INL/EXT-14-33914

2014 Annual Wastewater Reuse Report for the Idaho National Laboratory Site's Central Facilities Area Sewage Treatment Plant

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February 2015

The INL is a U.S. Department of Energy National Laboratory
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ABSTRACT

This report describes conditions, as required by the state of Idaho Wastewater Reuse Permit (#LA-000141-03), for the wastewater land application site at the Idaho National Laboratory Site's Central Facilities Area Sewage Treatment Plant from November 1, 2013, through October 31, 2014. The report contains, as applicable, the following information:

- Site description
- Facility and system description
- Permit required monitoring data and loading rates
- Status of compliance conditions and activities
- Discussion of the facility's environmental impacts.

The current permit expires on March 16, 2015. A permit renewal application was submitted to Idaho Department of Environmental Quality on September 15, 2014.

During the 2014 permit year, no wastewater was land-applied to the irrigation area of the Central Facilities Area Sewage Treatment Plant and therefore, no effluent flow volumes or samples were collected from wastewater sampling point WW-014102.

Seepage testing of the three lagoons was performed between August 26, 2014 and September 22, 2014. Seepage rates from Lagoons 1 and 2 were below the 0.25 inches/day requirement; however, Lagoon 3 was above the 0.25 inches/day. Lagoon 3 has been isolated and is being evaluated for future use or permanent removal from service.

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ACRONYMS

CFA	Central Facilities Area
CWI	CH2M-WG Idaho, LLC
DEQ	Idaho Department of Environmental Quality
IDAPA	Idaho Administrative Procedure Act
INL	Idaho National Laboratory
J-U-B	J-U-B Engineers, Inc.
MG	million gallons
R&MS	Regulatory and Monitoring Services
STP	Sewage Treatment Plant
SwRI	Southwest Research Institute
WRP	Wastewater Reuse Permit

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1. INTRODUCTION

The Central Facilities Area (CFA) Sewage Treatment Plant (STP) is a wastewater land application facility operated by Battelle Energy Alliance, LLC, under Wastewater Reuse Permit (WRP) LA-000141-03 issued by the State of Idaho, Department of Environmental Quality (DEQ). The permit was re-issued on March 17, 2010.

The WRP expires on March 16, 2015 (Neher 2010). A pre-application meeting was held with DEQ on July 1, 2014 (Lewis 2014a) to discuss information to be included in the renewal application. The permit renewal application, designation of Responsible Official and Authorized Representative form, and facility information form was submitted to DEQ on September 15, 2014 (Miller 2014a).

Following a description of the STP site, facility, and system, this report presents, as applicable, the status of monitoring data, special compliance conditions, noncompliances, and environmental impacts that occurred at the CFA STP during the 2014 reporting year.

2. SITE, FACILITY, AND SYSTEM DESCRIPTION

The STP is located approximately five miles north of the Idaho National Laboratory (INL) Site's southern boundary and southeast of the CFA, which is about 50 miles west of Idaho Falls in Butte County, Idaho (Figure 1). The STP is approximately 2,200 ft downgradient of the nearest drinking water well and 4,000 ft north of Highway 26. The wastewater land application area is approximately 2,200 ft from the nearest inhabited building.

As shown in Figure 1, the STP consists of a:

- 1.7-acre partial-mix, aeration lagoon (Lagoon No. 1)
- 10.3-acre facultative lagoon (Lagoon No. 2)
- 0.5-acre polishing lagoon (Lagoon No. 3)
- 73.5 acre wastewater land application area consisting of desert steppe and crested wheatgrass vegetative communities
- Computerized center-pivot, sprinkler irrigation system.

A 350-gpm (gallons per minute) pump moves wastewater from the polishing lagoon to the center-pivot sprinkler system, which waters the land application area at low pressures (about 30 lbs/in^2) to minimize aerosols and spray drift.

