STATEMENT OF BASIS

GROUND WATER DISCHARGE PERMIT UGW190002

OWL Danish Flats SWD
Evaporation Ponds
Grand County, Utah

October 2019

Purpose

OWL Danish Flats SWD has constructed lined evaporation ponds to contain and evaporate fresh and saline fluids obtained from a variety of ground water and surface water sources. This Ground Water Discharge Permit will require best available technology and compliance monitoring for 6 evaporation ponds in the Phase 2 area on the northwest portion of the facility. The facility is located in the Danish Flats area 2.5 miles north of I-70 interchange Exit 214, approximately 43 miles west of the Utah-Colorado border, in Section 8, Township 20 South, Range 24 East, in Grand County, Utah. The property is privately owned. The Danish Flats area is a desert landscape that gradually slopes to the southeast.

Site Geology and Hydrogeology

Geology

The Danish Flats area is part of the Greater Cisco area and is located in the Mancos Shale lowlands where weathered Mancos Shale is exposed at the surface over most of the area. Based on site boring logs from a geotechnical investigation, the site-specific geology consists of 15 to 40 feet of silty clay derived from and underlain by the Mancos Shale Formation. The Mancos Shale Formation is a marine deposit consisting of gray, thin-bedded, fissile shale ranging from 3,500 feet thick in western Grand County to 4,000 feet thick near the Utah-Colorado border (Hettinger and Kirschbaum, 2003). Soils associated with the Mancos Shale are alkaline and may have high concentrations of selenium. As a result, surface water in ephemeral washes is likely to have high salinity, high turbidity, considerable hardness, and elevated levels of sulfate and selenium. The Mancos Shale is between 900 and 1,000 feet thick in the Danish Flats area.

Hydrogeology

Shallow ground water in the Greater Cisco area is limited to alluvial deposits along ephemeral washes and drainages. There are no major watercourses on or near the project site. Ground water was not encountered in any of the Danish Flats site soil borings. Therefore, the first ground water that would be encountered would be in discontinuous sandstone channel lenses within the Mancos Shale. The Mancos Shale overall does not yield ground water and forms an effective aquitard that inhibits ground water migration. Ground water that comes in contact with the Mancos Shale typically contains very high total dissolved solids concentrations due the high content of sulfate. Potential aquifers below the Mancos Shale are discontinuous stream channel sandstones of the Dakota, Cedar Mountain, and Morrison formations. However, these sandstones are the hydrocarbon reservoirs for oil and gas production in the Greater Cisco area and any ground water contained in them would most likely be saline. This is supported by the hydrostatic gradient in Dakota and Morrison hydrocarbon reservoirs in and the presence of saline water in the

Morrison Formation near Cisco. A search of the Utah Division of Water Rights data base indicates no water wells have been drilled within a 5-mile radius of the project site.

Ground Water Quality

Ground Water Classification

As indicated by the site geology and hydrogeology above, the presence of at least 900 feet of Mancos Shale coupled with the absence or poor quality of shallow ground water beneath the site indicate a very low risk and low vulnerability to ground water quality. The site is assigned Class IV Protection Levels based on the lack of a shallow aquifer and the characteristics of the Mancos Shale.

Class IV Protection Levels

In accordance with UAC R317-6-4.7, Class IV ground water protection levels are established to protect human health and the environment.

Best Available Technology (BAT)

The composite liner system consists of a 6-inch clay underliner with a permeability of $1x10^{-5}$ cm/sec overlain by a 60-mil high-density polyethylene (HDPE) primary synthetic liner. Although the permeability of the clay underliner is an order of magnitude greater than the DWQ municipal lagoon clay liner specification, the primary liner is a 60-mil HDPE flexible membrane liner (FML). In addition to the safety factor provided by the 60-mil primary liner, a leak detection system has been installed. The ponds are slightly sloped at a minimum of 0.4% with a gravel/pipe trench leak detection system at the low end of each pond under the clay and FML liners. A riser access pipe from the trench is used for leak detection sump inspection. A perimeter berm was also constructed to prevent any surface water from entering or leaving the Phase 2 complex.

BAT Performance Monitoring

Source Water Monitoring

Non-hazardous, low and high salinity fluids will be placed into the ponds and evaporated. Regular pond water sample collection is not a condition of this permit. However, the operator will obtain laboratory analyses of any proposed discharge water of unknown character prior to placement into the ponds. Excepting dissolved metals in water, hazardous or radioactive waste materials cannot be discharged into the Phase 2 ponds without a permit amendment, as these wastes are subject to other DEQ disposal regulations. Storage and evaporation of petroleum E&P wastes is limited to the Phase 1 evaporation ponds under the jurisdiction of DOGM on the southeast portion of the facility.

Best Available Technology Monitoring

BAT monitoring will include minimum vertical freeboard, leak detection sump monitoring, 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 24 inches of vertical freeboard shall be maintained to ensure total containment of

untreated mine water and filter backwash.

Leak Detection Sump Monitoring

Monitoring of the sumps will be conducted on a weekly basis throughout the term of the permit. Detection of any sump fluids will be recorded and reported.

Maximum Allowable Head

Any fluids collected in the leak detection sump will be pumped back to the evaporation pond so that the water level in the leak detection sump is always less than one foot. 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 liner leak.

Potential Impacts to Ground Water

Potential impacts to ground water have been minimized by employing best available technology for the Evaporation Ponds. The Division of Water Quality will provide periodic onsite inspections during construction and operation of the facilities described above. The BAT performance monitoring plan, which the permittee is required to be submitted to the Director, will ensure that the facility is operated in accordance with design specifications and will also ensure that any indications of facility problems will be detected early and resolved.

Compliance Schedule Items

BAT Performance Monitoring Plan

The Permittee shall submit a revised and updated version of the BAT monitoring plan to the Director and secure approval of the plan. The plan will include all procedures and methods sufficient to ensure compliance with the BAT performance standards of Part I.D.3 of the permit, including minimum vertical freeboard of the ponds, maximum allowable leakage rate and maximum allowable head for the Evaporation Pond leak detection system. The approved document will become an enforceable Appendix C to this permit.

Reference Cited:

R.D. Hettinger and Mark A. Kirschbaum, 2003, Stratigraphy of the Upper Cretaceous Mancos Shale (Upper Part) and Mesaverde Group in the Southern Part of the Uinta and Piceance Basins, Utah and Colorado, Chapter 12 of U.S. Geological Survey Digital Data Series DDS-69-B http://pubs.usgs.gov/dds/dds-069/dds-069-b/REPORTS/Chapter_12.pdf