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GROUND WATER DISCHARGE PERMIT UGW050004
STATEMENT OF BASIS

Schreiber Foods, Inc. Cheese Plant
Amalga, Utah

February 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 pits, ponds, and lagoons[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 facility operations, maintenance, best available technology[7] (BAT) and the hydrogeologic and climatic conditions of the site, to ensure that the operation does not contaminate ground water.

Basis for Permit Renewal

This Permit is being renewed in accordance with R317-6-6.8 which states that a permit may be terminated or a renewal denied if any one of the four items below applies:

A. Noncompliance by the permittee with any condition of the Permit where the permittee has failed to take appropriate action in a timely manner to remedy the Permit violation;

B. The permittee's failure in the application or during the Permit approval process to disclose fully all significant relevant facts at any time;

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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)

C. A determination that the permitted facility endangers human health or the environment and can only be regulated to acceptable levels by plan modification or termination; or

D. The permittee requests termination of the Permit.

Basis for Modification and 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.

Changes and modifications to the renewed permit are further described below.

Facility Description

Schreiber Foods, Inc. (Schreiber) operates a cheese manufacturing plant at 2180 West 6550 North in Smithfield, Utah. Wastewater from the cheese plant is discharged via underground piping to a lagoon treatment system about 1.25 miles west of the plant in The Barrens area. The Barrens encompasses about 5,000 acres of wetlands, alkali mudflats, scrub grasslands, and grain fields situated in the middle of the Cache Valley. Soil surveys completed in 1913 identified over 1,500 acres of wetlands in The Barrens consisting of springs, open water, marsh, and extensive alkali mudflats. The Barrens drains into Clay Slough, which flows south into Cutler Reservoir on the Bear River.

<u>Land Application Areas</u>
Currently, treated wastewater is pumped from Cell 4 of the lagoon system and applied to two separate land application sites using wheel-line spray irrigation systems. The 110-acre land application site is located in Section 23, Township 13 North, Rangel West, Salt Lake Base Meridian, and is adjacent to the Schreiber wastewater treatment lagoons on the north and west. The 110-acre site is owned by Schreiber and is leased out for crop production. The 110-acre site slopes very gradually to the west-southwest and has an elevation of approximately 4,418 feet. The 160-acre land application site is located in Section 26, Township 13 North, Range 1 West, Salt Lake Base Meridian, and is southwest of the Schreiber wastewater treatment lagoons. The 160-acre site is privately owned agricultural land and Schreiber has an agreement that allows land application of the wastewater. The 160-acre site slopes very gradually to the west-northwest and has an

elevation of 4,415 feet.

The amount of wastewater applied annually to each land application site is determined by a nutrient management plan prepared for each area using crop nutrient uptake rates, average annual crop yields, wastewater quality, and soil and ground water monitoring results (STS, 2005; BIO-WEST, Inc., 2006). In addition, Schreiber submits annual reports for each land application area in accordance with the nutrient management plans. The most recent land application report available is from 2018. For the 2018 irrigation season, a total of 4,144,140 gallons of wastewater was applied to the 110-acre site. The maximum amount of wastewater applied to the subject property in any one day was 296,010 gallons. According to the nutrient management plan maximum hydraulic loading for the subject property is 931,870 gallons a day (STS, 2005).

During the 2018 irrigation season a total of 3,870,900 gallons of wastewater was applied to the 160-acre site. According to the nutrient management plan, maximum hydraulic loading for the subject property is 6,256,366 gallons a day (BIO-WEST, 2006). The maximum amount of wastewater applied to the subject property in any one day was 117,300 gallons.

Wastewater Quality

Currently, treated wastewater is pumped from Cell 4 of the lagoon system and spray irrigated on the 110-acre and 160-acre land application sites. Wastewater from Cell 4 is sampled monthly during the irrigation season as specified in the current nutrient management plans. Each sample is analyzed for biological oxygen demand, total suspended solids, total dissolved solids (TDS), nitrate + nitrite as N, total Kjeldahl nitrogen, total phosphorus, and pH. Table 1 summarizes 2018 wastewater analytical results from Cell 4.

