

STATE OF
COLORADO

Carter - DNR, Jocelyn <jocelyn.carter@state.co.us>

Pueblo Cement and Limestone Quarry M-2002-004 TR13 Adequacy Review1 message

Carter - DNR, Jocelyn <jocelyn.carter@state.co.us>

Tue, Apr 16, 2024 at 11:01 AM

To: Amy Rodrigues <aveek@gcc.com>

Cc: "Ebert - DNR, Jared" <jared.ebert@state.co.us>

Good morning Amy,

Please see the attached adequacy review for the TR-13 and the recalculated reclamation cost estimate for this permit. Let me know if you have any questions or concerns.

Thank you,

~Jocelyn

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Jocelyn Carter
Environmental Protection Specialist
Division of Reclamation, Mining, and Safety
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Denver, CO 80203
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20240416_M2002004_TR13_AdequacrReview_CostEst_GWSAP.pdf
1203K



April 16, 2024

Amy Rodrigues
GCC Rio Grande, Inc.
3372 Lime Rd
Pueblo, CO 81004

RE: GCC Rio Grande, Inc., Pueblo Cement Plant and Limestone Quarry, Reclamation Permit No. M-2002-004, Technical Revision 13 (TR-13), Beneficial Use of Coal Reject Material and Update to Financial Warranty Cost Estimate

Dear Ms. Rodrigues,

The Division of Reclamation, Mining, and Safety (DRMS/Division) received the Technical Revision 13 (TR-13) application on March 28, 2024, requesting the beneficial use of coal reject material as backfill and an update to the financial warranty cost estimate. Prior to the Division issuing a decision of the TR-13, please address the following issues to the satisfaction of the Division:

Part 1: Beneficial Use of Coal Reject Material

1. The TR-13 application requests the use of coal reject material to be incorporated with backfill material. How was this material handled, stored, and being disposed of currently?
2. The TR-13 application states that the coal material is rejected due to metal contamination; what is the nature of the contamination that causes this material to be rejected (and would now be incorporated into the backfill material if this is approved)?
3. Results of one composite sample that was tested was provided from a height of 3-4 feet from the ground surface around the current coal reject pile. The Division believes additional samples should be taken from the reject pile to characterize this material. For this TR, please develop a sampling plan that follows an incremental sampling methodology (ISM). The ISM is a structured composite sampling and processing protocol that reduces data variability and provides a reasonably unbiased estimate of mean contaminant concentrations in a volume of medium targeted for sampling. Provide the ISM based sampling plan to the Division for review and approval prior to implementation.
4. The sample tests produced results of eight contaminants; the Division believes that additional parameters should be analyzed. After conducting the ISM sampling, SPLP and TCLP testing should be conducted to assess the samples. The TCLP analysis should be



run for the most restrictive standards in Tables 1-4 of Regulation No. 41 – The Basic Standards for Groundwater (Reg. 41). This parameter list is included in Appendix A of the Divisions September 2023 guidance document, “Groundwater Monitoring: Sampling and Analysis Plan Guidance Construction Materials and Hard Rock Sites”. This document is included in the attachments.

5. The Division believes samples collected using the developed ISM plan discussed above and the results of the testing of the samples should be completed and analyzed before incorporating any additional or future coal reject as backfilling material. Please develop a sampling, analysis and reporting plan for future coal reject material that will document and ensure future coal reject material will be non-toxic and acid forming. Clearly define what sampling results would deem the coal reject, material as ineligible for backfilling material.

Part 2: Update to Financial Warranty Cost Estimate

6. Please review and comment on the attached reclamation cost estimate calculated based on the proposed changes made to Tasks #1 and #3.

This concludes the Division’s preliminary review of the TR-13 submitted. The decision date for TR-13 is April 27, 2024. Please provide the response to the above issues 5 business days prior to this date to allow time for the Division’s review. It is your responsibility to submit a written request for an extension to the decision date if more time is needed to adequately addresses the issues above.

If you have any questions, please contact me by email at Jocelyn.carter@state.co.us or by phone at (720) 666-1065.

Sincerely,



Jocelyn Carter
Environmental Protection Specialist
Division of Reclamation, Mining, and Safety

Ec: Jared Ebert, DRMS
Eric Scott, DRMS

Enclosures: Reclamation Cost Estimate
Groundwater Monitoring: Sampling and Analysis Plan Guidance Construction
Materials and Hard Rock Site, September 2023

COST SUMMARY WORK

Task description: Cost Estimate w/ TR13 and 2023 Insp

Site: Pueblo Cement Plant and
Limestone Quarry

Permit Action: 2024 TR13

Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 000 State: Colorado Abbreviation: None
Date: 4/15/2024 County: Pueblo Filename: M004-000
User: JLC

Agency or organization name: DRMS

TASK LIST (DIRECT COSTS)

Task	Description	Form Used	Fleet Size	Task Hours	Cost
001	Conveyor Belt Demo	DEMOLISH	1	200.00	\$97,310
001A	Demo and Plug Monitoring Wells	BOREHOLE	1	0.00	\$9,028
002	Grade Highwall to 4:1	DOZER	2	138.79	\$128,773
003	Arroyo Restoration	SCRAPER1	2	431.97	\$1,208,872
004	Arroyo Topsoil Placement	SCRAPER1	3	19.73	\$78,209
005	Rip Haul Roads and Conveyor Area	RIPPER	2	40.05	\$37,526
006	Pit Area Overburned/Topsoil Placement	SCRAPER1	3	21.58	\$85,564
007	Weed Management	REVEGE	1	24.00	\$64,779
008	Revegetation Arroyo 27 ac and Affected Area 71 ac	REVEGE	1	60.00	\$199,957
009	Mobilization/Demobilization	MOBILIZE	1	9.12	\$43,124
010	Lube Truck	MISCTRUK	1	100.00	\$9,316
011	Fuel Truck	MISCTRUK	1	100.00	\$9,316
012	Construction Management Truck	MISCTRUK	1	100.00	\$8,863
<u>SUBTOTALS:</u>				1245.24	\$1,980,637

INDIRECT COSTS

OVERHEAD AND PROFIT:

Liability insurance:	2.02	Total =	\$40,009
Performance bond:	1.05	Total =	\$20,797
Job superintendent:	622.62	Total =	\$40,520
Profit:	10.00	Total =	\$198,064
		TOTAL O & P =	\$299,389
		CONTRACT AMOUNT (direct + O & P) =	\$2,280,026

LEGAL - ENGINEERING - PROJECT MANAGEMENT:

Financial warranty processing (legal/related costs):	\$500	Total =	\$500
Engineering work and/or contract/bid preparation:	4.25	Total =	\$96,901
Reclamation management and/or administration:	5.00		\$114,001

