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GROUND WATER DISCHARGE PERMIT UGW270008
STATEMENT OF BASIS

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December 2020

Introduction

The Division of Water Quality (DWQ) under the authority of the Utah Ground Water Quality Protection Rules[1](Ground Water Rules) issues ground water discharge permits to facilities which have a potential to discharge contaminants to ground water[2]. As defined by the Ground Water Rules, such facilities include mining operations.[3] The Ground Water Rules are based on an anti-degradation strategy for ground water protection as opposed to non-degradation; therefore, discharge of contaminants to ground water may be allowed provided that current and future beneficial uses of the ground water are not impaired and the other requirements of Rule 317-6-6.4.A are met.[4] Following this strategy, ground water is divided into classes based on its quality[5]; and higher-quality ground water is given greater protection[6] due to the greater potential for beneficial uses. DWQ has developed permit conditions consistent with R317-6 and appropriate to the nature of the mined materials, facility operations, maintenance, best available technology[7] (BAT) and the hydrogeologic and climatic conditions of the site, to ensure that the operation would not contaminate ground water.

Basis for Permit Issuance

Under Rule 317-6-6.4A, DWQ may issue a ground water discharge permit if:

1) The applicant demonstrates that the applicable class TDS limits, ground water quality standards protection levels and permit limits established under R317-6-6.4E will be met;
2) The monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;
3) The applicant is using best available technology to minimize the discharge of any pollutant; and
4) There is no impairment of present and future beneficial uses of ground water.

1 Utah Admin. Code Rule 317-6
2 https://deq.utah.gov/ProgramsServices/programs/water/groundwater/docs/2008/08Aug/GWQP_PermitInfo.pdf
3 Utah Admin Code Rule 317-6-6.1A
4 Preamble to the Ground Water Quality Protection Regulations of the State of Utah, sec. 2.1, August, 1989
5 Utah Admin. Code Rule 317-6-3
6 Utah Admin. Code Rule 317-6-4
7 Utah Admin. Code Rule 317-6-1(1.3)

Purpose

Ground Water Discharge Permit UGW270008 is undergoing the renewal process which occurs every five years. The permit was originally issued in 2013 then renewed during a modification to add a second evaporation pond in 2015. Sawtooth Caverns, LLC is the current operator of the solution mining facility.

Sawtooth Caverns, LLC is operating a Natural Gas Liquids Storage Facility (Project) in Millard County, Utah approximately 10 miles north of Delta. The Project entails solution mining storage caverns in a subsurface salt deposit for the purpose of storing propane, butane, and other refined hydrocarbons as approved. The resulting brine from the solution mining process is stored in two above ground earthen ponds for evaporation. The Project lies within an approximately 750-acre site located on Utah School and Institutional Trust Lands Administration (SITLA) lands. This Ground Water Discharge Permit requires best available technology and ground water compliance monitoring for two 159 acre brine evaporation ponds.

The brine evaporation ponds were constructed using a combination of excavation into the ground surface and the construction of elevated berms. Berms have an external height of up to 45 feet above the ground level, with internal excavation depths up to 20 feet. The ponds are approximately 42 feet deep. Berms are constructed with 2H:1V exterior slopes, 2.5H:1V interior slopes, and a 22-foot wide platform on top to allow berm/pond maintenance. During brine evaporation, a minimum of 3 feet of freeboard is maintained in the ponds to allow adequate storage area for incidental precipitation. The ponds were constructed with a compacted subgrade and double lining system with a leak detection system to ensure adequate protection of the groundwater and the environment.

Geologic Description

Regional. The brine evaporation ponds are situated overtop of the subsurface salt deposit in the Sevier – Black Rock Desert in the Basin and Range physiographic province of Utah. The mountains that surround the basin of the Sevier Desert are composed of a variety of consolidated sedimentary, metamorphic and igneous rock. The basin is underlain by deposits that consist primarily of semi-consolidated and unconsolidated sediments of Tertiary and Quaternary age. The basin-fill includes sand, silt, clay and gravel deposited as alluvial fans, stream alluvium, mudflows, lacustrine (lake) sediments and deltas. The basin fill also contains scattered basalt flows and tuffs of late Tertiary and Quaternary age. Tertiary and Quaternary basin-fill deposits are over 7,000 feet thick. Oligocene and Miocene basin-fill sediments contained evaporate deposits. Through time, evaporites in the area flowed to form a salt dome.