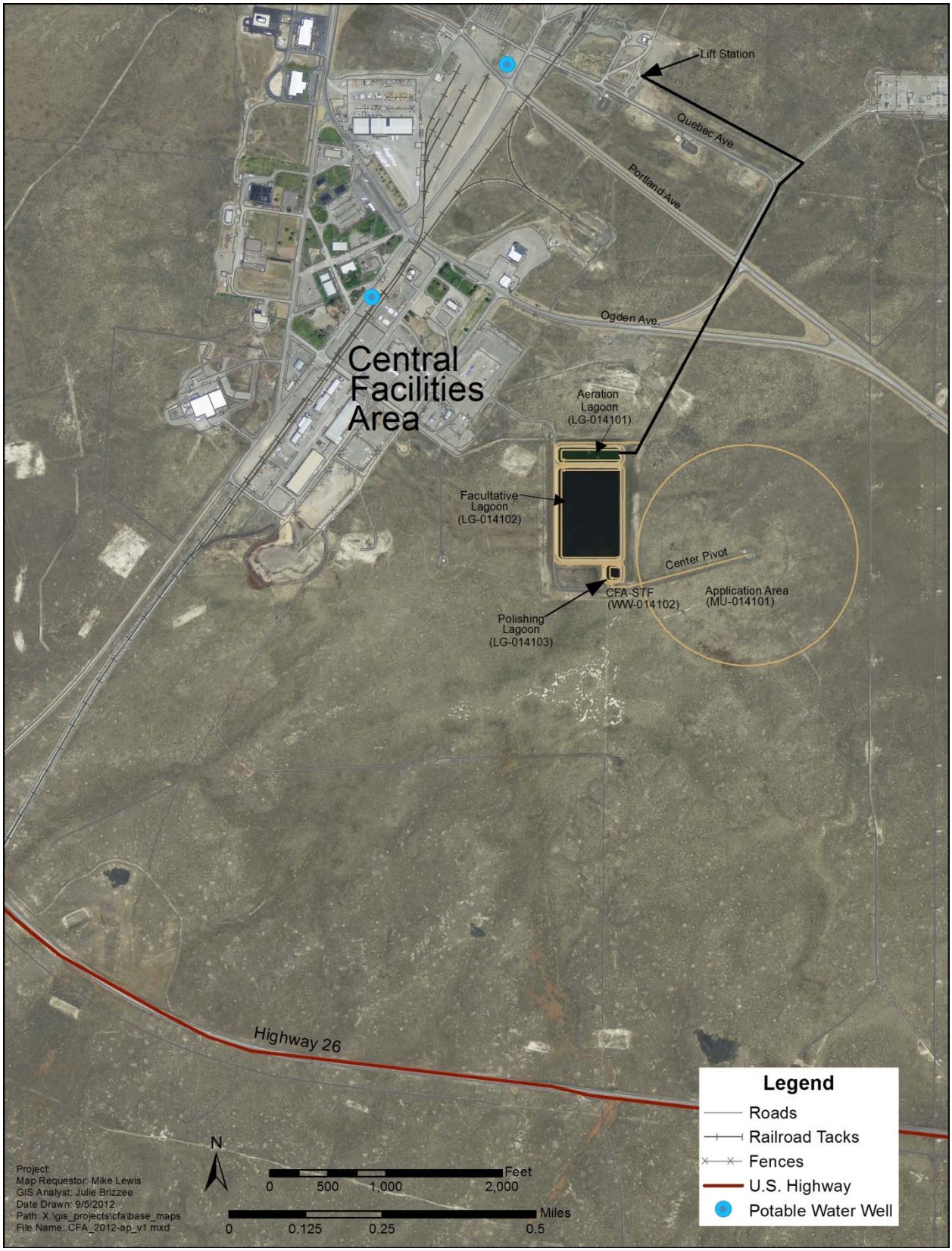

Figure 1. Area map showing the location of the Central Facilities Area Sewage Treatment Plant.

As stipulated in the permit (Section F, Table 4), no grazing of domesticated animals or cultivation of crops for human consumption occurred on the application area during the 2014 permit year.