CONTINGENCY: 0.00 Total = \$0

TOTAL INDIRECT COST = \$510,792

TOTAL BOND AMOUNT (direct + indirect) = \$2,491,429

DEMOLITION WORK

Task description: Conveyor Belt Demo

Site: Pueblo Cement Plant and
Limestone Quarry

Permit Action: 2024 TR13

Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 001
Date: 4/15/2024
User: JLC

State: Colorado
County: Pueblo

Abbreviation: None
Filename: M004-001

Agency or organization name: DRMS

UNIT COSTS

Location adjustment: 88.00 %

Structure or Item Description	Dimensions	Demolition Menu Selection	Quantity	Unit	Unit Cost	Total Cost
Conveyor Belt	6' x 10' x 4850'	Conveyor, demolition, on-site disposal, existing pit, 10,000 ft. haul	291,000.00	CF	\$0.38	\$110,580.00

Job Hours: 190.00

Subtotal
(unadjusted): \$110,580.00

Total Cost
(adjusted for location): \$97,310.40

BOREHOLE SEALING WORK

Task description: Demo and Plug Monitoring Wells

Site: Pueblo Cement Plant and
Limestone Quarry

Permit Action: 2024 TR13

Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 001A
Date: 4/15/2024
User: JLC

State: Colorado
County: Pueblo

Abbreviation: None
Filename: M004-001A

Agency or organization name: DRMS

UNIT COSTS

Borehole Description	Sealing/Item Method	Diameter	Length	Quantity	Unit	Unit Cost	Total Cost
Monitoring Wells MW-5 thru 24	Portland cement grout - 2 in. (labor, equip, materials)	2	1565	1,565.00	LF	\$5.27	\$8,248.33
Borehole Markers	Borehole location/identification marker (EA, material cost only)	NA	NA	20.00	EA	\$39.00	\$780.00

Job Hours: 0.00

Total Cost: \$9,028.00

BULLDOZER WORKTask description: **Grade Highwall to 4:1**Site: **Pueblo Cement Plant and
Limestone Quarry**Permit Action: **2024 TR13**Permit/Job#: **M2002004****PROJECT IDENTIFICATION**Task #: **002**
Date: **4/15/2024**
User: **JLC**State: **Colorado**
County: **Pueblo**Abbreviation: **None**
Filename: **M004-002**Agency or organization name: **DRMS****HOURLY EQUIPMENT COST**Basic Machine: **Cat D9T - 9SU**
Horsepower: **405**
Blade Type: **Semi-Universal**
Attachment: **3-shank ripper**
Shift Basis: **1 per day**
Data Source: **(CRG)****Cost Breakdown:**

		<u>Utilization %</u>
Ownership Cost/Hour:	\$238.76	NA
Operating Cost/Hour:	\$162.29	100
Ripper own. Cost/Hour:	\$18.32	NA
Ripper op. Cost/Hour:	\$4.49	50
Operator Cost/Hour:	\$40.04	NA
Total unit Cost/Hour:	\$463.90	
Total Fleet Cost/Hour:	\$927.79	

MATERIAL QUANTITIESInitial Volume: **107,666**
Swell factor: **1.430**
Loose volume: **153,962 LCY**Source of estimated volume: **HW 7,500' long 30' height**Source of estimated swell factor: **Cat Handbook****HOURLY PRODUCTION**Average push distance: **120 feet**
Unadjusted hourly production: **1,093.1 LCY/hr**Materials consistency description: **Rock, well ripped or blasted 0.8**Average push gradient: **-15 %**
Average site altitude: **5,100 feet**Material weight: **3,300 lbs/LCY**Weight description: **Decomposed rock - 75% Rock, 25% Earth****Job Condition Correction Factor**

		<u>Source</u>
Operator Skill:	0.750	(AVG.)
Material consistency:	0.800	(CAT HB)
Dozing method:	1.100	(50% SL)

Visibility:	1.000	(AVG.)
Job efficiency:	0.830	(1 SHIFT/DAY)
Spoil pile:	1.000	(DOZ-OC)
Push gradient:	1.329	(CAT HB)
Altitude:	1.000	(CAT HB)
Material Weight:	0.697	(CAT HB)
Blade type:	1.000	(PAT)

Net correction: 0.5074

Adjusted unit production: 554.64 LCY/hr

Adjusted fleet production: **1109.28** LCY/hr

JOB TIME AND COST

Fleet size: 2 Dozer(s)

Unit cost: \$0.836/LCY

Total job time: **138.79** Hours

Total job cost: **\$128,773**

SCRAPER TEAM WORKTask description: **Arroyo Restoration**Site: **Pueblo Cement Plant and
Limestone Quarry**Permit Action: **2024 TR13**Permit/Job#: **M2002004****PROJECT IDENTIFICATION**Task #: **003**
Date: **4/15/2024**
User: **JLC**State: **Colorado**
County: **Pueblo**Abbreviation: **None**
Filename: **M004-003**Agency or organization name: **DRMS****HOURLY EQUIPMENT**COSTShift basis: **1 per day**

	Equipment Description
-Scraper:	Cat 637G w/push-pull
-Dozer:	NA
Support Equipment -Load Area:	NA
-Dump Area:	NA
Road Maintenance -Motor Grader:	CAT 14M
-Water Truck:	Water Tanker, 10,000 Gal.

Cost Breakdown:**Scraper Work Team****Support Equipment****Maintenance Equipment**

	Scraper	Dozer	Load Area	Dump Area	Motor Grader	Water Truck
%Utilization-machine:	100	NA	NA	NA	50	50
Ownership cost/hour:	\$255.23	NA	NA	NA	\$149.33	\$135.95
Operating cost/hour:	\$280.59	NA	NA	NA	\$46.40	\$82.60
%Utilization-ripper:	NA	NA	NA	NA	0	NA
Ripper own. cost/hour:	NA	NA	NA	NA	\$5.83	\$0.00
Ripper op. cost/hour:	NA	NA	NA	NA	\$0.00	\$0.00
Operator cost/hour:	\$47.07	NA	NA	NA	\$46.87	\$0.00
Unit Subtotals:	\$582.89	NA	NA	NA	\$248.43	\$218.55
Number of Units:	4	0	0	0	1	1
Group Subtotals:	Work: \$2,331.56		Support:	\$0.00	Maint:	\$466.98

Total work team cost/hour: **\$2,798.54****MATERIAL QUANTITIES**Initial volume: **883,710** CCY
Loose volume: **994,174** LCYSwell factor: **1.125**Source of estimated volume: **Table L-1 AM-01**
Source of estimated swell factor: **Cat Handbook****HOURLY PRODUCTION****Scraper Bowl (volume) Basis:**Material weight: **2,650 lbs/LCY**
Material description: **Decomposed rock - 25% Rock,
75% Earth**
Rated Payload: **81,600 pounds**Struck Volume: **24.00** LCY
Heaped Volume: **34.00** LCY
Average Volume: **29.00** LCY

Payload Capacity: 30.79 LCYAdjusted Capacity: 29.00 LCYCycle Time:Scraper Loading Time: 1.00 MinutesManeuver and Spread Time: 0.60 MinutesJob Condition Correction:

