MEMORANDUM

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FROM: Wendy Waudby, P.E., Staff Engineer, Boise Regional Office

DATE: October 13, 2016

SUBJECT: **I-241-01 CS Beef Packers, LLC, Staff Analysis supporting reuse permit issuance**

Executive Summary

CS Beef Packers, LLC is currently constructing an industrial beef packing plant/facility near Kuna in Ada County. The facility plans to use 1,286 irrigated acres, which will be irrigated with center pivots. The annual estimated recycled water volume for irrigation is approximately 300 million gallons. The facility will be permitted for year-round application of recycled water. Staff recommends issuance of I-241-01 for a period of five years.

1 Introduction

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400 for issuing recycled water reuse permits. It briefly states the principal facts and significant questions considered in preparing the draft permit and provides a summary of the basis for the draft permit conditions.

The following is a brief summary of timelines:

- A meeting was held with the permittee on March 6, 2015 to discuss the overall project.
- The pre-application workshop was held on March 20, 2015.
- Meetings were held with the permittee and their representatives on October 1, 2015 and January 28, 2016 to discuss the industrial wastewater treatment and reuse systems.
- A permit application and associated technical report were received on February 5, 2016.
- The permit application was determined incomplete on March 4, 2016.
- A meeting was held on April 7, 2016 to discuss DEQ's comments on the permit application and technical report.
- DEQ met with the permittee and their representatives at the facility location and toured the construction of the facility and locations of the reuse sites on April 20, 2016.
- A revised Technical Report: Industrial Wastewater Reuse Permit (Technical Report) (HDR 2016b) was received on June 29, 2016.

- DEQ's Completeness Determination letter, determining the application complete, was dated July 18, 2016. The date of this letter is the "effective date of application".
- DEQ's Preliminary Decision letter to the applicant was dated August 17, 2016.
- Staff requested and received additional information by e-mail on September 2 and September 7, 2016, respectively.

2 Site Location and Ownership

This facility will be a new beef packing plant. The J.R. Simplot Company and Caviness Beef Packers, Ltd. have formed CS Beef Packers, LLC (CSBP), which will be the permittee. The CSBP facility is currently under construction. The facility is located approximately 10 miles southeast of the Kuna city-center.

The reuse sites are primarily located south of the packing plant as shown in Figure 1. One reuse site is located northeast of the packing plant. The reuse sites are surrounded by privately owned land and Bureau of Land Management (BLM) property as shown in Figure 2. The facility and majority of the reuse sites are owned by CSBP. CS Property Development, LLC purchased the reuse site associated with Pivot 11 (MU-241-11) in 2015. The reuse sites associated with Pivots 7 through 10 (MU-241-07 through MU-241-10) are leased and the lease agreement was included in the Technical Report. All reuse sites will be operated by the permittee.

CSBP has the following other applicable permits/approvals (HDR 2016b):

- a "permit to construct" air quality permit, issued by DEQ in 2015
- water rights for water supply for production and irrigation
- conditional use permit for operations, issued by Ada County

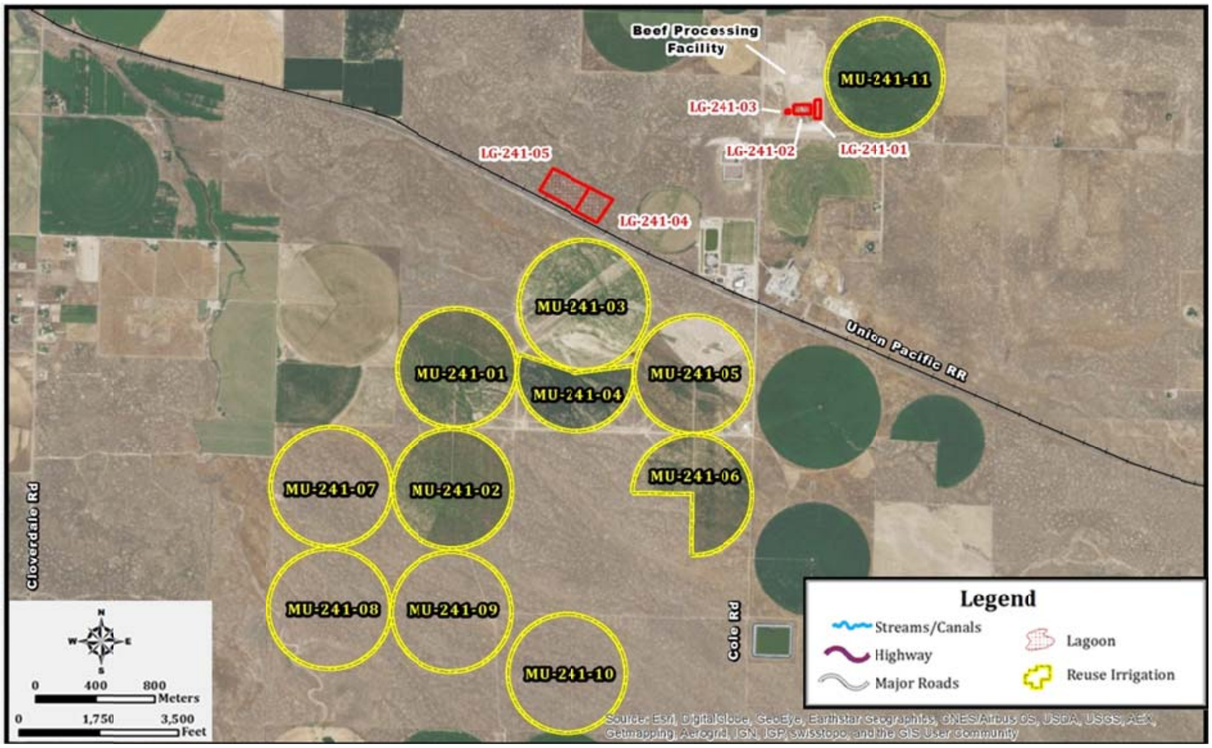

Figure 1. Site map.

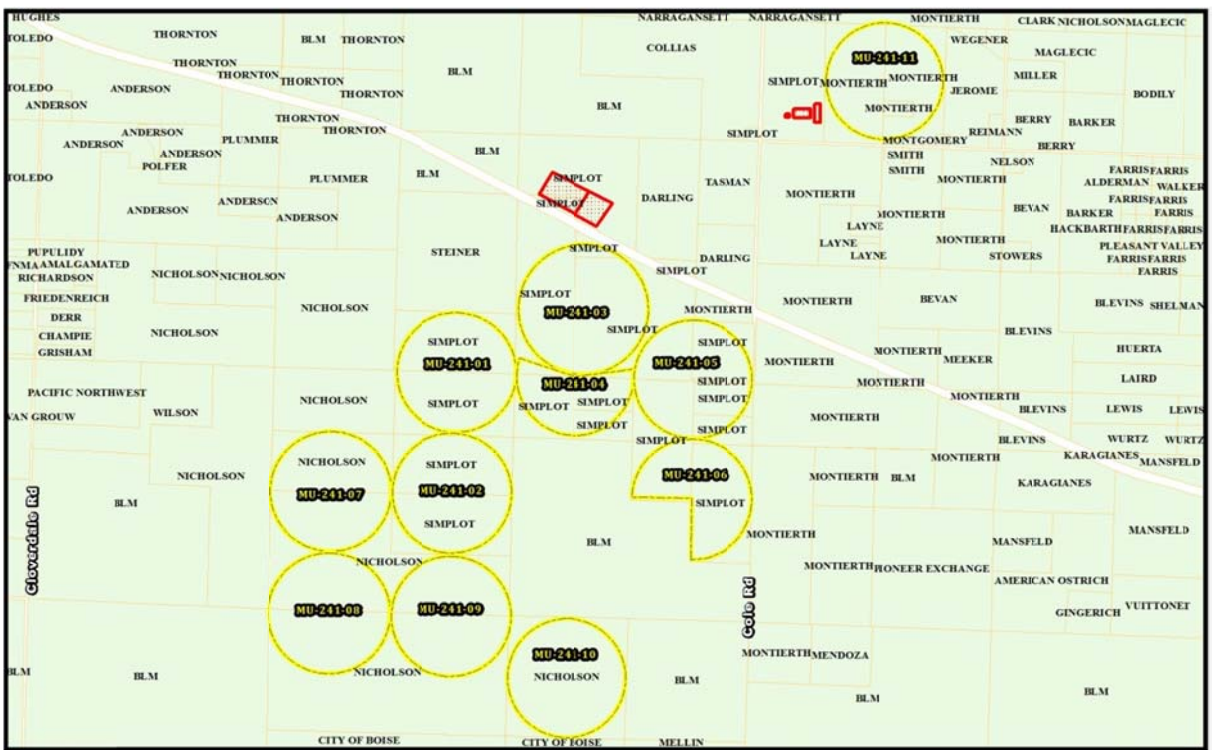

Figure 2. Surrounding land ownership.

3 Process Description

The new beef packing plant operated by CSBP will harvest and process beef primarily sourced from the northwest U.S. (HDR 2016a). The facility will produce various beef products. Wastewater will be generated from carcass washing, beef processing activities, cleaning the facility, paunch (stomach contents) washing, and pen washing. The beef packing plant wastewater will be directed to a dissolved air floatation unit (DAF). The DAF effluent and the screened pen wastewater will be directed to the industrial wastewater treatment system. A process flow diagram depicting the wastewater flows and pretreatment are shown in Figure 3.

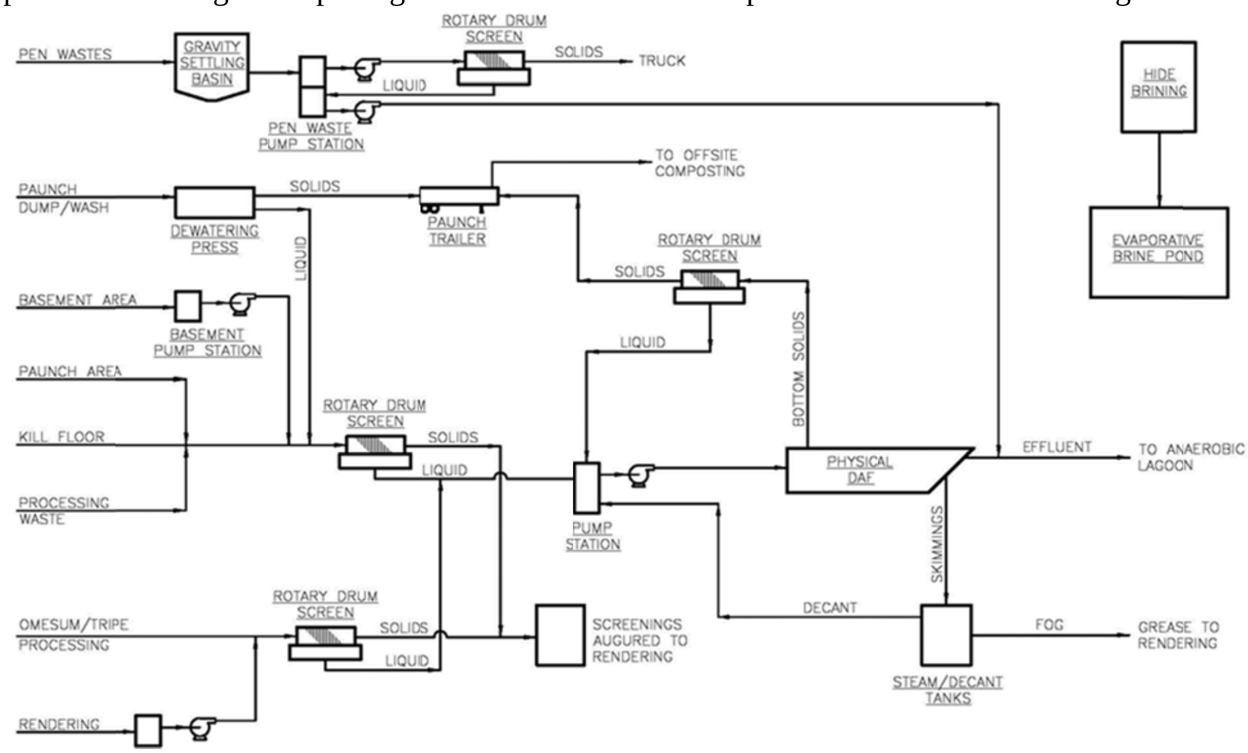

Figure 3. Industrial wastewater flows and pretreatment (HDR 2016a).

