly recognizes that the surface estate and the mineral estate are separate and distinct interests in real property and that one may be severed from the other. It is the intent of the general assembly that this article provide a streamlined procedure for providing notice to owners of mineral interests concerning impending surface development and to facilitate the negotiation of a surface use agreement providing for the joint use of the surface and a mechanism for resolution if an agreement is not reached. Further, it is the intent of the general assembly to include local governments in this process without creating additional liabilities for local governments.

PROCESS:

(1) Not less than thirty days before the date scheduled for the initial public hearing by a local government on an application for development, the applicant shall send notice, by certified mail, return receipt requested, or by a nationally recognized overnight courier, to:

(I) A mineral estate owner who either:

(A) Is identified as a mineral estate owner in the county tax assessor's records, if those records are searchable by parcel number or by section, township, and range numbers or other legally sufficient description; or

(B) Has filed in the office of the county clerk and recorder in which the real property is located a request for notification in the form specified in subsection (3) of this section.

(II) Such notice shall contain the time and place of the initial public hearing, the nature of the hearing, the location and legal description by section, township, and range of the property that is the subject of the hearing, the name of the applicant and the local government considering the application for development.

Such notice shall contain the name and address of the mineral estate owners to whom notices were sent in accordance with paragraph a of this subsection (1).

(1.5) If an applicant files more than one application for development for the same new surface development with a local government, the applicant shall only be required to send notice pursuant to subsection (1) of this section of the initial public hearing scheduled for the first application for development to be considered by the local government. Local governments shall, pursuant to section 24-6-402 (7), provide notice of subsequent hearings to mineral estate owners who register for such notification.

(2) (a) The applicant shall identify the mineral estate owners entitled to notice pursuant to this section by examining the records in the office of the county tax assessor and clerk and recorder of the county in which the real property is located, including the appropriate request for notification pursuant to subsection (3) of this section. Notice shall be sent to the last-known address of the mineral estate owner as shown by such records.

(b) If such records do not identify any mineral estate owners, including their addresses of record, the applicant shall be deemed to have acted in good faith and shall not be subject to further obligations under this article. The applicant shall not be liable for any errors or omissions in such records.

(3) A mineral estate owner who requests or desires to obtain notice under this article or the mineral estate owner's agent may file in the office of the county clerk and recorder of the county in which the real property is located a request for notification form that identifies the mineral estate owner's mineral estate and the corresponding surface estate by parcel number and by section, township, and range numbers or other legally sufficient description. The clerk and recorder shall file request for notification forms in the real estate records for the county and shall also keep an index of request for notification forms by section, township, and range numbers or by subdivision lots and blocks.

(4) Prior to convening an initial public hearing on an application for development, a local government shall require the applicant to certify that notice has been provided to the mineral estate owner pursuant to subsection (1) of this section.

(5) A mineral estate owner may waive the right to notice under this section in writing to the applicant. Failure of a mineral estate owner to be identified in the records described in paragraph (a) of subsection (1) of this section or to file a request for notification under subsection (3) of this section shall not waive the right of such mineral estate owner to f ile an objection with the local government to such application for development no later than thirty days following the initial public hearing for approval of the application for development or to exercise the remedies set forth in section 24-65.5-104.

(6) Before completing the sale of a mineral estate, a mineral estate owner who has received notice as the owner of the mineral estate of a pending public hearing with respect to an application for development pursuant to this section shall notify the buyer of the mineral estate of the existence of the application for development. A transfer of an interest in a mineral estate by a mineral estate owner following the filing of a request for notification pursuant to subsection (3) of this section shall not modify the address to which the applicant may deliver notice under paragraph (a) of subsection (1) of this section until the transferee of such interest has filed an amendment to the request for notification describing the address to which such notices shall be sent.

INSTRUCTIONS
CONDITIONAL USE APPLICATION

Map drawn to scale and Textual information should include:

a. Map - showing property boundary lines.

b. Text - legal description and acreage (obtain at County Assessor's office).

c. Map - show the written names of adjacent landowners' names (outside of boundary lines). Obtain adjacent landowners name at Assessor's office.

d. Printout of adjacent landowners' names and addresses. These may be obtained at the County Assessor's office.

e. Map - draw in location of existing residence and out buildings.

f. Map - draw in location of new use, i.e. second residence, new business, etc.

g. Map - draw in location of water wells, existing septic system, proposed new septic system.

h. Map - measure and write in the distance between existing and proposed residences and buildings from each other, and from boundary lines of property.

i. Map - draw in and identify all driveway and access roads in and out of property.

j. Provide a Quadrangle Map showing elevations and topography and Site. May purchase topography maps from BLM office or W.R. Realty (Jack Leonard), 112 West Victory Way.

The application must provide detailed textual information explaining what the use is and why you are applying for the Conditional Use Permit.

Submitting Application

Application, maps and accompanying textual documents must be turned in to the Planning Department 20 days before the next Planning Commission Meeting. The Planning Commission meets the first Tuesday of each month. The application will be presented to the Planning Commission for their recommendation, and then to the Board of County Commissioners for final approval. A notice of these hearings will be mailed by certified mail to all adjacent landowners and will be advertised in the Legal Section of the Craig Daily Press.

I-4
Dept. of the Interior, Bureau of Land Management
Right-of-way Application

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Bureau of Land Management
Department of the Interior

Wexpro Company®

Form 299 – Rights-of-Way Application
Powder Wash Evaporation Facility (PWEF) Plan of Development

Prescribed by DOI/USDA/DOT
P.L. 96-487 and Federal
Register Notice 5-22-95

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

FORM APPROVED
OMB Control Number: 0596-0082
Expiration Date: 8/31/2020

FOR AGENCY USE ONLY

Application Number

Date Filed

NOTE: Before completing and filing the application, the applicant should completely review this package and schedule a preapplication meeting with representatives of the agency responsible for processing the application. Each agency may have specific and unique requirements to be met in preparing and processing the application. Many times, with the help of the agency representative, the application can be completed at the preapplication meeting.

1. Name and address of applicant *(include zip code)*

Wexpro Company
PO Box 458
Rock Springs, Wy 82902

2. Name, title, and address of authorized agent if different from item 1 *(include zip code)*

Tammy Fredrickson
Senior Permit Agent

3. Telephone *(with area code)*
307-352-7500
Applicant

Authorized Agent
307-352-7514

4. As applicant are you? *(check one)*

a. ☐ Individual
b. ☒ Corporation*
c. ☐ Partnership/Association*
d. ☐ State Government/State Agency
e. ☐ Local Government
f. ☐ Federal Agency

* *If checked, complete supplemental page*

5. Specify what application is for: *(check one)*

a. ☒ New authorization
b. ☐ Renewing existing authorization number
c. ☐ Amend existing authorization number
d. ☐ Assign existing authorization number
e. ☐ Existing use for which no authorization has been received *
f. ☐ Other*

* *If checked, provide details under item 7*

6. If an individual, or partnership, are you a citizen(s) of the United States? ☐ Yes ☐ No

7. Project description (describe in detail): (a) Type of system or facility, *(e.g., canal, pipeline, road);* (b) related structures and facilities; (c) physical specifications *(Length, width, grading, etc.)*; (d) term of years needed: (e) time of year of use or operation; (f) Volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction *(Attach additional sheets, if additional space is needed.)*

a. Produced water evaporation pond and associated facilities.
b. Lined evaporation pond, skim pit, central tankage and associated equipment shown on attached diagrams.
c. Approximately 9.25 disturbed acres including access road. After interim reclamation facility will be reduced to 6.49 acres.
d. 30 years.
e. Year round use.
f. Produced water transported via tank truck and transfered via pipe through skim pit and to evaporation pond.
g. Approximately 8 weeks. August 1, 2018 - September 27, 2018.
h. No temporary work area required.

8. Attach a map covering area and show location of project proposal

9. State or local government approval: ☐ Attached ☐ Applied for ☒ Not Required

10. Nonreturnable application fee: ☒ Attached ☐ Not required

11. Does project cross international boundary or affect international waterways? ☐ Yes ☒ No *(if "yes," indicate on map)*

12. Give statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested.

Wexpro Company has the technical and financial capabilities to maintain and terminate the right-of-way for which authorization is being requested. A reclamation cost estimate is also included with this application.

13a. Describe other reasonable alternative routes and modes considered.

JC Donnell 17 injection well is no longer capable of accepting water. Pond was originally planned for this existing location however it was recommend to be moved by BLM to protect Greater Sage Grouse.

b. Why were these alternatives not selected?

Mitigation for protection of sage grouse and sage grouse habitat.

c. Give explanation as to why it is necessary to cross Federal Lands.

To dispose of and evaporate produced water for oil and gas wells on Federal lands.

14. List authorizations and pending applications filed for similar projects which may provide information to the authorizing agency. *(Specify number, date, code, or name)*

None.

15. Provide statement of need for project, including the economic feasibility and items such as: (a) cost of proposal (construction, operation, and maintenance); (b) estimated cost of next best alternative; and (c) expected public benefits.

Having an evaporation pond within close proximity to well locations will greatly reduce truck traffic and commercial disposal costs that are ultimately charged back to the consumer. Reducing costs will help keep consumer rates down.

16. Describe probable effects on the population in the area, including the social and economic aspects, and the rural lifestyles.

The pond will be located within an existing, rural oil and gas field. There will be no effect on rural lifestyles.

17. Describe likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, soil, and soil stability.

Environmental effects should be minimal and water disposal by evaporation is a preferred source of disposal when injection is not available.

18. Describe the probable effects that the proposed project will have on (a) populations of fish, plantlife, wildlife, and marine life, including threatened and endangered species; and (b) marine mammals, including hunting, capturing, collecting, or killing these animals.

This chosen location will reduce the effects on wildlife. It is outside of crucial sage grouse habitat and is located close to existing roads and well locations reducing longer truck traffic routes.

19. State whether any hazardous material, as defined in this paragraph, will be used, produced, transported or stored on or within the right-of-way or any of the right-of-way facilities, or used in the construction, operation, maintenance or termination of the right-of-way or any of its facilities. "Hazardous material" means any substance, pollutant or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq., and its regulations. The definition of hazardous substances under CERCLA includes any "hazardous waste" as defined in the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 U.S.C. 6901 et seq., and its regulations. The term hazardous materials also includes any nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 42 U.S.C. 9601(14), nor does the term include natural gas.

Please refer to the "Hazardous Material List" on file at the Little Snake BLM Office.

20. Name all the Department(s)/Agency(ies) where this application is being filed.

Bureau of Land Management
Little Snake Field Office

I HEREBY CERTIFY, That I am of legal age and authorized to do business in the State and that I have personally examined the information contained in the application and believe that the information submitted is correct to the best of my knowledge.

Signature of Applicant	Date
	3/15/18

Title 18, U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

GENERAL INFORMATION
ALASKA NATIONAL INTEREST LANDS

This application will be used when applying for a right-of-way, permit, license, lease, or certificate for the use of Federal lands which lie within conservation system units and National Recreation or Conservation Areas as defined in the Alaska National Interest lands Conservation Act. Conservation system units include the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Trails System, National Wilderness Preservation System, and National Forest Monuments.

Transportation and utility systems and facility uses for which the application may be used are:

1. Canals, ditches, flumes, laterals, pipes, pipelines, tunnels, and other systems for the transportation of water.

2. Pipelines and other systems for the transportation of liquids other than water, including oil, natural gas, synthetic liquid and gaseous fuels, and any refined product produced therefrom.

3. Pipelines, slurry and emulsion systems, and conveyor belts for transportation of solid materials.

4. Systems for the transmission and distribution of electric energy.

5. Systems for transmission or reception of radio, television, telephone, telegraph, and other electronic signals, and other means of communications.

6. Improved right-of-way for snow machines, air cushion vehicles, and all-terrain vehicles.

7. Roads, highways, railroads, tunnels, tramways, airports, landing strips, docks, and other systems of general transportation.

This application must be filed simultaneously with each Federal department or agency requiring authorization to establish and operate your proposal.

In Alaska, the following agencies will help the applicant file an application and identify the other agencies the applicant should contact and possibly file with:

Department of Agriculture
Regional Forester, Forest Service (USFS)
P.O. Box 21628
Juneau, Alaska 99802-1628
Telephone: (907) 586-7847 *(or a local Forest Service Office)*

Department of the Interior
Bureau of Indian Affairs (BIA)
Alaska Regional Office
709 West 9th Street
Juneau, Alaska 99802
Telephone: (907) 586-7177

Department of the Interior
Alaska State Office
Bureau of Land Management
222 West 7th Avenue #13
Anchorage, Alaska 99513
Public Room: 907-271-5960
FAX: 907-271-3684
(or a local BLM Office)

U.S. Fish & Wildlife Service (FWS)
Office of the Regional Director
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: (907) 786-3440

National Park Service (NPS)
Alaska Regional Office
240 West 5th Avenue
Anchorage, Alaska 99501
Telephone: (907) 644-3510

Note - Filings with any Interior agency may be filed with any office noted above or with the Office of the Secretary of the Interior, Regional Environmental Officer, P.O. Box 120, 1675 C Street, Anchorage, Alaska 99513.

Department of Transportation
Federal Aviation Administration
Alaska Region AAL-4, 222 West 7th Ave., Box 14
Anchorage, Alaska 99513-7587
Telephone: (907) 271-5285

NOTE - The Department of Transportation has established the above central filing point for agencies within that Department. Affected agencies are: Federal Aviation Administration (FAA), Coast Guard (USCG), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA).

OTHER THAN ALASKA NATIONAL INTEREST LANDS

Use of this form is not limited to National Interest Conservation Lands of Alaska.

Individual department/agencies may authorize the use of this form by applicants for transportation and utility systems and facilities on other Federal lands outside those areas described above.

For proposals located outside of Alaska, applications will be filed at the local agency office or at a location specified by the responsible Federal agency.

SPECIFIC INSTRUCTIONS
(Items not listed are self-explanatory)

7 Attach preliminary site and facility construction plans. The responsible agency will provide instructions whenever specific plans are required.

8 Generally, the map must show the section(s), township(s), and range(s) within which the project is to be located. Show the proposed location of the project on the map as accurately as possible. Some agencies require detailed survey maps. The responsible agency will provide additional instructions.

9, 10, and 12 The responsible agency will provide additional instructions.

13 Providing information on alternate routes and modes in as much detail as possible, discussing why certain routes or modes were rejected and why it is necessary to cross Federal lands will assist the agency(ies) in processing your application and reaching a final decision. Include only reasonable alternate routes and modes as related to current technology and economics.

14 The responsible agency will provide instructions.

15 Generally, a simple statement of the purpose of the proposal will be sufficient. However, major proposals located in critical or sensitive areas may require a full analysis with additional specific information. The responsible agency will provide additional instructions.

16 through 19 Providing this information with as much detail as possible will assist the Federal agency(ies) in processing the application and reaching a decision. When completing these items, you should use a sound judgment in furnishing relevant information. For example, if the project is not near a stream or other body of water, do not address this subject. The responsible agency will provide additional instructions.

Application must be signed by the applicant or applicant's authorized representative.

EFFECT OF NOT PROVIDING INFORMATION: Disclosure of the information is voluntary. If all the information is not provided, the application may be rejected.

DATA COLLECTION STATEMENT

The Federal agencies collect this information from applicants requesting right-of-way, permit, license, lease, or certification for the use of Federal lands. The Federal agencies use this information to evaluate the applicant's proposal. The public is obligated to submit this form if they wish to obtain permission to use Federal lands.

SUPPLEMENTAL		
NOTE: The responsible agency(ies) will provide instructions	CHECK APPROPRIATE BLOCK	
I - PRIVATE CORPORATIONS	ATTACHED	FILED*
a. Articles of Incorporation	☐	☒
b. Corporation Bylaws	☐	☒
c. A certification from the State showing the corporation is in good standing and is entitled to operate within the State	☐	☒
d Copy of resolution authorizing filing	☐	☒
e. The name and address of each shareholder owning 3 percent or more of the shares, together with the number and percentage of any class of voting shares of the entity which such shareholder is authorized to vote and the name and address of each affiliate of the entity together with, in the case of an affiliate controlled by the entity, the number of shares and the percentage of any class of voting stock of that affiliate owned, directly or indirectly, by that entity, and in the case of an affiliate which controls that entity, the number of shares and the percentage of any class of voting stock of that entity owned, directly or indirectly, by the affiliate.	☐	☒
f. If application is for an oil or gas pipeline, describe any related right-of-way or temporary use permit applications, and identify previous applications.	☐	☐
g. If application is for an oil and gas pipeline, identify all Federal lands by agency impacted by proposal.	☐	☐
II - PUBLIC CORPORATIONS		
a. Copy of law forming corporation	☐	☐
b. Proof of organization	☐	☐
c. Copy of Bylaws	☐	☐
d. Copy of resolution authorizing filing	☐	☐
e. If application is for an oil or gas pipeline, provide information required by item "I - f" and "I - g" above.	☐	☐
III - PARTNERSHIP OR OTHER UNINCORPORATED ENTITY		
a. Articles of association, if any	☐	☐
b. If one partner is authorized to sign, resolution authorizing action is	☐	☐
c. Name and address of each participant, partner, association, or other	☐	☐
d. If application is for an oil or gas pipeline, provide information required by item "I - f" and "I - g" above.	☐	☐

*If the required information is already filed with the agency processing this application and is current, check block entitled "Filed." Provide the file identification information *(e.g., number, date, code, name)*. If not on file or current, attach the requested information.

NOTICES

Note: This applies to the Department of Agriculture/Forest Service (FS)

This information is needed by the Forest Service to evaluate the requests to use National Forest System lands and manage those lands to protect natural resources, administer the use, and ensure public health and safety. This information is required to obtain or retain a benefit. The authority for that requirement is provided by the Organic Act of 1897 and the Federal Land Policy and Management Act of 1976, which authorize the secretary of Agriculture to promulgate rules and regulations for authorizing and managing National Forest System lands. These statutes, along with the Term Permit Act, National Forest Ski Area Permit Act, Granger-Thye Act, Mineral Leasing Act, Alaska Term Permit Act, Act of September 3, 1954, Wilderness Act, National Forest Roads and Trails Act, Act of November 16, 1973, Archeological Resources Protection Act, and Alaska National Interest Lands Conservation Act, authorize the Secretary of Agriculture to issue authorizations or the use and occupancy of National Forest System lands. The Secretary of Agriculture's regulations at 36 CFR Part 251, Subpart B, establish procedures for issuing those authorizations.

