STATEMENT OF BASIS

GROUND WATER DISCHARGE PERMIT UGW270001

MATERION NATURAL RESOURCES TAILINGS POND

August 2019

PURPOSE

The purpose of this statement of basis is to describe the Materion Natural Resources (formerly Brush Resources) tailings pond facility and changes made to the permit as part of the permit renewal process.

DESCRIPTION OF FACILITY AND BACKGROUND INFORMATION

The Materion Natural Resources beryllium mill is located approximately ten miles north of Delta, in Millard County, Utah. The plant was constructed in 1968 and began operation in 1969. The plant extracts beryllium from bertrandite ore mined at Materion Natural Resources' mine located about fifty-five miles to the west, and from high-grade beryl ores imported from throughout the world. The facility also reprocesses beryllium hydroxide precipitate from their refinery in Elmore, Ohio. The beryllium concentrate produces a moist precipitate, which is packaged in drums and shipped to Brush Wellman refinery in Ohio. All plant wastewater and tailings are disposed of in a 220-acre tailings pond at the plant site. This tailings pond has received all of the wastewater and tailings from the mill facility since 1969. Subsurface investigations conducted by Materion Natural Resources discovered that a seepage mound had developed in previously unsaturated sediments under the tailings pond.

The original ground water discharge permit required the permittee to modify the tailings pond to reduce the seepage rate and to take measures to protect ground water from potential contamination. As the result of studies, a discharge minimization technology (DMT) was approved for the existing facility and incorporated into the permit as performance criteria.

To comply with permit requirements during previous permit terms, Materion Natural Resources has completed slime sealing of the tailings pond, installed an additional 20 monitoring wells to better define the seepage mound footprint, installed and continuously pumped 34 seepage mound recovery wells, and acquired all the land overlying the current seepage mound footprint and its projected lateral extent. Discharge Minimization Technology (DMT) instituted by Materion Natural Resources during previous permit terms to reduce seepage mound volume will continue through the current permit term.

SITE HYDROGEOLOGY

The mill site is located in the Sevier Basin of the Basin and Range Physiographic Province. This province includes the isolated deserts, valleys, and salt flats of western Utah. The Sevier Basin was formed as a result of faulting during late Miocene time, and was then filled with

unconsolidated deposits of eolian, fluvial, and lacustrine origin. Recharge to the valley-fill sediments is primarily infiltration of snow melt, surface runoff, and direct precipitation. Ground water recharge to the area is predominantly from the North Tintic and Tintic Mountains to the northeast. Ground water discharge is principally through evapo-transpiration, interbasin flow, and ground water pumpage by wells.

The subsurface stratigraphy of the site is comprised of shallow sediments underlain by two permeable aquifers. All three zones are separated by laterally extensive clay layers that act as aquicludes. Shallow sediments are stratified units comprised of gravels, sands, and silts that are considered highly permeable but are not saturated by naturally occurring recharge processes. Seepage from the tailings pond has led to saturation of vadose zone sediments from the surface to the top of the first clay aquiclude. The aerial extent of this seepage mound is documented by extensive monitoring well control and is currently contained on land owned by Materion Natural Resources.

Saturated sediments represent a multiple aquifer system and are zoned into two coarse-grained, permeable aquifers: an upper confined aquifer, and a lower confined aquifer. The upper artesian aquifer consists primarily of silty, fine to medium coarse sand and sandy gravel, with some local silty fine sand layers. Based on water level measurements, an upward hydraulic gradient exists in this aquifer. Wells completed in the upper artesian aquifer are monitored by compliance wells as one component of the compliance monitoring program for the site. The lower confined aquifer is used as a water supply source for the general area.

GROUND WATER CLASSIFICATION

The ground water classification of the upper artesian aquifer under the tailings pond is Class IA Pristine ground water to Class II Drinking Water Quality ground water with an average total dissolved solids of approximately 465 mg/l. Class IA quality ground water is found in upgradient monitoring wells MW-31 (408 ± 41 mg/L) and NSW (334 ± 80 mg/L) and downgradient wells DH-55 (499 ± 115 mg/L) and DH-56 (497 ± 27 mg/L). Upgradient well DH-14 (535 ± 569 mg/L) and down gradient monitoring well DH-57 (526 ± 24 mg/L) contain Class II Drinking Water Quality ground water. The average upgradient total dissolved solids concentration is 414 ± 303 mg/L while the downgradient TDS concentration is 508 ± 70 mg/L.

Background water quality is based on historical data prior to original permit issuance and subsequent compliance data collected as a permit requirement from the monitoring wells screened in the upper artesian aquifer. These wells are listed in Table 1 of this Statement of Basis. Materion Natural Resources has also conducted numerous hydrogeologic investigations of aquifer conditions and water quality.

BASIS FOR SPECIFIC PERMIT CONDITIONS

The intent of the discharge minimization technology is to stabilize the extent and ultimately reduce the volume of the unsaturated zone seepage mound by dewatering portions of the mound. Materion Natural Resources will pump the maximum amount of water possible from the seepage mound extraction pumping system. The focus of the mound stabilization is to pump from the highest

producing recovery wells with secondary effort employed on locations that have limited production and a higher propensity for monitoring well and pump repairs. If it is determined that the seepage mound recovery system extraction rate is insufficient to keep up with tailings pond seepage, and mound volume increases by more than 10%, a minimum extraction rate may again be invoked as a DMT requirement by DWQ. Final containment and dissipation of the seepage mound is addressed in the currently approved Closure Plan prepared by Materion Natural Resources.

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Materion Natural Resources

Table 1

Groundwater Quality of Background Wells

Parameter	G.W. Standard	Limit of Detection	Stockwell Mean	DH 14A Mean	MW 31 Mean
Arsenic	0.05	0.0005	0.004	0.006	0.010
Barium	2.0	0.005	0.040	0.058	0.040
Beryllium	0.004	0.001	<0.001	0.001	<0.0005
Cadmium	0.005	0.0005	<0.0005	<0.0005	<0.0005
Chromium	0.1	0.005	<0.005	<0.005	<0.005
Copper	1.3	0.005	<0.01	<0.01	<0.010
Flouride	4.0	0.1	0.330	0.510	0.400
Lead	0.015	0.0005	<0.005	<0.005	<0.005
Mercury	0.002	0.0002	<0.0002	<0.0002	<0.0002
Nitrate	10.0	0.1	0.400	0.280	0.400
Nitrite	1.0	0.1	0.020	0.050	0.010
Selenium	0.05	0.0005	0.003	0.001	0.001
Silver	0.1	0.0005	<0.0005	<0.0005	<0.0005
Sulfate	250	1	56	65	59
TDS	500	5	377	390	426
Zinc	5	0.01	0.057	0.050	0.050
pH	6.5 - 8.5	0.05	8.0	7.5	7.6
Radium 226 pCi/L	5	0.5	nd	0.33	0.10
Radium 228 pCi/L	5	0.5	nd	0.30	0.40
Thorium 230 pCi/L	5	1	nd	1.11	0.13
Thorium 232 pCi/L	5	1	nd	1.00	0
Uranium, total ug/L	30	0.5	2.00	3.00	2.62
Gross Alpha pCi/L	15				

units: milligrams per liter (mg/L) unless otherwise noted. No units for pH
nd = no detections

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