Spent brine water from hide processing will be sent to an on-site brine evaporation pond. Stormwater from outside the pens will be retained and infiltrated onsite. The sanitary wastewater from showers, toilets, drinking fountains, etc. will be directed to a separate sanitary wastewater treatment and large soil adsorption system. This sanitary wastewater will not be treated in the industrial wastewater treatment system.

The industrial wastewater treatment processes are described in detail in the Preliminary Engineering Report (PER) (HDR 2016a), while a summary of the processes are described herein. The facility is designed to process approximately 1,500 head of cattle per day with an average weight of 1,250 pounds per head of cattle. A wastewater design flow of 700 gallons per head of cattle is used in the PER. CSBP plans to operate the facility an average of 5.5 days per week, based on alternating operations at five days per week for two week and six days per week for two weeks. CSBP plans to operate for one shift per day. Wastewater will be generated on non-production days and is estimated to be 0.38 million gallons (MG) on non-production

Saturdays and 0.2 MG on non-production Sundays. The average weekly pretreatment effluent flow is estimated to be 6.17 MG based on a 5.5 day production week.

Pretreated wastewater will flow by gravity to a covered anaerobic lagoon as shown in Figure 3. The primary functions of the anaerobic lagoon are to significantly reduce biological oxygen demand (BOD) and to equalize flow. The water will flow by gravity from the anaerobic lagoon to an aerated lagoon where the water will be stabilized and oxidized. The water will be pumped from the aerobic lagoon to two settling/storage lagoons. Recycled water will be pumped from the settling/storage lagoons to the reuse sites. The process flow diagram for the industrial wastewater treatment system is shown in Figure 4. However, one management unit (MU), Pivot 11/MU-241-11, will be irrigated with aerobic lagoon effluent instead of settling/storage lagoons effluent.

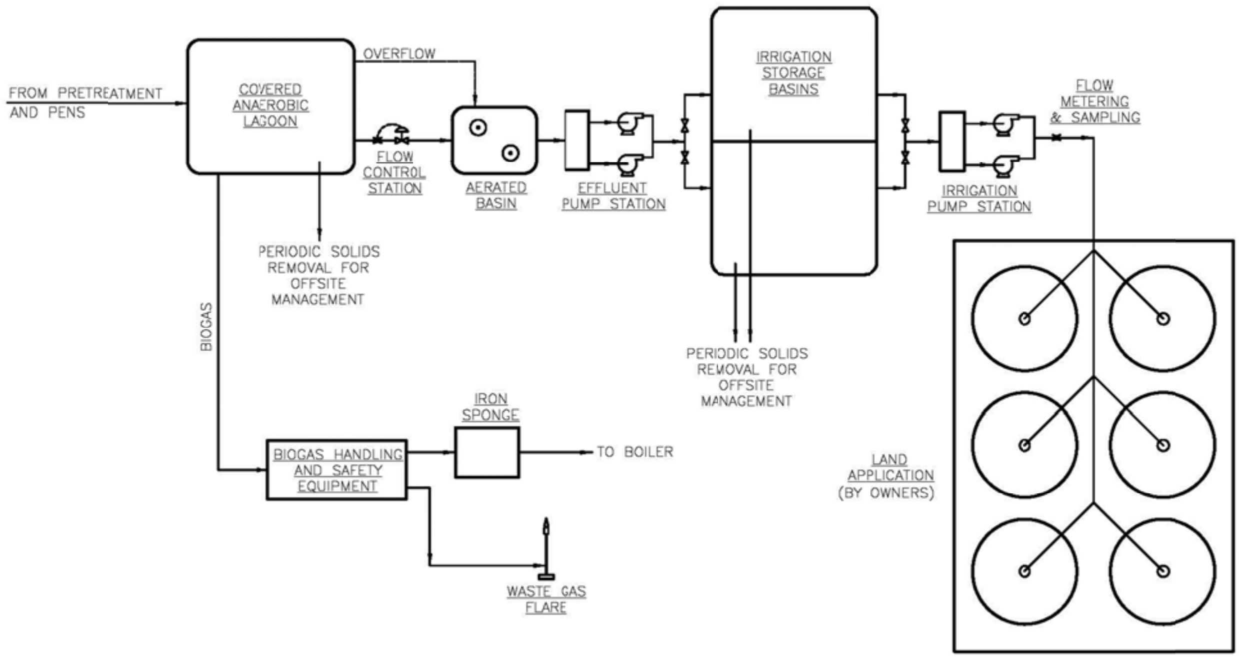

Figure 4. Process flow diagram for industrial wastewater treatment (HDR 2016a).

Nitrogen and phosphorus removal through biomass solids settling in the storage lagoons was described in the PER. The design of the anaerobic lagoon and the storage lagoons includes solids removal piping. The following are the anticipated solids streams:

- Screened pen wastes to truck
- Dewatered paunch solids to offsite compositing
- Screened bottom solids from the DAF to offsite composting
- Anaerobic lagoon solids to offsite management
- Irrigation storage lagoons to offsite management

Management of these solids streams will be further defined in a solids management plan as discussed in Section 5.4.

The reuse sites are summarized in Table 1. All reuse sites will utilize center pivots to irrigate using recycled water and supplemental irrigation water.

Table 1. Summary of reuse sites (with buffers).

Pivot	Management Unit	Acres
Pivot 1	MU-241-01	123.5
Pivot 2	MU-241-02	123.5
Pivot 3	MU-241-03	154.9
Pivot 4	MU-241-04	67.8
Pivot 5	MU-241-05	110.0
Pivot 6	MU-241-06	92.6
Pivot 7	MU-241-07	124.9
Pivot 8	MU-241-08	124.9
Pivot 9	MU-241-09	124.9
Pivot 10	MU-241-10	124.9
Pivot 11	MU-241-11	114.0
	Total	**1286**

Supplemental irrigation water to Pivots 1 through 6 is provided by two ground water wells. A new ground water well is planned to irrigate Pivots 7 through 10. Pivot 11 is currently supplied by an existing well, however, CSBP plans to either install a new well or use one of their production wells (Murray 2016).

4 Site Characteristics

4.1 Site Management History

The Technical Report provided site management history in various sections. The reuse sites for Pivots 1 through 10 were open range (undeveloped with some cattle grazing). Simplot purchased the land for Pivots 1 through 6 as shown in Figure 2. Pivots 1 through 6 were constructed in 2014 and 2015 and agricultural irrigation began in 2015. CSBP added fertilizer to the soil for Pivots 1 through 6 in 2015 and soils are discussed in Section 4.3. For 2016, CSBP had the following crop plan: Pivots 1 and 2 – white beans followed by corn or alfalfa, and Pivots 3, 4, 5, and 6 – alfalfa. CSBP plans to construct Pivots 7 through 10 in 2016.

Pivot 11 has been in agricultural production since the early 1990s (HDR 2016b). The Pivot 11 site was formally used under Wastewater Land Application Permit No. LA-000055-03, as management unit MU-005510. Permit LA-000055-03 was for land application of treated beef processing wastewater. MU-005510 was added to the MUs starting in December of 1998, with the issuance of Permit LA-000055-03. Land application of treated industrial wastewater under Permit LA-000055-03 ended in 2007 (DEQ 2013). Permit LA-000055-03 was terminated on August 8, 2013. An affiliated company of CSBP purchased Pivot 11 and the associated land in 2015 (Murray 2016).

Irrigation for Pivots 1 through 10 will consist of treated industrial wastewater from the irrigation storage lagoons as well as ground water from supplemental irrigation water wells. Irrigation for

Pivot 11 will consist of treated industrial wastewater from the aerobic lagoon and ground water from a supplemental irrigation water well. Supplemental irrigation water will be used to meet agronomic requirements and limit loadings to each MU. CSBP anticipates crops to be grown will include alfalfa, silage corn, triticale, winter wheat, and double cropping with triticale/corn or triticale/alfalfa (HDR 2016a).

4.2 Climatic Characteristics

The climatic characteristics are described in detail in section 4.2 of the Technical Report. The data is taken from the weather station located in Kuna, Idaho. The draft permit establishes the growing season as April 1 through October 31, which is the same as indicated in the Technical Report.

The average annual precipitation is 10.1 inches per year, of which 5.43 inches occur during the non-growing season (November 1 through March 31). The annual average maximum temperature is 63.7 °F and annual average minimum temperature is 36.3 °F. Additional meteorological data can be found at: *http://www.wrcc.dri.edu/summary/climsmid.html.*

The Technical Report provided wind direction information for the nearby city of Nampa as wind direction information for Kuna was not available. The wind direction is predominantly from the southwest.

Crop evapotranspiration for this location was taken from the ET_{Idaho} website located at: *http://data.kimberly.uidaho.edu/ETIdaho/* using the Kuna National Weather Station (NWS) located at latitude 43° 29’ North, longitude 116° 25’ West at an elevation of 2,680 feet. The growing season precipitation deficit (P_{def}) for proposed crops is shown in Table 2. P_{def} is equivalent to the net irrigation water demand (IR_{net}).

Table 2. Growing season precipitation deficit (UofI 2012).

Crop	P_{def} (inches)
Alfalfa, frequent cuttings	40.0
Silage corn	24.7
Winter grain	24.3

4.3 Soils

Soil types present are described in detail in Section 4.3 of the Technical Report. The dominant soil type is Chilcott-Sebree complex. The reuse sites are relatively flat with slopes from 0 to 4 percent. The soil is well drained with a depth of 20 to 40 inches to duripan. CSBP’s consultant used the Natural Resource Conservation Service (NRCS) soil survey to identify soil types and characteristics. Soil samples were also collected from the reuse sites. Composite samples were collected from Pivots 1 through 6. Discrete soil boring samples were collected for Pivots 1 through 10. A surface soil sample was collected from Pivot 11. Soil textures for Pivots 1 through 6 were loam, sandy loam, and silt loam. The Technical Report indicates all proposed reuse sites are suitable for agricultural production and states, “With good irrigation practices, and by following soil test recommendations, soils should provide good crop yields and are sustainable.”

The 2015 soil sample results for Pivots 1 through 6 averaged:

- medium range nitrate levels,
- low to medium phosphorus levels,
- low to medium iron and manganese, and
- high soluble salts.

In 2016, surface soil samples (0 to 1 foot) were collected. The soluble salt levels for Pivots 1, 2, 3, 5, and 6 were less in 2016 than in 2015 as shown in Table 3. The 2016 soluble salt level for Pivot 4 was higher. The sodium adsorption ratio (SAR) was tested in 2015, but not 2016, as shown in Table 3. The Technical Report indicates the lower salt levels in 2016 reflect irrigation, crop production, soil cultivation, and leaching. The Technical Report states, “the leaching of salts below the root zone (a temporary, but necessary agronomic practice to improve soil conditions for crop production in southwest Idaho).” Considering the proposed salt loadings from recycled water and supplemental irrigation water in the Technical Report, leaching does not appear to be proposed as a temporary agronomic practice. Recycled water characteristics and estimated loadings are discussed in Sections 4.6 and 4.8, respectively. Management of salt is discussed in Section 5.8.

