

STATE OF
COLORADO

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M-1980-183 Pit 29 GW Monitoring Additional Information Required

1 message

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Tue, Jan 16, 2024 at 3:23 PM

To: Fred Marvel <fmarvel@brannan1.com>, Emily Schallenkamp <eSchallenkamp@brannan1.com>, Brad Hagen <brad@civilresources.com>, Daniel Dodero <ddodero@brannan1.com>

Cc: Amy Eschberger - DNR <amy.eschberger@state.co.us>, "Lennberg - DNR, Patrick" <patrick.lennberg@state.co.us>

Hello.

The Division reviewed the December 7, 2023 response letter from Civil Resources and the 4th Qtr well monitoring data submitted on January 12, 2024. Please see the attached letter requesting additional information.

Kind Regards,

Nikie Gagnon
Environmental Protection Specialist**COLORADO**
Division of Reclamation,
Mining and Safety
Department of Natural Resources

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2 attachments**Pit 29_GW Level Monitoring_Additional Request.pdf**
281K**Groundwater Monitoring_Sampling and Analysis Plan Guidance.pdf**
319K



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

January 16, 2024

Fred Marvel
Brannan Sand and Gravel Company, LLC
2500 East Brannan Way
Denver, CO 80229

Re: Pit 29, Permit No. M-1980-183, Groundwater Monitoring Results, Additional Information Required

Dear Mr. Marvel:

On December 7, 2023, the Division of Reclamation, Mining and Safety (Division/DRMS) received a response from Brad Hagen, with Civil Resources, LLC, to our review of the submitted 3rd Quarter 2023 Groundwater Level Monitoring Report for Pit 29. After review of this response, the Division requires the following additional information:

1. The Division acknowledges that 2023 has been a higher-than-average precipitation year. However, the water level data submitted to date does not support the statement in Item #1, second bullet of the response, that the "recently observed groundwater level has not exceeded the maximum level observed pre-project east of Pit 29." The Division reviewed the original 1980 permit application for information on baseline or historic groundwater depths at the site. Exhibit G, page 17 of the 1980 application states, "On the basis of 42 registered wells located within ½-mile radii, of which 32 are shallow alluvial wells, the median depth to groundwater level is 23 feet." Additionally, the groundwater level monitoring data submitted to the Division since 2005 shows the deepest groundwater level at MW-1, located on the east side of Pit 29, is 26.87 feet recorded on 3/31/2015. The shallowest level is 14.45 feet recorded on 9/11/2023. The average depth to groundwater reported at MW-1 for monitoring years 2005, 2006, and 2010-2018 is 21.54 feet and the average depth to groundwater reported since the slurry wall repair (2019-2023) is 16.12 feet. Based on this, the depth to groundwater reported at MW-1 is several feet higher today than the depths reported during the first 10 years of monitoring, and the historic depth of 23 feet stated in the original permit application. Please provide the "observed pre-project east of Pit 29" groundwater monitoring data that is referred to in the December 7th response.

On January 12, 2024, the Division received the operator's 4th Quarter 2023 Groundwater Level Monitoring Report, and requires the following:

2. Per the September 2023 DRMS Groundwater Monitoring: Sampling and Analysis Plan Guidance (enclosed; see Section 1.2), the table of water level data should include the



location (Lat/Long), land surface elevation, top of casing elevation, total depth, screened interval, and completion date for each monitoring well. Additionally, please include a 2nd data table that shows the groundwater elevation for each measurement to date and include a graph displaying the elevation data for each well over time. A map showing the monitoring well locations should also be included with the report. Please revise and resubmit the 4th Quarter 2023 Groundwater Level Monitoring Report to meet these requirements and ensure all future monitoring reports are submitted accordingly.

Please provide the requested information to the Division within 30 days of this letter, by February 15, 2024. The Division reserves the right to further supplement this document with additional items and details as necessary. If you need additional information or have any questions, please contact me at the address below or by telephone at 303-866-3567 x 8126 or by email at nikie.gagnon@state.co.us.

Sincerely,

Nikie

Gagnon

Digitally signed by Nikie Gagnon
DN: cn=Nikie Gagnon, o=Department
of Natural Resources, ou=Division of
Reclamation, Mining and Safety,
email=nikie.gagnon@state.co.us,
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Date: 2024.01.16 15:07:13 -0700

Nikie Gagnon
Environmental Protection Specialist

Enclosure: DRMS Groundwater Monitoring: Sampling and Analysis Plan Guidance, September 2023

ec: Brad Hagen, Civil Resources, LLC
Emily Schallenkamp, Brannan Sand and Gravel
Daniel Doderio, Brannan Sand and Gravel
Amy Eschberger, DRMS
Patrick Lennberg, DRMS



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

Contents

Introduction 3

1 Background Information..... 4

1.1. Site Description 4

1.2. Baseline Groundwater Characterization 4

1.2.1. Monitoring Well Installation 5

1.2.2. Baseline Groundwater Quantity 5

1.2.3. Baseline Groundwater Quality..... 6

2 Predicted Impacts to Hydrologic Balance..... 6

3 Groundwater Monitoring Plan..... 7

3.1. Groundwater Points of Compliance..... 7

3.2. Groundwater Quality Standards..... 7

4 Sampling Methods 8

References 9

Appendix A: Full parameter list (with table value standards) from Regulation 41, Tables 1-4..... 10

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.