The STP serves all major CFA facilities. The wastewater is derived from: bus and vehicle maintenance areas; boiler blowdown; heating, ventilation, and air conditioning systems; employee showers and restrooms; laboratories; craft shops; a fire station; and a medical dispensary. Additional wastewater may be transported from other area comfort stations, septic tanks and portable toilets.

3. EFFLUENT MONITORING AND LOADING RATES

This section describes the sampling and analytical methods used in the effluent monitoring program. It provides the effluent monitoring data, the effluent flow data, and a summary of the truck-hauled wastewater that is discharged to the CFA STP. The section also includes the calculated hydraulic and nutrient loading rates as required by the permit.

3.1 Sampling Program and Analytical Methods

During the 2014 permit year, no wastewater was applied to the land application area, therefore, no effluent sampling was required by the permit.

However, when wastewater is land applied, INL Regulatory and Monitoring Services (R&MS) monitors effluent discharges at the CFA STP. The R&MS program involves sampling, analysis, and data interpretation carried out under a quality assurance program in accordance with the permit. Samples are collected from the CFA STP pump pit (WW-014102) prior to discharge to the sprinkler pivot.

CH2M-WG Idaho, LLC (CWI), wastewater operators are subcontracted to perform the monthly permit required effluent total coliform analyses when wastewater is land applied. The CWI, State of Idaho-licensed wastewater operators perform the total coliform analysis using *Standard Methods for Examination of Water and Wastewater*. The pH analysis is performed by R&MS personnel on a grab sample collected at the effluent location.

All other effluent samples would be submitted to and analyzed by Southwest Research Institute's Analytical and Environmental Chemistry Department located in San Antonio, Texas.

3.2 Effluent Monitoring Results

The permit year covered in this report is November 1, 2013, through October 31, 2014. No wastewater was land applied during this period and therefore, no samples were collected.

3.3 Flow Volumes and Hydraulic Loading Rates

Daily effluent flow readings are recorded at the pivot control panel when the pivot is operating. The pivot was not operated during the 2014 permit year.

The permit (Section F, Table 4) specifies the following:

- Application season (growing season) is April 1 through October 31. Application to frozen or snow-covered ground is prohibited.
- Application of supplemental (fresh) irrigation water is prohibited.
- Wastewater shall not exceed 37 million gallons (MG) annually or 18.5 in./acre.
- Wastewater may be applied on a maximum of 73.5 acres.

No wastewater was applied during the 2014 permit year. No supplemental irrigation water was applied to the application area.

Figure 2 shows the effluent flow volumes to the CFA STP pivot from permit year 2004 through the current permit year. Volumes decreased significantly from 2004 through 2007, remained relatively stable from 2007 through 2010, and dropped to 1.22 MG in 2011 and 0 MG in 2012, 2013, and 2014. Reduction in personnel and operations is expected to have resulted in a reduction in the wastewater flow.