Table 3. Composite soil samples (0 to 1 foot) (HDR 2016b).

	2015				2016	
Field	**pH**	**SAR**	**Soluble Salts (mmhos/cm)**	**Classification**	**Soluble Salts (mmhos/cm)**	**Classification**
Pivot 1	8.2	16.0	10.8	Saline-Sodic	1.6	Normal
Pivot 2	7.1	14.8	4.3	Saline-Sodic	0.8	Normal
Pivot 3	8.3	12.7	3.5	Normal	0.8	Normal
Pivot 4	8.1	4.49	1.0	Normal	3.5	Sodic
Pivot 5	8.4	8.47	1.7	Normal	0.8	Normal
Pivot 6	8.4	13.7	2.9	Sodic	1.0	Normal

In 2016, surface soil samples (0 to 1 foot) were collected for four areas each of Pivots 7 through 10. In general, the soils were normal. Two of the four areas for Pivot 8 and one area for Pivot 9 were saline. One area for Pivot 10 was sodic. The Technical Report states, “Similar to pivots 1 through 6, once soils associated with proposed pivots 7 through 10 are cultivated, cropped, and irrigated, salt and sodium levels are expected to decline.”

The soils for Pivot 11 are normal with medium levels of nitrate and phosphorus and low exchangeable sodium percentage (ESP) and soluble salts.

The Technical Report recommends conditioning the soils being converted to irrigated agriculture through good irrigation practices and soil amendments. CSBP applied elemental sulfur to soils to address sodic concerns in 2015.

CSBP plans to irrigate with recycled water during the non-growing season and the growing season. The Technical Report calculated the available water holding capacity (AWHC) for each reuse site as the area weighted average for each pivot for a soil depth of up to five feet or the limiting layer, based on the NRCS soil classifications, as shown in Table 4. The estimated AWHC did not consider limiting layer data from soil borings at the reuse sites.

Table 4. Estimated AWHC (HDR 2016b).

	Pivot										
	1	2	3	4	5	6	7	8	9	10	11
Area w/buffer (acres)	123.5	123.5	154.9	67.8	110.0	92.6	124.9	124.9	124.9	124.9	114.0
AWHC (inches)	5.72	5.45	7.13	5.56	6.50	5.88	4.88	4.80	7.24	4.66	3.03

4.4 Surface Water

The Technical Report discusses surface water in Section 4.5. The Snake River is located approximately 14 miles southwest of the facility. The Boise River is located approximately 10 miles northeast of the facility. The New York Canal is approximately 3.5 miles northwest of the facility. Remnants of Indian Creek and Sand Creek run through some of the reuse sites. However, these creek remnants no longer carry water and the upstream water sources have been diverted. The Technical Report indicates these creek remnants may carry or hold water during high runoff events. The Technical Report included a FEMA flood hazard zone map, which indicates a 100-year floodplain (designated A in Figure 5) runs through a portion of Pivots 3, 5, and 9. The draft permit requires CSBP to prepare a runoff management plan as discussed in Section 5.2.

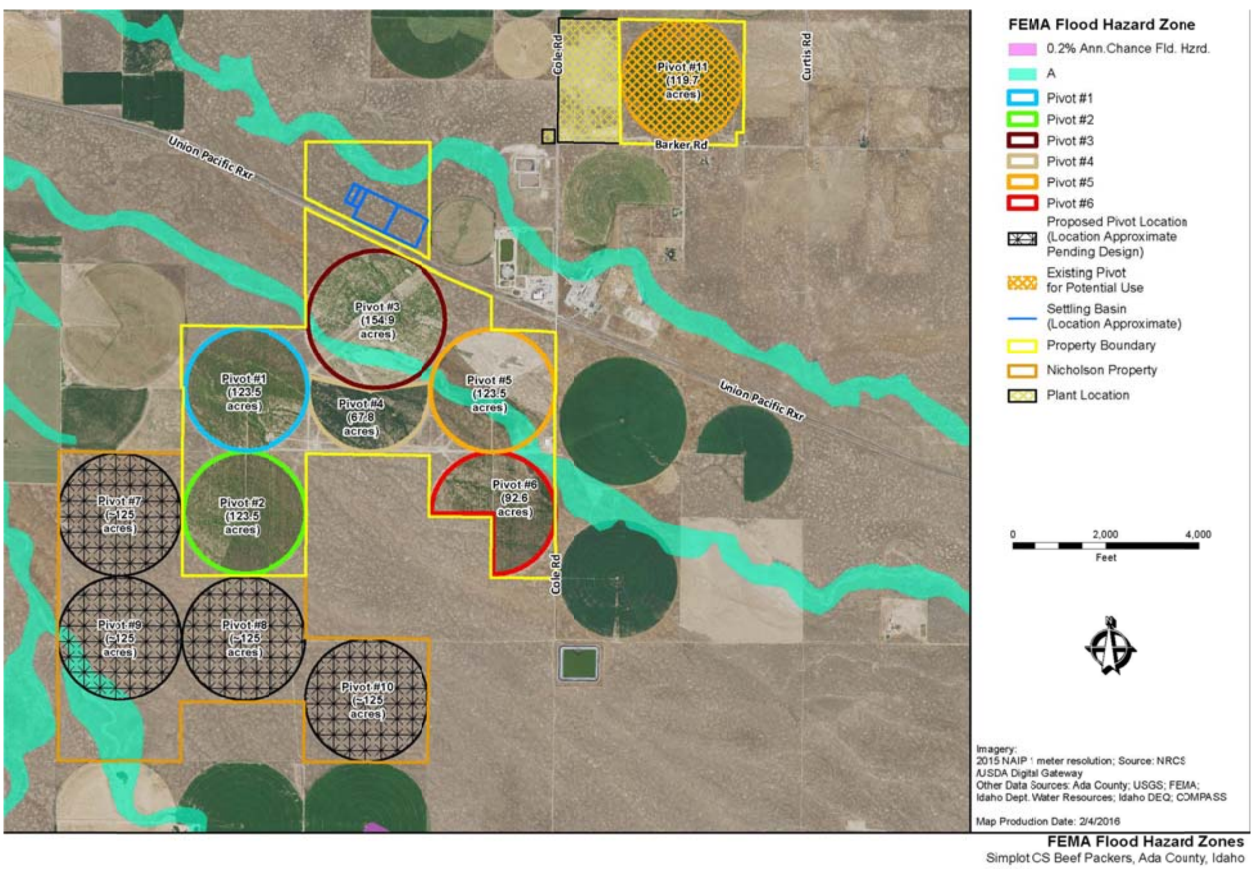

Figure 5. 100-year flood map (HDR 2016b). 'A' designates the 100-year floodplain.

4.5 Ground Water/Hydrogeology

Ground water and hydrogeology are described in detail in Section 4.7 of the Technical Report and are summarized here. The reuse sites are located within the western part of the Snake River Plain. There is an unsaturated sand and clay layer under the reuse sites on top of basalt. In reuse site area there are four geologic units important as aquifer systems: fractured basalt, lower sand and gravel, upper sand and gravel, and sand-silt. The sand-silt unit may not be in the reuse site area, but does underlie the basalt unit several miles east of the facility. The fractured basalt unit overlies both the upper and lower sand and gravel aquifers and consists of a thick sequence of lava flows with thicknesses from 40 to 600 feet. The average basalt thickness under the reuse sites was estimated to be 350 feet. The upper sand and gravel aquifer is discontinuous and thickness varies. The lower sand and gravel aquifer has varying thicknesses with one area over 600 feet thick. The lower sand and gravel aquifer appears to be confined to partially confined based on the average static water levels being 10 to 60 feet above first water for wells drilled in 2014 and 2015. The upper and lower aquifers appear to be separated by at least one clay layer, but well logs from older irrigation wells suggest the two aquifers are connected in some places. CSBP tapped the upper aquifer for drill water and the nearby monitoring wells for closed permit LA-000055 were also screened in the upper aquifer. The wells in the upper aquifer showed significant drawdown during pumping and yielded 5 to 40 gallons per minute (gpm). CSBP’s two recently drilled irrigation wells tap the lower aquifer and yielded approximately 3,000 gpm with approximately 20 feet of drawdown.

The Technical Report provided ground water flow direction information based on monitoring well information from former permit LA-000055, which indicated ground water flows from north to south/southeast across MU-241-11 as shown in Figure 6. CSBP used a different consultant for the analysis of ground water relating to their municipal large scale soil absorption system (LSAS). The LSAS is proposed to be located west of the storage lagoons near the northwestern property boundary. The LSAS analysis indicated ground water flows from north/northwest to south/southwest across MU-241-01 through MU-241-06 as shown in Figure 7 (Power 2016) based on wells in the area. The deeper regional aquifer typically flows from the northeast to the southwest (DEQ 2016).

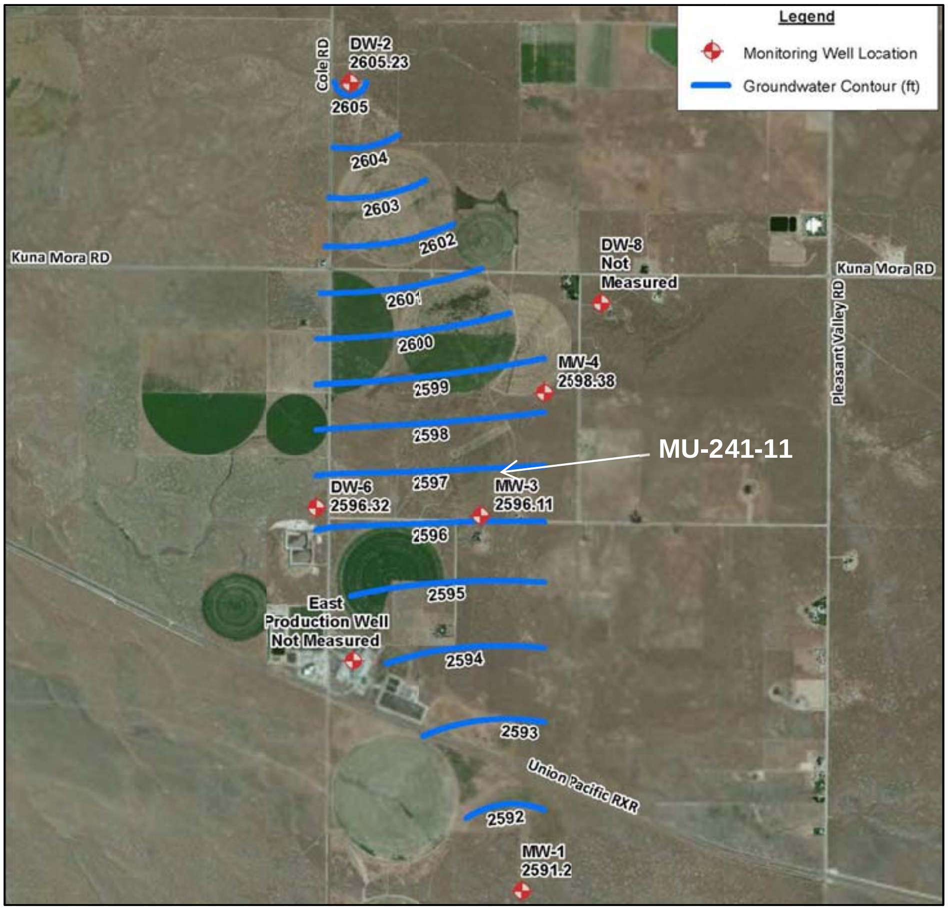

Figure 6. Ground water contours across MU-241-11 (HDR 2016a).