Site Altitude: 5100 feet

	Scraper	Push Dozer	Source
Altitude Adj:	1.000	NA	(CAT HB)
Job Efficiency:	0.830	NA	(CAT HB)
Net Correction:	0.830	NA	

Travel Time:Road Condition: Hard, smooth, stabilized, surfaced, watered, maintained 2.0Haul Route:

Seg #	Haul Distance (Ft)	Grade (%)	Roll. Res (%)	Total Res (%)	Velocity (fpm)	Travel Time (min)
1	750.00	4.00	2.00	6.00	1477	0.59

Haul Time: 0.59 minutesReturn Route:

Seg #	Haul Distance (Ft)	Grade (%)	Roll. Res (%)	Total Res (%)	Velocity (fpm)	Travel Time (min)
1	750.00	-4.00	2.00	-2.00	2972	0.32

Return Time: 0.32 minutesTotal Scraper team cycle time: 2.51 minutesAdjusted for job conditions: 1,150.76 LCY/HourSelected Number of Scrapers: 2 Scraper(s)Adjusted single scraper team (unit) hourly production: 1,150.76 LCY/HourAdjusted multiple scraper team (fleet) hourly production: 2,301.51 LCY/HourUnadjusted unit production/hour: 1,386.45 LCY/Hour

Optimal Number of Scrapers per push dozer: _____

JOB TIME AND COSTFleet size: 2 Team(s)Total job time: 431.97 HoursUnit cost: \$1.216 /LCYTotal job cost: \$1,208,872

SCRAPER TEAM WORKTask description: Arroyo Topsoil PlacementSite: Pueblo Cement Plant and
Limestone QuarryPermit Action: 2024 TR13Permit/Job#: M2002004**PROJECT IDENTIFICATION**Task #: 004
Date: 4/15/2024
User: JLCState: Colorado
County: PuebloAbbreviation: None
Filename: M004-004Agency or organization name: DRMS**HOURLY EQUIPMENT**COSTShift basis: 1 per day

	Equipment Description
-Scraper:	Cat 637G w/push-pull
-Dozer:	NA
Support Equipment -Load Area:	NA
-Dump Area:	NA
Road Maintenance -Motor Grader:	CAT 14M
-Water Truck:	Water Tanker, 10,000 Gal.

Cost Breakdown:

Scraper Work Team

Support Equipment

Maintenance Equipment

	Scraper	Dozer	Load Area	Dump Area	Motor Grader	Water Truck
%Utilization-machine:	100	NA	NA	NA	50	50
Ownership cost/hour:	\$255.23	NA	NA	NA	\$149.33	\$135.95
Operating cost/hour:	\$280.59	NA	NA	NA	\$46.40	\$82.60
%Utilization-ripper:	NA	NA	NA	NA	0	NA
Ripper own. cost/hour:	NA	NA	NA	NA	\$5.83	\$0.00
Ripper op. cost/hour:	NA	NA	NA	NA	\$0.00	\$0.00
Operator cost/hour:	\$47.07	NA	NA	NA	\$46.87	\$0.00
Unit Subtotals:	\$582.89	NA	NA	NA	\$248.43	\$218.55
Number of Units:	6	0	0	0	1	1
Group Subtotals:	Work: \$3,497.34		Support:	\$0.00	Maint:	\$466.98

Total work team cost/hour: \$3,964.32**MATERIAL QUANTITIES**Initial volume: 43,560 CCY
Loose volume: 52,925 LCYSwell factor: 1.215Source of estimated volume: Table L-1 AM-01
Source of estimated swell factor: Cat Handbook**HOURLY PRODUCTION****Scraper Bowl (volume) Basis:**Material weight: 1,600 lbs/LCY
Material description: Top Soil
Rated Payload: 81,600 pounds
Payload Capacity: 51.00 LCYStruck Volume: 24.00 LCY
Heaped Volume: 34.00 LCY
Average Volume: 29.00 LCY
Adjusted Capacity: 29.00 LCY

Cycle Time:Scraper Loading Time: 1.00 MinutesManeuver and Spread Time: 0.60 MinutesJob Condition Correction:

Site Altitude: 5100 feet

	Scraper	Push Dozer	Source
Altitude Adj:	1.000	NA	(CAT HB)
Job Efficiency:	0.830	NA	(CAT HB)
Net Correction:	0.830	NA	

Travel Time:Road Condition: Hard, smooth, stabilized, surfaced, watered, maintained 2.0Haul Route:

Seg #	Haul Distance (Ft)	Grade (%)	Roll. Res (%)	Total Res (%)	Velocity (fpm)	Travel Time (min)
1	1500.00	4.00	2.00	6.00	1477	1.07

Haul Time: 1.07 minutesReturn Route:

Seg #	Haul Distance (Ft)	Grade (%)	Roll. Res (%)	Total Res (%)	Velocity (fpm)	Travel Time (min)
1	1500.00	-4.00	2.00	-2.00	2972	0.56

Return Time: 0.56 minutesTotal Scraper team cycle time: 3.23 minutesAdjusted for job conditions: 894.24 LCY/HourSelected Number of Scrapers: 2 Scraper(s)Adjusted single scraper team (unit) hourly production: 894.24 LCY/HourAdjusted multiple scraper team (fleet) hourly production: 2,682.72 LCY/HourUnadjusted unit production/hour: 1,077.40 LCY/Hour

Optimal Number of Scrapers per push dozer: _____

JOB TIME AND COSTFleet size: 3 Team(s)Total job time: 19.73 HoursUnit cost: \$1.478 /LCYTotal job cost: \$78,209

BULLDOZER RIPPING WORK

Task description: Rip Haul Roads and Conveyor Area

Site: Pueblo Cement Plant and Limestone Quarry Permit Action: 2024 TR13 Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 005 State: Colorado Abbreviation: None
Date: 4/15/2024 County: Pueblo Filename: M004-005
User: JLC

Agency or organization name: DRMS

HOURLY EQUIPMENT COST

Basic Machine: Cat D9T - 9SU Horsepower: 405
Ripper Attachment: 3-Shank Ripper Shift Basis: 1 per day
Data Source: (CRG)

Cost Breakdown:

		Utilization %
Ownership Cost/Hour:	\$238.76	NA
Operating Cost/Hour:	\$162.29	100
Ripper Ownership Cost/Hour:	\$18.32	NA
Ripper Operating Cost/Hour:	\$8.98	100
Operator Cost/Hour:	\$40.04	NA
Total Unit Cost/Hour:	\$468.39	
Total Fleet Cost/Hour:	\$936.77	

MATERIAL QUANTITIES

Selected estimating method: Area

Alternate Methods:

Seismic: NA Bank Volume: NA BCY NA
Area: 58.60 acres Rip Depth (ft): 1.00 Volume: 94,541 BCY or CCY

