

TEP Rocky Mountain LLC
Proposed Drill Cuttings Management Plan for the
Puckett GV 1-8 Well Pad (COGCC Location ID 323823)
November 7, 2018

Purpose

This site-specific Drill Cuttings Management Plan (Plan) has been prepared to describe the proposed management and handling plan for drill cuttings that will be generated during upcoming drilling activities planned at the Puckett GV 1-8 well pad (COGCC Location ID 323823). This Plan is also being submitted in support of a Variance Request (prepared pursuant to Section 502.b of the COGCC rules) seeking permission to transport drill cuttings generated from the GV 1-8 well pad to a nearby, permitted oil and gas location (i.e., the Federal GM 41-8 well pad, COGCC Location ID 334794) for permanent management and disposal.

Need

The primary reasons for seeking approval of an alternative management plan for the drill cuttings from this pad are as follows:

- 1) Spatial constraints at the GV 1-8 Well Pad. The GV 1-8 pad is located in the bottom of Riley Gulch as shown on the attached Exhibit. Due to the extremely steep terrain and topography of this area, the size of the pad is very limited and there is no room for the on-site disposal of drill cuttings at this location. The only options for management of drill cuttings generated from this pad is to transport and manage the cuttings at another, nearby permitted oil and gas location, or to haul the drill cuttings off the mountain to an off-site commercial disposal facility.
- 2) Adverse and unacceptable safety and environmental risks associated with transporting the cuttings to an off-site commercial disposal facility. The only access to / from this well pad is the road in the bottom of Riley Gulch. This is an unimproved, dirt road with grades that have been surveyed up to 17% in several locations. Due to the wintertime conditions during which these wells will be drilled and the number of truck trips per day that will be required to keep pace with the rate at which cuttings will be generated and brought to the surface, TEP is deeply concerned about worker safety associated with hauling many truck-loads of drill cuttings per day down a very steep, slick (frozen and/or muddy), and narrow road. The potential for trucking accidents can be largely mitigated upon COGCC's approval of TEP's request to manage these drill cuttings at the nearby Federal GM 41-8 well pad. Additional details regarding the volumes of cuttings, truck trips per day, etc. are provided in the Safety and Environmental Considerations section below.

Safety and Environmental Considerations

Worker Safety. As noted above, the only access road to this well pad is a narrow, single lane, unimproved, dirt road that travels through the bottom of Riley Gulch and is built upon the steep, clay slopes of the Green River formation. As shown in Photos 1 and 2 below, not only is the grade of the road very steep (surveyed at 17% at several sections), but there are numerous sharp, blind corners and the line



Photo 1. Access road leading to the GV 1-8 well pad. Surveyed 17% grade.



Photo 2. The “Ant Hill” section of the access road leading to the GV 1-8 well pad.

of sight visibility is very limited. Because this is the only access road in / out of these pads, this road will also be very congested with other drilling, completions, roustabout / construction, and other oil field support services related traffic. Traffic management and controlling heavy truck traffic on the narrow access road is going to be a very challenging aspect of safely working at this location – there is simply little or no room for two vehicles going in opposite directions to pass each other. Hauling drill cuttings down the mountain for off-site disposal at a commercial facility will unnecessarily add additional large trucks on the road each day and will only make matters worse at a location that is already very challenging.

The estimated volume of drill cuttings and the number of associated truck loads per day for the GV 1-8 (15 wells at 273 cubic yards / well) are estimated as follows:

Cuttings Volume	Number of Tandem Axel Loads
4,095 cubic yards	512 loads (avg. 9 round trips/day)*

*Estimated 60 days to complete drilling at the MV 60-8D

Compounding the safety concerns associated with the unimproved condition of the road and the steep grade, is the fact that drilling and completions activities at this location will occur during the months of February through April. Due to these winter-time / early spring conditions, road conditions will be frozen, snow-packed, slick, and muddy. If a truck does slide off the road, the slopes below the road are extremely steep and treacherous which could make rescue and response efforts challenging and dangerous.