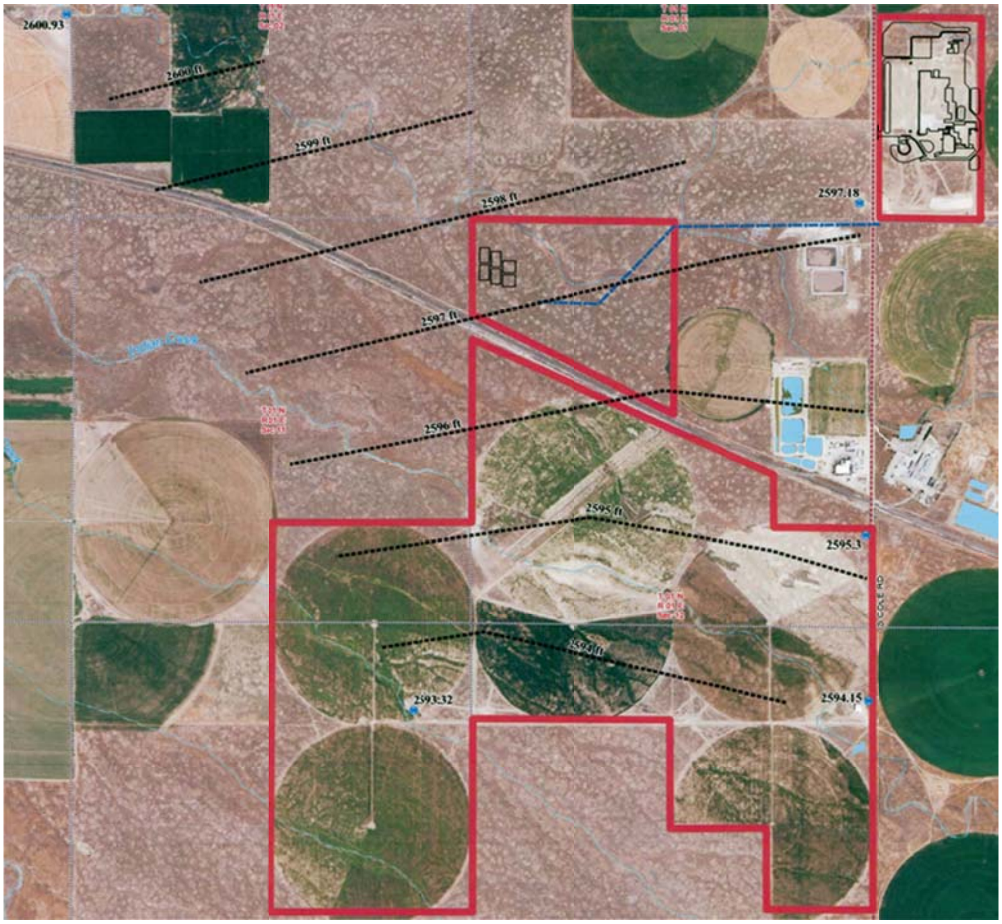

Figure 7. Ground water flow contours across MU-241-01 through MU-241-06 (Power 2016).

CSBP has not performed water quality sampling in the upper aquifer. The Technical Report provided water quality sampling results collected for reuse permit LA-000054 and closed reuse permit LA-000055 for chloride, nitrate, pH, iron, manganese, and total dissolved solids (TDS). Results for LA-000055 also included chemical oxygen demand (COD) and total coliform. The iron, nitrate, and TDS results for the monitoring wells for LA-000054 were elevated compared to the results for LA-000055 and CSBP irrigation wells (lower aquifer). The nitrate levels were still well below the *Ground Water Quality Rule*, IDAPA 58.01.11, primary constituent standard of 10 mg/L. However, some of the iron and TDS results for LA-000054 exceeded the secondary constituent standards of 0.3 mg/L and 500 mg/L, respectively. Total coliform results exceeded the primary constituent standard of 1 colony forming unit per 100 mL for one sampling event for each of two monitoring wells for LA-000055.

The nearest public water system wells are for CSBP and are located near the beef packing plant. There is also a public water system for the industrial facility to the east of the plant. These public water system wells are upgradient or side gradient of the ground water flow direction and should not be impacted by reuse operations. The Well Location Acceptability Analysis (WLAA) included the public water system well for the industrial facility to the east and categorized this well as not within the capture zone and the water quality meets the *Ground Water Quality Rule*. There are several private wells located around the facility which were identified in the WLAA included in the Technical Report. The WLAA identified and evaluated eight domestic or public wells and found these wells to be either in a hydraulically isolated aquifer, not within the capture zone, and/or the water quality meets the *Ground Water Quality Rule*. The WLAA states, "This WLAA should be revisited…once the groundwater monitoring network has been established…"

Staff recommends CSBP install an initial ground water monitoring network due to the limited ground water quality data available, estimated loadings (see Section 4.8), leaching necessary as part of good irrigation practices, uncertainty of travel times through fractured basalt, lack of clay or confining layers between ground surface and first water, and preliminary ground water modeling indicating potential increases in TDS and nitrate. In ground water, TDS is a measurement of salt, while in recycled water non-volatile dissolved solids (NVDS) can be used as a rough estimate of salt content. Salts are discussed further in Section 5.8. Preliminary ground water modeling using DEQ's Water Reuse/Land Treatment System Modeling spreadsheets indicates nitrate and TDS concentrations in ground water may increase from reuse activities. However, without site specific loadings and ground water data, the model could not be calibrated. The draft permit requires a nitrate and NVDS study as a compliance activity, which must include identifying and quantifying sources of nitrate and NVDS in all streams used for land application on the reuse sites, evaluating the relationship between NVDS and total dissolved inorganic solids (TDIS), analyzing the net nitrogen and net salt loading to each reuse site, and modeling the potential ground water impacts. Staff also recommends monitoring common ions in ground water during the first year of the permit and the fourth year of the permit. Common ions can be used to determine the chemical signatures of the ground water from each well. As part of the future permit renewal application process, staff recommends evaluating whether CSBP needs to reduce TDS and/or nitrate loading through source reduction strategies and/or increasing land application acreage.

The Technical Report recommended an initial ground water monitoring well network consisting of three (3) wells completed in the upper aquifer with proposed locations shown in Figure 8. The proposed upgradient well is southeast of the storage lagoons and LSAS. However, the proposed upgradient monitoring well should be located upgradient of the storage lagoons and the LSAS. CSBP did not propose monitoring wells upgradient of Pivot 11 or around the anaerobic, aerobic, or brine lagoons at this time. There are two existing monitoring wells near Pivot 11 from former permit LA-000055. One existing monitoring well is east of Pivot 11 and one existing monitoring well is at the southern boundary of Pivot 11, designated as MW-4 and MW-3 in Figure 6, respectively. Staff recommends monitoring these wells if possible. As a compliance activity, the draft permit requires CSBP to prepare plans for one upgradient and two downgradient monitoring wells in the upper aquifer and to install the monitoring wells after receiving approval of the plans from DEQ. The draft permit includes a compliance activity requiring CSBP to perform a hydrogeological characterization and prepare a ground water monitoring plan, which is required to include the following:

1) Determination of ground water depth and flow direction.

2) Establish background ground water quality.

3) Determination of aquifer characteristics required for ground water modeling, including testing each monitoring well to determine hydraulic conductivity.

4) Prepare an updated WLAA. The preliminary WLAA relied on the ground water flow characteristics from the former permit LA-000055. Once the permittee has determined gradient, flow direction, and hydraulic conductivity of the initial ground water monitoring well network, the WLAA can be updated.

5) An evaluation of the initial ground water monitoring well network to determine if the wells provide sufficient coverage for assessing upgradient and downgradient ground water quality of the reuse sites. Staff recommends quarterly sampling of ground water monitoring wells for a minimum of two years/eight sampling events. If the evaluation determines the initial ground water monitoring well network is inadequate because it does not provide sufficient coverage, then

   a) Prepare plans for a modified ground monitoring well network that will provide sufficient ground water quality data to characterize the impacts of reuse activities,

   b) Prepare an implementation schedule for a modified ground water monitoring well network.

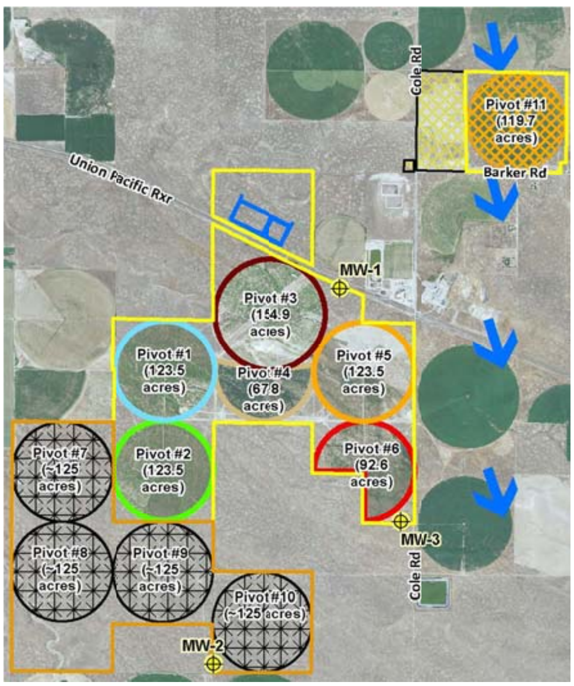

Figure 8. CSBP monitoring wells proposed in Technical Report (HDR 2016b).

4.6 Wastewater/Recycled Water Characterization and Loading Rates

The process water streams and treatment are described in the PER and summarized in the Technical Report and Section 3. The estimated annual wastewater flow to the anaerobic lagoon is 321 MG. Wastewater flows and quality for the facility are not available as the facility is under construction. Flows and loadings were estimated based on similarly operated facilities and the experience of the design team (HDR 2016a). Limited process data for similar facilities was provided in the PER. Nitrogen removal percentages for two meat packing facilities was provided in the PER and showed highly variable nitrogen removal through anaerobic lagoons. The nitrogen removal for one facility averaged 10%, however the minimum daily removal was negative 58% and the maximum daily removal was 63%. The PER used a nitrogen removal rate of 10% for the anaerobic lagoon. No nitrogen removal in the aerobic lagoon was assumed. Nitrogen removal in the storage lagoons was estimated based on biomass solids settling. The PER stated, “Additional removal by nitrification/denitrification and ammonia volatilization will occur, but are expected to be relatively minor.” The nitrogen removal in the storage lagoons was based on the assumptions that the biomass/total suspended solids (TSS) contains seven (7) percent nitrogen on a dry weight basis and the settling efficiency of the biomass/TSS is 75%. The nitrogen removal in the storage lagoons was estimated to be 12% during the summer and 18% in the winter. The PER indicated the 75% settling efficiency is conservative and included TSS removal data for one facility which showed a settling efficiency of greater than 90%.