Source of estimated quantity: Operator Supplied Map from Inspection

HOURLY PRODUCTION

Seismic:

Seismic Velocity: NA feet/second

Area:

Average Ripping Depth: 2.63 feet/pass
Average Ripping Width: 7.67 feet/pass
Average Ripping Length: 400.00 feet/pass
Average Dozer Speed: 88.00 feet/minute
Average Maneuver Time: 0.25 minutes/pass
Production per unit area: 0.881 acres/hour

Job Condition Correction Factors

Unadjusted Hourly Unit Production: 0.881 Acres/hr
Site Altitude: 5,100 feet
Altitude Adj: 1.00 (CAT HB)
Job Efficiency: 0.83 (1 shift/day)
Net Correction: 0.83 multiplier

Adjusted Hourly Unit Production: 0.73 Acres/hr
Adjusted Hourly Fleet Production: 1.46 Acres/hr

JOB TIME AND COST

Fleet size: 2 Grader(s) Total job time: 40.06 Hours

Unit cost: \$640.384 Per acre Total job cost: \$37,526

SCRAPER TEAM WORKTask description: **Pit Area Overburned/Topsoil Placement**Site: **Pueblo Cement Plant and
Limestone Quarry**Permit Action: 2024 TR13Permit/Job#: M2002004**PROJECT IDENTIFICATION**Task #: 006
Date: 4/15/2024
User: JLCState: Colorado
County: PuebloAbbreviation: None
Filename: M004-006Agency or organization name: DRMS**HOURLY EQUIPMENT**COSTShift basis: 1 per day

	Equipment Description
-Scraper:	Cat 637G w/push-pull
-Dozer:	NA
Support Equipment -Load Area:	NA
-Dump Area:	NA
Road Maintenance -Motor Grader:	CAT 14M
-Water Truck:	Water Tanker, 10,000 Gal.

Cost Breakdown:**Scraper Work Team****Support Equipment****Maintenance Equipment**

	Scraper	Dozer	Load Area	Dump Area	Motor Grader	Water Truck
%Utilization-machine:	100	NA	NA	NA	50	50
Ownership cost/hour:	\$255.23	NA	NA	NA	\$149.33	\$135.95
Operating cost/hour:	\$280.59	NA	NA	NA	\$46.40	\$82.60
%Utilization-ripper:	NA	NA	NA	NA	0	NA
Ripper own. cost/hour:	NA	NA	NA	NA	\$5.83	\$0.00
Ripper op. cost/hour:	NA	NA	NA	NA	\$0.00	\$0.00
Operator cost/hour:	\$47.07	NA	NA	NA	\$46.87	\$0.00
Unit Subtotals:	\$582.89	NA	NA	NA	\$248.43	\$218.55
Number of Units:	6	0	0	0	1	1
Group Subtotals:	Work: \$3,497.34		Support:	\$0.00	Maint:	\$466.98

Total work team cost/hour: **\$3,964.32****MATERIAL QUANTITIES**Initial volume: 60,016 CCY
Loose volume: 67,518 LCYSwell factor: 1.125Source of estimated volume: Table L-1 AM-01, Inspection Map, 2'OB+1'TS
Source of estimated swell factor: Cat Handbook**HOURLY PRODUCTION****Scraper Bowl (volume) Basis:**Material weight: 2,650 lbs/LCY
Material description: Decomposed rock - 25% Rock,
75% Earth
Rated Payload: 81,600 poundsStruck Volume: 24.00 LCY
Heaped Volume: 34.00 LCY
Average Volume: 29.00 LCY

Payload Capacity: 30.79 LCYAdjusted Capacity: 29.00 LCYCycle Time:Scraper Loading Time: 1.00 MinutesManeuver and Spread Time: 0.60 MinutesJob Condition Correction:

Site Altitude: 5100 feet

	Scraper	Push Dozer	Source
Altitude Adj:	1.000	NA	(CAT HB)
Job Efficiency:	0.830	NA	(CAT HB)
Net Correction:	0.830	NA	

Travel Time:Road Condition: Hard, smooth, stabilized, surfaced, watered, maintained 2.0Haul Route:

Seg #	Haul Distance (Ft)	Grade (%)	Roll. Res (%)	Total Res (%)	Velocity (fpm)	Travel Time (min)
1	1000.00	4.00	2.00	6.00	1477	0.76

Haul Time: 0.76 minutesReturn Route:

Seg #	Haul Distance (Ft)	Grade (%)	Roll. Res (%)	Total Res (%)	Velocity (fpm)	Travel Time (min)
1	1000.00	-4.00	2.00	-2.00	2972	0.41

Return Time: 0.41 minutesTotal Scraper team cycle time: 2.77 minutesAdjusted for job conditions: 1,042.74 LCY/HourSelected Number of Scrapers: 2 Scraper(s)Adjusted single scraper team (unit) hourly production: 1,042.74 LCY/HourAdjusted multiple scraper team (fleet) hourly production: 3,128.23 LCY/HourUnadjusted unit production/hour: 1,256.32 LCY/Hour

Optimal Number of Scrapers per push dozer: _____

JOB TIME AND COSTFleet size: 3 Team(s)Total job time: 21.58 HoursUnit cost: \$1.267 /LCYTotal job cost: \$85,564

REVEGETATION WORKTask description: **Weed Management**Site: **Pueblo Cement Plant and
Limestone Quarry**Permit Action: **2024 TR13**Permit/Job#: **M2002004****PROJECT IDENTIFICATION**Task #: **007**
Date: **4/15/2024**
User: **JLC**State: **Colorado**
County: **Pueblo**Abbreviation: **None**
Filename: **M004-007**Agency or organization name: **DRMS****FERTILIZING****Materials**

Description	Units / Acre	Unit	Cost / Unit	Cost /Acre
			\$	\$
			Total Fertilizer Materials Cost/Acre	\$0.00

Application

Description	Cost /Acre
	\$
Total Fertilizer Application Cost/Acre	\$0.00

TILLING

Description	Cost /Acre
Weed control spraying (MEANS 31 31 16.13 3100)	\$338.80
Total Tilling Cost/Acre	\$338.80

SEEDING

Seed Mix	Rate – PLS LBS / Acre	Seeds per SQ. FT	Cost /Acre
			\$
Totals Seed Mix	0.00	0.00	\$0.00

Application

Description	Cost /Acre

	\$
Total Seed Application Cost/Acre	\$0.00

MULCHING and MISCELLANEOUS**Materials**

Description	Units / Acre	Unit	Cost / Unit	Cost /Acre
			\$	\$
Total Mulch Materials Cost/Acre				\$0.00

Application

Description	Cost /Acre
	\$
Total Mulch Application Cost/Acre	\$0.00

NURSERY STOCK PLANTING

Common Name	No / Acre	Type and Size	Planting Cost	Fertilizer Pellet Cost	Cost /Acre
					\$
Totals Nursery Stock Cost / Acre					\$0.00