Community Safety

If required to transport drill cuttings from this location to an off-site commercial disposal facility, this option will also increase heavy truck traffic through the Town of Parachute, the I-70 corridor, and through the community of Debeque by the same number of trips as indicated in the table above. Again, increased truck traffic through these local communities during the winter months when poor road conditions are common, unnecessarily increases the safety risk to these areas.

A comparison of the total vehicle miles required for transportation and disposal of cuttings to the GM 41-8 pad versus the off-site commercial disposal option are summarized in the table below.

GV 1-8 to GM 41-8 (1.1 miles one-way)	GV 1-8 to Off-Site Commercial Disposal (27 miles one-way)	MV 60-8D to GM 41-8 (0.8 miles one way)	MV 60-8D to Off Site Commercial Disposal (26 miles one way)	Total Vehicle Miles for Disposal at GM 41-8	Total Vehicle Miles for Off- Site Commercial Disposal
512 loads @ 2.2 round trip miles = 1126 vehicle miles	512 loads @ 54 round trip miles = 27,648 vehicle miles	594 loads @ 1.6 round trip miles = 950 vehicle miles	594 loads @ 52 round trip miles = 30,888 vehicle miles	2,076 Miles Driven*	58,536 Miles Driven*

*Assumes the same size and type of truck (tandem axel dump at 8 cy / load) used for both options.

Environmental Safety / Protection

The access road to this pad mostly follows the bottom of Riley Gulch which is an intermittent water way that is tributary to Parachute Creek, which is also tributary to the Colorado River. The added trips associated with the off-site, commercial disposal option also poses an increased and unnecessary risk of accidental exposure of E&P wastes to these water ways. In the event of a spill of waste materials off the road and onto the steep side slopes below the road, the physical cleanup of the steep side slopes would result in considerable surface disturbance and might not even be possible in some areas due to the steepness of the slope.

However, if COGCC approves the management and disposal of drill cuttings at the nearby GM 41-8 pad, much of these health and environmental risks become negligible. As explained in the variance request letter, the distance of the haul route from the GV 1-8 pad to the GM 41-8 pad is 1.1 miles, whereas the distance of the haul route from the GV 1-8 pad to the designated off-site, commercial disposal facility is approximately 27 miles. Because the nearby GM 41-8 pad is located in close proximity to the GV 1-8, disposal at this location would remove most, if not all of the truck traffic (associated with cuttings disposal) from the access road, the communities of Parachute and Debeque, and the I-70 corridor. As a result, the associated safety and environmental risks would be greatly minimized / averted.

Outstanding Compliance Issues, Spills, Corrective Actions

Based upon a review of the COGCC database for the facilities associated with this proposal, there are no unresolved or outstanding compliance issues (e.g., corrective actions from previous COGCC field inspections, open spills, etc.) for any of the locations. Additionally, both facilities were checked for any open action items within TEP's internal inspection and maintenance programs, and there was no unresolved equipment, storm water management, weed control, housekeeping, SPCC, or other issues identified at either pad. The results of this review are summarized in the table below.

Pad Name	COGCC Location ID no.	COGCC FIR Corrective Actions (CAs)?	Un-resolved spills?	Production / Equipment	Storm water, weeds, SPCC
GV 1-8 pad	323823	Doc # 689700278; 9/12/17; no CAs	No	Pass. No issues.	Pass. No issues.
GM 41-8 pad	334794	Doc # 689700460; 10/16/17; no CAs	No	Pass. No issues.	Pass. No issues.

Drill Cuttings Management Procedure

Drilling activities will commence at the GV 1-8 well pad in February 2019, where 15 new wells are planned to be drilled. The estimated cuttings volume to be generated during drilling of the 15 new proposed wells on the GV 1-8 pad is approximately 4,095 cy. Due to the limited size and physical constraints of the GV 1-8 well pad, there will be no permanent disposal of drill cuttings on the well pad itself. The drill cuttings from these new wells will be transported by truck a distance of approximately 1.1 miles, where they will be managed at a separate off-site drilling pit proposed on the GM 41-8 well pad.