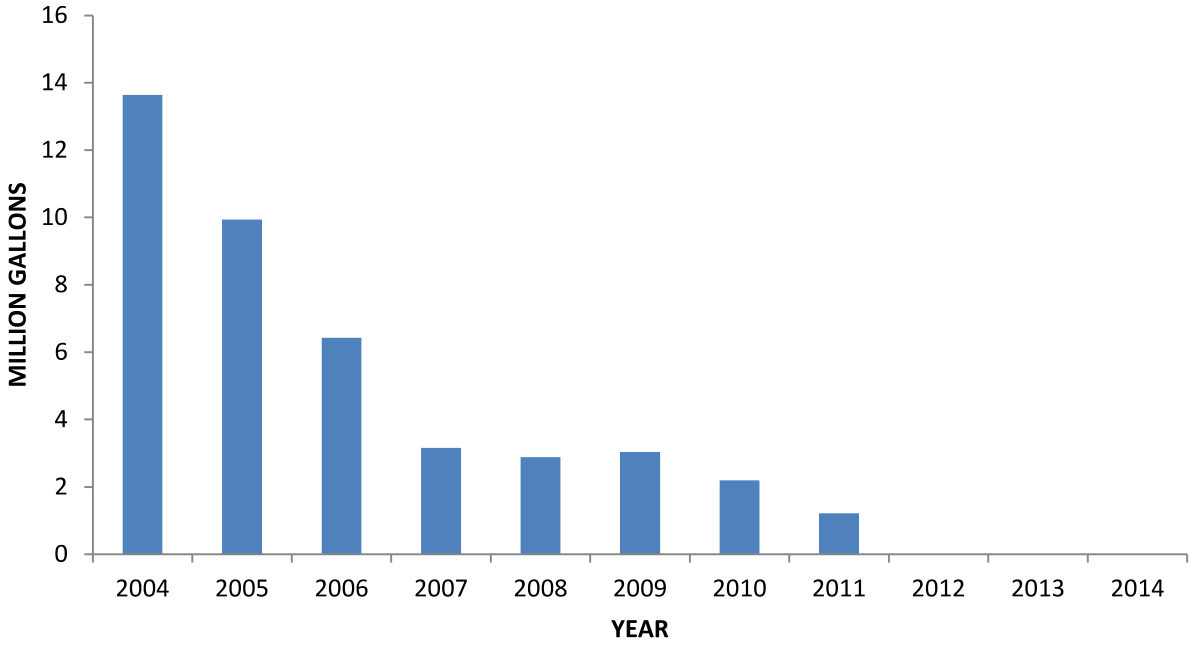

Figure 2. Annual effluent flow to the Central Facilities Area Sewage Treatment Plant pivot.

3.3.1 Truck-hauled Wastewater Discharges

Truck-hauled wastewater consists of wastewater pumped from portable toilets, septic tanks, and comfort stations. These wastewater systems are pumped by septic system pumping companies licensed in the State of Idaho. Prior to discharge, CFA STP personnel are contacted by the pumping company. CFA STP personnel record the date and the estimated volume of wastewater discharged. The wastewater is then discharged into a manhole upstream of the influent flow meter. For the 2014 permit year, approximately 8,700 gallons of truck-hauled wastewater was discharged to the CFA STP.

3.4 Nutrient Loading Rates

The permit requires loading rate calculations for total dissolved solids, total nitrogen, chemical oxygen demand, and total phosphorus to the land application area. For the 2014 permit year, loading rates were zero since no wastewater was land applied.

4. SOIL MONITORING

The CFA STP permit required that the soil within the land application area be sampled in October 2010, and then three years later in October 2013. Samples were collected at 10 locations (Figure 3) in the land application area as identified in the permit. Subsamples are taken from the 0–12, 12–24, and 24–36 in. depths at each location and composited, yielding three composite samples, one from each depth. Soil samples were collected as required and the results reported in the 2010 (Stenzel 2011a) and 2013 (Mascareñas 2014a) annual reports.

4.1 Sampling Program and Analytical Methods

When sampling is required, soil samples are collected by R&MS personnel. The R&MS program involves sampling, analysis, and data interpretation carried out under a quality assurance program in accordance with the permit. Samples were analyzed by Southwest Research Institute's Analytical and Environmental Chemistry Department located in San Antonio, Texas, using *Methods of Soil Analysis*.