JOB TIME AND COST

No. of Acres: 191.2
 Estimated Failure Rate: 0%
 *Selected Replanting Work Items: NONE

Cost /Acre: \$338.80
 Cost /Acre*: \$0.00

Initial Job Cost: **\$64,778.56**
 Reseeding Job Cost: **\$0.00**
 Total Job Cost: **\$64,779**
 Job Hours: **24.00**

REVEGETATION WORKTask description: Revegetation Arroyo 27 ac and Affected Area 71 acSite: Pueblo Cement Plant and
Limestone QuarryPermit Action: 2024 TR13Permit/Job#: M2002004**PROJECT IDENTIFICATION**Task #: 008
Date: 4/15/2024
User: JLCState: Colorado
County: PuebloAbbreviation: None
Filename: M004-008Agency or organization name: DRMS**FERTILIZING****Materials**

Description	Units / Acre	Unit	Cost / Unit	Cost /Acre
5-10-10, 5-10-15, 6-12-12	100.00	pound	\$0.39	\$39.00
			Total Fertilizer Materials Cost/Acre	\$39.00

Application

Description	Cost /Acre
Tractor towed spreader (MEANS 32 01 90.13 0120)	\$41.82
Total Fertilizer Application Cost/Acre	\$41.82

TILLING

Description	Cost /Acre
Disc harrowing, 6" deep (MEANS 32 91 13.23 6100)	\$112.82
Weed control spraying (MEANS 31 31 16.13 3100)	\$338.80
Total Tilling Cost/Acre	\$451.62

SEEDING

Seed Mix	Rate – PLS LBS / Acre	Seeds per SQ. FT	Cost /Acre
Switchgrass - Blackwell	1.00	8.93	\$11.50
Blue Grama - Native	1.00	16.32	\$13.73
Buffalograss - Native/Plains	2.00	1.93	\$24.13
Sand Dropseed	0.25	29.84	\$2.44
Little Bluestem - Native	1.00	5.97	\$13.57
Sideoats Grama - Vaughn	3.00	9.85	\$25.13
Western Wheatgrass - Native	2.00	5.05	\$12.00
Prairie Junegrass	0.25	13.29	\$6.50

Totals Seed Mix	10.50	91.18	\$108.99
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Application

Description	Cost /Acre
Drill Seeding (DRMS Survey Cost)	\$232.00
Total Seed Application Cost/Acre	\$232.00

MULCHING and MISCELLANEOUS**Materials**

Description	Units / Acre	Unit	Cost / Unit	Cost /Acre
Hay, delivered {MEANS 31 25 14.16 1200}	2.00	TON	\$429.79	\$859.57
Total Mulch Materials Cost/Acre				\$859.57

Application

Description	Cost /Acre
Crimping, with tractor {DMG survey data}	\$74.46
Power mulcher (MEANS 32 91 13.16 0350)	\$147.67
Total Mulch Application Cost/Acre	\$222.13

NURSERY STOCK PLANTING

Common Name	No / Acre	Type and Size	Planting Cost	Fertilizer Pellet Cost	Cost /Acre
					\$
Totals Nursery Stock Cost / Acre					\$0.00

JOB TIME AND COST

No. of Acres:	98	Cost /Acre:	\$1,955.13
Estimated Failure Rate:	25%	Cost /Acre*:	\$340.99
*Selected Replanting Work Items:	SEEDING		

Initial Job Cost:	\$191,602.74
Reseeding Job Cost:	\$8,354.26
Total Job Cost:	\$199,957
Job Hours:	60.00

EQUIPMENT MOBILIZATION/DEMOBILIZATIONTask description: Mobilization/DemobilizationSite: Pueblo Cement Plant and
Limestone QuarryPermit Action: 2024 TR13Permit/Job#: M2002004**PROJECT IDENTIFICATION**

Task #: 009 State: Colorado Abbreviation: None
 Date: 4/15/2024 County: Pueblo Filename: M004-009
 User: JLC

Agency or organization name: DRMS**EQUIPMENT TRANSPORT RIG COST**

Shift basis: 1 per day
 Cost Data Source: CRG Data

Truck Tractor Description: GENERIC ON-HIGHWAY TRUCK TRACTOR, 6X4, DIESEL POWERED,
400 HP (2ND HALF, 2006)Truck Trailer Description: GENERIC FOLDING GOOSENECK, DROP DECK EQUIPMENT
TRAILER (25T, 50T, AND 100T)**Cost Breakdown:**

Available Rig Capacities	0-25 Tons	26-50 Tons	51+ Tons
Ownership Cost/Hour:	\$20.26	\$36.04	\$47.05
Operating Cost/Hour:	\$39.51	\$76.08	\$82.85
Operator Cost/Hour:	\$22.52	\$22.52	\$22.52
Helper Cost/Hour:	\$0.00	\$23.53	\$23.53
Total Unit Cost/Hour:	\$82.29	\$158.17	\$175.95

NON ROADABLE EQUIPMENT:

Machine Description	Weight/ Unit (TONS)	Owner ship Cost/hr/ unit	Haul Rig Cost/hr/unit	Fleet Size	Haul Trip Cost/hr/ fleet	Return Trip Cost/hr/ fleet	DOT Permit Cost/ fleet
Cat D9T - 9SU	66.13	\$257.08	\$175.95	2	\$866.06	\$351.90	\$500.00
CAT 14M	23.57	\$155.16	\$82.29	1	\$237.45	\$82.29	\$250.00
Cat 637G w/push-pull	59.59	\$255.23	\$175.95	6	\$2,587.08	\$1,055.70	\$1,000.00
Water Tanker, 10,000 Gal.	41.10	\$135.95	\$158.17	1	\$294.12	\$158.17	\$250.00
Drill/Broadcast Seeder with Tractor	25.00	\$6.73	\$82.29	2	\$178.04	\$164.58	\$250.00
Power Mulcher (Bowie LD-90)	6.00	\$25.94	\$82.29	1	\$108.23	\$82.29	\$250.00

Subtotals: **\$4,270.98** **\$1,894.93** **\$2,500.00****ROADABLE EQUIPMENT:**

Machine Description	Total Cost/hr/ unit	Fleet Size	Haul Trip Cost/hr/ fleet	Return Trip Cost/hr/ fleet
Light Duty Pickup, 4x4, 3/4 T.	\$15.83	1	\$15.83	\$15.83

Subtotals: **\$15.83** **\$15.83**

EQUIPMENT HAUL DISTANCE and Time

Nearest Major City or Town within project area region:	<u>PUEBLO</u>	
Total one-way travel distance:	<u>10.00</u>	miles
Average Travel Speed:	<u>55.00</u>	mph

Total Non-Roadable Mob/Demob Cost *	<u>\$43,118.38</u>
'* two round trips with haul rig:	
Total Roadable Mob/Demob Cost **	<u>\$5.76</u>
'** one round trip, no haul rig:	