The anaerobic lagoon and the storage lagoons will each have floors sloped to low-points at the center to provide a location for solids to collect and accumulate. Each of these lagoons will have solids draw-off pipes to remove settled solids. CSBP is still determining how they will manage solids and they have not indicated how frequently solids will be removed from lagoons. A solids management plan is required in the draft permit as discussed in Section 5.4. The permit application is based on the storage lagoons effluent nitrogen loadings indicated in the PER, which assume settled solids in the storage lagoons will not enter the effluent piping. The PER states, “The intakes from the storage basins will be designed and located to reduce the potential for solids combining with treated wastewater and discharge to the land application farms.” The invert elevations of the storage lagoons effluent pipes are just above the interior toes of the dikes. CSBP does not anticipate settled solids entering the storage lagoons effluent pipes, because the influent and effluent pipes are located at opposite corners of the lagoons and the lagoons will generally be quiescent allowing solids to settle (Ursillo 2016). The PER did not assume any salts would be removed through the wastewater treatment process. The PER estimated the NVDS concentration in the pretreatment effluent as 446 mg/L and assumed the concentration remains the same throughout the wastewater treatment system.

The source of recycled water for Pivot 11, MU-241-11, is aerobic lagoon effluent (Murray 2016). The biological solids created in the aerobic lagoon will be kept in suspension by the surface aerators (HDR 2016a). The estimated water quality of the aerobic lagoon effluent for nitrogen (N), phosphorus (P), NVDS, and COD is shown in Table 5.

Table 5. Aerobic lagoon effluent water quality (HDR 2016a).

	Parameter			
Units	**Nitrogen**	**Phosphorus**	**Salts (NVDS)**	**COD**
mg/L	164	27	446	269

The PER estimated the recycled water quality for average and peak design for summer and winter as shown in Table 6.

Table 6. Average and peak design estimated recycled water quality and loadings (HDR 2016a).

		Average		Peak Design	
Parameter	**Unit**	**Summer**	**Winter**	**Summer**	**Winter**
Flow	mgd	0.880	0.880	0.929	0.929
BOD_5	lbs/day	675	1,480	1,080	2,330
	mg/L	92	201	140	301
TSS	lbs/day	700	1,025	974	1,460
	mg/L	95	140	126	188
COD	lbs/day	1,190	2,640	1,930	4,160
	mg/L	167	370	249	537
Nitrogen	lbs/day	1,060	991	1,650	1,650
	mg/L	144	135	213	213
Phosphorus	lbs/day	157	137	248	248
	mg/L	21	19	32	32
NVDS	lbs/day	3,270	3,270	3,350	3,350
	mg/L	446	446	433	433

The estimated recycled water effluent quality was summarized in the PER and is shown in Table 7. The Technical Report used these values for estimating loadings to the reuse sites.

Table 7. Estimated recycled water quality and loadings (HDR 2016b).

	Parameter			
Units	**Nitrogen**	**Phosphorus**	**Salts (NVDS)**	**COD**
lbs/year	373,000	53,300	1,190,000	701,000
mg/L	139	20	446	269

4.7 Hydraulic Loading Rates

The draft permit requires the hydraulic loading rate during the growing season to be substantially at the irrigation water requirement (IWR). The hydraulic loading rate is the total loading based on recycled water and supplemental irrigation water. The IWR is based on the P_{def} of a specific crop for specific conditions (climatic and soil conditions) and the method of applying the irrigation water. P_{def} is discussed in Section 4.2, which includes P_{def} values for specific crops. The irrigation system efficiency (E_i) can be based on values found in the literature. CSBP plans to utilize center pivots for all reuse sites. The Technical Report indicates an irrigation system efficiency of 80% will be utilized, which is in agreement with the DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater (DEQ Guidance) Table 4-12.

The IWR is estimated using the equation:

$$IWR = P_{def}/E_i$$

The draft reuse permit requires CSBP to determine and report the IWR for each irrigated MU and compare it to the hydraulic loadings actually applied to the associated MU annually. The IWR for the growing season for potential crops are shown in Table 8. The cropping plan is discussed in Section 5.6.

Table 8. Growing season Irrigation Water Requirement (inches) (UofI 2012).

		Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Silage Corn - truncated season	P_{def}	-0.02	0.50	4.23	9.47	7.91	2.63	0.02	24.7
	IWR	-0.03	0.63	5.29	11.84	9.89	3.29	0.03	30.9
Alfalfa - frequent cuttings	P_{def}	4.54	6.81	6.94	7.73	6.33	4.49	3.11	40.0
	IWR	5.67	8.51	8.68	9.66	7.92	5.61	3.89	49.9
Winter Grain - Irrigated	P_{def}	4.67	7.95	8.07	2.16	0.66	0.45	0.33	24.3
	IWR	5.83	9.93	10.08	2.70	0.82	0.56	0.41	30.3

For irrigation scheduling methods, the Technical Report indicates a combination of field evaluation of soil moisture and crop health will be checked with the calculated IWR. The draft permit requires the Plan of Operation (PO) to include an irrigation scheduling plan as indicated in Section 8. This plan should describe how irrigation events are scheduled including recycled water and supplemental irrigation water scheduling. This plan should also describe irrigation scheduling when the weather differs from the historical average.

The industrial wastewater treatment system includes two 25 MG settling/storage lagoons for a total storage volume of 50 MG. This capacity appears to be adequate based on the water balance analyses included in the Technical Report. The analyses assumed the minimum total volume for both storage lagoons would be 10 MG at the end of October and the maximum non-growing season volume would be 80% of the total volume or a total of 40 MG. The water balance analyses also used non-growing season hydraulic loading rates (HLR_{ngs}), which were significantly lower than the maximum calculated HLR_{ngs}.

The maximum HLR_{ngs} is calculated by adding the non-growing season evaporation (ET_{ngs}) to the AWHC and subtracting the non-growing season precipitation (PPT_{ngs}).

$$HLR_{ngs} = AWHC + ET_{ngs} - PPT_{ngs}$$

The Technical Report calculated the PPT_{ngs} as 5.43 inches based on the average total precipitation for the Kuna NWS from 1926 to 1996, which is conservative when compared to the the 30-year normal of 5.26 inches (through 1996). The total maximum HLR_{ngs} for all the reuse sites is 166 million gallons (MG). The calculation of HLR_{ngs} assumes zero water content at the start of the non-growing season. DEQ’s Guidance acknowledges this is typical, but indicates adjusting AWHC for typical end of growing season soil water content (dependent upon typical management practices on a site-specific basis) would be a more reasonable assumption. CSBP estimates actual HLR_{ngs} would be significantly below the estimated maximum HLR_{ngs}. The Technical Report analyzed one water balance scenario where the entire 1,286 acres is utilized, which resulted in HLR_{ngs} of 103 MG compared to the maximum HLR_{ngs} of 166 MG. The second water balance scenario analyzed utilized 1,172 acres, which resulted in a HLR_{ngs} of 103 MG compared to a maximum HLR_{ngs} of 159 MG for the reduced acreage. The draft permit limits the HLR_{ngs} to the maximum HLR_{ngs} shown in Table 9, using the AWHC described in Section 4.3.

Table 9. Estimated maximum non-growing season hydraulic loading rate (HDR 2016b).

Pivot	Area w/buffer (acres)	AWHC (inches)	ET_{ngs} (inches)	PPT_{ngs} (inches)	HLR_{ngs} (inches)	HLR_{ngs} (MG)
Pivot 1	123.5	5.72	4.61	5.43	4.90	16.42
Pivot 2	123.5	5.45	4.61	5.43	4.63	15.52
Pivot 3	154.9	7.13	4.61	5.43	6.31	26.53
Pivot 4	67.8	5.56	4.61	5.43	4.74	8.72
Pivot 5	110.0	6.50	4.61	5.43	5.68	16.96
Pivot 6	92.6	5.88	4.61	5.43	5.06	12.72
Pivot 7	124.9	4.88	4.61	5.43	4.06	13.76
Pivot 8	124.9	4.80	4.61	5.43	3.98	13.49
Pivot 9	124.9	7.24	4.61	5.43	6.42	21.76
Pivot 10	124.9	4.66	4.61	5.43	3.84	13.01
Pivot 11	115.0	3.03	4.61	5.43	2.21	6.90
Total	**1286**					**166**

4.8 Constituent Loading Rates

Estimated loadings for two acreage scenarios were provided in the Technical Report. The first scenario used the entire proposed acreage of 1,286 acres and the associated estimated loadings are shown in Table 10. The Technical Report did not account for Pivot 11 being irrigated with the higher strength aerobic lagoon effluent, therefore the total loadings for the entire 1,286 acres would be slightly higher than what is listed in Table 10. The second scenario used a reduced acreage of 1,172 acres, which did not include Pivot 11. The estimated loadings for the second scenario are shown in Table 11, which are higher due to the reduced acreage.

Table 10. Estimated constituent loading rates for 1,286 acres[a].

	Nitrogen (lbs/ac)	Phosphorus (lbs/ac)	NVDS (lbs/ac)	COD GS (lbs/ac/day)	COD NGS (lbs/ac/day)
Recycled Water	290	41	925	1.81	1.01
Supplemental Irrigation Water	17.6	-	2,204	-	-
Total	308	41	3,129	1.81	1.01

a. The draft permit also requires N and P loadings from fertilizer to be reported. The Technical Report indicates fertilizer recommendations will be based on soil test results.

Table 11. Estimated constituent loading rates for 1,172 acres[a].

	Nitrogen (lbs/ac)	Phosphorus (lbs/ac)	NVDS (lbs/ac)	COD GS (lbs/ac/day)	COD NGS (lbs/ac/day)
Recycled Water	318	45	1,015	1.98	1.11
Supplemental Irrigation Water	17.4	-	2,172	-	-
Total	335	45	3,187	1.98	1.11

a. The draft permit also requires N and P loadings from fertilizer to be reported. The Technical Report indicates fertilizer recommendations will be based on soil test results.

A hypothetical typical crop plan was included in the Technical Report and included estimated crop uptakes and loading rates for each management unit for the 1,172 acre scenario, which is more conservative than the full acreage scenario. The estimates indicate the nitrogen loadings would be similar to the crop uptake of nitrogen as shown in Figure 9. The Technical Report indicated the nitrogen crop uptake values accounted for a 15% nitrogen fixation for alfalfa. DEQ Guidance cites research indicating, in a nitrogen adequate environment for alfalfa, 10 to 25% of the nitrogen may be provided by fixation. CSBP's use of 15% nitrogen fixation for alfalfa is within the range listed in DEQ Guidance. The Technical Report recommended a nitrogen loading limit of 150% of crop uptake, which is typical for reuse permits. The draft permit includes a nitrogen limit of 150% of typical crop uptake calculated as indicated in Section 6.7. The draft permit requires the crop uptake for alfalfa to be reduced by 15% to account for nitrogen fixation. The estimated typical nitrogen loadings are significantly less than the nitrogen permit limit of 150% of typical crop uptake as shown in Figure 9, which used silage corn for Pivots 1 and 2 and alfalfa for Pivots 3 through 10.