Construction of the GM 41-8 drilling pit will be constructed and managed in two phases: Phase I will receive drill cuttings from the new wells drilled at MV 60-8D well pad, and Phase 2 will receive drill cuttings from new wells drilled at the GV 1-8 pad. After all cuttings from the GV 1-8 pad have been received and tested for compliance with COGCC 910-1 cleanup standards, this portion (Phase 2) of the drilling pit will be closed. Drill cuttings from the MV 60-8D well pad as being addressed through a separate Section 502.b variance request.

As drill cuttings are brought to the surface, they will be temporarily placed into a designated storage cell that is close to the rig shaker assembly. Once the temporary storage cell becomes full, a loader will place the cuttings into a dump truck where they will be transported to the drill cuttings management pit located at the GM 41-8 pad – a total distance of 1.1 miles. There, cuttings from each new well will be segregated and placed into the drilling pit and periodically sampled to determine if the cuttings meet COGCC 910-1 standards. Additional treatment or amendment of the cuttings may be needed occasionally to ensure that COGCC 910-1 standards are met prior to reclamation. If needed, clean fill material may be mixed with the cuttings to ensure that cleanup standards are met. Confirmation samples of the blended material will be collected and submitted to an approved analytical laboratory and analyzed for the full COGCC 910-1 list of organic, inorganic, and metal compounds (in soils) to ensure that these materials comply with COGCC cleanup standards. If sample results indicate that any of the inorganic parameters (i.e., Sodium Absorption Ratio, Electrical Conductivity, etc.) exceed their respective cleanup standards or background concentrations, these materials must be covered with a minimum cap of 3-ft of clean material (i.e., soils meeting 910-1 cleanup standards).

Representative samples from the entire volume of the drilling pit will be collected and analyzed to ensure compliance with COGCC 910-1 cleanup standards prior to reclaiming the drilling pit. If the composition of the cuttings is verified to comply with the entire list of 910-1 cleanup standards (including the inorganic parameters), these materials may be either buried in-situ within the drilling pit, or they may be re-used on the fill slope as needed to help shape and contour the pad in preparation for interim reclamation activities as outlined in COGCC's Interim Reclamation requirements of COGCC Rule 1003. In addition, storm water BMPs will be installed and maintained as per TEP's site-specific Storm Water Management Plan that has been prepared and implemented for each location.

After all cuttings from the Federal MV 60-8D and Puckett GV 1-8 pads have been received and tested for compliance with COGCC 910-1 cleanup standards, each Phase of the drilling pit will be closed. The moisture content of all drill cuttings will be kept as low as practicable at all times to prevent accumulation of liquids. Both pads are included in TEP's storm water management program and will be inspected and maintained per COGCC's Site Stabilization and Storm Water Management requirements, Rule 1002(f).

Interim reclamation of the Federal GM 41-8 pad and the closure of the proposed drilling pit will occur within six (6) months following completion of testing and closure of the drill cuttings management pit. The disturbed areas surrounding the existing well location, including access roads if applicable, will be re-contoured to blend as nearly as possible with the natural topography. A working area will be maintained for long-term production operations around each of the existing well heads and production equipment area. Compacted areas of the well pad not required for long-term operations will be ripped to a depth of eighteen (18) inches when surface conditions permit. TEP will complete final grading of back-fill and cut slopes to prevent erosion and encourage establishment of vegetation. Existing drainages will be re-established where appropriate and topsoil will be spread in a uniform depth that will allow the establishment of desirable vegetation. All disturbed areas of the wells pad will be reseeded in the first favorable season following completion of activities on the GM 41-8 pad. TEP operates under an integrated Noxious Weed Management Plan that complies with the Colorado Noxious Weed Act, Colorado Oil & Gas Conservation Act, and the BLM Gold Book. All interim reclamation activities will be conducted in accordance with COGCC Rule 1003 (Interim Reclamation).