Transportation Cycle Time:

	Non-Roadable Equipment	Roadable Equipment
Haul Time (Hours):	<u>0.18</u>	<u>0.18</u>
Return Time (Hours):	<u>0.18</u>	<u>0.18</u>
Loading Time (Hours):	<u>2.10</u>	<u>NA</u>
Unloading Time (Hours):	<u>2.10</u>	<u>NA</u>
Subtotals:	<u>4.56</u>	<u>0.36</u>

JOB TIME AND COST

Total job time:	<u>9.13</u>	Hours
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Total job cost:	<u>\$43,124</u>
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MISCELLANEOUS TRUCK WORK

Task description: Lube Truck

Site: Pueblo Cement Plant and
Limestone Quarry

Permit Action: 2024 TR13

Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 010
Date: 4/15/2024
User: JLC

State: Colorado
County: Pueblo

Abbreviation: None
Filename: M004-010

Agency or organization name: DRMS

HOURLY EQUIPMENT COST

Make and Model: Lube Truck, 6x4, 250 HP
Attachment 1: _____
Attachment 2: _____
Labor Unit 1: Fuel/Lube Truck Driver
Labor Unit 2: _____

Horsepower: 250
Shift Basis: 1 per day
Weight: _____
(US Tons)

Cost Breakdown:

		Utilization %
Ownership Cost/Hour:	<u>\$16.65</u>	<u>NA</u>
Operating Cost/Hour:	<u>\$37.60</u>	<u>100</u>
Operator Cost/Hour:	<u>\$38.91</u>	<u>NA</u>
Total Unit Cost/Hour:	<u>\$93.16</u>	
Total Fleet Cost/Hour:	<u>\$93.16</u>	

JOB TIME AND COST

Fleet size: 1 Truck(s)

Total job time: 100.00 Hours

Unit cost: \$93.16 /Hour

Total job cost: \$9,316

MISCELLANEOUS TRUCK WORK

Task description: Fuel Truck

Site: Pueblo Cement Plant and
Limestone Quarry

Permit Action: 2024 TR13

Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 011
Date: 4/15/2024
User: JLC

State: Colorado
County: Pueblo

Abbreviation: None
Filename: M004-011

Agency or organization name: DRMS

HOURLY EQUIPMENT COST

Make and Model: Fuel Tanker, 6x4, 210 HP
Attachment 1: _____
Attachment 2: _____
Labor Unit 1: Fuel/Lube Truck Driver
Labor Unit 2: _____

Horsepower: 210
Shift Basis: 1 per day
Weight: _____
(US Tons)

Cost Breakdown:

		Utilization %
Ownership Cost/Hour:	<u>\$16.65</u>	<u>NA</u>
Operating Cost/Hour:	<u>\$37.60</u>	<u>100</u>
Operator Cost/Hour:	<u>\$38.91</u>	<u>NA</u>
Total Unit Cost/Hour:	<u>\$93.16</u>	
Total Fleet Cost/Hour:	<u>\$93.16</u>	

JOB TIME AND COST

Fleet size: 1 Truck(s)

Total job time: 100.00 Hours

Unit cost: \$93.16 /Hour

Total job cost: \$9,316

MISCELLANEOUS TRUCK WORK

Task description: Construction ManagementTruck

Site: Pueblo Cement Plant and
Limestone Quarry

Permit Action: 2024 TR13

Permit/Job#: M2002004

PROJECT IDENTIFICATION

Task #: 012
Date: 4/15/2024
User: JLC

State: Colorado
County: Pueblo

Abbreviation: None
Filename: M004-012

Agency or organization name: DRMS

HOURLY EQUIPMENT COST

Make and Model: Light Duty Pickup, 4x4, 3/4 T.
Attachment 1: _____
Attachment 2: _____
Labor Unit 1: Foreman
Labor Unit 2: _____

Horsepower: 160
Shift Basis: 1 per day
Weight: 2.25
(US Tons)

Cost Breakdown:

		Utilization %
Ownership Cost/Hour:	<u>\$5.01</u>	<u>NA</u>
Operating Cost/Hour:	<u>\$10.82</u>	<u>100</u>
Operator Cost/Hour:	<u>\$72.80</u>	<u>NA</u>
Total Unit Cost/Hour:	<u>\$88.63</u>	
Total Fleet Cost/Hour:	<u>\$88.63</u>	

JOB TIME AND COST

Fleet size: 1 Truck(s)

Total job time: 100.00 Hours

Unit cost: \$88.63 /Hour

Total job cost: \$8,863



COLORADO

**Division of Reclamation,
Mining and Safety**

Department of Natural Resources

**Groundwater Monitoring:
Sampling and Analysis Plan Guidance
Construction Materials and Hard
Rock Sites**

September 2023

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Introduction

This document is intended to provide guidance to permittees of Construction Materials or Hard Rock mines, on the typical requirement of a groundwater sampling and analysis plan, where the proposed operation has the potential to adversely impact the prevailing hydrologic balance of the affected land and of the surrounding area, with respect to the quantity and quality of water in groundwater systems. It is intended to supplement the [Groundwater Monitoring and Protection Technical Bulletin of November 19, 2019](#), and is an attempt to provide more detailed and specific guidance to permittees in an area where the Division has found approaches to compliance have varied widely.

Sites where mining will not expose groundwater, e.g., dry sites or sites where mining will not be near the water table, are not required to submit a groundwater sampling and analysis plan.

A Sampling and Analysis Plan should be tailored to the specific site to which it applies, but this guidance document does not take site-specific factors into account.

The remaining sections of this document are organized under the same headings that the Division would expect to see in a typical groundwater sampling and analysis plan.

Hyperlinks are included in the document text for convenience, and a full list of references is given at the end.

1 Background Information

1.1. Site Description

The Site Description should include the following:

- Name of the site or sampling area. Also include the name or abbreviation (e.g., “the Site”), if any, that will be used throughout the plan.
- A general description of the region in which the site or sampling area is located. Include the street address, city, state, and postal code, if appropriate.
- A detailed description of the physical geography of the site or sampling area. Include a description of the topography, land use/surface cover, any relevant physical features, past and present activities, existing structures. Give the area in acres.
- A description of the geology of the area, including lithology and stratigraphy. Give the composition, thickness and extent of each formation. Identify any faults or other major structural features in the area. Diagrams are often a helpful addition to a geologic description.
- A description of the hydrogeology of the area. Identify each aquifer underlying the site. Characterize each aquifer (hydraulic conductivity, isotropy, confined/unconfined, recharge zones, groundwater flow direction) and describe how the characterization was made. Identify aquitards/confining layers.
- At least two maps:
 - A vicinity map that shows the permit area within its geographic region.
 - A Monitoring Well Location map that shows the sampling sites or sampling areas within the local area. Scale criteria need not be followed for this map. The map should include a layer of projected potentiometric contour lines for each identified aquifer, or a groundwater directional flow arrow (if appropriate). All permitted wells within the map extent should be shown – this information is available from the Division of Water Resources (DWR). All sampling locations (historic, active and planned) should be shown. All springs and seeps should be shown. The outcrop of any geologic formations should be shown. Other physical features and man-made structures may be included for clarity.