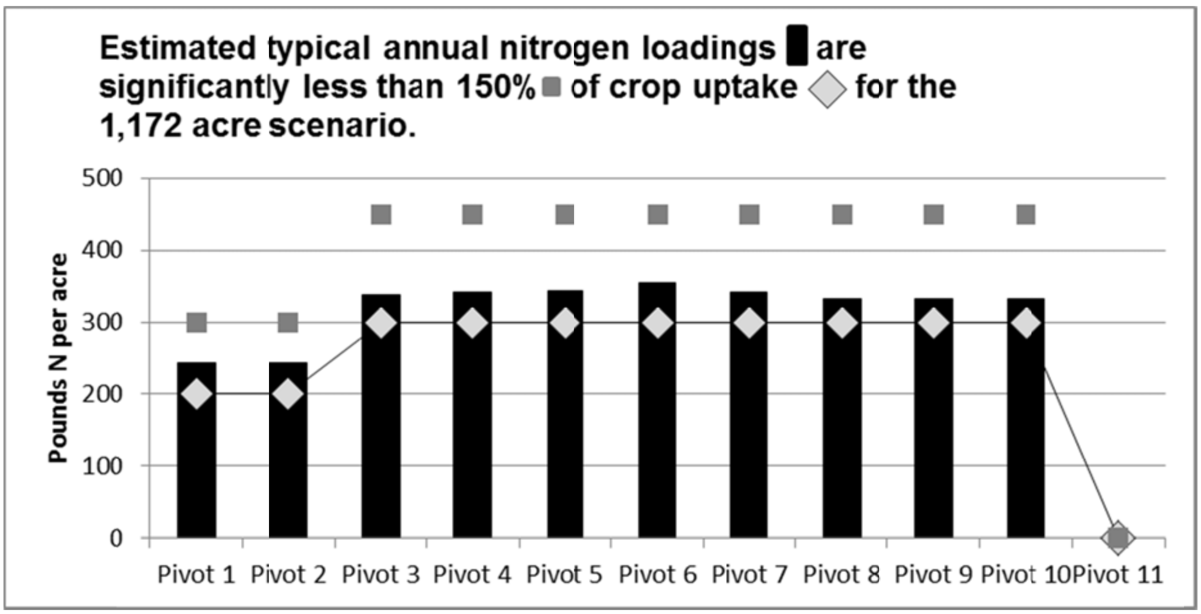

Figure 9. Estimated annual nitrogen loadings and crop uptakes.

Reuse permits do not typically contain phosphorus loading limits, unless impacts to surface water are anticipated. Surface water impacts are not likely due to the depth to ground water and the distance to surface water described in Section 4.4. When growing corn on Pivots 1 and 2 in the hypothetical cropping scenario, estimated phosphorus loadings are similar to estimated crop uptake as shown in Figure 10. However, when growing alfalfa on Pivots 3 through 10, the estimated crop uptakes are significantly less than the estimated phosphorus loadings. If phosphorus is applied at rates higher than crop uptake, it will accumulate in the soil profile. Initial soil sampling indicates phosphorus levels in the soil are low to medium as discussed in Section 4.3.

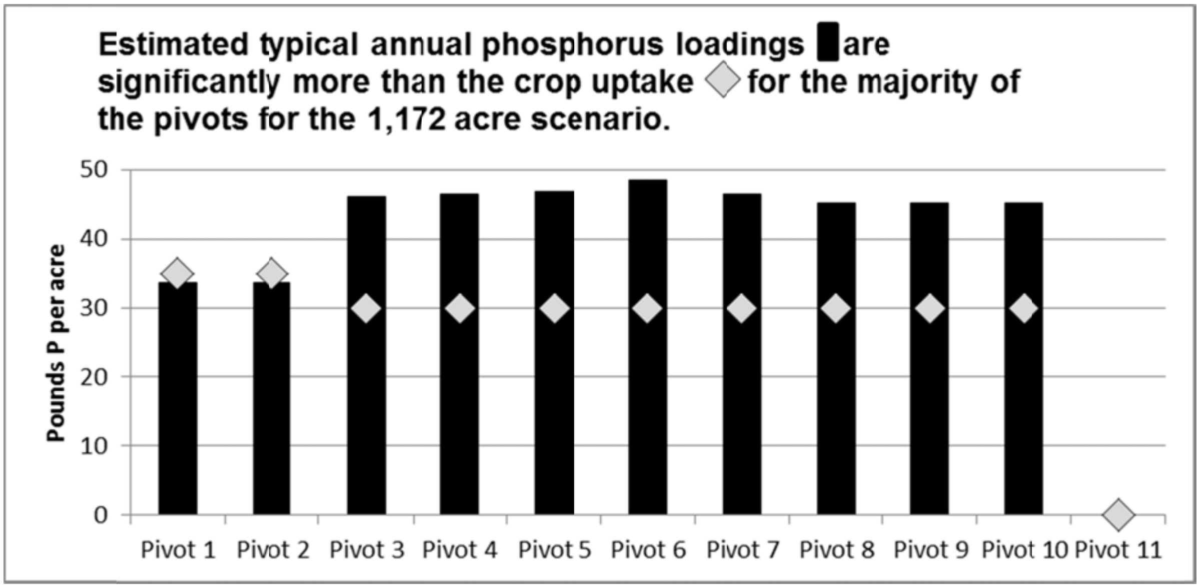

Figure 10. Estimated annual phosphorus loadings and crop uptakes.

The NVDS loading was estimated based on data from Caviness' facility in Texas and assumes NVDS is not removed through the treatment process. The estimated NVDS loadings from recycled water are less than the estimated crop uptakes for silage corn (Pivots 1 and 2) and alfalfa (Pivots 3 through 10), as shown in Figure 11. However, the NVDS loading from the supplemental irrigation water combined with the loading from recycled water, is significantly higher than the estimated crop uptakes for both silage corn and alfalfa. HDR completed ground water modeling for NVDS as discussed in Section 4.5. This is a new facility and there are many assumptions and uncertainties associated with the estimates. The Technical Report indicates nitrogen is the limiting constituent and NVDS loadings will be limited due to the nitrogen permit limit. CSBP has requested no permit limit for NVDS at this time and has recommended the permit require a NVDS study over a three year period. This study would assess NVDS makeup and concentrations, loadings, and ground water conditions. CSBP would then make recommendations for appropriate NVDS management. The draft permit includes a compliance activity to conduct a salt study as indicated in Sections 5.8 and 9. Staff recommends the future permit renewal process evaluate whether or not NVDS loading limits should be implemented.

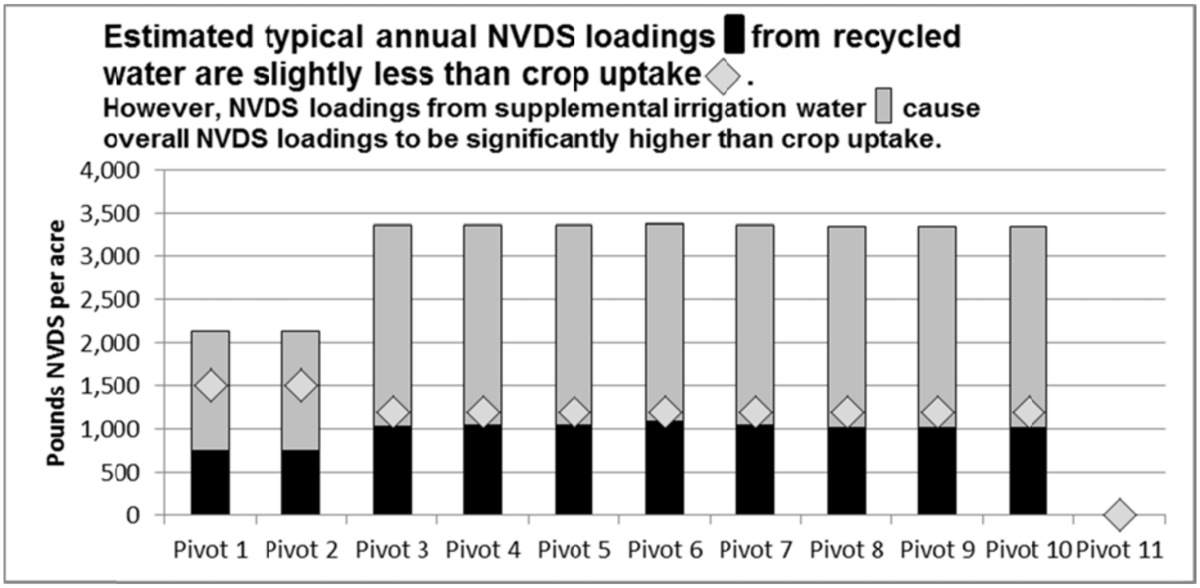

Figure 11. Estimated annual NVDS loadings and crop uptakes.

5 Site Management

5.1 Buffer Zones

Buffer zones for protection of surface water, ground water, drinking water supplies, and the public is required by IDAPA 58.01.17.604. DEQ Guidance provides recommended buffer distances for various reuse scenarios. For this permit, the following scenario was used in determining buffer distances: industrial, rural or industrial area, and sprinkler irrigated. A summary of buffer zones is shown in Table 12. The Technical Report discussed buffer zone management in Section 7.3.1 and included a buffer zone map.

Existing buffer zones satisfy the DEQ Guidance buffer requirements, except for the nearest private water supply, as shown in Table 12. There is a drinking water well owned by CSBP, identified as a domestic well at the farm shed, located less than 500 feet east of MU-241-05 along Cole Road. This well was included in the Preliminary Well Location Acceptability Analysis (WLAA) in the Technical Report. The WLAA indicated the location of this well is acceptable. Technical Report indicates this well is in a shed, was developed beneath the upper water zone aquifer below confining layers, and the well is cased to 361 feet below ground surface. The Technical Report indicated Cole Road adjacent to Pivot 6 is a private road, controlled by CSBP, with a gate, therefore a buffer is not required at this location. The DEQ Guidance buffer zone recommendations are specified in the draft permit, except the location of the existing well at the farm shed is considered acceptable based on the WLAA.

Fencing around the reuse sites is not required for this reuse scenario. Fencing around the lagoons is recommended to prevent entering of livestock and to discourage trespassing. CSBP plans to install fencing and signage around the storage lagoons as shown in Table 12. A buffer zone plan is a required component of the PO required by Compliance Activity CA-241-01 in the draft permit (see Section 8).

Table 12. Buffer zones (in feet).

	DEQ Guidance Buffer Zones[a]	Actual Reuse Area
Nearest Inhabited Residence	300	>300 (southeast of MU-241-11)
Nearest Public Water System	1,000	>1,000
Nearest Private Water Supply	500	>500 (south of MU-241-11) except CSBP well at farm shed
Areas Accessible to the Public	50	50 (Cole Road adjacent to MU-241-05 and Barker Road adjacent to MU-241-11)
Nearest Surface Water	100	10 miles northeast (Boise River)
Nearest Irrigation Ditches/Canals	50	3.5 miles northwest (New York Canal)
Fencing	Not required	Fencing will be provided around storage lagoons. The facility including the brine, anaerobic, and aerobic lagoons will be fenced.
Posting	Not required	Signage will be provided around the storage lagoons

a. DEQ Guidance provides recommended buffer distances, fencing, and posting for various reuse scenarios.

5.2 Runoff

An outline of the runoff management plan was included with the Technical Report. While Pivots 1 through 6 and Pivot 11 are operational, as discussed in Section 4.1, CSBP is modifying the piping and prefers to submit a runoff management plan once the irrigation system has been completed. DEQ received the irrigation improvements plans on August 30, 2016. In addition, the Technical Report indicated the reuse sites are relatively flat and CSBP does not anticipate runoff. However, some of the reuse sites have sodic soil, as discussed in Section 4.3, and sodic soil may possibly experience infiltration problems resulting in runoff (DEQ 2007). The outline of the runoff management plan indicates the plan will address soil monitoring and managing sodic conditions. The runoff management plan should also address non-growing season application and freezing conditions. The Technical Report indicated the following best management practices (BMPs) may be implemented:

- Using low-impact spray nozzles on pivot systems
- Irrigating when soils are not saturated
- Establishing berms where runoff could occur

A runoff management plan is a required component of the PO required by Compliance Activity CA-241-01 in the draft permit (see Section 8). The runoff management plan should include control structures and other BMPs designed to prevent runoff from the permitted site except in the event of a 25-year, 24-hour storm event or greater, using the Western Regional Climate Center (WRCC) Precipitation Frequency Map, Figure 28, Isopluvials of 25-YR, 24-HR Precipitation. For this site, the 25-year, 24-hour event is 2 inches (WRCC 1973).