Drill Cuttings Sampling Procedure

To demonstrate compliance that the drill cuttings generated from this pad complies with COGCC Rule 910-1, all drill cuttings produced from the new wells to be drilled will be characterized according to the following procedure:

Sampling Frequency

Prior to transportation from the original well pad, all drill cuttings will be dried to the greatest extent possible to minimize the accumulation of any fluids and to facilitate the physical management and handling of the material. As drill cuttings are brought to the surface at the GV 1-8 pad, they will be loaded and hauled directly to the cuttings disposal trench that is to be constructed at the GM 41-8 pad. There, the cuttings will be placed in an orderly manner into the cuttings disposal trench according to the order in which the wells are drilled.

First-Well Sampling: As discussed with COGCC, TEP will specifically target the cuttings from the first well drilled at the GV 1-8 pad for a more intensive and thorough characterization process to ensure that the analytical data for the drill cuttings generated from this first well are representative of the cuttings to be generated from the subsequent wells to be drilled from that same pad. This sampling strategy is appropriate since all wells from this pad will be drilled through the same geologic formations, will have similar completion depths, and will all be drilled using the same equipment, drilling muds, and techniques. This more aggressive sampling design will ensure that the initial well and all subsequent wells will meet applicable COGCC 910-1 standards. Samples from the first well on the GV 1-8 pad will include one grab sample from the surface horizon (0 to 1,000 feet deep); one grab sample from the surface horizon to the “top of gas” interval (1,000 feet to 5,400 feet); and two grab samples from the production zone (5,400 feet to total depth – TD, which is estimated to average approximately 7,300 feet). As a precautionary measure, cuttings from the production zone will be segregated (for each well) within the drilling pit and will be managed separately. Cuttings from the Production Zone are more likely to contain elevated hydrocarbon constituents and may require additional treatment to ensure that they meet COGCC 910-1 standards prior to final disposal. It is anticipated that drill cuttings produced from the surface horizon through the top of gas intervals (0 – 5,400 feet) will not exceed 910-1 standards; however, this will be verified through the sampling design as shown in the table below:

First-Well Sampling Frequency*		Subsequent Well Sampling Frequency*		Final Cell Confirmation Sampling **	
Depth	Number of Samples	Depth	Number of Samples	Location	Number of samples
Surface (0 – 1,000 ft)	1	Production zone (5,400 ft – TD)	1	One smpl from each third of cell	3-4
Top of Gas (1,000 to 5,400 ft)	1				
Production Zone (5,400 – TD)***	2				

* Before mixing / blending. Grab samples.

** After mixing / blending. Composite samples (5-point)

***Addition verification samples will be collected from any production zone materials that require treatment to meet COGCC 910-1 standards.

Subsequent-Well Sampling: To ensure that cuttings from subsequent wells continue to meet COGCC 910-1 standards, a single grab sample will be collected from drill cuttings produced from the production zone (5,400 feet to TD) of each subsequent well. It is anticipated that drill cuttings generated from the surface to the top of gas intervals (0 to 5,400 feet) will contain relatively minor concentrations of contaminants that would exceed COGCC 910-1 standards; therefore, targeting the production zone will

capture those cuttings that have the greatest potential to exceed 910-1 standards and that may also require additional treatment prior to final disposal. Any drill cuttings that are found to exceed the COGCC 910-1 clean-up standards may be mixed with additional available clean soils until the 910-1 standards have been achieved. Mixing will be accomplished using a track hoe and blending clean soils in with the production zone cuttings at a ratio of approximately 1:1 until the material is thoroughly mixed. A second verification sample will then be collected after mixing to ensure that the COGCC 910-1 standards are met. All samples will be submitted to an approved, fully accredited environmental laboratory for COGCC 910-1 analysis as described in the table below.

Verification Sampling of Entire Cell Contents Prior to Burial: Once all of the drill cuttings have been placed into the cuttings disposal trench at the GM 41-8, and the soil samples collected up to that point indicate that all COGCC 910-1 constituents are below their respective allowable thresholds, the cuttings will be fully mixed using a track-hoe. After the cuttings have been thoroughly mixed, and as a final check to ensure that the entire volume of the cell contents meet COGCC 910-1 standards, the drilling pit will be divided into thirds, and a composite sample (5-point) will be collected from each third of the drilling pit. All samples will be submitted to an approved, fully accredited environmental laboratory for COGCC 910-1 analysis as described in the table below.