All maps should include a title, legend, North arrow, scale bar, date, and section lines/marks. All maps must be prepared and signed by a registered land surveyor, professional, engineer, or other qualified person.

1.2. Baseline Groundwater Characterization

A Sampling and Analysis Plan will be informed by a baseline characterization of groundwater at the site, but may also need to include a plan to collect the data that will allow the initial characterization to be made. Applicants are encouraged to utilize information available from the public domain literature

and private sector data in developing their baseline groundwater characterization. These data sources will not require a Notice of Intent (Rule 5) to perform exploration operations. Private sector sources will likely include environmental site assessments performed as part of land acquisition.

Baseline sampling should be sufficient to allow the Division to assess the impacts of the future mining operation on the prevailing hydrologic balance. Sampling locations should be established upgradient and downgradient of the proposed operation, the number of sampling locations is not specified since it depends greatly on the site, (a minimum of three data points are needed to establish groundwater flow direction). Unless otherwise approved by the Division, all groundwater monitoring wells should be within the permit area. The screened intervals of groundwater monitoring wells should be sufficient to monitor each identified aquifer. Samples should be taken with sufficient frequency to capture site-specific temporal variability. The duration of the sampling period should be sufficient to identify seasonal trends. The minimum sample location, frequency and duration requirements for baseline groundwater characterization are summarized below:

- Upgradient and downgradient sampling locations in each identified aquifer
- Samples taken quarterly
- Five consecutive quarters of data

A table should be included with a row for each sampling location. Each point should have a unique identifier. The table should include the location (Lat/Long), land surface elevation, top of casing elevation, total depth, screened interval, and completion date. The latitude/longitude could be shown in decimal degrees showing five places to the right of decimal, e.g., 39.73934, -104.98486.

Upon request the Division is available for consultation during development of a Sampling and Analysis Plan.

1.2.1. Monitoring Well Installation

All monitoring wells should be:

- Permitted with the State Engineer's Office (SEO) Division of Water Resources (DWR); and
- Constructed (and later abandoned) according to the required SEO standards (see [2 CCR 402-2 Rules and Regulations for Water Well Construction, Pump Installation, Cistern Installation, and Monitoring and Observation Hole/Well Construction](#))

The well construction standards are designed to protect aquifer integrity and to ensure that constructed wells serve their purpose; in this case to provide representative, defensible data. Failure to follow the applicable permitting and well construction rules could result in unacceptable data; and failure to adequately protect groundwater resources could result in subsequent enforcement action as deemed appropriate by DRMS or the SEO.

All wells should be installed by a licensed contractor, as required by SEO. Site specific well placement and construction details should be recorded and approved by a qualified professional,

before being submitted to DRMS.

1.2.2. Baseline Groundwater Quantity

Baseline water level data should be recorded in a table, and a narrative description of how the data was collected should be provided. A graph of the water level against time at each monitoring point should also be included. In most cases a static water level can be measured using a depth gauge from the top of the casing, however if the aquifer is under confined conditions, and the pressure is such that the well is flowing, an alternative method will be necessary (for example: <https://www.usgs.gov/media/videos/measuring-water-levels-a-flowing-well>).

The potentiometric head at the well can be readily derived from the depth to water measurement and the casing elevation. Head measurements from three or more points may be interpolated to give a groundwater flow direction and an approximation of the potentiometric surface in the aquifer. In many cases it will be necessary to collect more data points to adequately characterize the pre-mining conditions.

Often a numerical model (for example: [Modflow](#)) will be an appropriate tool to characterize the hydrogeology of the site. In other cases, the Division acknowledges, routine one-dimensional groundwater equations may be appropriate to evaluate potential offsite hydrologic impacts. If a numerical model is used, it should be thoroughly documented, with all assumptions explicitly stated. The documentation should include:

- An explanation of the conceptual model, with assumptions explicitly stated
- A detailed description of the model grid, with figures
- A list of parameter values for boundary conditions and initial conditions
- Details of the model calibration

1.2.3. Baseline Groundwater Quality

A table should be provided with a complete list of water quality parameters to be measured. This will comprise both field parameters and laboratory analytes. The full parameter list should be based on Tables 1-4 from [Regulation 41: The Basic Standards for Groundwater](#) (Reg. 41). Parameters from these tables have been compiled in Appendix A for Construction Materials sites and Appendix B for Hard Rock sites.

The Division will entertain variances from the Reg. 41 list on a case-by-case basis, but any proposed variance must be justified.

Baseline groundwater quality data should be recorded in a table, with the sampling date. Minimum, maximum and average values for each parameter should be given.

2 Predicted Impacts to Hydrologic Balance

Following the characterization of baseline conditions a prediction should be made as to the possible impacts of the proposed mining operation on groundwater quantity and quality.

The prediction of likely impacts to groundwater quantity should include a prediction of the maximum spatial extent of drawdown caused by dewatering, or of mounding caused by impermeable cell liners/slurry walls, and the time-scale over which it will be observed. The extent and time to recovery to a steady-state following reclamation should also be predicted.

The prediction of impacts to groundwater quality should include a discussion of water quality parameters that may be elevated as a result of the proposed operation, and the likely spatial and temporal extent of the impact. It is noted here that [HB 19-1113](#), which applies to Hard Rock Sites only and was signed into law on April 4, 2019, requires most reclamation plans to demonstrate, by substantial evidence, a reasonably foreseeable end date for any water quality treatment necessary to ensure compliance with applicable water quality standards.

If a numerical model is used to inform any of the hydrologic predictions the model should be thoroughly documented, as discussed in Section 1.2.2.

3 Groundwater Monitoring Plan

A monitoring plan sufficient to verify the predictions of hydrologic impacts should be proposed. The locations of sampling points, and the frequency at which they will be sampled should be specified. A complete list of groundwater quality parameters to be sampled for should be given. A description of sampling methods should be included in sufficient detail to ensure that the procedure can be replicated throughout the life of the permit (Sampling Methods are discussed in more detail below).

A commitment should be made as to how the monitoring data will be reported to the Division. Typically monitoring data will be compiled into a report, to be submitted by a specified date, e.g. annually or quarterly.

The groundwater monitoring report will include:

- Tabulated data for all parameters
- Graphs/plots for selected parameters
- A narrative analysis of the data, with trends and anomalies identified
- A comparison of the observed data to the predictions **and** to the groundwater quality standards (see below)

The requirements of the groundwater monitoring plan may continue to apply until final bond release and termination of jurisdiction. Changes to the groundwater monitoring plan will require a Technical Revision to the permit.