BURDEN AND NONDISCRIMINATION STATEMENTS

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0082. The time required to complete this information collection is estimated to average 8 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call toll free (866) 632-9992 (voice). TDD users can contact USDA through local relay or the Federal relay at (800) 877-8339 (TDD) or (866) 377-8642 (relay voice). USDA is an equal opportunity provider and employer.

The Privacy Act of 1974 (5 U.S.C. 552a) and the Freedom of Information Act (5 U.S.C. 552) govern the confidentiality to be provided for information received by the Forest Service.

POWDER WASH EVAPORATION FACILITY
PLAN OF DEVELOPEMENT
DOMINION ENERGY WEXPRO

Section 4, T11N, R97W
MOFFAT COUNTY, COLORADO

The onsite inspection for this location was held on 08/01/2017. Present at the onsite were the following individuals:

Tim Barrett, BLM.
Kelly Elliott, Natural Resource Specialist, BLM.
Alex Fischer, COGCC
Jon Lison, Field Foreman, Dominion Energy Wexpro.
Tammy Fredrickson, Senior Permit Agent, Dominion Energy Wexpro.
Tom Fryer, District Manager, Dominion Energy Wexpro.
Kasey Werkele, Director of Operations, Dominion Energy Wexpro.

At the recommendation of the BLM Wildlife Biologist, Wexpro Company agreed to move the facility outside of the Sage Grouse Zone, to one of four recommended locations. The proposed facility is a non-commercial, centralized E&P waste management facility for the disposal and evaporation of produced water and will only serve Wexpro Company operations in the Powder Wash, Ace, and Jacks Draw fields of Moffat County, Colorado.

EXISTING ROAD:

A. Proposed Evaporation Facility Site as staked: Refer to the Evaporation Facility location plat and area map.

B. Proposed Access Route: Refer to general area map. All access roads are field roads within the Powder Wash, Ace, and Jacks Draw Unit boundaries or Moffat County Roads.

C. Plans for Improvement and/or Maintenance: All existing roads utilized will be maintained in their present condition and no improvements will be made.

PLANNED ACCESS ROADS:

A. Refer to Topo A and Topo B for access road information. The proposed access road is approximately 432' feet in length. Approximately 117 feet will be new construction and 315 feet is existing road. The entire access road will be authorized under rights-of-way with the Bureau of Land Management, Little Snake Field Office.

Water turnouts are utilized to divert runoff water from the road ditch in such a manner as to not cause erosion. Surface disturbance and vehicular travel will be limited to the approved access route.

As shown on Figure 5, one 18 inch culvert will be placed on the channel bottom, on a firm uniform bed, which has been shaped to accept it and aligned parallel to the channel to minimize erosion. Backfill will be thoroughly compacted. The culvert will be approximately 24 feet in length, with inlet and outlet drainage within the 50 ft rights-of-way. The snow will be removed from the road during winter as needed. Equipment used for snow removal will be equipped with shoes to keep the blade six (6) inches off the ground surface. Special precautions will be taken to ensure that equipment blades do not destroy vegetation.

Any topsoil (approximately 6 inches) removed in conjunction with road construction will be spread in the borrow area and will be seeded as discussed in the reclamation plan.

The access road will have six inches of pit run gravel laid over the entire surface length of the road. The running surface is currently 14 to 16 feet in width. A cattle guard and gate will be added to the existing road. Construction of the cattle guard will be in compliance with the "BLM Gold Book" standards.

B. Maximum grade: Will not exceed 10 percent.

C. Turnouts: Water turnouts will be constructed, within the 50' wide maximum disturbance, as required to divert runoff water from the road ditch in such a manner as to not cause erosion.

D. Location (center line): Access road is existing. Surface disturbance and vehicular travel will be limited to the approved access route, additional areas as needed will be approved in advance.

E. Surface materials will be taken from cuts along the access road and location. Spot surfacing may be required to maintain the running surface. The access road will be graveled to help with dust mitigation. Surfacing materials will be purchased from commercial suppliers in the marketing area.

F. Topsoil will be removed in conjunction with road and location construction and may be used for reclamation purposes within the Powder Wash Field. A Sundry Notice for each project will be submitted prior to moving top soil.

SPECIFICATIONS OF PROPOSED FACILITIES:

A. Refer to attached diagrams.

B. All facilities are less than 25 feet in height, unless required by other governing agencies and / or safety concerns to exceed 25 feet and are existing.

C. All above ground structures not subject to safety requirements will be painted Shale Green. All facilities will be painted as weather permits, but no later than one year after facility is in operation.

D. Off load produced water tanks are and will be surrounded by a dike of sufficient capacity to contain 110% of the largest storage tank.

E. All loading lines are currently placed inside the berm surrounding the tank battery.

F. Emissions control equipment, when required by published –CDPHE Regulations, will be identified, permitted, and installed through CDPHE.

G. Dominion Energy Wexpro will be taking all precautions to avoid any Hydro-carbons entering the evaporation pond. **Initial** Separation of Gas, Condensate and Produced Water occurs at the well location by interrupting the gas flow with pressure cuts, heat and forcing retention time in a three phase separator where the liquids and vapors are allowed to naturally separate from each other. Once the liquids have naturally separated and somewhat stabilize inside the vessel, mechanically controlled valves open at specifically set parameters allowing water to be dumped through piping to the water tank and condensate dumped through piping to the condensate tank. Once the liquids have entered the specified tanks, a **second** point of much more efficient natural separation takes place which is manually interfered with to move water and condensate to their appropriate tankage via pump truck transferring. The produced water would then be hauled, by trucks within the Powder Wash, Jacks Draw, and Ace field to the evaporation facility where the water truck driver connects hoses equipped with camlock fittings to a pump skid, engages the skids electrically driven offload pump which pumps the contents of the truck through a series of filters, to a skimmer tank which would serve as a **third** point of separation to extract any potential hydrocarbons. From the tanks, the produced water is transferred to a lined and netted skim pit, which would be approximately 100' x 58', this skim pit would serve as a **fourth** point of separation to separate any potential hydrocarbons. The produced water would then be transferred to the evaporation pond, which would be approximately 300' x 300'. The produced water is then pumped from the pond to Barracuda Wastewater evaporators where the water is forced through a stainless steel manifold with 30 spray nozzles specifically designed to allow longer float times maximizing evaporation. The evaporators will be electronically controlled

to operate only during specific weather conditions related to humidity, wind speed and temperature with intent of minimizing or eliminating overspray.

H. The skim pit and evaporation pond will be lined with a 4 part HDPE liner system, which will also include a leak detection system. (Sheet 4 of the engineered drawings).

1. Primary Liner, 60 mil min. HDPE.
2. 200 Mil GSE Hypernet Geonet or Approved Equal.
3. Secondary Liner, 60 mil min. HDPE.
4. Geotextile Fabric or Bedding Material Under Bottom Liner.

The skim pit will be netted with 1" or less size holes. The Evaporation Pond will have a "Bird Avert" system in place, which was highly recommend by Roy Brown with the Fish and Wildlife Service as a deterrent for birds and other animals, specifically, birds covered under the Migratory Bird Treaty Act (MBTA) for our Wyoming facilities. The evaporation facility will be completely fenced to keep wildlife, livestock, etc., out of the facility.

I. Construction of the Powder Wash Produced Water Evaporation Facility is expected to start the first part of August 2018 and will last approximately eight weeks. Construction of the pond will take approximately two weeks followed by a six week period to install the pond liners. The tanks will be set and the generator will also be installed during this six week period. The entire facility will be fenced and this activity will take approximately two weeks. The entire Powder Wash Evaporation Facility will also be fenced.

J. Leak detection system:

- 4 Part HDPE Liner System, with leak detection for both Skim Pit and Evaporation Pond.
- Primary liner is 60 mil min. HDPE.
- 200 Mil GSE Hypernet Geonet or Approved Equal.
- Secondary liner, 60 mil min. HDPE.
- Geotextile Fabric or Bedding Material under bottom liner.

The Pond will be constructed with a pyramid shaped bottom and extended excavation at two down gradient corners where observation sumps will be installed and checked by operations personnel on a daily basis for early detection of liner breach.

4. SOURCE OF CONSTRUCTION MATERIALS:

All materials will be derived from cuts at the location and along the access road.

5. ANCILLARY FACILITIES: Camp facilities will not be required.

6. EVAPORARTION FACILITY LAYOUT: Refer to attached diagrams.

Diversion ditches and erosion control devices are one example of structural best management practices (BMP) used for erosion and sediment control. Diversion ditches will be constructed to direct run off away from unprotected slopes and to direct sediment laden runoff to a sediment trapping structure.

Typically, perimeter storm water controls are installed during clearing and grading of the site or immediately after construction. A third party or company representative will then select and install additional best management practice (BMP) storm water controls. BMP's will be evaluated and modified, if necessary, following reclamation. Please refer to the Storm Water Pollution Prevention Plan.

7. PLANS FOR RESTORATION OF THE SURFACE:

During construction, all woody vegetation and topsoil material will be removed from the location and stockpiled.

All areas of the Powder Wash Evaporation Facility not needed for operations will be reclaimed and reseeded as per the attached Reclamation Plan.

An annual weed spraying program is in place within this field and weeds are controlled through the use of herbicides to prevent the intrusion of noxious or invasive weeds.

At the end of the evaporation facility life, an estimated 30 years, the entire location will be re-contoured to blend with the existing terrain and reseeded. At that time a reclamation plan will be submitted for approval.

An estimate of the cost for reclamation, closure, and abandonment of the proposed facility has been included with this submittal. Prior to the commencement of construction, Wexpro Company will provide the required financial assurance to the Bureau of Land Management.

8. SURFACE AND MINERAL OWNERSHIP: Surface ownership along the proposed new access road and the Evaporation Facility site are both Federal.

9. OTHER INFORMATION:
The dirt contractor will have a copy of any additional stipulations and the surface use plan on-site during the construction operations.

A Class III Cultural Resource Inventory (17-WAS-251) and a Paleontological Field Survey were completed for the evaporation facility site. Both reports have been forwarded to the BLM.

Additional applications have been or will be filed with the following agencies:

1. Colorado Oil and Gas Conservation Commission: Form 2A, Form 27.
2. Colorado Department of Public Health & Environment: For all associated equipment.
3. Moffat County: Conditional Use Permit

All plans have been included as an attachment to this submittal and are considered to be a part of this plan of development.

OPERATORS REPRESENTATIVE

Tammy Fredrickson
Senior Permit Agent
307-352-7514
Tammy.Fredrickson@DominionEnergy.com

Kasey Werkele
Director of Operations
(307) 352-7506
Kasey.Werkele@DominionEnergy.com

Preliminary Closure Plan
Rule 908.g (1) B

Wexpro Company®

Dominion Energy

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458
Rock Springs, WY 82902-0458

Powder Wash Evaporation Facility

Project Information

Wexpro Company has prepared a reclamation cost estimate for the proposed Powder Wash Evaporation Facility that will traverse across Bureau of Land Management administered land location in: Section 4, T11N, and R97W. The disturbance footprint of the location will cover an approximate 4.97 acres.

The following estimate is prepared with the understanding that the production equipment will have been previously removed from well pad. Liners from both the Evaporation and Skim ponds will be removed and disposed of at a licensed facility. The soils under the liner will be tester per Table 910-1. Available topsoil will be stripped and stockpiled, areas will be re-contoured to match the surrounding terrain, all areas of disturbance will be ripped to 18" centers, topsoil will be respread, after topsoil has been spread evenly the area will be cross ripped to 3" (or depth of the topsoil layer) and the ground that is disturbed by these activities will be re-contoured to match existing conditions and revegetated with a native seed mix.

Construction estimates provided by Terry R. Pitt Construction.

CONSTRUCTION ITEM	APPROXIMATE QUANTITY	COST
Mob/Demob- Scraper, Dozer & Blade	1	$3000.00
Removal & Disposal of Pit Liners (Evaporation Pond)	1 @ 300' x 300'	$43,000.00
Removal & Disposal of Pit Liners (Skim Pit)	1 @ 200' x 50'	$18,000.00
Table 910-1 Soil Analysis for Evaporation Pond and Skim Pit	10 samples (5 samples per pit)	$20,000.00
Topsoil removal, re-contouring, topsoil spreading, ripping	149.10 hours	$25,446.40
Re-Seeding of Disturbance	4.97 acres	$8,926.96
	Subtotal=	$118,373.36
10% contingency		$11,837.33
Bond (3%)		$3,551.20
Contractor Profit (10%)		$11,837.33
ED&C (8%)		$9,469.86
BLM Admin Cost (10%)		$11,837.33
BLM Indirect Cost (21.8%)		$25,805.39
	Total=	$192,711.80

Thank you,

April Stegall
Reclamation Agent

I-5
Colorado Oil & Gas Conservation Commission
Form 15 – Evaporation Pit Permit
Form 15 – Skim Pit Permit

FORM 15 Rev 10/11

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303) 894-2100 Fax: (303) 894-2109

OGCC RECEPTION

Document Number: 401566644

EARTHEN PIT REPORT / PERMIT

This form is to be used for both reporting and permitting pits. Rule 903 describes when a Permit with prior approval, or a Report within 30 days is required for pits. Submit required attachments and forms.

Form Type: [X] PERMIT [ ] REPORT OGCC PIT NUMBER:

NOTE: Operator to provide OGCC Pit Number only if available on an existing pit for pit report

ATTACHMENTS

Detailed Site Plan	X
Design/Cross Sec	X
Topo Map	X
Calculations	
Sensitive Area Info	
Mud Program	
Form 2A	X
Form 26	
Water Analysis	

OGCC Operator Number: 95960 Contact Name: Tammy Fredrickson

Name of Operator: WEXPRO COMPANY

Address: P O BOX 45003 Phone: (307) 352-7514

City: SALT LAKE CITY State: UT Zip: 84145-0601 Email: Tammy.Fredrickson@dominionenergy.com

Pit Location Information

Operator's Pit/Facility Name: PWEP Evaporation Pit Operator's Pit/Facility Number:

API Number (associated well): 05- 00

OGCC Location ID (associated location): Or Form 2A # 401520294

Pit Location (QtrQtr, Sec, Twp, Rng, Meridian): NWNW-4-11N-97W-6

Latitude: 40.946683 Longitude: -108.301703 County: MOFFAT

Operation Information

Pit Use/Type (Check all that apply): Pit Type: [X] Lined [ ] Unlined

[ ] Drilling: (Ancillary, Completion, Flowback, Reserve Pits) [ ] Oil-based Mud; [ ] Salt Sections or High Chloride Mud

[X] Production: [ ] Skimming/Settling; [ ] Produced Water Storage; [ ] Percolation; [X] Evaporation

[ ] Special Purpose: [ ] Flare; [ ] Emergency; [ ] Blowdown; [ ] Workover; [ ] Plugging; [ ] BS&W/Tank Bottoms

[ ] Multi-Well Pit: Construction Date: Actual or Planned:

Method of treatment prior to discharge into pit: Separation at well facility

Offsite disposal of pit contents: [ ] Injection; [X] Commercial; [ ] Reuse/Recycle; [ ] NPDES; Permit Number:

Other Information:

Site Conditions

Distance (in feet) to the nearest surface water: 481 Ground Water (depth): 72 Water Well: 1852

Is this location in a Sensitive Area? No Existing Location?

Pit Design and Construction

Size of Pit (in feet): Length: 300 Width: 300 Depth: 16 Calculated Working Volume (in barrels): 150014

Flow Rates (in bbl/day): Inflow: 173 Outflow: Evaporation: 173 Percolation:

Primary Liner. Type: GSE Hypernet Geonet Thickness (mil): 60

Seconday Liner (if present): Type: HDPE Thickness (mil): 60

Is Pit Fenced? Yes Is Pit Netted? No Leak Detection? Yes

Other Information: Pit will be lined with a 4 part HDPE liner system, whick will also include a leak detection system. Liner will consist of a 60 mil HDPE primary liner, 200 mil GSE Hypernet Geonet or approved equal. Secondary liner is 60 mil HDPE. Geotextile fabric or bedding material will be placed under bottom liner. Two obersvation sumps will be installed. Wexpro is seeking approval to utilize a Bird Avert System in place of a net.

Operator Comments:

Certification

I hereby certify all statements made in this form are, to the best of my knowledge, true, correct, and complete.

Signed: | Print Name: Tammy Fredrickson

Title: Senior Permit Agent | Email: Tammy.Fredrickson@dominionenergy.com | Date:

Approval

Signed: | Title: | Date:

Best Management Practices

No	BMP/COA Type	Description
5	Interim Reclamation	Wexpro will use only certified weed free native seed mixes, unless recommended otherwise by Federal agencies. If needed, reclamation area will be fenced to minimize livestock/wildlife impact until plant species are capable of sustaining growth.
5	Planning	Location and layout of evaporation pit has been designed to meet all federal and state safety regulations. An additional observation sump beyond what was required has been added by Wexpro Company.
5	Wildlife	The entire facility will be fenced to prevent deer, elk, and domestic livestock from entering the pond. The Bird Avert system will be utilized to distract birds from landing on the pond.

Total: 3 comment(s)

CONDITIONS OF APPROVAL:

COA Type	Description

Attachment Check List

Att Doc Num	Name
401579799	DESIGN: PLAN AND CROSS SECTION
401579804	DETAILED SITE PLAN
401579806	OTHER
401579810	TOPOGRAPHIC MAP

Total Attach: 4 Files

General Comments

User Group	Comment	Comment Date
		Stamp Upon Approval

Total: 0 comment(s)

FORM 15 Rev 10/11

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303) 894-2100 Fax: (303) 894-2109

OGCC RECEPTION

Document Number: 401579861

EARTHEN PIT REPORT / PERMIT

This form is to be used for both reporting and permitting pits. Rule 903 describes when a Permit with prior approval, or a Report within 30 days is required for pits. Submit required attachments and forms.