Until adequate characterization of the cuttings materials has been completed, personnel will segregate cuttings from individual wells inside the drilling pit. Mixing the cuttings from multiple wells will not be allowed until the cuttings have been characterized as described above and are below applicable COGCC 910-1 cleanup standards.

Sample Analysis

It is proposed the all drill cuttings be analyzed in accordance with the following list of analytes from the COGCC 910-1 Table.

As shown in the table below, and through this variance, TEP is requesting relief for treating drill cuttings produced from the GV 1-8 and the MV 60-8D well pads for the inorganic constituents of Electrical Conductivity (EC), Sodium Absorption Ration (SAR), and pH. If present within the rooting zone, elevated concentrations of these inorganic constituents can affect soil characteristics and interfere with establishing vegetation that is needed for successful reclamation of the location. However, all cuttings from these wells will be buried in the drilling pit located at the GM 41-8 and will be covered with at least three feet of clean fill, and any elevated concentrations of these inorganic constituents will not impact or interfere with the reclamation activities planned at the GM 41-8 well pad.

Additionally, TEP is requesting relief from meeting the 910-1 Arsenic standard due to the naturally elevated concentrations of this metal that is found throughout the Piceance Basin. Background concentrations for arsenic typically exceed the COGCC cleanup standard for this metal, and the standard is simply not attainable.

Record Keeping

TEP will maintain records of all drill cuttings generated from each well including total volume of cuttings per well, date cuttings were transported to the GM 41-8 drilling pit, and analytical data for all samples associated with each well. TEP will maintain these records for a period of 5-years and will provide data to COGCC upon request.

Table of COGCC 910-1 Contaminants Applicable to Drill Cutting Produced from the GV 1-8 and the MV 60-8D well pads.

Contaminant of Concern	COGCC Table 910-1 Threshold (mg/Kg)	Analytical Method
DRO	500	SW 8015M
GRO		SW8015D
BENZENE	0.17	SW 8260C
TOLUENE	85	
ETHYLBENZENE	100	
XYLENE TOTAL	175	
ACENAPHTHENE	1,000	SW 846, SW 8270D
ANTHRACENE	1,000	
BENZO(A)ANTHRACENE	0.22	
BENZO(A)PYRENE	0.022	
BENZO(B)FLUORANTHENE	0.22	
BENZO(K)FLUORANTHENE	2.2	
CHRYSENE	22	
DIBENZO(A,H)ANTHRACENE	0.022	
FLUORANTHENE	1,000	
FLUORENE	1,000	
INDENO(1,2,3-CD) PYRENE	0.22	
NAPHTHALENE	23	
PYRENE	1,000	
ARSENIC*	0.39	SW 6010C, 6020A, 7471B, SW 7196A,
BARIUM	15,000	
CADMIUM	70	
CHROMIUM	-	
CHROMIUM (III)	120,000	
CHROMIUM (IV)	23	
COPPER	3,100	
LEAD	400	
MERCURY	23	
NICKEL	1,600	
SELENIUM	390	
SILVER	390	
ZINC	23,000	
ELECTRICAL CONDUCTIVITY (EC) (mmho/cm)*	<4 mmhos/cm or x2 bkgd	USDA H60
pH*	6 to 9	SW9045D
SODIUM ADSORPTION RATIO (SAR)*	12	USDA H60

*TEP is requesting relief for treating drill cuttings produced from the GV 1-8 and the MV 60-8D well pads for these constituents.