Table 1
Cell 4 Wastewater Analytical Results
All units in milligrams per liter except pH

Sample Date	pH	BOD	Nitrate + Nitrite as N	TKN	TP	TDS	TSS
6/19/2018	8.50	45.1	0.0661	31.4	21.7	2,470	27.9
7/18/2018	8.63	43.8	0.0940	26.0	19.6	2,650	26.5
8/21/2018	8.67	43.4	0.0906	29.9	21.9	2,840	63.2
9/20/2018	8.84	54.8	0.0635	33.7	19.9	3,030	20.5

BOD Biological oxygen demand
TDS Total dissolved solids
TKN Total Kjeldahl nitrogen
TP Total phosphorus

Hydrogeology

Regional Hydrogeology

Cache Valley is a 70-mile by 25-mile mountain valley straddling the Utah-Idaho border and was the bed of ancient Lake Bonneville during Pleistocene time. Cache Valley is filled with alluvial fan and pluvial lake deposits and is bordered by the Bear River Range to the east and the Wellsville Range, Junction Hills, and Malad Range to the west (Hintze, 1988). The Schreiber property is covered by Holocene to Uppermost Pleistocene sedimentary deposits of silt, clay, and minor sand from alluvial (flowing water), lacustrine (lake), or paludal (marsh) processes younger than Lake Bonneville deposits (Solomon, 1999). These younger deposits commonly overlay, grade into, and consist of older reworked Lake Bonneville deposits. Typical thickness of these fine-grained deposits is three (3) to 10 feet (Solomon, 1999). The underlying Lake Bonneville sediments consist of silt, clay, and minor fine-grained sand. The estimated maximum thickness of this layer is approximately 50 feet (Solomon, 1999). Underlying the Lake Bonneville sediments are 600 to over 1,000 feet of fluvial and lacustrine sediments (Robinson, 1999). These deposits consist mostly of silt and clay, but do contain some layers of sand and fine gravel (Robinson, 1999). These sediments contain the major aquifers of the Cache Valley (Bjorkland and McGreevy, 1971).

Bjorkland and McGreevy (1971) indicate that groundwater occurs in confined, perched, and unconfined aquifers in Cache Valley. The confined portion of the principal aquifer is typically overlain by a shallow unconfined aquifer (Bjorkland and McGreevy, 1971). Robinson (1999) identified eight distinct hydrostratigraphic units within Cache Valley, four of which are important to this investigation. The upper confining layer, identified as B-l, is an aquitard composed primarily of clay, silt, and sand of Lake Bonneville deposits less than 100 feet thick. Underlying the B-1 aquitard is the upper confined aquifer (A-1), which is about 30 feet thick and composed of gravel to cobbles interbedded with sand and silt with discontinuous clay lenses. Water from this aquifer is typically high in iron and not used for domestic supply. The third underlying layer is the lower confining layer, (B-2), which is an aquitard approximately 30 feet thick composed of thickly bedded clay and thin gravel lenses near the valley margins (Robinson, 1999). Underlying B-2 aquitard is the lower confined aquifer (A-2), which is up to 1,340 feet thick and composed of gravel and sand with discontinuous silt and clay lenses. Ground water from this aquifer is typically good, and this layer is the major aquifer in Cache Valley (Robinson, 1999) usually identified as the principal aquifer.

Anderson and others (1994), Kariya and others (1994), and Bjorkland and McGreevy (1971) indicate that ground water flow in the principal aquifer near the subject properties is to the southwest. This flow direction matches the overall topography in the area. Recharge occurs from infiltration of precipitation, seepage from streams, and subsurface inflow from both consolidated and unconsolidated deposits. Recharge occurs mainly as runoff from the adjacent mountains infiltrates into the coarse unconsolidated deposits (i.e., alluvial fans) at the margins of the valley (Kariya and others, 1994). Anderson and others (1994) show the subject property is located within a discharge zone of the principal aquifer.

Local Hydrogeology

There is scant information published for the shallow, unconfined aquifer in Cache Valley. This aquifer may be comprised of the B-l aquitard of Robinson (1999) or younger post-Lake Bonneville deposits. Based on numerous wells drilled in the shallow unconfined aquifer in Cache Valley, the direction of ground water flow typically follows the topographic gradient of the land surface and the flow direction in the principal aquifer. Based on water levels measured in site monitoring wells in October 2018, depth to ground water ranges from 4.83 to 12.50 feet below ground surface. Based on ground water contour maps provided in the 2018 Land Application Annual reports, ground water flows generally toward the west.

Based on soil classification samples collected during monitoring well installations on the 160-acre land application site, sediments in the area are composed primarily of clay and silt. The typical porosity of silt ranges from 35 to 50% and the porosity of clay ranges from 33 to 60% (Fetter, 1994). However, the hydraulic conductivity of clay ranges from 10^{-9} to 10^{-6} centimeters per second (cm/s) and the hydraulic conductivity of silt ranges from 10^{-6} to 10^{-4} cm/s (Fetter, 1994).