5.3 Seepage Rate Testing

Multiple lagoons are being constructed for this facility as discussed in Section 3. Table 13 contains a summary of the industrial wastewater related lagoons for the facility, which will be associated with the reuse permit. CSBP plans to seepage test all of these lagoons in the fall of 2016. While the Wastewater Rules do not require industrial facilities to seepage test lagoons, industrial facilities are still required to comply with the Ground Water Quality Rule. CSBP has elected to demonstrate compliance with the Ground Water Quality Rule through seepage testing their lagoons as indicated in their Preliminary Engineering Report (HDR 2016a). The draft permit sets an allowable seepage rate for each lagoon of 0.125 inches per day, and requires seepage testing of each lagoon ten years after the initial testing is conducted. DEQ may also require seepage testing after any modification to a lagoon that may have damaged the liner.

Table 13. Lagoons associated with Permit I-241-01.

Lagoon	Description
LG-241-01	Brine Pond
LG-241-02	Anaerobic Lagoon
LG-241-03	Aerobic Lagoon
LG-241-04	East Storage Lagoon
LG-241-05	West Storage Lagoon

Test procedures for completing seepage tests should be submitted at least 42 days prior to the anticipated date of the first seepage test. A seepage test report must be submitted to DEQ for review and approval within 90 days after completion of the seepage test. One overall report or individual reports may be submitted. The draft permit requires CSBP to receive approval of the seepage tests from DEQ prior to discharging industrial wastewater to the lagoons.

Information on seepage testing procedures are located at: *http://www.deq.idaho.gov/water-quality/wastewater/lagoon-seepage-testing.aspx*.

5.4 Waste Solids, Biosolids, Sludge, and Solid Waste

A plan has not been developed for disposing of solids as CSBP is still in the process of determining how to dispose of or reuse solids. The Technical Report briefly discusses waste solids management in Section 7.3.4. CSBP does not anticipate applying solids to the reuse sites (HDR 2016a). Sources of solids are:

- Grit solids from pen waste (mostly manure and bedding)
- Paunch solids
- Bottom solids from DAF
- Settled solids from anaerobic lagoon
- Settled solids from storage lagoons

The draft permit requires the development of a solids management plan as a component of the PO required by Compliance Activity CA-241-01 (see Section 8). Once the facility begins operating, they will be generating solids. CSBP may submit a solids management plan to DEQ for review and approval prior to submitting the PO.

5.5 Nuisance Odors

An outline of a nuisance management plan was included with the Technical Report. CSBP anticipates odors will be minimal. The packing plant will use a packed bed scrubber. They plan to use a solution of sodium hypochlorite and sodium hydroxide to oxidize odorants from the rendering plant and plant ventilation air (Witt 2016). The anaerobic lagoon will be covered as discussed in Section 3. The draft permit requires the development of a nuisance management plan as a component of the PO required by Compliance Activity CA-241-01 (see Section 8). The nuisance management plan should discuss odor prevention, odor minimization, and handling odor complaints. CSBP may submit a nuisance management plan to DEQ for review and approval prior to submitting the PO.

5.6 Cropping Plan

A cropping plan has not been submitted. Once the facility is operating and producing recycled water, CSBP anticipates crops to be grown will include alfalfa, silage corn, triticale, winter wheat, and double cropping with triticale/corn or triticale/alfalfa (HDR 2016). CSBP proposed including a permit requirement to submit a cropping plan prior to each growing season. Staff concurs and recommends including a permit requirement for an annual proposed cropping plan to be submitted as part of each annual report. This annual cropping plan should identify which crops will be planted on each MU for the upcoming growing season. In addition, a cropping plan is a required component of the PO required by Compliance Activity CA-241-01 (see Section 8). The cropping plan in the PO should discuss the overall cropping plan for the sites including all crops to be grown at the reuse sites, when crops should be planted, when crops should be rotated, fertilization, estimated crop uptakes of nutrients, plow down, and nutrients released from plow down.

5.7 Grazing

CSBP does not intend to graze animals at the reuse sites. Grazing is not allowed unless it is conducted in accordance with a DEQ approved grazing management plan. If CSBP is interested in grazing in the future, they will need to submit a grazing management plan to DEQ for review and approval prior to each grazing event.

5.8 Salts

Estimated salt loadings, from recycled water and supplemental irrigation water, are significantly higher than estimated crop uptake as shown in Figure 11. The Technical Report included preliminary ground water modeling of NVDS using DEQ’s Water Reuse/Land Treatment System Modeling spreadsheets. The model was run for recycled water plus supplemental irrigation water as well as for supplemental irrigation water alone. The upgradient TDS concentration was assumed to be 425 mg/L based on results from the monitoring wells for reuse permit LA-000054. The preliminary modeling results indicate the TDS concentration in ground water may increase to above the secondary constituent standard of 500 mg/L. This preliminary modeling used estimated loadings and baseline ground water data from a monitoring well from a nearby facility. The model did not use site specific data and could not be calibrated with site specific data because the facility is currently under construction. The draft permit requires the installation of ground water monitoring wells and analysis of site specific data once the facility is operating as discussed in Section 4.5.

The Technical Report recommended the permit include a NVDS study as a compliance activity to assess NVDS makeup and concentrations, loadings, and ground water conditions. The draft permit requires CSBP to perform a hydrogeological characterization and prepare a ground water monitoring plan as discussed in Section 4.5. The results can be utilized to model potential NVDS impacts to ground water. The draft permit requires a Nitrate and NVDS study as a compliance activity as discussed in Section 4.5. Time is required for CSBP to complete constructing the facility, to operate the facility, to collect data, and to prepare the hydrogeological characterization and ground water monitoring plan. The draft permit requires the nitrate and NVDS study to be submitted to DEQ for review and approval within 42 months of permit issuance. This should provide DEQ time to review the nitrate and NVDS study prior to the pre-application workshop to be held 48 months after permit issuance.

6 Monitoring

The proposed monitoring requirements for the draft permit are described in detail in the following subsections. All monitoring will be conducted in accordance with the facility's Quality Assurance Project Plan (QAPP). See Section 7 for requirements regarding the QAPP.

6.1 Wastewater/Recycled Water Monitoring

The goal of wastewater/recycled water monitoring is to provide a timely and cost-effective assessment of the adequacy of wastewater treatment process operations and operation and management procedures (DEQ 2007). Flow monitoring is critical for constituent loading calculations for permit compliance purposes.

The Technical Report recommended monitoring recycled water monthly for nitrogen, phosphorus, NVDS, and COD and semi-annually for TDIS. Staff recommends monthly monitoring of phosphorus, pH, NVDS, electrical conductivity (EC), and COD. Staff recommends semi-annual monitoring for TDIS. Staff recommends three times per week nitrogen monitoring, when irrigating, of the aeration lagoon effluent and the storage lagoons effluent as shown in Table 14, until CSBP can provide data showing the nitrogen concentrations are consistent. Three 24-hour composite samples per week for nitrogen monitoring is recommended due to the irregularity of the nitrogen data provided in the PER (discussed in Section 4.6), the lack of operational data for this new facility, and the importance of accurate nitrogen loadings for determining permit compliance. As discussed in Section 4.8, aeration lagoon effluent will be provided to Pivot 11 instead of storage lagoons effluent. When the facility begins operating, the total nitrogen concentrations will likely be inconsistent due to the startup of the biological treatment system. In addition, CSBP plans to use ground water to seepage test the lagoons, which may result in diluted effluent for a time. When CSBP is able to measure total nitrogen concentrations from normal operations will depend on irrigation scheduling and the biological treatment system. The permit includes a compliance activity for each sampling point, requiring CSBP to demonstrate nitrogen concentrations are consistent over a minimum period of 30 days. Once CSBP demonstrates consistency at a sampling point, the permit requires monthly nitrogen monitoring at the associated sampling point. The draft permit does not define what consistent means. The permittee will need to analyze the results and justify to DEQ why they consider the results consistent.

The Technical Report recommended monitoring recycled water flow from the storage lagoons daily. The Technical Report indicated the recycled water flow to each pivot will be calculated based on the use of a flow totalizer, pivot speed, and nozzle package. The Technical Report indicated CSBP would verify the calculated pivot flow rates annually using a portable flow meter system. The PO and QAPP should include and describe the verification of the pivot flow rates. The draft permit requires annual verification of pivot flow rates and reporting of the verification in the annual report. Since MU-241-11 will be provided with aerobic lagoon effluent, a flow meter must be provided for this flow.

Table 14. Wastewater/recycled water quality monitoring.

Monitoring Point Serial Number and Location	Sample Description	Sample Type and Frequency	Constituents (Units in mg/L Unless Otherwise Specified)
WW-241-01 Recycled water downstream from storage, prior to land application	Recycled water applied to MU-241-01 through MU-241-10	24 hour composite/three times per week when irrigating until CA-241-03 is approved, then composite/monthly when irrigating	- Total Kjeldahl nitrogen, as N - Nitrite + nitrate-nitrogen, as N
		Composite/monthly, when irrigating	- Total phosphorus, as P - pH - Non-volatile dissolved solids - Electrical Conductivity - Chemical oxygen demand
		Composite/semi-annually (May and August)	- Total Dissolved Inorganic Solids
WW-241-02 Wastewater downstream of aerobic lagoon, prior to storage	Partially treated wastewater applied to M-241-11	24 hour composite/three times per week when irrigating until CA-241-04 is approved, then composite/monthly when irrigating	- Total Kjeldahl nitrogen, as N - Nitrite + nitrate-nitrogen, as N
		Composite/monthly, when irrigating	- Total phosphorus, as P - pH - Non-volatile dissolved solids - Electrical Conductivity - Chemical oxygen demand
		Composite/semi-annually (May and August)	- Total Dissolved Inorganic Solids

6.2 Soil Monitoring

The purpose of requiring soil monitoring is provided by Section 7.4.1 of the DEQ Guidance, which states:

> *Soil monitoring has a dual purpose within the wastewater-land application program. The first is a nutrient management purpose… Testing for macro-nutrients such as nitrogen, phosphorus, and potassium; pH; and micro-nutrients, are needed so that nutrient loading through wastewater and/or fertilizer can be managed to maximize both crop growth and the efficiency with which nutrients are being utilized…*
>
> *The second purpose of soil monitoring is to assess soil quality. This involves characterizing the chemical and physical properties of soils of wastewater-land application sites initially during site characterization as well as over time… Soil quality monitoring can signal the accumulation of constituents which may constitute a risk to ground water, given leaching conditions. Soil data can then be utilized to determine appropriate loading rates and management. Monitoring of soils should also include metals and a periodic infiltration study, if SAR levels or operational observation indicate increased runoff or runoff potential.*

Buildup of soil salinity can be detrimental to crop health and reduce yield. Under certain conditions, high levels of sodium can reduce the soil's ability to infiltrate water and cause runoff and impact crop health. Excessive irrigation and/or high strength reuse water may cause anaerobic soil conditions and the reduction of naturally occurring iron and manganese to their more mobile forms.

The Technical Report recommended semi-annual soil monitoring for EC, nitrate, ammonium, plant available phosphorus, pH, and SAR. DEQ concurs with the recommended frequency and parameters, except for SAR monitoring. Instead of monitoring SAR, the draft permit requires exchangeable sodium percentage (ESP) monitoring. In addition, the draft permit requires monitoring percent organic matter because organic matter mineralizes over time to yield plant available nitrogen (DEQ 2007).