Form Type: [X] PERMIT [ ] REPORT OGCC PIT NUMBER: _____

NOTE: Operator to provide OGCC Pit Number only if available on an existing pit for pit report

ATTACHMENTS

Detailed Site Plan	X
Design/Cross Sec	X
Topo Map	X
Calculations	
Sensitive Area Info	
Mud Program	
Form 2A	X
Form 26	
Water Analysis	

OGCC Operator Number: 95960 Contact Name: Tammy Fredrickson

Name of Operator: WEXPRO COMPANY

Address: P O BOX 45003 Phone: (307) 352-7514

City: SALT LAKE CITY State: UT Zip: 84145-0601 Email: Tammy.Fredrickson@dominionenergy.com

Pit Location Information

Operator's Pit/Facility Name: PWEP Skim Pit Operator's Pit/Facility Number: _____

API Number (associated well): 05- _____ 00

OGCC Location ID (associated location): _____ Or Form 2A # 401520294

Pit Location (QtrQtr, Sec, Twp, Rng, Meridian): NWNW-4-11N-97W-6

Latitude: 40.946683 Longitude: -108.301703 County: MOFFAT

Operation Information

Pit Use/Type (Check all that apply): Pit Type: [X] Lined [ ] Unlined

[ ] Drilling: (Ancillary, Completion, Flowback, Reserve Pits) [ ] Oil-based Mud; [ ] Salt Sections or High Chloride Mud

[X] Production: [X] Skimming/Settling; [ ] Produced Water Storage; [ ] Percolation; [ ] Evaporation

[ ] Special Purpose: [ ] Flare; [ ] Emergency; [ ] Blowdown; [ ] Workover; [ ] Plugging; [ ] BS&W/Tank Bottoms

[ ] Multi-Well Pit: Construction Date: _____ Actual or Planned: _____

Method of treatment prior to discharge into pit: Separation at well facility

Offsite disposal of pit contents: [ ] Injection; [X] Commercial; [ ] Reuse/Recycle; [ ] NPDES; Permit Number: _____

Other Information: Four phase separation plan beginning at well location, transfer to storage tanks, and then to skim pit. Final to skim off any hydrocarbons from the skim put and put them back into the skim tank.

Site Conditions

Distance (in feet) to the nearest surface water: 481 Ground Water (depth): 72 Water Well: 1852

Is this location in a Sensitive Area? No Existing Location? _____

Pit Design and Construction

Size of Pit (in feet): Length: 100 Width: 58 Depth: 12 Calculated Working Volume (in barrels): 4085

Flow Rates (in bbl/day): Inflow: 173 Outflow: 173 Evaporation: _____ Percolation: _____

Primary Liner. Type: GSE Hypernet HDPE Thickness (mil): 60

Seconday Liner (if present): Type: HDPE Thickness (mil): 60

Is Pit Fenced? Yes Is Pit Netted? Yes Leak Detection? Yes

Other Information: Primary liner is 60 mil min. HDPE. 200 mil GSE Hypernet Geonet. Secondary liner is 60 mil min. HDPE. Geotextile fabrc or bedding material will be placed under bottom liner. Pit will be netted with 1 inch or less size holes.

Operator Comments:	

Certification

I hereby certify all statements made in this form are, to the best of my knowledge, true, correct, and complete.

Signed:		Print Name:	Tammy Fredrickson		
Title:	Senior Permit Agent	Email:	Tammy.Fredrickson@dominionenergy.com	Date:	03/20/2018

Approval

Signed:		Title:	Date:	

Best Management Practices

No	BMP/COA Type	Description
5	Planning	Location and layout of skim pit has been designed to meet all federal and state safety regulations. One observation sump will be utilized to monitor for leaks.
5	Traffic control	Facility area will be fenced and gated. The gate will be locked during non-operational hours.
5	Wildlife	Pit will be netted to distract and keep birds from landing on the pond.

Total: 3 comment(s)

CONDITIONS OF APPROVAL:

COA Type	Description

Attachment Check List

Att Doc Num	Name
401579861	PIT PERMIT SUBMITTED
401579917	DESIGN: PLAN AND CROSS SECTION
401579918	DETAILED SITE PLAN
401579919	OTHER
401579920	TOPOGRAPHIC MAP
401579923	OPERATIONS PLAN

Total Attach: 6 Files

General Comments

User Group	Comment	Comment Date
		Stamp Upon Approval

Total: 0 comment(s)

I-6
Colorado Oil & Gas Conservation Commission
Form 2A

Dominion Energy Wexpro
2221 Westgate, Rock Springs, WY 82901
Mailing Address:
P. O. Box 458, Rock Springs, WY 82902-0458

Dominion Energy

Form 2A
Colorado Oil and Gas Conservation Commission
Oil and Gas Location Assessment

Wexpro Company®

Powder Wash Evaporation Facility

FORM 2A Rev 08/13

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203
Phone: (303) 894-2100 Fax: (303) 894-2109

Oil and Gas Location Assessment

Document Number: 401520294

Date Received: 02/14/2018

☒ New Location ☐ Refile ☐ Amend Existing Location Location#:

This Oil and Gas Location Assessment is to be submitted to the COGCC for approval prior to any ground disturbance activity associated with oil and gas operations. Approval of this Oil and Gas Location Assessment will allow for the construction of the below specified Location; however, it does not supersede any land use rules applied by the local land use authority. Please see the COGCC website at http://cogcc.state.co.us/ for all accompanying information pertinent this Oil and Gas Location Assessment.

Location ID:

Expiration Date:

☐ This location assessment is included as part of a permit application.

CONSULTATION

☐ This location is included in a Comprehensive Drilling Plan. CDP #

☐ This location is in a sensitive wildlife habitat area.

☐ This location is in a wildlife restricted surface occupancy area.

☐ This location includes a Rule 306.d.(1)A.ii. variance request.

Operator

Operator Number: 95960

Name: WEXPRO COMPANY

Address: P O BOX 45003

City: SALT LAKE CITY State: UT Zip: 84145-0601

Contact Information

Name: Tammy Fredrickson

Phone: (307) 352-7514

Fax: (307) 352-7575

email: Tammy.Fredrickson@dominionenergy.com

RECLAMATION FINANCIAL ASSURANCE

☐ Plugging and Abandonment Bond Surety ID: ☐ Gas Facility Surety ID:

☒ Waste Management Surety ID:

LOCATION IDENTIFICATION

Name: Powder Wash Evaporation Facility Number:

County: MOFFAT

QuarterQuarter: NWNW Section: 4 Township: 11N Range: 97W Meridian: 6 Ground Elevation: 6692

Define a single point as a location reference for the facility location. When the location is to be used as a well site then the point shall be a well location.

Footage at surface: 1038 feet FNL from North or South section line

1229 feet FWL from East or West section line

Latitude: 40.946683 Longitude: -108.301703

PDOP Reading: 1.5 Date of Measurement: 12/07/2017

Instrument Operator's Name: Cody Rich

RELATED REMOTE LOCATIONS

(Enter as many Related Locations as necessary. Enter the Form 2A document # only if there is no established COGCC Location ID#)

This proposed Oil and Gas Location is: LOCATION ID # FORM 2A DOC #

Production Facilities Location serves Well(s)	312896
	413947
	312784
	312804
	413707
	312917
	413617
	312905
	416378
	312784
	313345
	413707
	312798
	312808
	413594
	312926
	313385
	413703
	313384
	416367
	312888
	313267
	414061
	312893
	312805
	312817
	312798
	413880
	392534
	313106
	312811
	313270
	313351
	313126
	312909
	313161
	413594
	421618
	413617
	313102
	414020
	416367
	312885
	312851
	312849
	312817
	313222
	413772
	313351
	413947

Production Facilities Location serves Well(s)	312792	
	413880	
	312824	
	312790	
	311778	
	413703	
	313370	
	313384	
	312803	
	413462	
	312866	
	312936	
	313373	
	313422	
	313385	
	413772	
	312786	
	313125	
	312812	
	312892	
	416367	
	421618	
	416367	
	416425	
	313126	
	313374	
	312893	
	413461	
	312814	
	313382	
	313343	
	392534	
	313098	
	414020	
	313107	
	312849	
	312816	
	312814	
	416637	
	312874	
	312800	
	313368	
	312887	
	312809	
	312810	
	312936	
	313106	
	312909	
	312870	
	312804	

Production Facilities Location serves Well(s)	312802	
	414060	
	313386	
	312888	
	312903	
	413461	
	312813	
	312872	
	313371	
	416378	
	313386	
	312923	
	312805	
	414020	
	414020	
	312801	
	313341	
Well Site is served by Production Facilities	313372	

FACILITIES

Indicate the number of each type of oil and gas facility planned on location

Wells		Oil Tanks*		Condensate Tanks*	2	Water Tanks*	4	Buried Produced Water Vaults*	
Drilling Pits		Production Pits*		Special Purpose Pits	2	Multi-Well Pits*		Modular Large Volume Tanks	
Pump Jacks		Separators*		Injection Pumps*		Cavity Pumps*	3	Gas Compressors*	
Gas or Diesel Motors*	1	Electric Motors	3	Electric Generators*	1	Fuel Tanks*		LACT Unit*	
Dehydrator Units*		Vapor Recovery Unit*		VOC Combustor*		Flare*		Pigging Station*	

OTHER FACILITIES*

Other Facility Type	Number
Evaporators	4

*Those facilities indicated by an asterisk (*) shall be used to determine the distance from the Production Facility to the nearest cultural feature on the Cultural Setbacks Tab.

Per Rule 303.b.(3)C, description of all oil, gas, and/or water pipelines:

1 - 4" water pipeline from water tanks to skimmer pit.
1 - 4" water pipeline from skimmer pond to evaporation pit.

CONSTRUCTION

Date planned to commence construction: 06/01/2018 Size of disturbed area during construction in acres: 9.25

Estimated date that interim reclamation will begin: 10/01/2018 Size of location after interim reclamation in acres: 6.49

Estimated post-construction ground elevation: 6698

DRILLING PROGRAM

Will a closed loop system be used for drilling fluids: No

Is H_2S anticipated? No

Will salt sections be encountered during drilling: No

Will salt based mud (>15,000 ppm Cl) be used? No

Will oil based drilling fluids be used? No

DRILLING WASTE MANAGEMENT PROGRAM

Drilling Fluids Disposal: _____ Drilling Fluids Disposal Method: _____

Cutting Disposal: _____ Cuttings Disposal Method: _____

Other Disposal Description:

Purpose of the facility is to evaporate produced water from wells in the Ace, Jacks Draw, and Powder Wash fields that are owned/operated by Wexpro Company in Moffat County, Colorado.

Beneficial reuse or land application plan submitted? No

Reuse Facility ID: _____ or Document Number: _____

Centralized E&P Waste Management Facility ID, if applicable: _____

SURFACE & MINERALS & RIGHT TO CONSTRUCT

Name: Bureau of Land Management Phone: 970-826-5000

Address: 455 Emerson St Fax: 970-826-5002

Address: _____ Email: blm_CO_lsfo_web@blm.gov

City: Craig State: CO Zip: 81625

Surface Owner: ☐ Fee ☐ State ☒ Federal ☐ Indian

Check all that apply. The Surface Owner:
- ☒ is the mineral owner
- ☒ is committed to an oil and Gas Lease
- ☒ has signed the Oil and Gas Lease
- ☐ is the applicant

The Mineral Owner beneath this Oil and Gas Location is: ☐ Fee ☐ State ☒ Federal ☐ Indian

The Minerals beneath this Oil and Gas Location will be developed from or produced to this Oil and Gas Location: No

The right to construct this Oil and Gas Location is granted by: oil and gas lease

Surface damage assurance if no agreement is in place: Blanket Surface Surety ID: 20150035

Date of Rule 306 surface owner consultation 08/03/2017

CURRENT AND FUTURE LAND USE

Current Land Use (Check all that apply):

Crop Land: ☐ Irrigated ☐ Dry land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP

Non-Crop Land: ☒ Rangeland ☐ Timber ☐ Recreational ☒ Other (describe): Oil and Gas Operations

Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

Future Land Use (Check all that apply):

Crop Land: ☐ Irrigated ☐ Dry land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP

Non-Crop Land: ☒ Rangeland ☐ Timber ☐ Recreational ☒ Other (describe): Oil and Gas Operations

Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

CULTURAL DISTANCE INFORMATION

Provide the distance to the nearest cultural feature as measured from Wells or Production Facilities onsite.

	From WELL	From PRODUCTION FACILITY
Building:	Feet	2212 Feet
Building Unit:	Feet	2480 Feet
High Occupancy Building Unit:	Feet	5280 Feet
Designated Outside Activity Area:	Feet	5280 Feet
Public Road:	Feet	714 Feet
Above Ground Utility:	Feet	2274 Feet
Railroad:	Feet	5280 Feet
Property Line:	Feet	5280 Feet

INSTRUCTIONS:
- All measurements shall be provided from center of nearest Well or edge of nearest Production Facility to nearest of each cultural feature as described in Rule 303.b.(3)A.
- Enter 5280 for distance greater than 1 mile.
- Building - nearest building of any type. If nearest Building is a Building Unit, enter same distance for both.
- Building Unit, High Occupancy Building Unit, and Designated Outside Activity Area - as defined in 100-Series Rules.
-For measurement purposes only, Production Facilities should only include those items with an asterisk(*) on the Facilities Tab.

DESIGNATED SETBACK LOCATION INFORMATION

Check all that apply. This location is within a:

- ☐ Buffer Zone
- ☐ Exception Zone
- ☐ Urban Mitigation Area

- Buffer Zone - as described in Rule 604.a.(2), within 1,000' of a Building Unit.
- Exception Zone - as described in Rule 604.a.(1), within 500' of a Building Unit.
- Urban Mitigation Area - as defined in 100-Series Rules.
- Large UMA Facility – as defined in 100-Series Rules.

Pre-application Notifications (required if location is within 1,000 feet of a building unit):

Date of Rule 305.a.(1) Urban Mitigation Area Notification to Local Government: _____

Date of Rule 305.a.(2) Buffer Zone Notification to Building Unit Owners: _____

FOR MULTI-WELL PADS AND PRODUCTION FACILTIES WITHIN DESIGNATED SETBACK LOCATIONS ONLY:

☒ Check this box if this Oil and Gas Location has or will have Production Facilities that serve multiple wells (onl or offsite) and the Production Facilities are proposed to be located less than 1,000 feet from a Building Unit. *(Pursuant to Rule 604.c.(2)E.i., the operator must evaluate alternative locations for the Production Facilities that are farther from the Building Unit, and determine whether those alternative locations were technically feasible and economically practicable for the same proposed development.)*

☒ By checking this box, I certify that no alternative placements for the Production Facilities, farther from the nearest Building Unit, were available based on the analysis conducted pursuant to Rule 604.c.(2)E.i.

In the space below, explain rationale for siting the multi-well Production Facility(ies) that supports your Rule 604.c.(2)E.i determination. Attach documentation that supports your determination to this Form 2A.

The Building Unit is located on a Federal right-of-way held by Dominion Energy Pipeline Company and is used as an office for Wexpro's oil and gas operations. 305.a.(2) Buffer Zone Notification is not required as the Building Unit Owner is the applicants sister company. This location was suggested by the Bureau of Land Management, surface owner. The original proposed location was within a sensitive wildlife area.

SOIL

List all soil map units that occur within the proposed location. attach the National Resource Conservation Service (NRCS) report showing the "Map Unit Description" report listing the soil typical vertical profile. This data is to used when segregating topsoil.

The required information can be obtained from the NRCS web site at http://soildatamart.nrcs.usda.org/ or from the COGCC web site GIS Online map page found at http://colorado.gov/cogcc. Instructions are provided within the COGCC web site help section.

NRCS Map Unit Name: 201 - Tresana-Hiatha-Kandaly association, 2 to 20 percent slopes

NRCS Map Unit Name:

NRCS Map Unit Name:

PLANT COMMUNITY:

Complete this section only if any portion of the disturbed area of the location's current land use is on non-crop land.

Are noxious weeds present: Yes ☐ No ☒

Plant species from: ☐ NRCS or, ☒ field observation Date of observation: 10/25/2017

List individual species: Sagebrush, greasewood, bunchgrass.

Check all plant communities that exist in the disturbed area.

- ☐ Disturbed Grassland (Cactus, Yucca, Cheatgrass, Rye)
- ☒ Native Grassland (Bluestem, Grama, Wheatgrass, Buffalograss, Fescue, Oatgrass, Brome)
- ☐ Shrub Land (Mahogany, Oak, Sage, Serviceberry, Chokecherry)
- ☐ Plains Riparian (Cottonwood, Willow, Aspen, Maple, Poplar, Russian Olive, Tamarisk)
- ☐ Mountain Riparian (Cottonwood, Willow, Blue Spruce)
- ☐ Forest Land (Spruce, Fir, Ponderosa Pine, Lodgepole Pine, Juniper, Pinyon, Aspen)
- ☐ Wetlands Aquatic (Bullrush, Sedge, Cattail, Arrowhead)
- ☐ Alpine (above timberline)
- ☐ Other (describe):

WATER RESOURCES

Is this a sensitive area: ☐ No ☒ Yes

Distance to nearest

downgradient surface water feature: 481 Feet

water well: 1852 Feet

Estimated depth to ground water at Oil and Gas Location 72 Feet

Basis for depth to groundwater and sensitive area determination:

Division of Water Resources website information on wells in the area.

Is the location in a riparian area: ☒ No ☐ Yes

Was an Army Corps of Engineers Section 404 permit filed ☒ No ☐ Yes If yes attach permit.