The soil profile at the site consists of three units. The upper unit is comprised of fine-grained glacial lacustrine deposits consisting of deep-water calcareous silts and may contain younger alluvium up to 10 feet thick. The upper unit is underlain by pre-Lake Bonneville alluvium consisting of sand and sandy gravel beds. The lower unit consists of

alluvium, silt and sandy silt deposited in large low-gradient alluvial fans, river terraces, and abandoned river channels on the river delta. This unit ranges up to 30 feet in thickness.

Hydrogeology

The principal regional groundwater system is the unconsolidated basin-fill deposits that formed from erosion of the surrounding mountains and were laid down by streams, lakes, and mudflows. These regional deposits consist of interbedded and lenticular deposits of clay, silt, sand, gravel and boulders. The regional depositional processes created alternating and interfingering layers and lenses with regional horizontal and vertical heterogeneity. Differences in sorting and grain size influence local permeability and storage capacity, which can vary greatly depending on the nature of local depositional processes. Sediments are generally coarser near the mountain front and grade finer towards the valley centers. Stream channel deposits are coarser and better sorted than alluvial fan and mudflow deposits that generally occur at the base of steep drainages. Vast lakes that occupied the valleys many thousands of years ago deposited interbedded clay and finegrained sands. Rivers flowing into these lakes formed coarse-grained delta deposits near the ancient lake shore, such as near the mouth of Leamington Canyon.

Recharge to the principal groundwater aquifer system (basin-fill deposits) in the Sevier Desert occurs by stream infiltration along mountain fronts, subsurface inflow from consolidated rocks of mountain areas, subsurface inflow from adjoining basins, seepage from rivers, canals, reservoirs and unconsumed irrigation. Groundwater generally flows from recharge areas near the mountains on the northeast and east of the Sevier Desert toward discharge areas in the central and western parts of the area.

Aquifers in the area have been clearly defined using data collected during the installation of multiple wells constructed in the region around the facility, including Test Well MH-1 installed in 2009. The unconfined water table aquifer is located above the shallow artesian aquifer and is generally confined to the upper 50 to 150 feet, the shallow artesian aquifer to depths of about 150 to 700 feet, and the deep artesian aquifer between about 700 to 1,400 feet (the bottom of historically drilled wells). A previously undefined deeper confined aquifer (defined as the basement aquifer) is located at depths greater than 1,400 feet.

Ground Water Quality

Ground Water Classification. Ground water data from monitoring wells at the site indicates background water quality in the area is Class II – Drinking Water Quality Ground Water with total dissolved solids (TDS) greater than 500 mg/L and less than 3,000 mg/L. Protection levels have been established in accordance with UAC R317-6-4.5 for chloride, sodium, and TDS and are included in Table 2 of the ground water discharge permit.

Compliance Monitoring Program. Monitoring wells are sampled quarterly to determine if ground water quality has been impacted by the brine evaporation ponds. The following key leakage parameters were selected for compliance monitoring based on their high concentrations in the mine water compared to concentrations in shallow ground water:

- TDS
- Chloride
- Sodium

In addition, the Utah Tier 1 hydrocarbon constituent list parameters are analyzed to monitor for the presence of refined petroleum products.

Best Available Technology (BAT)

The brine evaporation ponds are lined with a synthetic double liner system. The primary liner consists of 80-mil HDPE geomembrane liner. The secondary liner consists of 60-mil HDPE geomembrane drain liner with 130-mil high raised studs supporting the primary liner. The studs create an unpressurized drainage space between the liners. The drainage gap allows fluid to flow freely to a collection sump where it can be removed and pumped back into the pond.