Preparing Drill Cuttings for Burial

As drill cuttings are brought to the GM 41-8 drilling pit for management and disposal, cuttings will be managed / handled as follows:

- The drilling pit at the GM 41-8 has been designed and constructed to accommodate the volume of cuttings from both the GV 1-8 and the MV 60-8D well pads.
- The GM 41-8 drilling pit will be filled with cuttings in two phases: First phase will be to haul, place, treat (as needed), and cover cuttings from the MV 60-8D wells into Cell 1. The second phase will be to haul, place, treat (as needed), and cover cuttings from the GV 1-8 wells into Cell 2.
- All cuttings from each well produced from the Surface Zone and from the Surface to Top of Gas Zone will be placed into the drilling pit in a chronological manner. It is anticipated that drill cuttings generated from these intervals will contain relatively minor concentrations of contaminants that would exceed COGCC 910-1 standards and will require minimal treatment. This will be verified by the sampling protocol described for the first well to be drilled from this pad.
- All cuttings from each well produced from the Production Zone will be stored in a separate part of the drilling pit for specific sampling and potential treatment if needed. Based upon analytical data for samples collected from the Production Zone, if treatment is required, clean fill will be added to the Production Zone cuttings at a 1:1 ratio and will be thoroughly mixed with a track-hoe. After mixing, additional composite samples will be collected and submitted to the laboratory for analysis. This process will be repeated until all materials are below the applicable COGCC 910-1 standards.
- To ensure that cuttings from each well are kept separate and readily identifiable, TEP will mark cuttings from each well by installing lathe on the edge of the trench, or by physically placing a barrier of clean fill between cuttings produced from each well. This will ensure that TEP will be able to clearly identify cuttings from specific wells for cuttings sampling and characterization as described above.
- After all cuttings from the respective wells have been placed and successfully treated, the cell will be covered with a minimum of 3-feet of clean fill. Once the Phase 1 cell has been covered, TEP will proceed to filling the Phase 2 cell with cuttings produced from the new wells to be drilled at the GV 1-8 well pad. Cuttings from the GV 1-8 wells will be segregated, sampled, and managed according to this same protocol.
- After both cells have been completely filled and covered, the drilling pit area will be reclaimed per the reclamation plat prepared for the GM 41-8 drilling pit.

Summary

Due to the size constraints of the Puckett GV 1-8 pad, all drill cuttings from the upcoming wells to be drilled in February thru March 2019 will require off-site management and disposal. TEP is requesting approval from COGCC to allow off-site treatment and disposal at a drill cuttings management pit to be constructed at the nearby GM 41-8 well pad. This option far out-weighs the safety and environmental risks that, otherwise, would be associated with the transportation and off-site disposal at a commercial disposal facility. This request to haul drill cuttings to the GM 41-8 pad will reduce the hauling distance by approximately 96% and would greatly reduce potential environmental impacts and minimize safety concerns. Vehicle emissions, dust pollution, and impacts to wildlife will also be reduced by hauling drill cuttings to the proposed drill pit on the GM 41-8 pad.