Is the location within a Rule 317B Surface Water Supply Area buffer zone: No

If the location is within a Rule 317B Surface Water Supply Area buffer have all public water supply systems within 15 miles been notified:

Is the Location within a Floodplain? ☒ No ☐ Yes

Floodplain Data Sources Reviewed (check all that apply)

- ☒ Federal (FEMA)
- ☒ State
- ☐ County
- ☐ Local
- ☐ Other

GROUNDWATER BASELINE SAMPLING AND MONITORING AND WATER WELL SAMPLING

Water well sampling required per Rule 609

WILDLIFE

☐ This location is included in a Wildlife Mitigation Plan

☐ This location was subject to a pre-consultation meeting with CPW held on _____

Operator Proposed Wildlife BMPs

No	Target Species	BMP Type	Description
1	GREATER SAGE-GROUSE	Wildlife - Minimization	The operator agrees to preclude the use of aggressive non-native grasses in greater sage-grouse habitat reclamation. The operator agress to reclaim/restore greater sage-grouse habitats with native shrubs, grasses and forbs identified by CPW that contribute to optimal greather sage-grouse habitat and other wildlife appropriate to the ecological site.
2	Deer and Elk	Wildlife - Minimization	If new oil and gas operations must occur within CPW-identified mule deer critical winter range or elk winter concentration areas), the operator agrees to conduct new oil and gas operations outside the time period from December 1 through April 15.

CPW Proposed Wildlife BMPs

No BMP

DESIGNATED SETBACK LOCATION EXCEPTIONS

Check all that apply:

☐ Rule 604.a.(1)A. Exception Zone (within 500' of a Building Unit) and is in an Urban Mitigation Area

☐ Rule 604.b.(1)A. Exception Location (existing or approved Oil & Gas Location now within a Designated Setback as a result of Rule 604.a.)

☐ Rule 604.b.(1)B. Exception Location (existing or approved Oil & Gas Location is within a Designated Setback due to Building Unit construction after Location approval)

☐ Rule 604.b.(2) Exception Location (SUA or site-specific development plan executed on or before August 1, 2013)

☐ Rule 604.b.(3) Exception Location (Building Units constructed after August 1, 2013 within setback per an SUA or site-specific development plan)

RULE 502.b VARIANCE REQUEST

☐ Rule 502.b. Variance Request from COGCC Rule or Spacing Order Number _____

ALL exceptions and variances require attached Request Letter(s). Refer to applicable rule for additional required attachments (e.g. waivers, certifications, SUAs).

OPERATOR COMMENTS AND SUBMITTAL

Comments

This facility will be covered by Wexpro Company's Stormwater Permit #COR03I332. The permit will be amended to include the new construction and acreages of disturbance for stormwater management.

All incoming water will be trucked. After initial separation at the well pad the produced water will be hauled from the Powder Wash, Jacks Draw, and Ace fields to the evaporation facility. Water will be transferred from trucks hoses equipped with camlock fittings to a pump skid, which then engages an electrically driven offload pump that pumps the produced water from the truck through a series of filters, to a skimmer tank.

Evaporation pond netting. Wexpro is proposing the use of the Bird Avert System. We currently have BLM approval on two of our Wyoming evaporation pits. I have attached a copy of the letter that has been sent to the Colorado Fish and Wildlife Conservation office by Wexpro. The Bird Avert System was highly recommended by the Fish and Wildlife office in Lander, Wyoming when Wexpro constructed our evaporation facilities in the Vermillion Basin just North of Powder Wash.

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct and complete.
Signed: _____ Date: 02/14/2018 Email: Tammy.Fredrickson@dominionenergy.com

Print Name: Tammy Fredrickson Title: Senior Permit Agent

Based on the information provided herein, this Application for Permit-to-Drill complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: _____ **Director of COGCC** Date: _____

Conditions Of Approval

All representations, stipulations and conditions of approval stated in this Form 2A for this location shall constitute representations, stipulations and conditions of approval for any and all subsequent operations on the location unless this Form 2A is modified by Sundry Notice, Form 4 or an Amended Form 2A.

COA Type	Description
Planning	General Form 28 Permit COAs: The following conditions of approval (COAs) will apply: COA 28a – All conditions of approval (COAs) attached to the Form 28 Permit will also apply to this Form 2A permit for this location. COA 28b - Commencement of building/constructing this location is not authorized until the Form 28 permit has been approved. COA 28c - Prior to the Form 28 Permit approval (and therefore start of construction), adequate financial assurance per Rules 704 and 908.11.g.(1).B. are required.
Planning	Planning: The following condition of approval (COA) will apply: COA 91 - In addition to the notifications required by COGCC listed in the Northwest Notification Policy (Notice of Intent to Construct a New Location) and Rule 316C. COGCC Form 42. FIELD OPERATIONS NOTICE (c. Notice of Construction or Major Change); operator shall notify the COGCC 48 hours prior to of pit site construction, pit liner installation, start of hydrostatic test, start of first use of pit(s) for operations, onsite and offsite pipeline testing (any permanent buried or temporary surface lines used for skimmer pit and evaporation pit operations) using the Form 42 (as described in Rule 316C.m. Notice of Completion of Form 2/2A Permit Conditions). The appropriate COGCC individuals will automatically be email notified.
Construction	Earthen Pit Construction: The following conditions of approval (COAs) will apply for construction of the two special purpose pits and ancillary facilities: COA 61 - Operator must submit a professional engineer (PE) approved/stamped as-built drawing (plan view and cross-sections) of the two special purpose pits and the oil and gas location (including all tanks and other pit operations equipment) within 30 calendar days of construction of all the location, pit, and all operating equipment. COA 22 - After installation of the uppermost liner and prior to operating each special purpose pit, the synthetic liner(s) integrity shall be tested to the operating capacity of the pit facility (not to exceed the 2-foot freeboard requirement). The operator shall monitor the pits for leaks for a period of 72 hours prior to either draining the pit or commencing operations. Operator shall notify the COGCC 48 hours prior to start of the hydrotest using the Form 42. Hydrotest monitoring results must be maintained by the operator for the life of the pit and provided to COGCC prior to using the pit via a Form 4 Sundry. COA 59 - The two special purpose pits must be fenced. The skimmer pit must also be netted. The operator must maintain the fencing and netting until the pit(s) is(are) closed. The fencing shall be placed a minimum of 3-feet from the pit liner anchor trench. COA 74 - Operator will use adequately sized secondary containment devices for all chemicals and/or hazardous materials stored or used on location. COA 40 - Operator will implement measures to ensure that adequate separation of hydrocarbons from the influent occurs to prevent accumulation of oil on the surface of stored completions fluids. Operator shall also employ a method for monitoring buildup of phase-separated hydrocarbons on the surface of stored fluids. COA 41 - No oil is permitted on the surface of the evaporation pit fluids.
Material Handling and Spill Prevention	Material Handling and Spill Prevention: The following COA will apply to this Form 2A Permit if any buried permanent flowlines and/or offsite pipelines (poly or steel) are used during operations at this oil and gas location: COA 45 - Operator shall pressure test pipelines (any pipelines from the off loading tanks to cavity pumps to evaporation pit to evaporators and to the skimmer pit) in accordance with Rule 1101.e.(1) prior to putting into initial service any temporary surface or permanent buried pipelines and following any reconfiguration of the pipeline network, and tested annually, unless agreed to by both parties that the flowlines can be managed under an approved COGCC variance.

Best Management Practices

No	BMP/COA Type	Description
1	Planning	The location and site layout has been designed to accommodate all operations within the limits of the disturbance while meeting federal and state safety regulations. Above ground facilities will be managed to minimize visual effects, such as painting them to blend with the enviornment.

2	Wildlife	The evaporation facility will be surrounded by an 8 ft wildlife fence to protect deer and elk from entering the pond area. No firearms or dogs will be allowed on location. There will be no feeding of wildlife. Traffic on the roads will be minimized within 3 hours of sunrise and sunset. Existing routes will be utilized as much as possible. Original location was moved to avoid sage grouse core area at the suggestion of the surface owner, BLM. Review state and federal GIS mapping to avoid Sensitive Wildlife Habitat. Locate failities to minimize visual effects (paint color, screening, etc). Install exclusionary devices to prevent bird and other wildlife access to equipment stacks, vents, and openings. Utilize Bird Avert System to distract birds from landing on the evaporation pond. Net skimmer pond to keep birds from landing on the skimmer pond. Wexpro will use only certified weed free native seed mixes, unless recommended otherwise by Federal Agencies. Vegetation monitoring will be completed until 75% growth is established. Interim reclamation will be completed on all distrubed areas not needed for active operations during late fall/early winter. If needed, reclaimed area will be fenced to minimize livestock/wildlife impact until plant species are capable of sustaining grazing. If need, fenced reclaimed areas to minimize livestock and wildlife impacts until plant species are capable of sustaining grazing.
3	Storm Water/Erosion Control	The evaporation facility will be included in Wexpro's Powder Wash stormwater plan and permit. Storm water and erosion control methods will be utilized from the start of construction until stabilization of the site. The access road is being constructed to not allow any sediment to migrate from the access road to nearby surface water or drainages leading to surface water. Diversion ditches will be implemented in a manner to minimize erosion, transport of sediment offsite and site degradation. The facility will be constructed with standard stormwater BMPs to incure compliance with CDPHE and COGCC requirements and to prevent any stormwater run-on and/or runoff. Inspections will be conducted in accordance with the Stormwater Permit to confirm that applicable BMP's are in place, maintained, and functioning. Stormwater inspections and corrective actions will be conducted on a 14-day schedule under CDPHE stormwater regulations until 70% reclamation is achieved. Once achieved, inspections will be conducted under COGCC requirements until 80% reclamation is achieved and the site is fully stabilized.
4	Material Handling and Spill Prevention	All tanks and above ground vessels containing hydrocarbons will be surrounded by a lined containment structure that is capable of containing 110% of the largest tank during the life of the pond. Spills will be managed in accordance with Wexpro's SPCC plan including prevention, spill containment and monthly inspections. The site will be constructed to minimize the potential for any production wastes, chemicals, fluids, etc. from leaving the location, including berms, barriers, and use of spill control materials. Best management practices will be implemented to contain any unintentional release of fluids. The ponds will be double-lined. A leak detection stystem will be included in the construction of the ponds.
5	Dust control	The site and access road will be graveled to reduce fugitive dust, which will be controlled by using water or other dust suppressants when necessary. Spoils from the pond and construction will be placed in a designated area. The topsoil will be stripped from the site and stockpiled around the perimeter. Excess topsoil may be utilized on other reclamation projects within the area. Once construction is completed, the topsoil will be spread over the the wasted material and seeded with a seed mix approved by the surface owner, BLM.
6	Interim Reclamation	Noxious weed control will follow Wexpro's weed management plan. Reclamation and revegetation will be used as a weed management tool. The site will be stabilized using seed mixes and materials compatible with soil types, moisture, and local climate conditions as specified in locally acceptable industry practices.

7	Final Reclamation	At the time of facility closure and site reclamation, Wexpro Company will submit a Form 4 Sundry Notice to COGCC outlining final closure and reclamation plans. Wexpro Company will collect water samples and soil samples and analyze per the closure and reclamation plan submitted with the Form 28. Wexpro Company will comply with COGCC's requirements for closure and reclamation.

Total: 7 comment(s)

Attachment Check List

Att Doc Num	Name
2168303	LEGAL/LEASE DESCRIPTION
401520294	FORM 2A SUBMITTED
401533886	ACCESS ROAD MAP
401533888	PROPOSED BMPS
401533889	CONST. LAYOUT DRAWINGS
401533890	HYDROLOGY MAP
401533893	LOCATION DRAWING
401533895	LOCATION PICTURES
401533901	REFERENCE AREA MAP
401533902	REFERENCE AREA PICTURES
401550650	NRCS MAP UNIT DESC

Total Attach: 11 Files

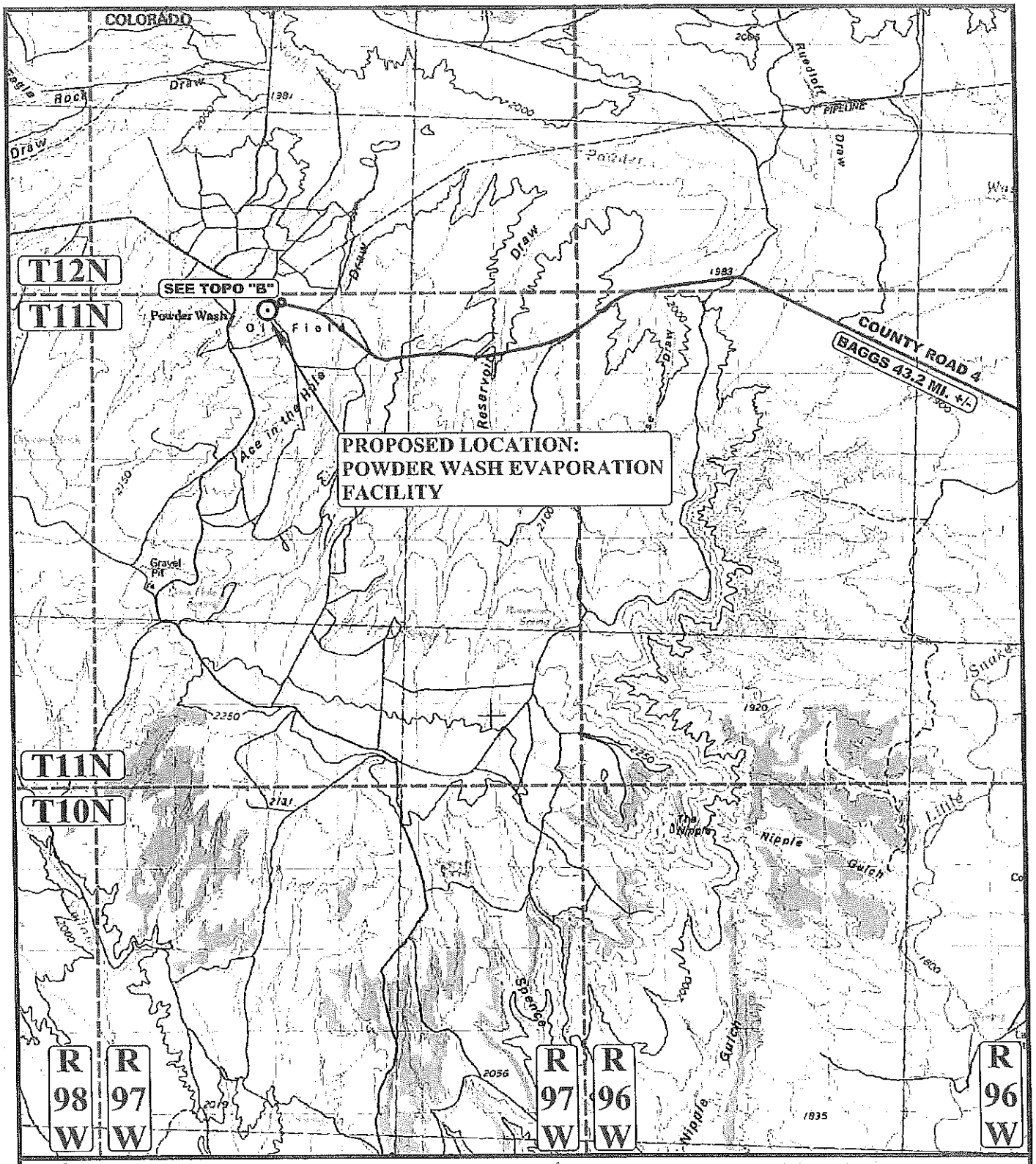
General Comments

User Group	Comment	Comment Date
OGLA	03/07/18 - location does not fall within sensitive wildlife habitat (SWH) or restricted surface occupany (RSO) areas, therefore no CPW consultation is required; 03/07/18 - initiated Form 2A review by Dave Kubeczko; discussed pit operations and conditions of approval with operator; placed preliminary COAs on the Form 2A for operator review; 03/08/18 - recieved comments on COAs and additional operational information for the evaporation pit facility from operator; revised Form 2A COAs; waiting on operator submittal of the Form 15s for the special use pits; 03/13/18 - completed Form 2A review by Dave Kubeczko; placed notification, Form 28, earthen pit construction (as-built, hydrostatic test, fencing/netting, equipment secondary containment, hydrocarbon separation), pipeline testing COAs on the Form 2A; 03/14/18 - passed Form 2A review by Dave Kubeczko; notification, Form 28, earthen pit construction (as-built, hydrostatic test, fencing/netting, equipment secondary containment, hydrocarbon separation), pipeline testing COAs; 03/14/18 - placed Form 2A "ON HOLD" pending receipt and review of associated Form 15s; 03/??/18 - took Form 2A off of :ON HOLD" and placed back into :IN PROCESS".	03/13/2018
Permit	Attached lease as directed by operator. Preliminary review complete.	03/08/2018
Permit	Corrected right to construct from Right of Way to lease with operator concurrence. Form passes completeness.	02/21/2018
Permit	Returning form to draft for correct NRCS map attachment.	02/20/2018

Total: 4 comment(s)

Public Comments

No public comments were received on this application during the comment period.