The draft permit requires semi-annual monitoring iron and manganese during the first year of the permit for characterization of the soil and the fourth year, to help determine if land application of recycled water may have impacted the soil. CSBP has already conducted some soil sampling for iron and manganese, however the sampling did not necessarily use the same sampling locations and depths that will be sampled for the permit.

The soil sampling protocols must be defined in the QAPP (see Section 7). Several soil samples are necessary at each reuse site to provide representative samples. The number of samples depends on the acreage of each site. Guidance for determining the number of samples needed can be found in Section 7.4.5.2 of the DEQ Guidance. At each sampling location, soil samples must be taken at soil depths of 0 to 12 inches, 12 to 24 inches, and 24 to 36 inches (or refusal). All the samples for each site are composited for each soil depth.

6.3 Ground Water Monitoring

The draft permit requires installing three ground water monitoring wells as discussed in Section 4.5. Ground water monitoring will be used to evaluate the facility's impact on ground water quality and also serves to assess compliance with the reuse permit and the *Ground Water Quality Rule*. The Technical Report recommended monitoring ground water for water table elevation, water table depth, nitrate, TDS, pH, EC, temperature, iron, manganese, chloride, and sulfate. In addition to the monitoring recommended in the Technical Report, the draft permit requires monitoring phosphorus. The Technical report recommended semi-annual sampling of ground water monitoring wells. The draft permit requires quarterly sampling of the ground water monitoring wells for the first two years of sampling as recommended by staff in Section 4.5, followed by semi-annual sampling thereafter. In addition, the draft permit requires monitoring common ions once during the first year of the permit and once during the fourth year of the permit as recommended in Section 4.5.

6.4 Supplemental Irrigation Water Monitoring

The draft permit imposes limits for overall growing season and non-growing season hydraulic loadings. CSBP plans to use supplemental irrigation water to meet crop irrigation water requirements during the growing season as discussed in Section 4.7. The draft permit requires CSBP to monitor each of the facility's supplemental irrigation wells. Some water rights documentation was included in the Technical Report, however, a summary indicating sufficient water rights to meet the crops irrigation water requirements was not provided. CSBP is in the process of determining where to locate the fourth supplemental irrigation water well and where to permanently source the water for Pivot 11. DEQ's PO Checklist requires CSBP to confirm water rights, in combination with recycled water volume, are sufficient to meet crop water needs/IWRs. For the most part, recycled water and supplemental irrigation water will be delivered using the same pipelines. The draft permit requires backflow prevention to protect ground water from recycled water. Each well is equipped with a chemigation check valve that provides backflow protection for the wells (Murray 2016). The chemigation check valve is an anti-siphon valve with a low pressure drain and an air vent.

The Technical Report recommended monitoring supplemental irrigation water semi-annually for total Kjeldahl nitrogen, nitrate + nitrite-nitrogen, total phosphorus, non-volatile dissolved solids, and chemical oxygen demand. DEQ concurs with the recommendations and the draft permit requires monitoring these parameters.

6.5 Crop Yield and Tissue Monitoring

The Technical Report included crop harvest and plant tissue monitoring recommendations. DEQ concurs with the recommendations. The draft permit requires monitoring the following crop harvest parameters for the harvested portion for each crop for each management unit: crop type, harvest date, sample collection date, harvested acreage, as-harvested ('wet') yield, as-harvested (field) moisture content, and dry yield. For plant tissue monitoring, the draft permit requires analyzing the harvested portion of each crop for each management unit for: moisture content, total Kjeldahl nitrogen, nitrate nitrogen, phosphorus, and ash.

6.6 Meteorological Monitoring

Meteorological monitoring is not required in the draft permit. However, the outline for the runoff management plan included in the Technical Report indicates weather monitoring will be part of the runoff management plan. Weather monitoring as part of the runoff management plan will help the facility ensure they consider precipitation when scheduling irrigation and they are not applying recycled water during freezing conditions. Staff recommends evaluating whether meteorological monitoring is warranted as a permit requirement during the next permitting cycle.

6.7 Calculation Methodologies

The PO should include the methods of calculation to determine permit compliance. The draft permit requires calculations in the Reporting Requirements section. The following describes recommended methods of calculation.

The IWR should be calculated with an irrigation efficiency corresponding to the type of irrigation, such as pivot. The IWR should be calculated using the tables for the Kuna National Weather Station and corresponding to the type of crop grown as described in Section 4.7.

The draft permit requires daily monitoring of the volume of recycled water and supplemental irrigation water applied to each management unit. The monthly hydraulic loading rate should be calculated by summing the daily hydraulic loading rates corresponding to each month. The annual report should compare the monthly hydraulic loadings to the IWR for each month.

The draft permit requires the annual total nitrogen loading from all sources for each reuse site. The total nitrogen loading for a reuse site will be the sum of the nitrogen from recycled water, supplemental irrigation water, fertilizer, and any solids applied to the reuse site. The PO should indicate how the nitrogen loading is calculated and include sample calculations. DEQ Guidance Section 4.4.14 provides example calculations. Additional potential methods for calculating the nitrogen loading from recycled water and supplemental irrigation water follow.

Annual nitrogen loading from recycled water calculation:

Calculate the pounds of nitrogen per acre for each management unit for each month as follows:

[(mean monthly TKN in mg/L+ mean monthly nitrate+nitrite-nitrogen in mg/L)*monthly recycled water flow in MGD*8.34]/acres utilized

Then sum all the months when recycled water was applied at the reuse site for the total nitrogen loading, in pounds per acre, from recycled water

Annual nitrogen loading from supplemental irrigation water calculation:

Calculate the pounds of nitrogen per acre for each management unit as follows:

[(mean TKN in mg/L+ mean nitrate+nitrite-nitrogen in mg/L)*growing season supplemental irrigation water flow in MGD*8.34]/acres utilized

The draft permit limits the total nitrogen loading to 150% of the typical crop uptake. When three years of crop uptake data is available for a hydraulic management unit, the typical crop uptake is to be calculated prior to each growing season so the permittee knows the nitrogen loading limit prior to the start of each growing season. For alfalfa, crop uptake must be reduced by 15% to account for nitrogen fixation as discussed in Section 4.8.

The draft permit requires the annual total phosphorus loading from all sources for each reuse site. The total phosphorus loading for a reuse site will be the sum of the phosphorus from recycled water, supplemental irrigation water, fertilizer, and any solids applied to the reuse site.

Annual phosphorus loading from recycled water calculation:

Calculate the pounds of phosphorus per acre for each month as follows:

$$\frac{\text{monthly total phosphorus in mg/L} * \text{monthly flow in MGD} * 8.34}{\text{acres utilized}}$$

Then sum all the months when recycled water was applied at the reuse site for the total phosphorus loading, in pounds per acre, from recycled water

The draft permit requires calculation of the annual salt loading from recycled water and supplemental irrigation water. The recycled water and supplemental irrigation water calculations will be based on NVDS concentrations. The net salt loading will be the recycled water plus supplemental irrigation water salt loadings minus the ash removed by the crop in pounds per acre.

7 Quality Assurance Project Plan

The QAPP is a written document outlining the procedures used by the permittee to ensure the data collected and analyzed meets the requirements of the permit.

In support of the agency mission, DEQ is dedicated to using and providing objective, correct, reliable, and understandable information. Decisions made by DEQ are subject to public review and may at times, be subject to rigorous scrutiny. Therefore, DEQ’s goal is to ensure that all decisions are based on data of known and acceptable quality.

The QAPP is a permit requirement and must be submitted to DEQ as a stand-alone document for review and acceptance. The QAPP is used to assist the permittee in planning for the collection, analysis, and reporting of all monitoring data in support of the reuse permit and explaining data anomalies when they occur.

DEQ does not approve QAPPs, but reviews them to determine if the minimum EPA guideline requirements are met and that the reuse permit requirements are satisfied. The reason DEQ does not approve QAPPs is that the responsibility for validation of the facility sampling data lies with the permittee’s quality assurance officer and not with DEQ.

The format of the QAPP should adhere to the recommendations and references in 1) the Assurance and Data Processing sections of the DEQ Guidance and 2) EPA QAPP guidance documents. EPA QAPP guidance documents are available at the following website: *http://www.epa.gov/quality/qapps.html*

The Technical Report included an outline of the QAPP. Compliance Activity CA-241-02 of the draft permit requires a QAPP to be developed and implemented as indicated in Section 9.

8 Site Operation and Maintenance

CSBP will operate and maintain the industrial wastewater treatment facilities, reuse system, and reuse sites. CSBP plans to hire a plant manager and an environmental manager. CSBP has already hired a farm manager to manage the reuse sites. The permit application does not indicate whether or not CSBP plans to hire a licensed operator. Staff recommends CSBP hire a licensed wastewater operator with a wastewater treatment land application license; however, the draft permit does not require CSBP to hire licensed operators.

CSBP does not own the land for Pivots 7 through 10. The Technical Report included a copy of the leases. The leases commence on September 1, 2016 and expire on August 31, 2026. The draft permit is for a term of five years. The permit renewal application will be due 180 days prior to the permit expiration. Staff recommends CSBP be required to document sufficient acreage is available long-term as part of the future permit renewal application.

The annual reporting year is November 1 through October 31. The due dates of annual reports are January 15.

The draft permit includes a compliance activity requiring CSBP to prepare a draft PO and submit the draft PO to DEQ for review and approval within three months of permit issuance. The draft permit requires CSBP to submit an updated PO to DEQ for review and approval by March 30, 2018, to allow the facility over one year of operational experience to appropriately update the PO. The Technical Report included an outline for a PO. The PO needs to comply with the applicable requirements stated in section 300.05 of the Recycled Water Rules and needs to address applicable items in the DEQ's PO Checklist. The PO must include operation and maintenance information as well as the plans listed below. If the plans were discussed previously in this Staff Analysis, then the applicable section is referenced. The plans may be submitted with the PO or the permittee may submit plans individually.

- Buffer zone (see Section 5.1)
- Cropping (see Section 5.6)
- Irrigation management and scheduling (see Section 4.7)
- Nuisance and odor management (see Section 5.5)
- Runoff management (see Section 5.2)
- Salt management (see Section 5.8)
- Solids management (see Section 5.4)

9 Compliance Activities Required in Permit

The following compliance activities are specified in the draft permit.

1. Submit a draft PO that incorporates the requirements of the new permit within three months of permit issuance, as discussed in Section 8. Submit an updated PO by March 30, 2018.

2. Submit a QAPP, including verification that the plan has been implemented by the facility, by February 28, 2017, as discussed in Section 7.

3. Submit an Irrigation Lagoons Effluent Nitrogen Study for review and approval as discussed in Section 6.1.
4. Submit an Aerobic Lagoon Effluent Nitrogen Study for review and approval as discussed in Section 6.1.
5. Submit lagoon seepage rate test proposed schedule and procedures at least 42 days prior to the first planned seepage test, as discussed in Section 5.3. Submit a seepage test report within 90 days after completion of the seepage test. Complete the seepage tests and receive approval from DEQ prior to discharging industrial wastewater to the lagoons.
6. Submit plans for three ground water monitoring wells within two months of permit issuance, as discussed in Sections 4.5 and 6.3. Install the three monitoring wells within three months after approval of the plans.
7. Submit a Hydrogeological Characterization and Ground Water Monitoring Plan for review and approval, as discussed in Section 6.3 within three years of permit issuance.
8. Submit a NVDS study plan for review and approval, as discussed in Section 5.8, within three years of permit issuance.
9. Schedule a Pre-Application Workshop one year prior to permit expiration.
10. Submit a permit renewal application 180 days prior to the expiration of the permit.

10 Recommendations

Staff recommends the permit be issued. The permit specifies hydraulic and constituent loading limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

11 References

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