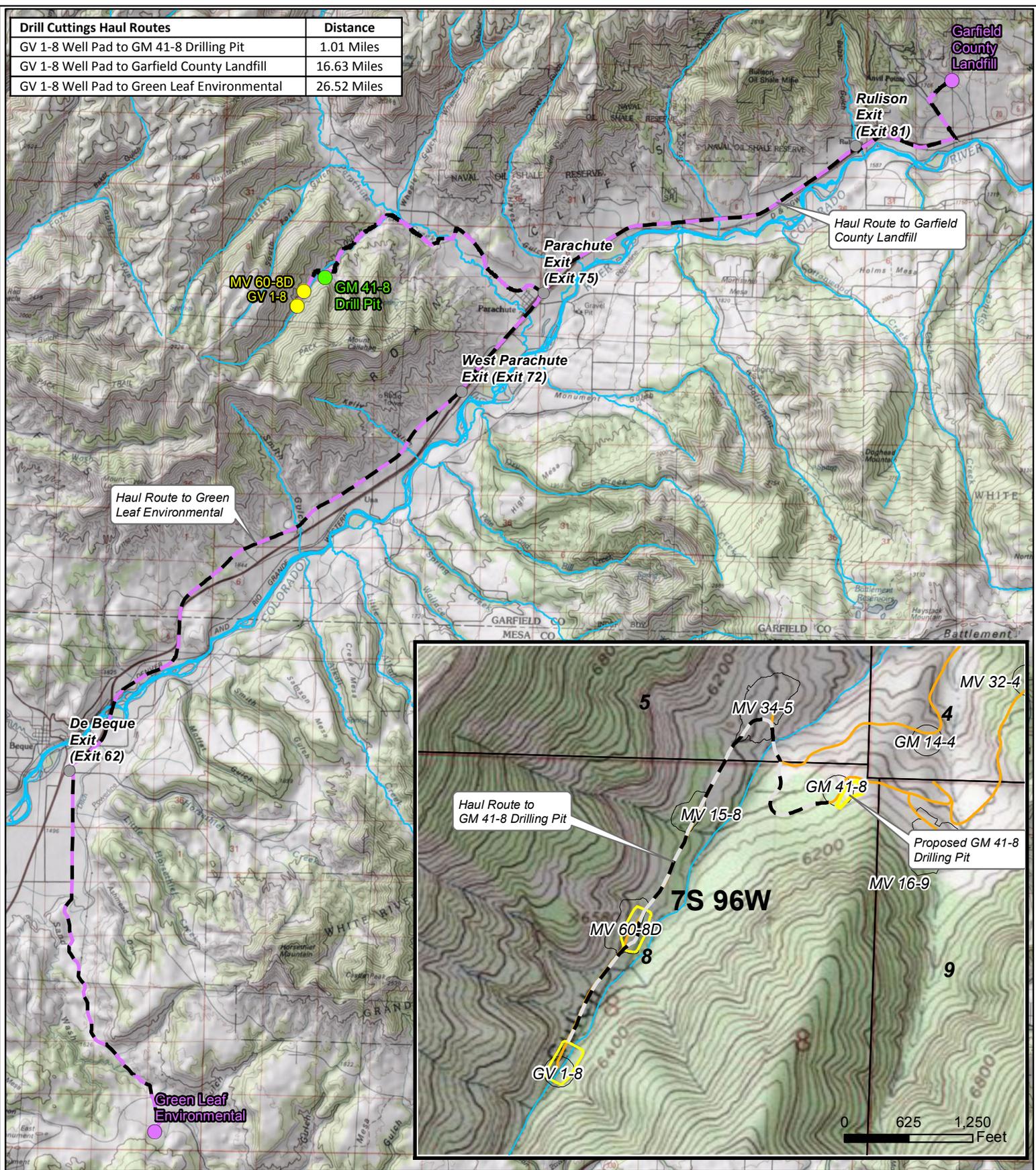
In addition to the arguments above, it should be noted that the BLM is the surface owner at the GM 41-8 location where the cuttings would be ultimately disposed. After multiple discussions and on-site meetings with the BLM, they fully support this drill cuttings management proposal and TEP is working with BLM to obtain the necessary NEPA approvals / documentation to allow management and disposal at the GM 41-8 pad. Final approval from BLM is expected by November 15, 2018.

These drill cuttings are generated from a drilling process that uses exclusively water-based bentonitic drilling fluids and will be managed / disposed in accordance with COGCC Rules 907.d(1-3).

It is far safer to manage the cuttings on the mountain near the pad, than to haul hundreds of truck-loads up and down a steep, treacherous, and congested road during the wintertime, and then transporting this material approximately 27 miles to an off-site commercial disposal facility.

Based upon the reasons provided above, TEP requests permission to transport, manage, and dispose of drill cuttings generated from the new, permitted wells to be drilled at the GV 1-8 pad to the GM 41-8 pad.

Drill Cuttings Haul Routes	Distance
GV 1-8 Well Pad to GM 41-8 Drilling Pit	1.01 Miles
GV 1-8 Well Pad to Garfield County Landfill	16.63 Miles
GV 1-8 Well Pad to Green Leaf Environmental	26.52 Miles



Legend

- Commercial Disposal Facility
- Existing Well Pad
- Proposed Drilling Pit
- Proposed Pad or Pit
- Haul Route (Commercial)
- Haul Route (GM 41-8 Drill Pit)
- Existing Road
- Stream
- River
- Existing Pad

TEP Rocky Mountain LLC

**GV 1-8 and MV 60-8D
Drill Cuttings Haul Routes
Variance Request Exhibit**

November 1, 2018