LEGEND:

⊙ PROPOSED LOCATION

N

WEXPRO COMPANY

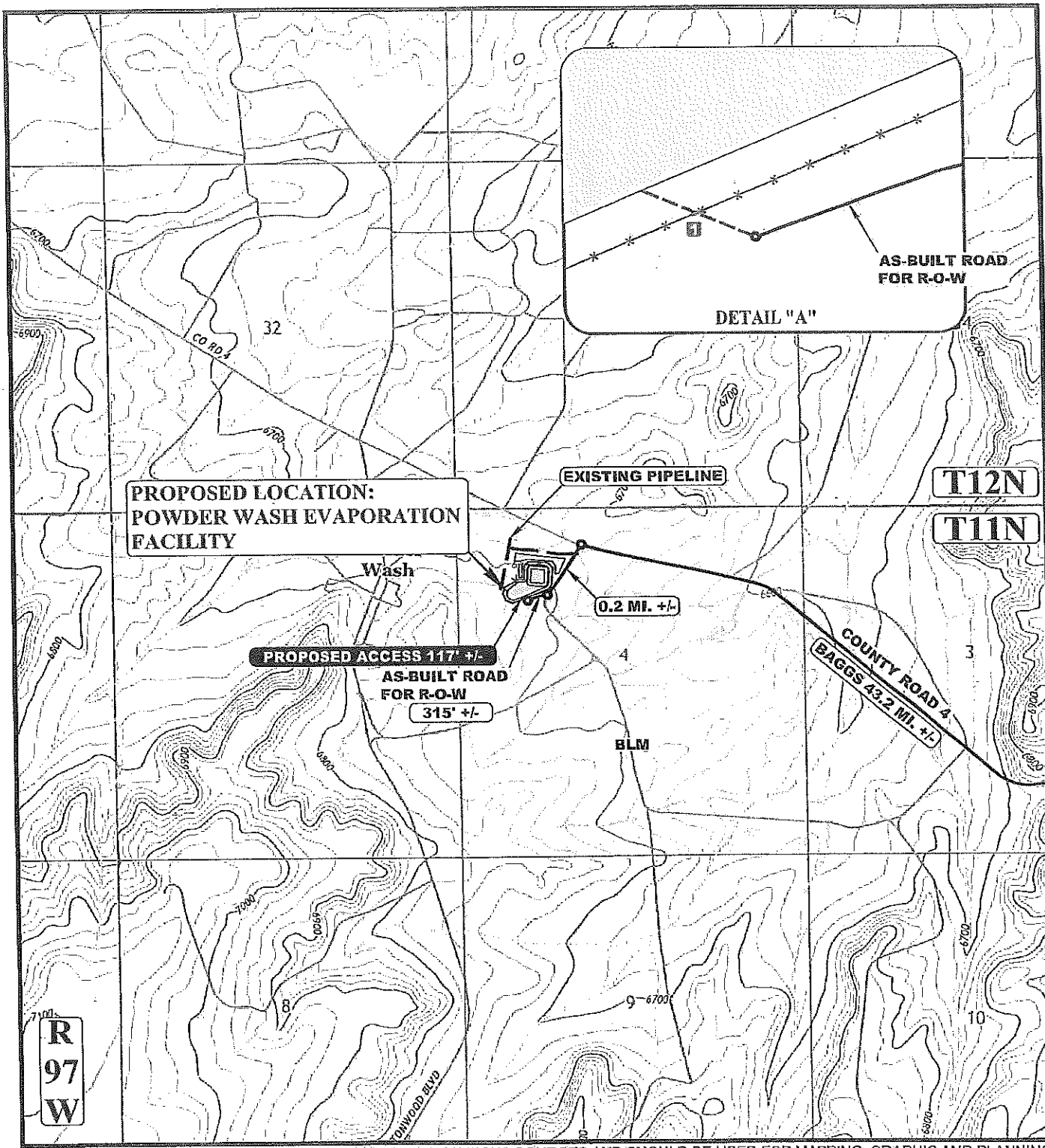
POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

UINTAH ENGINEERING & LAND SURVEYING

UELS, LLC
Corporate Office * 85 South 200 East
Vernal, UT 84078 * (435) 789-1017

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 100,000

ACCESS ROAD MAP — TOPO A



NOTE: PARCEL DATA SHOWN HAS BEEN OBTAINED FROM VARIOUS SOURCES AND SHOULD BE USED FOR MAPPING, GRAPHIC AND PLANNING PURPOSES ONLY. NO WARRANTY IS MADE BY UINTAH ENGINEERING AND LAND SURVEYING (UELS) FOR ACCURACY OF THE PARCEL DATA.

LEGEND:

- EXISTING ROAD
- PROPOSED ROAD
- EXISTING PIPELINE
- PROPOSED FENCE
- INSTALL CATTLE GUARD

N

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 24,000
ACCESS ROAD MAP			TOPO B

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BMP's

GENERAL NOTES

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- ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL CODES WILL BE REVIEWED AND STRICTLY COMPLIED WITH.

Estimated Precipitation / Evaporation Data

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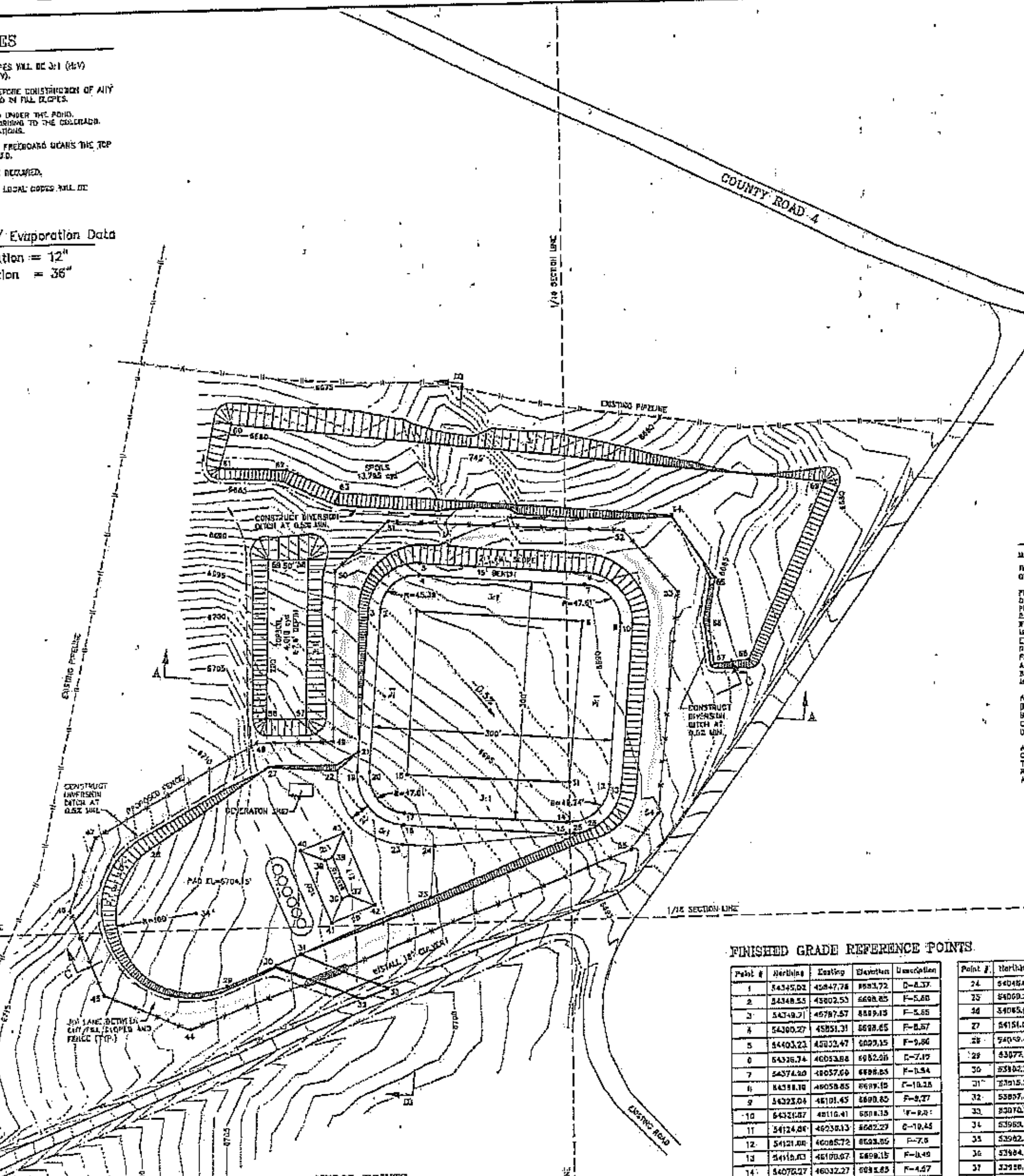
Average Annual Evaporation = 36"



MATERIALS SPECIFICATION

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CONTROL POINTS

Northing	Easting	Elevation	Description
50000.00	50000.00	8544.00	SE COR SEC 4
49989.74	47373.49	6708.92	S 1/4 COR SEC 4
49978.15	44737.44	6703.48	SW COR SEC 4
52618.54	44723.80	6732.09	W 1/4 COR SEC 4
55267.96	44708.07	6628.05	NW COR SEC 4
55275.41	47352.46	8808.00	N 1/4 COR SEC 4
55280.35	49995.36	6678.57	NE COR SEC 4
52602.31	49989.72	6640.55	E 1/4 COR SEC 4

FINISHED GRADE REFERENCE POINTS

Point #	Northing	Easting	Elevation	Description
1	54345.02	45847.78	6583.72	C-8.37
2	54348.55	45802.53	6698.85	F-5.60
3	54349.71	45787.57	6689.15	F-5.65
4	54300.27	45851.31	6698.65	F-8.57
5	54403.23	45932.47	6699.15	F-9.86
6	54336.74	46053.88	6682.06	C-7.17
7	54374.80	46057.69	6698.65	F-0.54
8	54358.18	46058.65	6689.15	F-10.28
9	54323.04	46101.45	6690.65	F-9.37
10	54321.07	46116.41	6688.15	F-8.81
11	54124.86	46230.13	6682.27	C-10.45
12	54121.00	46085.72	6593.65	F-7.6
13	54119.03	46100.07	6699.15	F-8.49
14	54070.27	46032.27	6693.65	F-4.57
15	54050.32	46031.50	6690.15	F-4.40
16	54138.47	45833.92	6681.96	C-10.05
17	54091.01	45830.23	6690.35	C-1.77
18	54076.05	45820.00	6688.15	C-1.71
19	54143.36	45771.50	6689.15	C-1.71
20	54142.17	45786.48	6698.05	C-1.71
21	54170.07	45773.58	6699.15	C-0.50
22	54145.28	45740.50	6704.15	F-2.77
23	54051.13	45027.12	6704.16	F-2.88
24	54048.05	45665.65	6704.15	F-4.10
25	54060.28	46040.67	6690.15	F-1.64
26	54065.05	46060.60	6698.15	F-6.20
27	54151.03	45881.19	6704.15	GRADE
28	54059.46	45512.06	6704.15	C-8.44
29	53077.01	45605.61	6704.15	C-2.62
30	53902.20	45657.84	6704.15	C-1.37
31	53915.27	45659.20	6704.15	C-0.60
32	53857.52	45775.88	6702.24	GRADE
33	53070.57	45867.09	6701.67	GRADE
34	53969.40	45588.55	6704.15	C-4.10
35	53982.50	45661.55	6704.15	F-3.03
36	53984.23	45750.74	6692.15	C-11.65
37	53950.06	45759.90	6692.15	C-10.95
38	54030.10	45740.00	6692.15	C-11.40
39	54032.20	45720.64	6692.15	C-11.60
40	54045.27	45699.48	6704.15	C-0.65
41	53952.00	45737.74	6704.15	F-0.49
42	53076.07	45721.33	6704.15	F-1.90
43	54097.48	45753.07	6704.15	F-0.07
44	53022.12	45610.77	6707.58	FENCE COR
45	53080.90	45453.45	6710.32	FENCE COR
46	53073.53	45411.67	6710.04	FENCE COR
47	54067.02	45444.22	6716.30	FENCE COR
48	54183.67	45646.52	6704.16	FENCE COR
49	54184.11	45741.60	6699.78	FENCE COR
50	54397.65	45749.80	6691.01	FENCE COR
51	54459.44	45813.64	6684.80	FENCE COR
52	54441.33	46105.31	6686.71	FENCE COR
53	54362.61	46173.44	6686.34	FENCE COR
54	54084.34	46146.38	6690.14	FENCE COR
55	54038.02	46111.35	6692.14	FENCE COR
56	54213.03	45555.60	6709.75	F-7.00
57	54212.72	45702.60	6707.22	F-2.60
58	54412.67	45713.37	6697.04	F-7.60
59	54413.84	45663.20	6689.70	F-7.60
60	54566.32	45616.10	6686.30	F-7.19
61	54530.13	45604.30	6683.30	F-5.49
62	54526.20	45607.17	6689.30	F-6.02
63	54410.37	45792.85	6686.30	F-6.12
64	54459.71	46167.00	6688.30	F-1.03
65	54370.05	46219.88	6686.30	F-2.46
66	54323.27	46311.53	6688.30	F2.32
67	54260.17	46217.75	6688.30	F-1.79
68	54274.15	46261.31	6689.30	F-3.84
69	54497.62	46357.72	6686.30	F-5.57

UINTAH
ENGINEERING & LAND SURVEYING
CIVIL ENGINEERING AND LAND SURVEYING SERVICES
85 South 200 East, Vernal, UT 84078
O: 435.789.1017
www.uintahgroup.com
- SINCE 1964 -

DOMINION ENERGY WEXPRO

POWDER WASH EVAPORATION FACILITY

LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

REV	DATE	BY	REVISIONS
1	11/30/17	D.G.W.	[illegible]
2	6/12/18	D.G.W.	[illegible]

RESPONSIBLE ENGINEER:

COLORADO REGISTERED PROFESSIONAL ENGINEER, DAVID GLENN ..., 37502

GRADING PLAN

SCALE: 1" = 100'
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W - 2 1 1 0
PROJ. NO.: DOMIN-17-0033
FILE: 33120

SHEET 2

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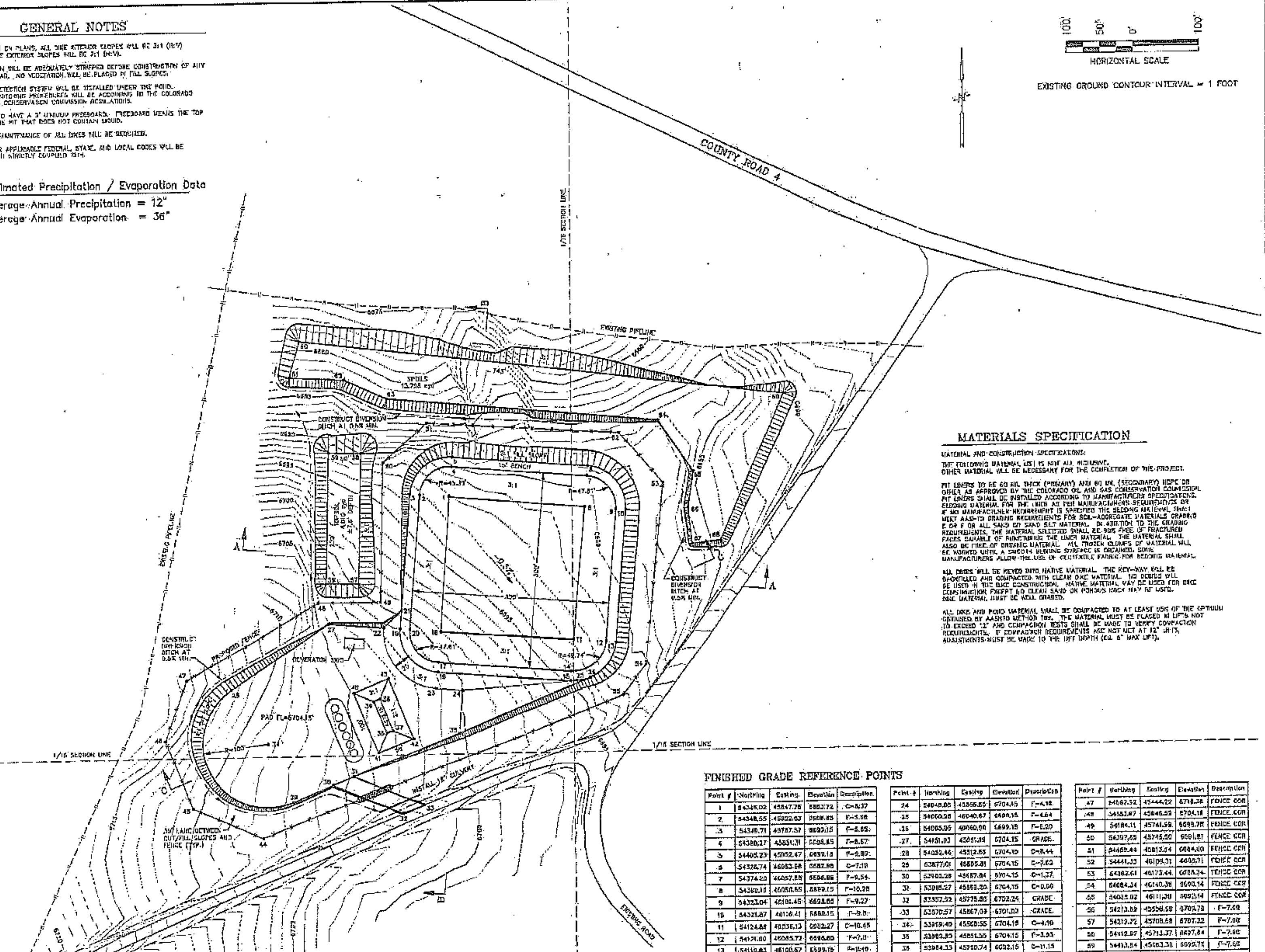

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52662.21	49999.72	6640.53	E 1/4 COR SEC 4