BAT Performance Monitoring

Best available technology monitoring includes minimum vertical freeboard, maximum allowable leakage rate, and maximum allowable head monitoring. These performance standards are based on the precedence of previous ground water discharge permits and *Action Leakage Rates For Leak Detection Systems* (EPA, January 1992).

Minimum Vertical Freeboard. A minimum of 36 inches of vertical freeboard shall be maintained to ensure total containment of solution mining liquids.

Maximum Allowable Leakage Rate. The leak detection system is the primary compliance monitoring point because it is the early warning system that demonstrates protection of ground water quality. The maximum allowable leakage rate established by EPA is 200 gallons per acre per day. Based on a pond area of approximately 159 acres, the maximum allowable leakage rate through the primary HDPE liner is 465 gallons per minute.

Maximum Allowable Head. The maximum allowable head imposed on the secondary HDPE liner and leak detection sump has been established at 1 foot, equivalent to a leakage rate of 11 gpm in the process component monitoring system (PCMS). Any fluids collected in the leak detection sump are pumped back to the brine evaporation ponds. As long as the leak detection system complies with the BAT performance standards of the permit, the facility is compliant. In the event that the leak detection system has flows or heads that exceed the BAT performance standards of the permit, a BAT failure exists and the permittee will be required to regain BAT by a number of solutions including identifying and repairing the BAT failure.

Potential Impacts to Ground Water

Potential impacts to ground water have been minimized by employing best available technology for the brine evaporation ponds. The Division of Water Quality conducts periodic onsite inspections of the facilities described above. The *Sawtooth Brine Pond 1 and 2 Operating Plan* is attached and enforceable as an appendix to the ground water discharge permit to ensure that the facility is operated in accordance with design specifications, and also ensures that any indications of facility problems will be detected early and resolved. In addition to BAT performance monitoring, ground water quality monitoring of the water table aquifer is conducted in monitoring wells to determine if ground water quality has been impacted by the brine evaporation ponds.

Compliance History

Ground water protection level exceedances were first detected in a monitoring well at the site (GA-13) in December 2016. As a result, a Source Assessment and Contamination Study (SACS) Plan was submitted to DWQ in February 2017 in accordance with permit requirements.

The SACS identified two possible sources of contamination. The first incident was a liner tear in Pond 1 in May 2015. A pump was being replaced and the liner was inadvertently compromised while removing the faulty pump. The pond was emptied, the liner was repaired and there has not been further evidence of leakage.

In addition, several time periods where identified when inoperable pumps in the leak detection sumps caused increased hydraulic head. It was concluded the increased head pressure was also a potential cause of seepage from the pond liners into the environment. Improved pump maintenance procedures were implemented to prevent a recurrence.

During routine ground water compliance sampling, two additional monitoring wells (GA-15 and GA-17) were subsequently found to be in exceedance of ground water protection levels. This led to a revised SACS submitted in May 2018 proposing subsurface investigation activities to determine the extent of ground water exceeding protection levels as a result of the previous brine pond releases.

Data collected during the subsurface investigation was presented in a report submitted in November 2018. The report concluded that the down gradient extent of ground water that was above protection levels had been determined through a series of direct push borings and temporary monitoring wells installed during the investigation.

DWQ provided comments on the report which led to a “Phase 3” investigation conducted by Sawtooth to, among other things, evaluate potential ground water remedial options at the site.

A report documenting the Phase 3 investigation activities was submitted to DWQ in October 2020. DWQ is in the process of reviewing this report and further requirements under the ground water discharge permit regarding investigation and remediation activities are forthcoming.

Compliance Schedule Items

In addition to routine monitoring data submitted to the DWQ in quarterly reports, requirements and deadlines for submitting future plans and documents are specified in the Compliance Schedule under Part II.G of the permit and include the following:

- Revised organization chart
- Revised quarterly report format
- Revised Sawtooth Brine Pond 1 and 2 Operating Plan
- Revised Ground Water Monitoring Plan
- Final Closure Plan

Each submittal is subject to review by DWQ and upon approval by the Director becomes enforceable under the permit.