3.1. Groundwater Points of Compliance

It is likely that one or more Groundwater Points of Compliance (POC) will be established, these are locations at which compliance with the applicable standard will be assessed. Detailed guidance on POCs has been given in the [Groundwater Monitoring and Protection Technical Bulletin of November 19, 2019](#), and will not be repeated here. POCs should be identified in the groundwater monitoring plan.

3.2. Groundwater Quality Standards

As is discussed in detail in the [Groundwater Monitoring and Protection Technical Bulletin of November 19, 2019](#), the Division does not have the authority to set groundwater quality standards, but it does have both the authority and the obligation to apply the standards set by the Water Quality Control Commission, (in practice, this often involves the determination of how the Interim Narrative Standard from Reg. 41 should be applied at a site). For the sake of clarity, the numerical values for groundwater quality parameters that represent the applicable standard should be agreed and recorded in a table at the same time the POCs are established.

4 Sampling Methods

The goal of sampling is to make accurate, repeatable field measurements and to collect representative groundwater samples for laboratory analysis. There is no single correct method to conduct groundwater sampling, however there many incorrect methods. Follow accepted best industry practices to ensure that a representative sample is collected and analyzed. Applicable references include those from the [US Environmental Protection Agency](#), and the [US Geological Survey](#).

It is likely that the contracted analytical laboratory will supply detailed instructions for sample collection and handling.

Best practices for sampling:

- Details of sampling events should be recorded – documentation is critical for Quality Assurance
- All samples should be collected on the same day, if possible
- Sampling should occur in a progression from upgradient to downgradient wells
- Depth to water should be measured first
- Field instruments should be calibrated according to manufacturer's specifications prior to use
- Field parameters (temperature, pH, conductivity, dissolved oxygen) should be measured and recorded before and after each purge of the well
- A well should be purged at least three times before samples are collected for lab analysis; if field parameters vary by >10% between consecutive purges, purging should continue up to six times

- Samples should be collected in the appropriate container and handled in a manner appropriate for the analysis
- Manufacturer's instructions for the correct use and disposal of equipment should be followed
- Ship samples well before the holding time is up; ideally, within 24 hours of sample collection
- Do not leave sampling devices in monitoring wells for reuse

References

DRMS Groundwater Monitoring and Protection Technical Bulletin: November 19, 2019

https://drive.google.com/file/d/121Uc_KmuAx7xhc8heQcROPnK_u-kcG-J/view?pli=1

Well Construction Rules

<https://dwr.colorado.gov/services/well-construction-inspection>

Modflow Documentation

<https://www.usgs.gov/mission-areas/water-resources/science/modflow-and-related-programs>

Water Quality Control Commission regulations

<https://cdphe.colorado.gov/water-quality-control-commission-regulations>

EPA Groundwater Sampling Methodology

<https://www.epa.gov/sites/default/files/2015-06/documents/Groundwater-Sampling.pdf>

USGS National Field Manual for the Collection of Water-Quality Data

<https://www.usgs.gov/mission-areas/water-resources/science/national-field-manual-collection-water-quality-data-nfm#overview>

HB 19-1113: Protect Water Quality Adverse Mining Impacts

<https://leg.colorado.gov/bills/hb19-1113>

Appendix A: Full parameter list for Construction Material Sites (with Table Value Standards) from Regulation 41, Tables 1-4

Analyte	Table Value Standard (mg/L, unless other units given)	Reg. 41 Table Reference (1-4)
pH Field (pH unit)	6.50 - 8.50	2 and 3
TDS	400 mg/L, or 1.25X background	4
Chloride - Dissolved	250	2
Fluoride - Dissolved	2	3
Nitrate (NO ₃)	10	1
Nitrite (NO ₂)	1.0	1
Nitrite + Nitrate as Nitrogen	10	1
Sulfate - Dissolved	250	2
Aluminum - Dissolved	5	3
Antimony - Dissolved	0.006	1
Arsenic - Dissolved	0.01	1
Barium - Dissolved	2	1
Beryllium - Dissolved	0.004	1
Boron - Dissolved	0.75	3
Cadmium - Dissolved	0.005	1
Chromium - Dissolved	0.1	1 and 3
Cobalt - Dissolved	0.05	3
Copper - Dissolved	0.2	3
Iron - Dissolved	0.3	2
Lead - Dissolved	0.05	1
Lithium - Dissolved	2.5	3
Manganese - Dissolved	0.05	2
Mercury - Dissolved	0.002	1
Molybdenum - Dissolved	0.21	1
Nickel - Dissolved	0.1	1
Selenium - Dissolved	0.02	3
Silver - Dissolved	0.05	1
Thallium - Dissolved	0.002	1
Uranium - Dissolved	0.0168 to 0.03	1
Vanadium - Dissolved	0.1	3
Zinc - Dissolved	2	3

- These analytes, at a minimum, will be tested for during the five (5) quarters of baseline monitoring. It will be up to the Operator/Permittee to submit a Technical Revision with proper justification to reduce the analyte list.

Appendix B: Full parameter list for Hard Rock Sites (with Table Value Standards) from Regulation 41, Tables 1-4

Analyte	Table Value Standard (mg/L, unless other units given)	Reg. 41 Table Reference (1-4)
pH Field (pH unit)	6.50 - 8.50	2 and 3
TDS	400 mg/L, or 1.25X background	4
Chloride - Dissolved	250	2
Fluoride - Dissolved	2	3
Nitrate (NO ₃)	10	1
Nitrite (NO ₂)	1.0	1
Nitrite + Nitrate as Nitrogen	10	1
Sulfate - Dissolved	250	2
Aluminum - Dissolved	5	3
Antimony - Dissolved	0.006	1
Arsenic - Dissolved	0.01	1
Barium - Dissolved	2	1
Beryllium - Dissolved	0.004	1
Boron - Dissolved	0.75	3
Cadmium - Dissolved	0.005	1
Chromium - Dissolved	0.1	1 and 3
Cobalt - Dissolved	0.05	3
Copper - Dissolved	0.2	3
Iron - Dissolved	0.3	2
Lead - Dissolved	0.05	1
Lithium - Dissolved	2.5	3
Manganese - Dissolved	0.05	2
Mercury - Dissolved	0.002	1
Molybdenum - Dissolved	0.21	1
Nickel - Dissolved	0.1	1
Selenium - Dissolved	0.02	3
Silver - Dissolved	0.05	1
Thallium - Dissolved	0.002	1
Uranium - Dissolved	0.0168 to 0.03	1
Vanadium - Dissolved	0.1	3
Zinc - Dissolved	2	3
Cyanide - Free	0.2	1
Beta and Photon emitters	4 mrem/yr	1
Gross Alpha	15 pCi/L	1

- These analytes, at a minimum, will be tested for during the five (5) quarters of baseline monitoring. It will be up to the Operator/Permittee to submit a Technical Revision with proper justification to reduce the analyte list.