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4	54380.27	45851.31	6698.45	F=8.57
5	54405.23	45952.47	6699.18	F=9.80
6	54376.74	46053.68	6687.98	C=7.18
7	54374.20	46057.88	6696.86	F=9.54
8	54360.10	46058.65	6699.15	F=10.28
9	54323.04	46101.45	6693.88	F=9.27
10	54321.87	46108.41	6680.15	F=9.8
11	54124.84	46036.13	6682.27	C=10.45
12	54171.00	46085.72	6698.80	F=7.0
13	54119.83	46100.67	6699.15	F=8.40
14	54075.27	46022.27	6698.65	F=4.57
15	54060.32	46031.10	6693.15	F=4.40
16	54136.47	45933.92	6682.98	C=10.00
17	54091.01	45632.25	6698.25	C=1.77
18	54076.05	45629.66	6693.15	C=1.71
19	54143.34	45771.50	6693.15	C=1.71
20	54142.17	45786.46	6698.85	C=1.71
21	54170.07	45773.30	6699.15	C=0.60
22	54145.20	45716.29	6704.15	F=2.77
23	54087.13	45027.12	6704.15	F=2.96
24	54048.05	45866.55	6704.15	F=4.18
25	54060.28	46040.67	6680.15	F=4.64
26	54005.05	46060.90	6699.15	F=6.20
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28	54052.46	45512.55	6704.15	C=8.44
29	53877.01	45805.81	6704.15	C=2.62
30	53902.28	45657.84	6704.15	C=1.37
31	53916.27	45593.20	6704.15	C=0.00
32	53357.52	45775.80	6702.24	GRADE
33	53570.57	45867.03	6701.02	GRADE
34	53969.40	45560.55	6704.15	C=4.10
35	53982.55	45651.55	6704.15	F=3.93
36	53984.13	45750.74	6692.15	C=11.15
37	53988.06	45729.95	6697.15	C=10.93
38	54036.10	45740.58	6692.15	C=11.46
39	54032.28	45720.04	6692.15	C=11.58
40	54045.27	45699.48	6706.15	C=0.65
41	53952.88	46737.71	6704.15	F=0.40
42	53976.07	45791.33	6704.15	F=1.90
43	54057.40	45724.07	6704.15	F=0.67
44	53822.12	45560.77	6707.59	FENCE COR
45	53860.95	45453.45	6716.32	FENCE COR
46	53975.63	45411.47	6716.04	FENCE COR
47	54067.32	45444.22	6718.38	FENCE COR
48	54183.87	45646.55	6704.18	FENCE COR
49	54184.11	45741.59	6699.78	FENCE COR
50	54397.65	45745.50	6691.87	FENCE COR
51	54469.44	45813.54	6684.80	FENCE COR
52	54441.33	46109.31	6689.71	FENCE COR
53	54382.61	46173.44	6688.34	FENCE COR
54	54084.34	46140.38	6690.14	FENCE COR
55	54035.02	46111.30	6692.14	FENCE COR
56	54213.89	45556.90	6702.72	F=7.68
57	54219.72	45708.68	6707.22	F=7.08
58	54412.87	45713.37	6697.84	F=7.60
59	54413.84	45663.30	6699.76	F=7.60
60	54386.32	45610.18	6685.30	F=7.19
61	54532.13	45604.30	6688.30	F=5.49
62	54520.20	45607.17	6688.30	F=5.02
63	54496.37	45702.85	6688.30	F=5.12
64	54459.71	46107.00	6688.30	F=1.00
65	54379.05	46210.00	6688.30	F=2.46
66	54323.27	46711.53	6688.30	F2.32
67	54288.17	46217.75	6688.30	F=1.29
68	54274.15	46261.31	6688.30	F=3.81
69	54497.02	46357.72	6685.30	F=5.57

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DOMINION ENERGY WEXPRO

POWDER WASH EVAPORATION FACILITY
LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

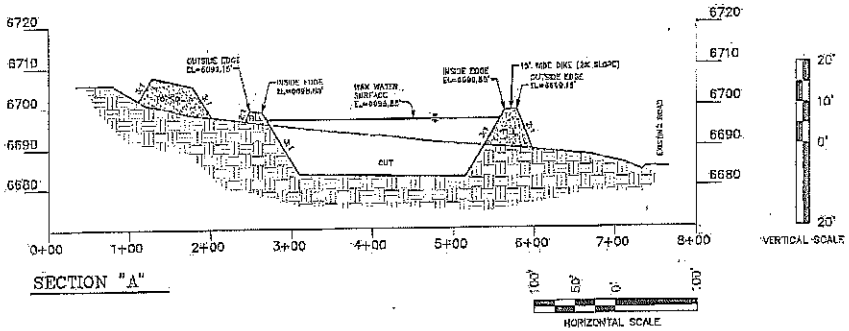
REV	DATE	BY	REVISIONS
1	11-20-17	D.G.W.	[illegible]
2	12-02-20	D.G.W.	add diversion ditches

RESPONSIBLE ENGINEER:
COLORADO REGISTERED PROFESSIONAL ENGINEER 37602

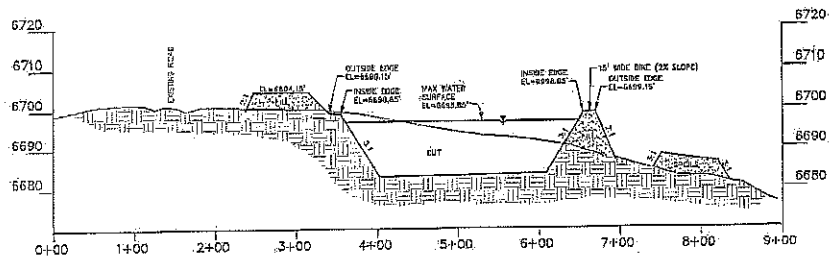
GRADING PLAN

SCALE: 1" = 100'
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
UELS FILE NO.: W + 2 1 1 0
PROJ. NO.: DOM04-17-0031
FILE: 33120

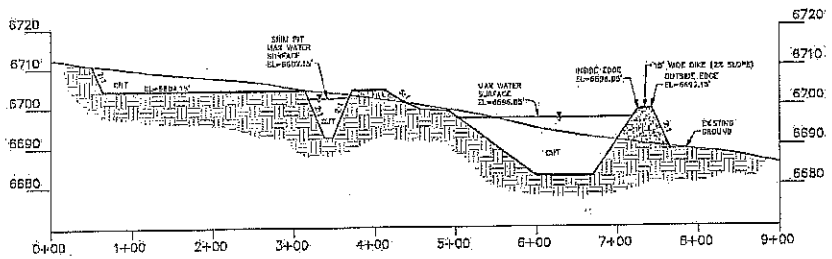
SHEET 2



SECTION "A"



SECTION "B"



SECTION "C"

DISTURBANCE AREA

4.97 ACRES (DISTURBANCE FOOTPRINT)
6.49 ACRES (FENCED AREA)

EARTHWORK APPROXIMATE YARDAGES

RAW CUT = 27,713 CU. YDS.
FILL = 12,652 CU. YDS.
FILL+10% = 13,918 CU. YDS.
EXCESS = 13,795 CU. YDS.

TOP SOIL CUT & STOCKPILE

RAW CUT = 4,011 CU. YDS.
Top soil for area within all areas of new disturbance (6" depth)

EVAPORATION POND VOLUME

POND VOLUME EXCLUDING FREEBOARD
31,195 cyd, 19.34 acre feet, 150,014 BBL

SURFACE AREA AT MAX LIQUID DEPTH
81,457 SQUARE FEET (1.870 ACRES)

SKIM PIT VOLUME

POND VOLUME EXCLUDING FREEBOARD
849 cyd, 0.53 acre feet, 4,085 BBL

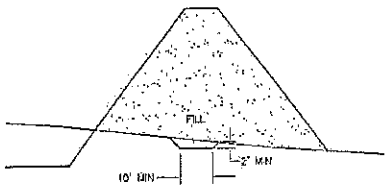
SURFACE AREA AT MAX LIQUID DEPTH
4,000 SQUARE FEET (0.106 ACRES)

MAXIMUM DAM HEIGHT

TOP OF DIKE ELEVATION (AT CENTERLINE) TO LOWEST NATURAL GROUND = 10.00 FT.

DAM LENGTH

PERIMETER OF POND (FILL SECTION)
950 FT



KEY-WAY DETAIL

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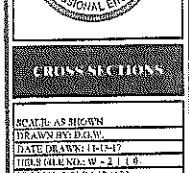
POWDER WASH EVAPORATION FACILITY
LOCATED IN THE NW 1/4 OF
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

KEY	NO.	BY	DESCRIPTION
	1		
	2		
	3		
	4		

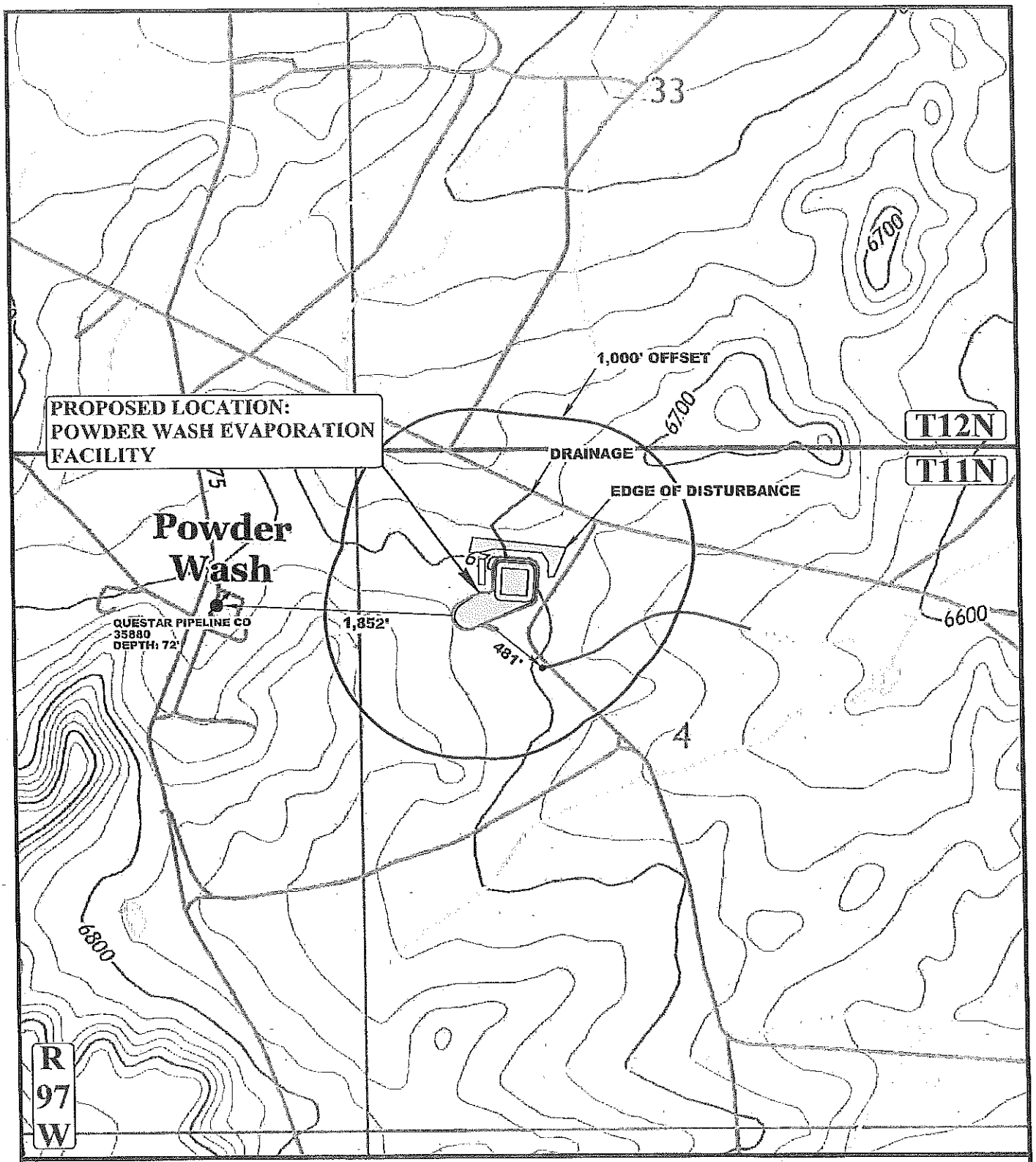
RESPONSIBLE ENGINEER



CROSS SECTIONS

SCALE: AS SHOWN
DRAWN BY: D.G.W.
DATE DRAWN: 11-13-17
TIOGA FILE NO.: W - 2 1 1 0
PROJ. NO: DOM04-174053
FILE: 33120

SHEET 3



LEGEND:

EXISTING DRAINAGE
1000' OFFSET BOUNDARY
EDGE OF DISTURBANCE
FLOOD PLAINS
WATER WELLS

N

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POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 6,000
HYDROLOGY MAP			TOPO W

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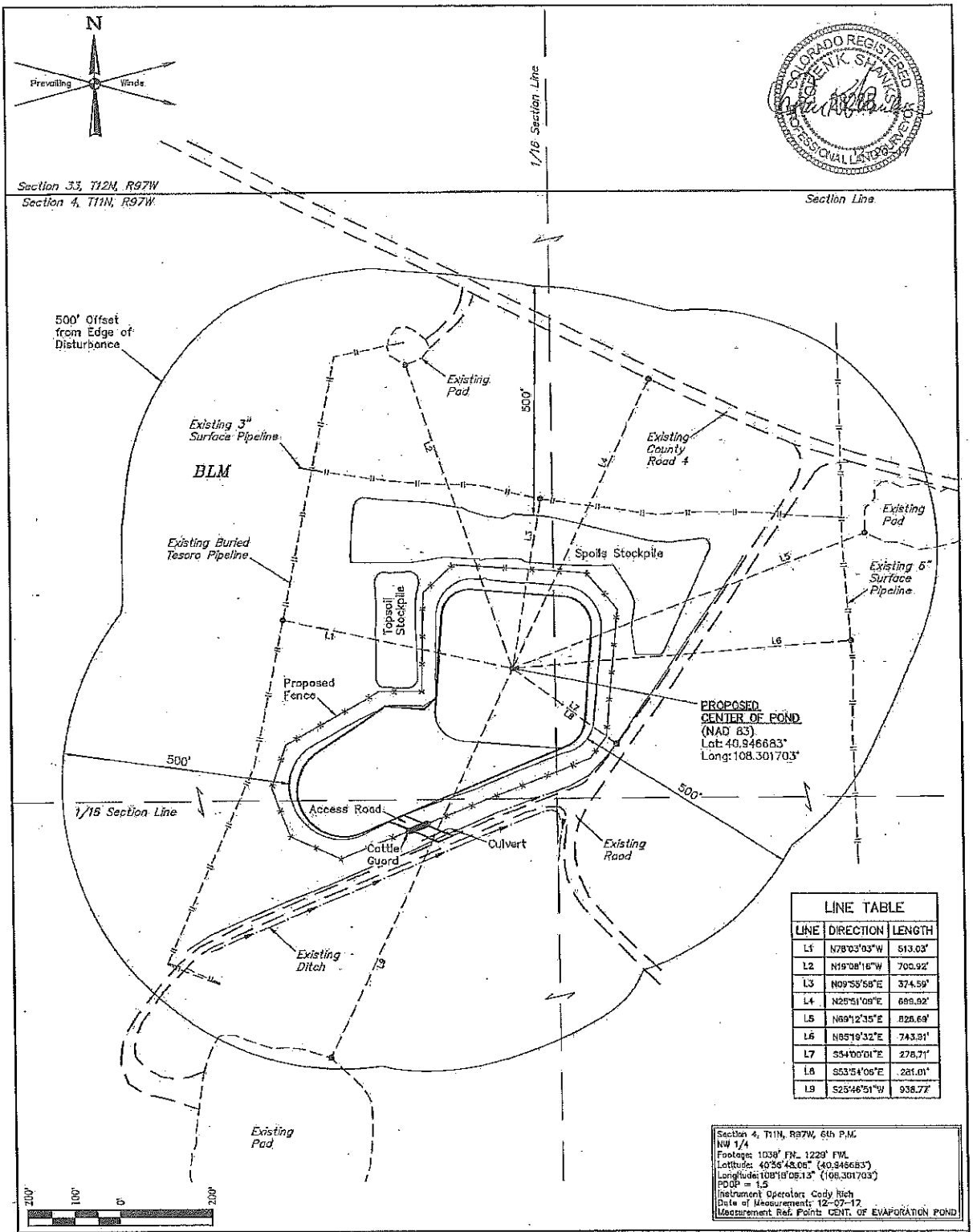

LINE TABLE		
LINE	DIRECTION	LENGTH
L1	N78°03'03"W	513.03'
L2	N19°08'16"W	700.92'
L3	N09°55'58"E	374.59'
L4	N25°51'09"E	686.92'
L5	N69°12'35"E	826.69'
L6	N85°19'32"E	743.91'
L7	S54°00'01"E	278.71'
L8	S53°54'06"E	281.01'
L9	S25°46'51"W	938.77'

Section 4, T11N, R97W, 6th P.M.
NW 1/4
Footage: 1039' FN., 1229' FW.
Latitude: 40°56'48.05" (40.946683)
Longitude: 108°18'05.13" (108.301703)
PDOP = 1.5
Instrument Operator: Cody Rich
Date of Measurement: 12-07-17
Measurement Ref. Point: CENT. OF EVAPORATION POND

PLANT COMMUNITY

- ☐ DISTURBED GRASSLAND
- ☐ NATIVE GRASSLAND
- ☐ SHRUB LAND
- ☐ PLAINS RIPARIAN
- ☐ MOUNTAIN RIPARIAN
- ☐ FOREST LAND
- ☐ WETLANDS AQUATIC
- ☐ ALPINE
- ☐ OTHER (Describe)

CURRENT LAND USE

CROP LAND:	☐ IRRIGATED	☐ DRY LAND	☐ IMPROVED PASTURE	☐ HAY MEADOW	☐ CRP
NON-CROP LAND:	☐ RANGELAND	☐ TIMBER	☐ RECREATIONAL	☐ OTHER (Describe)	
SUBDIVIDED:	☐ INDUSTRIAL	☐ COMMERCIAL	☐ RESIDENTIAL		

FUTURE LAND USE

CROP LAND:	☐ IRRIGATED	☐ DRY LAND	☐ IMPROVED PASTURE	☐ HAY MEADOW	☐ CRP
NON-CROP LAND:	☐ RANGELAND	☐ TIMBER	☐ RECREATIONAL	☐ OTHER (Describe)	
SUBDIVIDED:	☐ INDUSTRIAL	☐ COMMERCIAL	☐ RESIDENTIAL		

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NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

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SURVEYED BY	CODY RICH	12-07-17	SCALE
DRAWN BY	C.D.L.	12-11-17	1" = 200'

LOCATION DRAWING — **FIGURE #5**

WEXPRO COMPANY
POWDER WASH EVAPORATION FACILITY
SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO
DATE: 12-11-17 C.D.L.

