GROUND WATER DISCHARGE PERMIT UGW270008
STATEMENT OF BASIS

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Purpose

Magnum NGLs Solution Mining, LLC (Magnum) is constructing 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 and butane. The resulting brine from the solution mining process will be stored in an above ground earthen pond 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 will require best available technology and ground water compliance monitoring for a 159 acre brine evaporation pond.

The brine evaporation pond will be constructed using a combination of excavation into the ground surface and the construction of elevated berms. Berms would have an external height of up to 45 feet above the ground level, with internal excavation depths up to 20 feet, depending on undisturbed land contours. The pond will be approximately 42 feet deep. Berms would be 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 would be maintained in the pond to allow adequate storage area for incidental precipitation. The pond would be constructed with a compacted subgrade and double lining system with a proactive leak detection system to ensure adequate protection of the groundwater and the environment.

Geologic Description

Regional. The brine evaporation pond is 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 Magnum site, including Magnum's MH-1 Test Well (constructed 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. In accordance with UAC R317-6-3.5 and ground water quality data provided in the permit application which includes ground water in in area waters source wells and nearby groundwater compliance wells, is classified as Class II Drinking Water Quality Ground Water in the deeper aquifers. The shallow water table

aquifer underlying the evaporation pond has not been tested yet. As required in Part I.H.1 of the permit, an accelerated background monitoring program will be completed by the permittee to collect data for calculating well-specific background ground water quality statistics. After securing Director approval of the Accelerated Background Monitoring Report, background concentrations will be adjusted in accordance with the reopener provision in Part IV.N of the permit.

Class II Protection Levels. In accordance with UAC R317-6-4.5, Class II ground water will be protected for use as drinking water or other similar beneficial use with conventional treatment prior to use. Class II protection levels are established in accordance with the following criteria in UAC R317-6-4.2B:

a. Total dissolved solids (TDS) may not exceed the greater of 1.25 times the background concentration or the background plus two standard deviations.

b. When a contaminant is present in a detectable amount as a background concentration, the concentration of the pollutant may not exceed the greater of 1.25 times the background concentration, 0.25 times the ground water quality standard, or background plus two standard deviations; however, in no case will the concentration of a pollutant be allowed to exceed the ground water quality standard.

c. When a contaminant is not present in a detectable amount as a background concentration, the concentration of the pollutant may not exceed the greater of 0.25 times the ground water quality standard, or the limit of detection.

Because the accelerated background monitoring program has not been completed, interim Class II protection levels were established by the greater of 1.25 times the background concentration or 0.25 times the ground water quality standard. In accordance with Part 1.H.b of the permit, protection levels may be adjusted when the accelerated background monitoring program has been completed by the permittee and approved by the Director.

Compliance Monitoring Program. A quarterly compliance monitoring program will commence when solution mining operations begin. 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

Best Available Technology (BAT)

The brine evaporation pond will be lined with a synthetic double liner system. The primary liner will consist of 80-mil HDPE geomembrane liner covering the full upstream embankment and basin of the pond. No horizontal joints will be allowed on the interior slopes. Horizontal joints and welds will be made a minimum distance of 5 feet onto the pond floor from the inside toe of the pond slopes, thus eliminating stress on the horizontal

joints. The liner will be hot wedge welded to ensure continuous uninterrupted watertight containment. The secondary liner will consist 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. The liner will be hot wedge welded to ensure continuous uninterrupted watertight containment.

BAT Performance Monitoring

Best available technology monitoring will include 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 will be determined following system construction. Any fluids collected in the leak detection sump will be pumped back to the brine evaporation pond. 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 such as a liner leak, or conducting contaminant transport modeling to demonstrate that ground water quality is protected despite the exceedence of BAT performance standards.

Potential Impacts to Ground Water

Potential impacts to ground water have been minimized by employing best available technology for the brine evaporation pond. The Division of Water Quality will provide periodic onsite inspections during construction and operation of the facilities described above. The Brine Evaporation Pond Operating Manual, which the permittee is required to be submitted to the Executive Secretary, will ensure that the facility is operated in accordance with design specifications and will also ensure that any early 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 will be conducted in monitoring wells to determine if ground water quality has been impacted by the brine evaporation pond.

Compliance Schedule Items

Accelerated Background Ground Water Monitoring Report. The Permittee shall submit a background ground water monitoring report for Director approval 60 days after the accelerated background monitoring program has been completed in accordance with the following requirements:

a) At least eight (8) samples will be collected for each compliance monitoring well and parameter over a two year period at a quarterly sampling frequency utilizing the procedures outlined in the approved Brine Evaporation Pond Water Table Aquifer Monitoring Program.

b) Each sampling event will include independent water samples for each compliance monitoring well.

c) Samples will be analyzed for all parameters listed in Table 1 of the permit plus the major ions calcium, magnesium, potassium, and sodium.

d) All data for each well and parameter will be validated and the following statistical calculations will be performed and reported:

- Mean concentration
- Standard deviation
- Mean concentration plus 2 standard deviations
- Mean concentration times 1.25 for Class II ground water wells

In accordance with Part IV.N.3 of the permit, ground water protection levels may be adjusted when the accelerated background monitoring program has been completed by the permittee and approved by the Director.

Water Quality Sampling Plan. The permittee submitted water quality sampling and protection plans with the permit application. These plans will be incorporated as enforceable Appendices A and C of the permit and shall be updated or modified as required by the Director. The revised plans will be submitted for approval, within 60 days following receipt of notice from the Director that updates or revisions to the plan are required.

Brine Evaporation Pond Operating Manual. After evaporation pond construction is completed, the Permittee shall submit a BAT monitoring system design and operating manual to the Director and secure approval of the plan prior to the start of solution

mining operations. The plan will include all procedures and methods sufficient to ensure compliance with the BAT performance standards of Part I.D.2 of the permit. The manual should include a description of the monitoring components, general instructions for use, and a design plat of the monitoring points. The approved document will become an enforceable Appendix D to this permit.

Final Closure Plan. In the event that the permittee decides to discontinue its operations at the facility the permittee shall notify the Director of such a decision and submit a Final Closure Plan within 180 days. The Final Closure Plan shall be submitted no later than 180 days prior to the closure of the facility. The permittee shall resubmit Final Closure Plans within 60 days of receipt of written notice of deficiencies therein.

Permit Application Documents

The following documents are considered part of the ground water quality discharge permit application and will be kept as part of the administrative file.

1. Magnum NGLs Brine Evaporation Pond Storage Project Ground Water Discharge Permit Application Supporting Documents, prepared and submitted by Cardno Entrix for Magnum NGLs Solution Mining, LLC, June 4, 2013.
2. Underground Injection Control Permit for Magnum NGLs Brine Evaporation Pond Storage Project UTU-27-AP-9232389, issued by Walter L. Baker, P.E, Director of the Utah Water Quality Board, January 18, 2012
3. Construction Permit for Magnum NGLs Brine Evaporation Pond Storage Project, issued by Walter L. Baker, P.E, Director of the Utah Water Quality Board, August 7, 2012.
4. Magnum NGLs Brine Evaporation Pond Storage Project LCRS & PCMS Leakage Rate Calculations prepared and submitted by AMEC for Magnum NGLs Solution Mining, LLC, May 23, 2011