Robinson (1999) considered the B-l layer to be a very low-permeability aquitard. Because of the very low permeability of this aquitard layer, there is probably little to no hydraulic connection between the shallow, unconfined aquifer in the area and the deeper aquifers. If there is a connection between the shallow, unconfined aquifer and the deeper aquifers, it is probably an upward flow of ground water from the deeper aquifers to the shallow, unconfined aquifer due to its location within the regional ground water discharge area. This is supported by numerous flowing wells and springs in this area.

Surface Water

The Amalga Barrens encompasses about 5,000 acres of wetlands, alkali mudflats, scrub grasslands, and grain fields situated in the middle of the ground water discharge area of Cache Valley. Soil surveys completed in 1913 identified over 1,500 acres of wetlands in the Barrens area, consisting of springs, open water, marsh, and extensive alkali mudflats. The Barrens area drains into the ephemeral flowing Clay Slough, which flows south into Cutler Reservoir. The shallow, unconfined aquifer is probably hydraulically connected to surface waters in the area. Recharge of the shallow, unconfined aquifer in the area occurs primarily from infiltration of precipitation and unconsumed irrigation water and seepage from canals and streams (Kariya and others, 1994).

Ground Water Quality

Deep Aquifer

Ground water in the deep confined principal aquifer for most of Cache Valley has TDS concentrations below 500 milligrams per liter (mg/L). Ground water in the deep confined principal aquifer in the northwestern part of Cache Valley has TDS concentrations between 500 and 750 mg/L, and the area southwest of Amalga has ground water TDS concentrations between 750 and 1,000 mg/L (Lowe and others, 1994). Robinson (1999) identified TDS concentrations as high as 1,200 mg/L in the deep confined principal aquifer near The Barrens. The deep confined principal aquifer is protected from surface contaminants by the thick clay-rich confining layer and the corresponding upward vertical hydraulic gradient.

Ground Water Quality Class

The uppermost shallow ground water at the site is naturally high in TDS. In accordance with UAC R317-6-3.5, ground water in the 110-acre land application area is Class IV Saline Ground Water and ground water in the 160-acre land application area ranges from Class III Limited Use Ground Water to Class IV Saline Ground Water. Additionally, given the shallow nature of ground water in the area, there is a close interconnection between surface water and ground water. Therefore, Class IC Ecologically Important Ground Water is also an applicable classification for ground water at the site.

Protection Levels

On the basis of sampling completed since the permit was originally issued, ground water protection levels have conservatively been established at each monitoring well using the criteria for Class III ground water. The protection levels for total dissolved solids are 1.25 times the background value or background plus two standard deviations, whichever is greater. When a contaminant is present in a detectable amount in the background concentration, the concentration of the pollutant may not exceed 1.5 times the background concentration, or 0.5 times the ground water quality standard, or background plus two standard deviations, whichever is greater. When a contaminant is not present in a detectable amount, the concentration of the pollutant may not exceed 0.5 times the ground water quality standard, or exceed the limit of detection, whichever is greater.

Compliance Monitoring Program

Compliance monitoring is conducted on an annual frequency sampling 8 monitoring wells at the 110 acre site and 3 monitoring wells at the 160 acre site for the following parameters:

- Ammonia as N,
- Chloride,
- Nitrate + nitrite as N,
- Total dissolved phosphorus,
- TDS, and
- Total phosphorous.

In addition, samples are analyzed for the following major ions: bicarbonate, carbonate, calcium, magnesium, potassium, and sodium.

Ground Water Protection Level Exceedances

Three monitoring wells at the 110-acre land application site are now in out-of-compliance status for having exceeded ground water protection levels in two consecutive sampling events. Monitoring well MW-1 (ammonia, total phosphorus, and dissolved phosphorus), MW-2 (ammonia and total phosphorus), and MW-4 (nitrate-nitrite). The corrective action for these exceedances is being addressed under the Compliance Schedule of the Permit Part I.G. The compliance schedule requirements designed to address the protection level exceedances include preparing a ground water application for the wastewater lagoons within 180 days of permit issuance, preparing mass water balance calculations for all wastewater generated at the facility to determine the overall capacity of the lagoons and land application activities to manage the wastewater, and revising the nutrient management plans that guide land application rates. The Director may require additional actions as documents are reviewed and evaluated.

DWQ-2019-015939