DISTANCES FROM WELLHEAD																
WELL NAME	BUILDING		BUILDING UNIT		HIGH OCCU. BUILDING		D.O.A.A.		PUBLIC ROAD		ABOVE GROUND UTILITY		RAILROAD		PROPERTY LINE	
	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH	DIRECTION	LENGTH
CENTER OF POND	S86°W	2212'	S82°W	2480'	OVER 1 MILE		OVER 1 MILE		N30°E	714'	S88°W	2274'	OVER 1 MILE		OVER 1 MILE	

UINTAH
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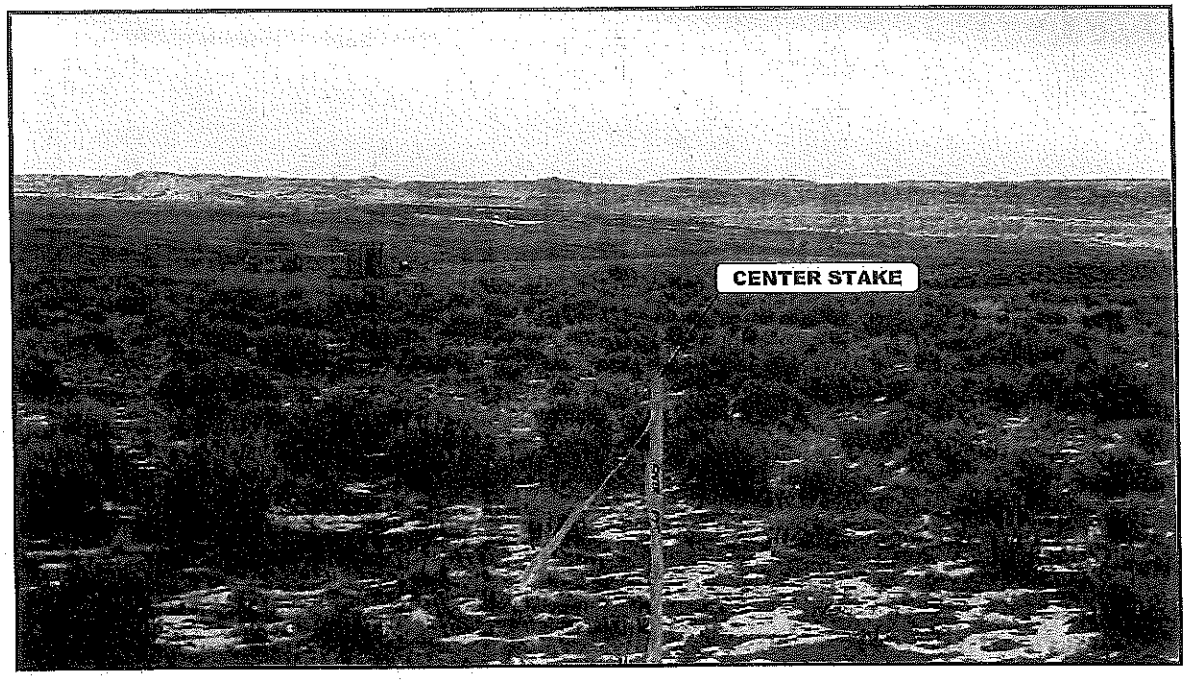

PHOTO: VIEW FROM CENTER LOCATION STAKE CAMERA ANGLE: NORTHERLY

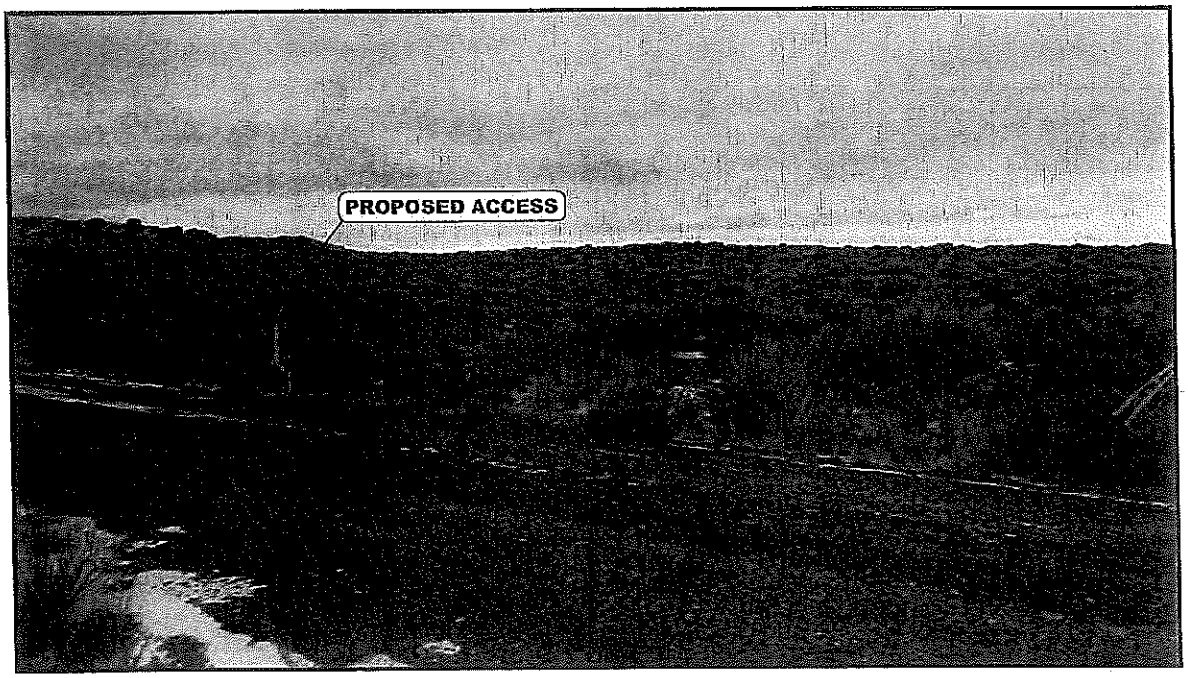

PHOTO: VIEW FROM BEGINNING OF PROPOSED ACCESS CAMERA ANGLE; NORTHWESTERLY

WEXPRO COMPANY

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NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

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TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
LOCATION PHOTOS			PHOTO 1

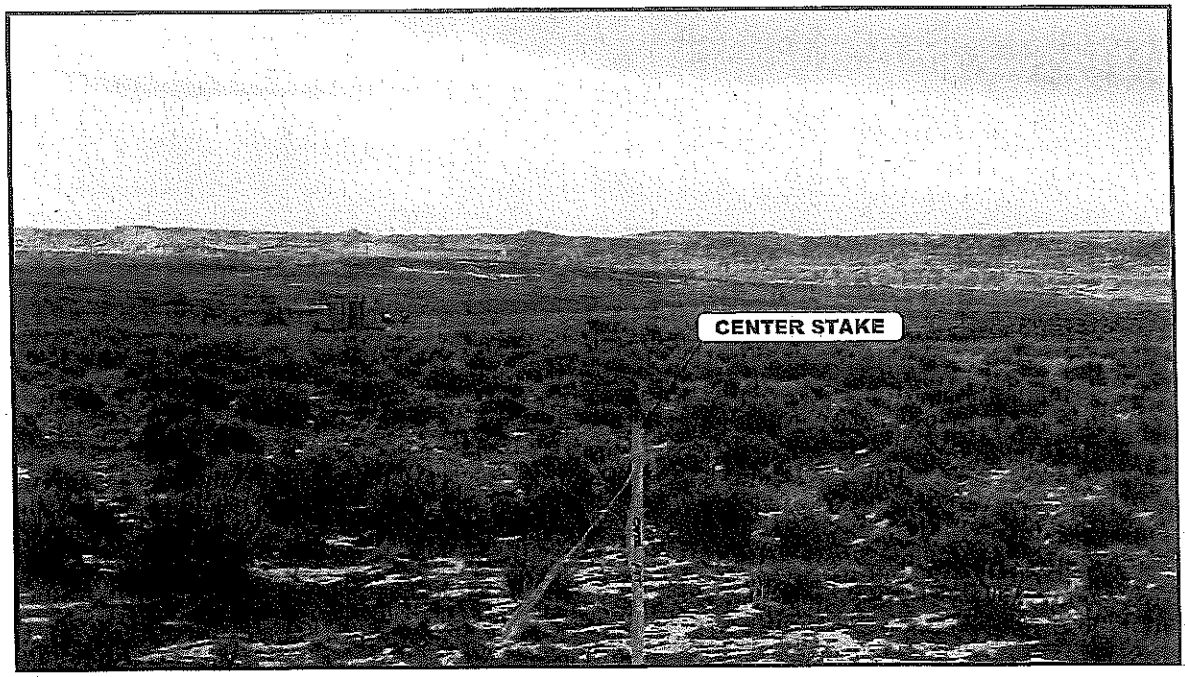

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: NORTHERLY

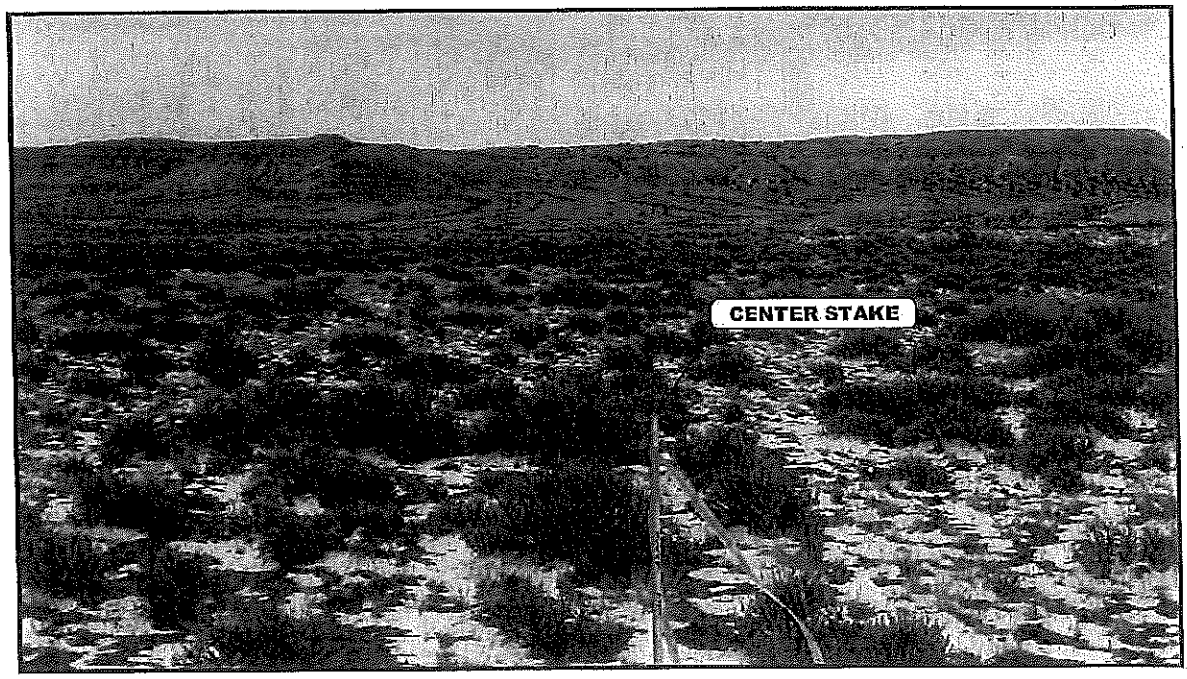

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: EASTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
LOCATION PHOTOS			PHOTO 2

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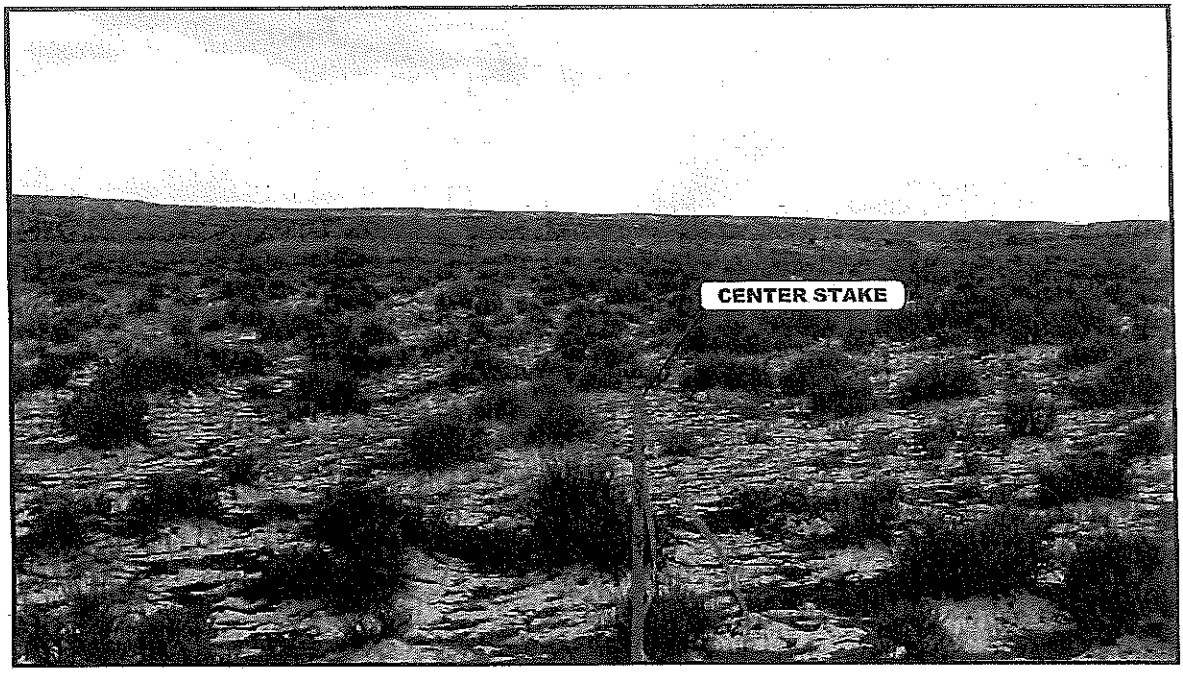

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: SOUTHERLY

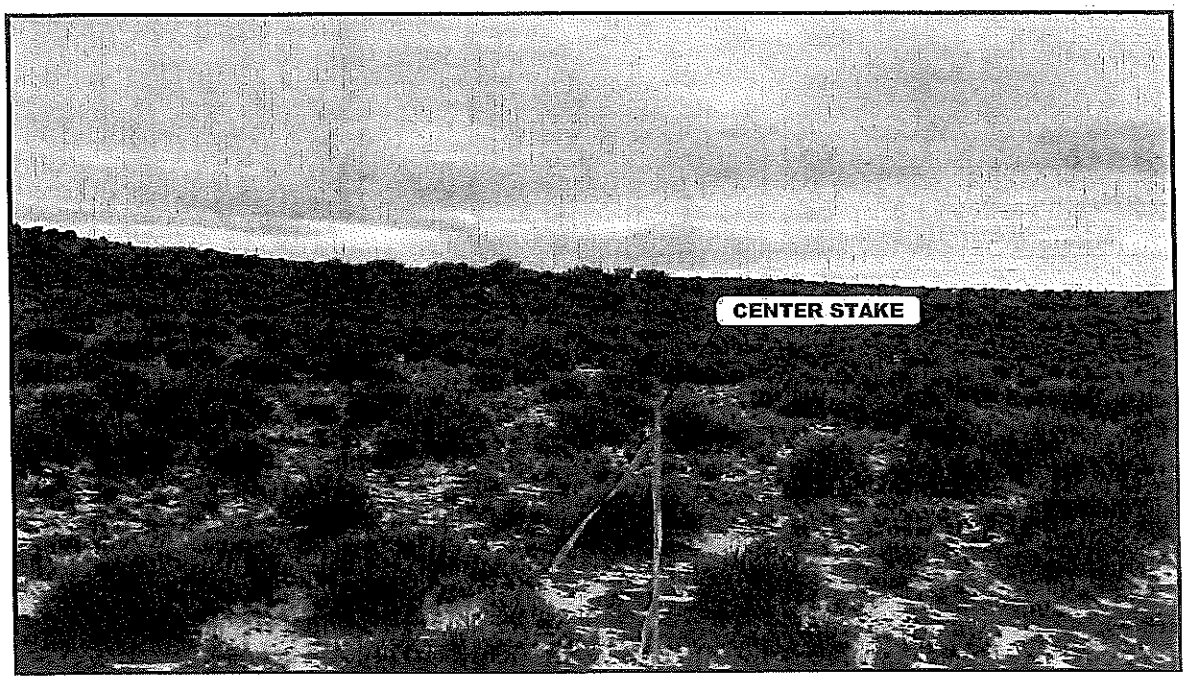

PHOTO: VIEW FROM CENTER LOCATION STAKE

CAMERA ANGLE: WESTERLY

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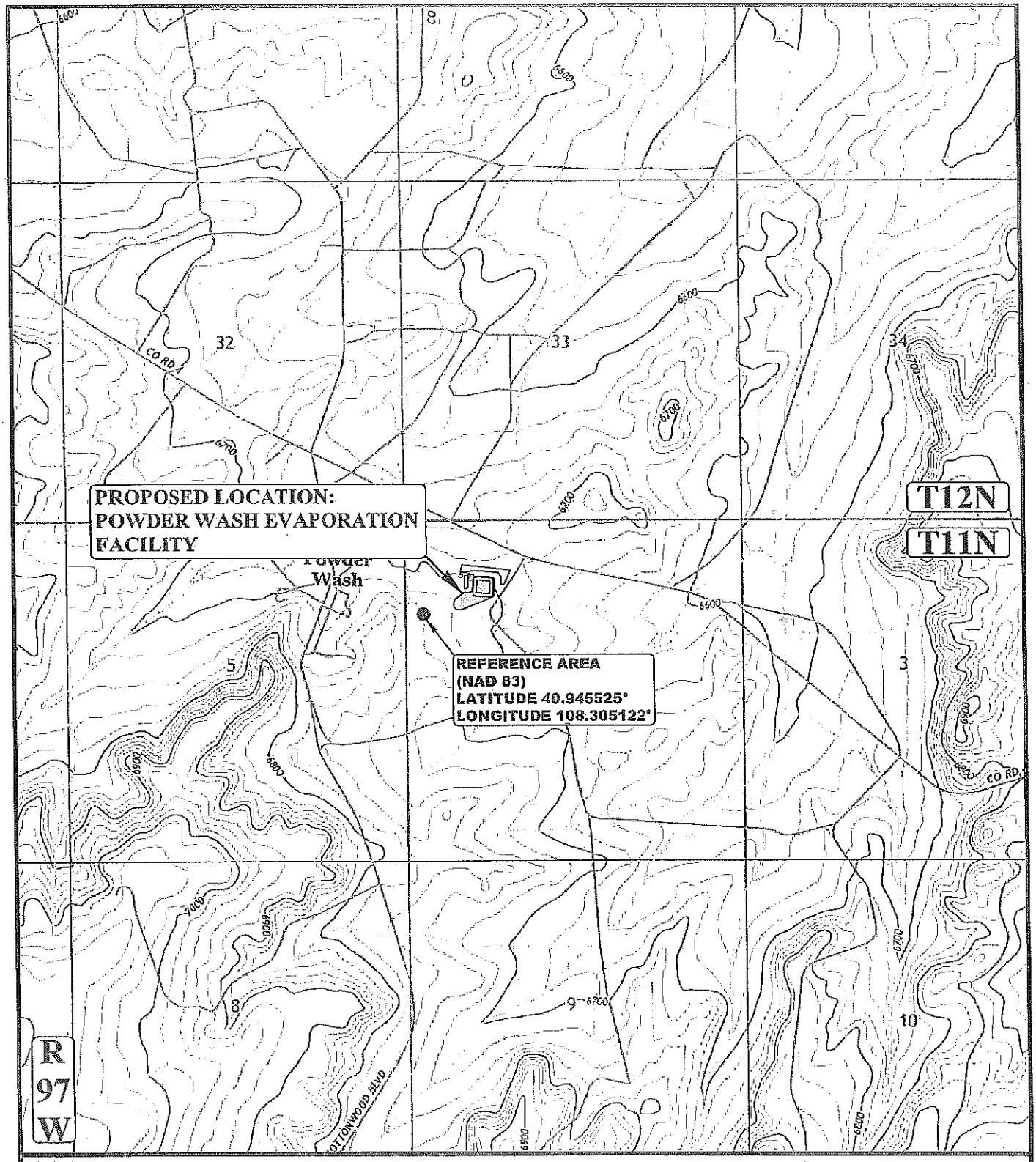
TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
LOCATION PHOTOS			PHOTO 3



LEGEND:

N

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POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

SURVEYED BY	J.L.	10-25-17	SCALE
DRAWN BY	Z.T.	12-11-17	1 : 24,000
REFERENCE AREA MAP			REF TOPO

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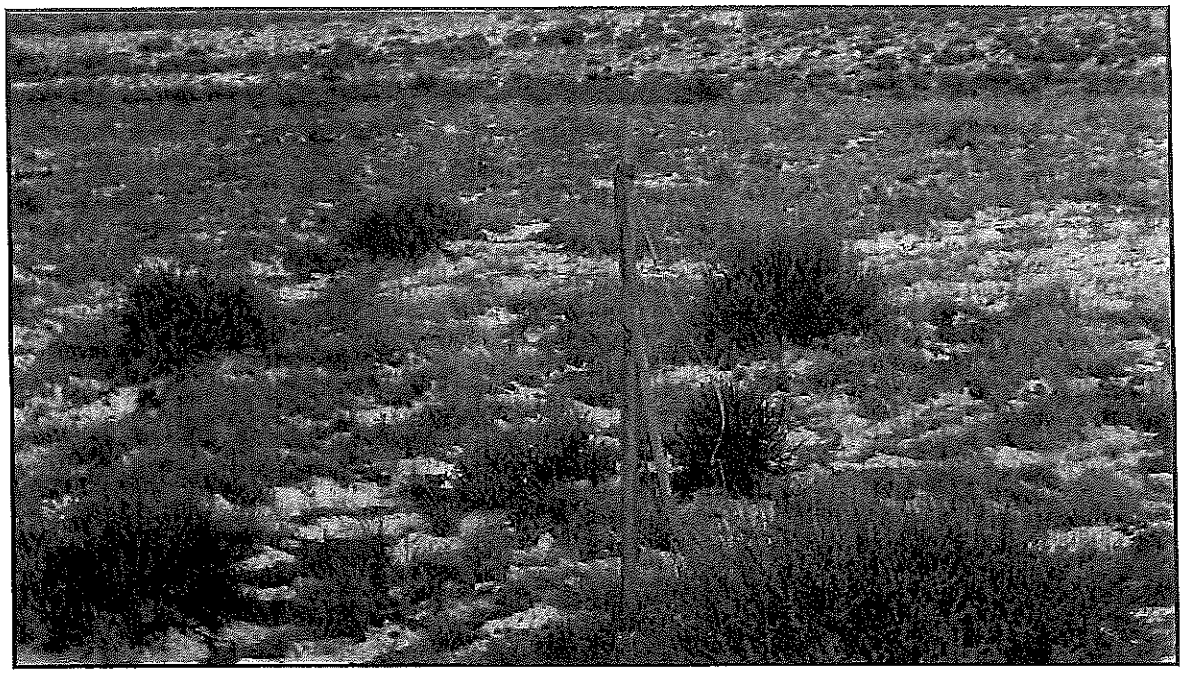

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: SOUTHERLY

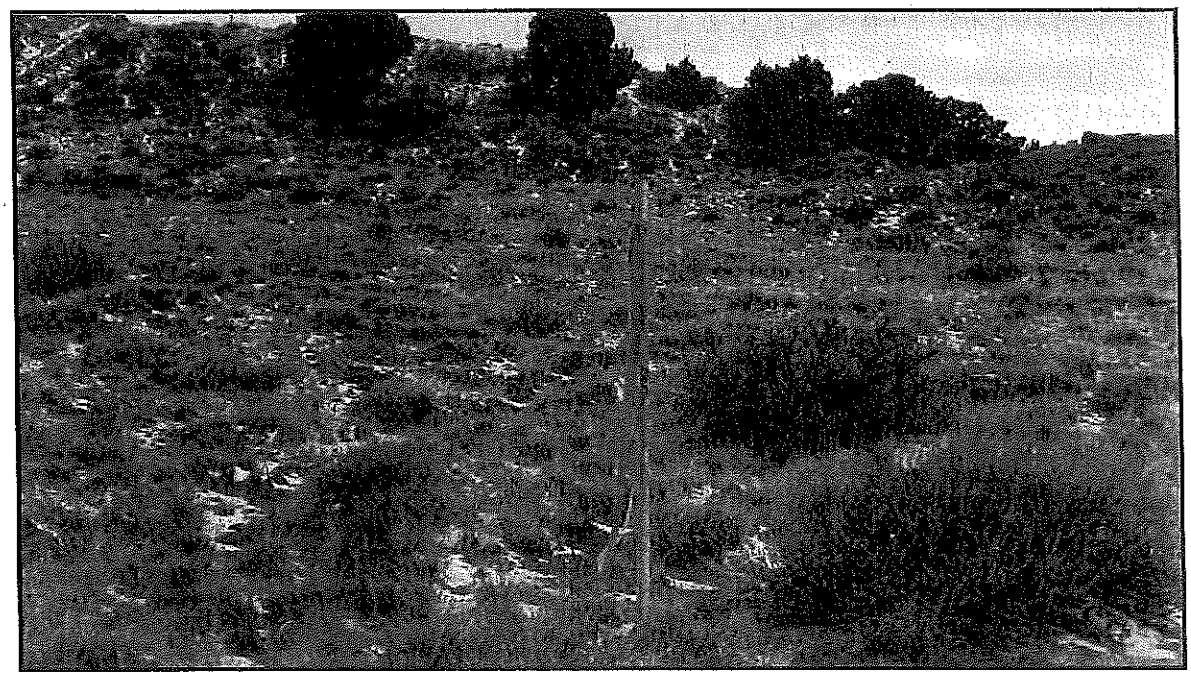

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: WESTERLY

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TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
REFERENCE AREA PHOTOS			REF 2

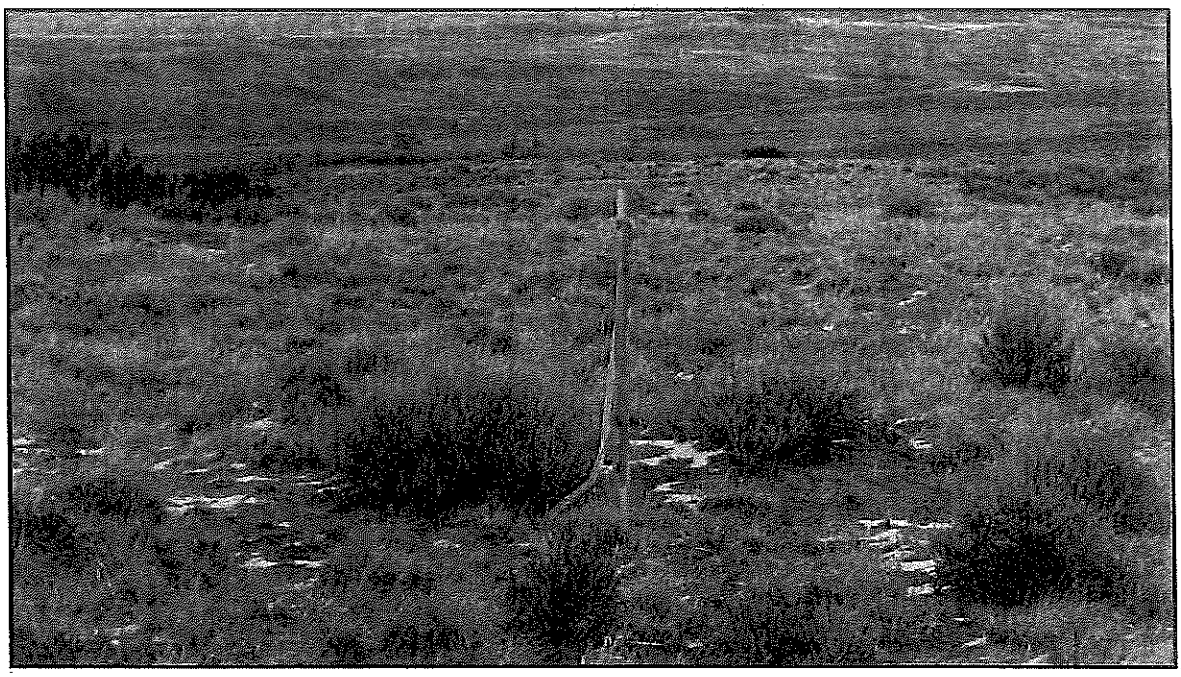

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: NORTHERLY

PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: EASTERLY

WEXPRO COMPANY

POWDER WASH EVAPORATION FACILITY
NW 1/4, SECTION 4, T11N, R97W, 6th P.M.
MOFFAT COUNTY, COLORADO

TAKEN BY	J.L.	10-25-17	
DRAWN BY	Z.T.	12-11-17	
REFERENCE AREA PHOTOS			REF 1

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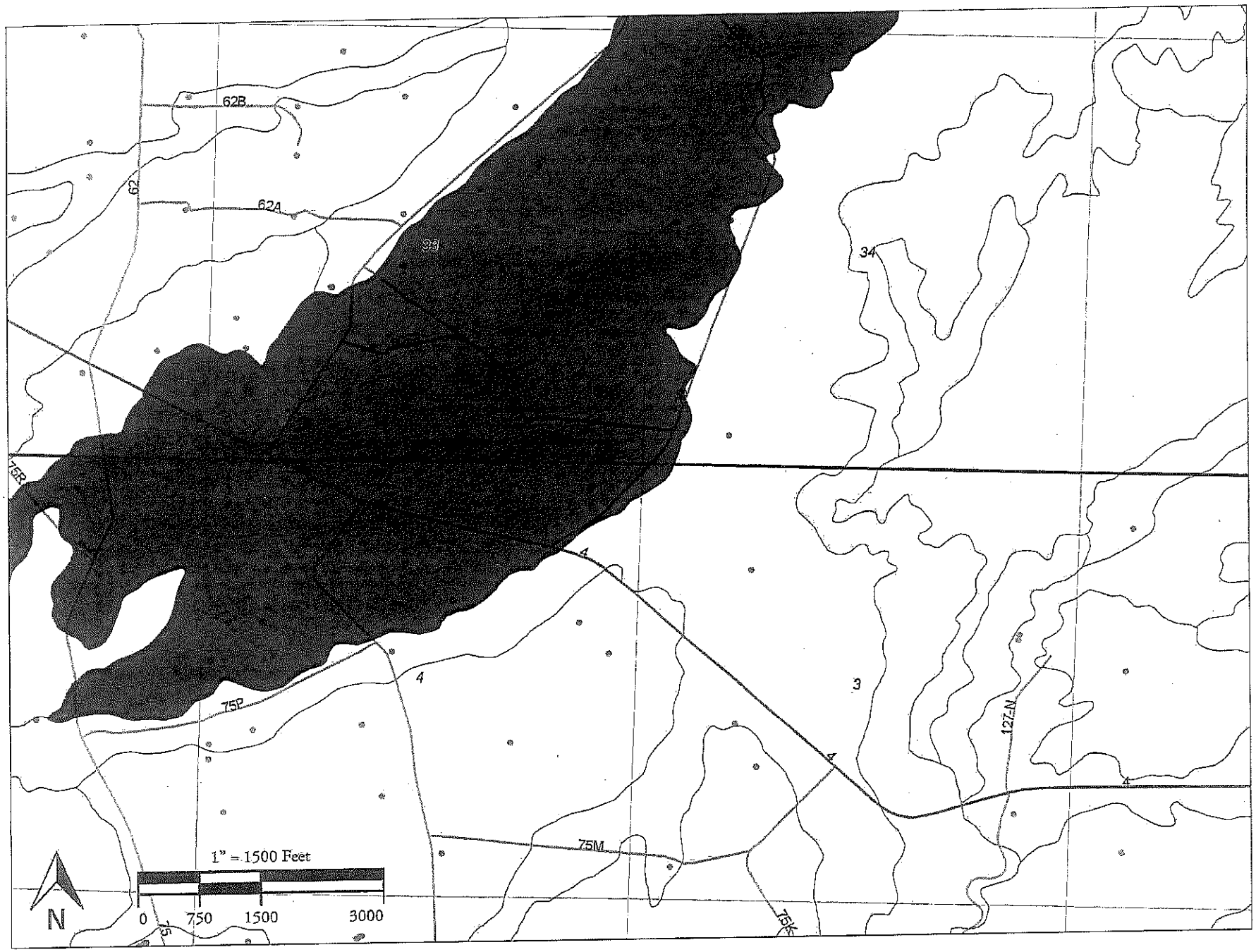
62B
62A
62
33
34
75R
75P
75M
75K
127-N
4
3
N
1" = 1500 Feet
0
750
1500
3000

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Moffat County Area, Colorado

201—Tresano-Hiatha-Kandaly association, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: jpbs
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Tresano and similar soils: 35 percent
Hiatha and similar soils: 30 percent
Kandaly and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tresano

Setting

Landform: Alluvial fans, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 2 inches: loam
H2 - 2 to 28 inches: clay loam
H3 - 28 to 60 inches: loam

Properties and qualities

Slope: 2 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Clayey 9-11" P.Z. (R034XY419CO)
Hydric soil rating: No

Description of Hiatha

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum derived from shale

Typical profile

H1 - 0 to 2 inches: silty clay
H2 - 2 to 14 inches: silty clay
H3 - 14 to 18 inches: weathered bedrock

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 7.0
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Alkali Upland (R034XY418CO)
Hydric soil rating: No

Description of Kandaly

Setting

Landform: Hills
Landform position (two-dimensional): Summit

Landform position (three-dimensional): Head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone

Typical profile
H1 - 0 to 3 inches: loamy sand
H2 - 3 to 60 inches: loamy sand

Properties and qualities
Slope: 2 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Dry Sandy (R034XY434CO)
Hydric soil rating: No

Minor Components

Moderately deep sandy loamy soils
Percent of map unit: 4 percent
Landform: Hills, hillslopes
Landform position (two-dimensional): Footslope

Badlands
Percent of map unit: 4 percent
Landform: Hillslopes

Simanni
Percent of map unit: 4 percent
Hydric soil rating: No

Ruedloff
Percent of map unit: 4 percent

Shallow sandy soils
Percent of map unit: 4 percent
Landform: Hillslopes, hills

Landform position (two-dimensional): Summit

Data Source Information

Soil Survey Area: Moffat County Area, Colorado
Survey Area Data: Version 10, Oct 12, 2017

Tammy L Fredrickson (GasInfrastructure - 4)

From: Tammy L Fredrickson (GasInfrastructure - 4)
Sent: Thursday, March 08, 2018 7:52 AM
To: Dave Kubeczko - DNR
Subject: Wexpro Form 2A Document 401520294
Attachments: PW Evap Facility.xls; bird avert.pdf

Dave,
I received your message yesterday and thought an email response with attachments might help.

1. There will be no interim reclamation. At most the topsoil and stockpile areas will be seeded and Wexpro intends to submit requests to the BLM to use some of the topsoil stockpile within the Powder Wash area for reclamation projects should they arise.
2. Yes, the stormwater BMP indicating 114 day inspections is a typo. The correct number is 14.
3. All incoming water will be trucked. After initial separation at the well pad the produced water would then be hauled, by trucks within the Powder Wash, Jacks Draw, and Ace field to the evaporation facility where the water truck driver connects hoses equipped with camlock fittings to a pump skid, engages the skids electrically driven offload pump which pumps the contents of the truck through a series of filters, to a skimmer tank. I have attached a drawing of the facility layout.
4. Evaporation pond netting. Wexpro is proposing the use of the Bird Avert System. We currently have BLM approval on two of our Wyoming evaporation pits. I have attached a copy of the letter that has been sent to the Colorado Fish and Wildlife Conservation office by Wexpro. The Bird Avert System was highly recommend by the Fish and Wildlife office in Lander, Wyoming when Wexpro constructed our evaporation facilities in the Vermillion Basin just North of Powder Wash.

Please let me know if you have any additional questions or need further details.

Thank you,

Tammy Fredrickson
Senior Permit Agent
Regulatory Affairs

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