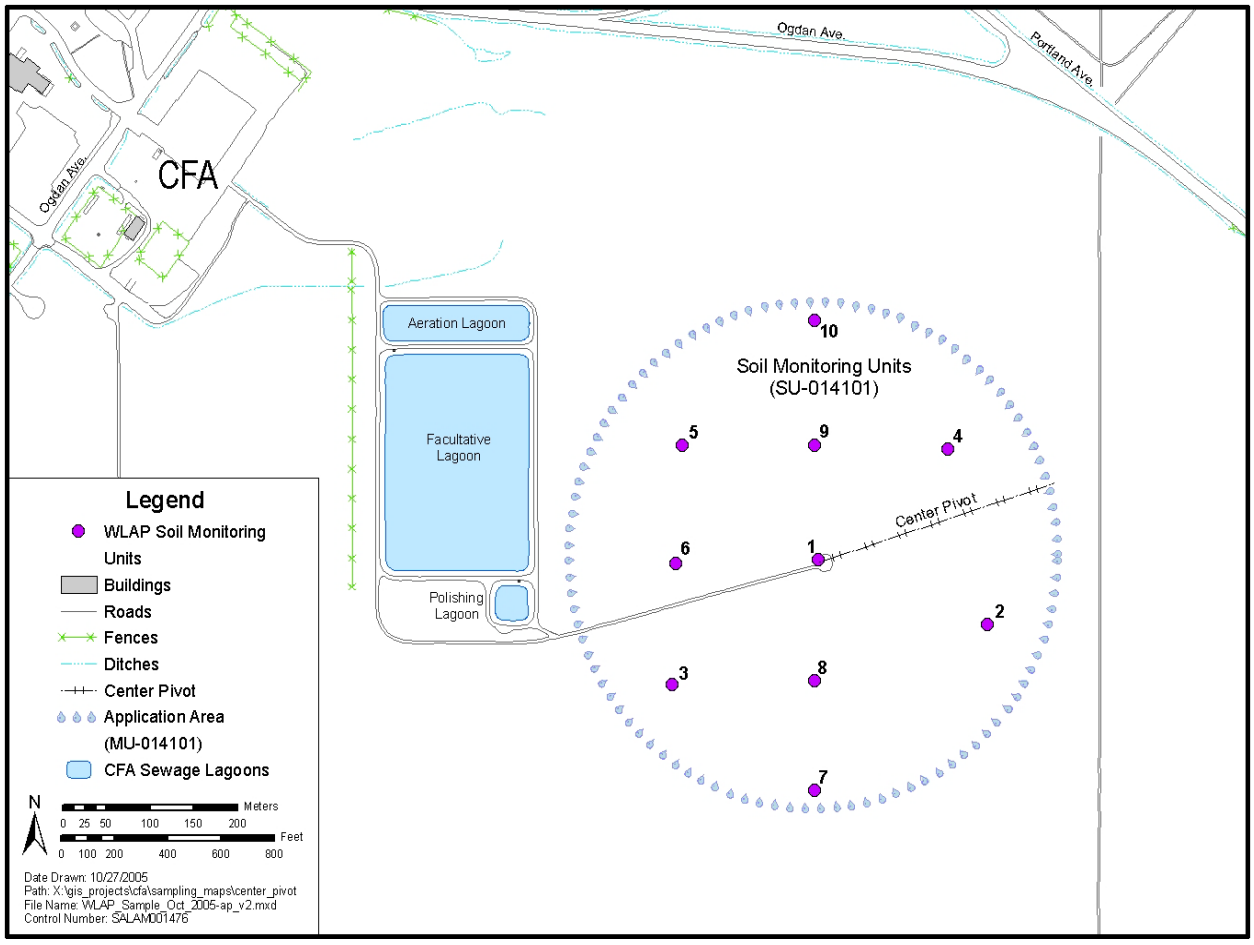

Figure 3. Central Facilities Area Sewage Treatment Plant Wastewater Reuse Permit soil monitoring locations.

5. PERMIT YEAR ACTIVITIES AND ISSUES

This section provides information and status associated with applicable activities and issues during the permit year.

5.1 Status of Permit Required Compliance Activities

Section H, Paragraph 5, of the permit requires that DEQ be notified within 30 days of completing any work described in Section E, and that the annual report shall provide the status of compliance activities still in progress at the end of the permit year.

Compliance Activity CA-141-01(within 12 months of permit issuance): A final Plan of Operation (Operation &Maintenance Manual) for the wastewater reuse facility, incorporating the requirements of this permit shall be submitted to the Department for review and approval.

The permit was issued on March 17, 2010, and therefore, the Plan of Operation was required to be submitted to the DEQ by March 17, 2011, for review and approval. The Plan of Operation was submitted to the DEQ on February 28, 2011 (Stenzel 2011b), and approved on June 23, 2011 (Rackow 2011). This compliance activity is completed.

Compliance Activity CA-141-02 (May 31, 2014): Submit a Seepage Testing Procedure to DEQ for review and approval for the three wastewater treatment lagoons. The Procedure shall describe the testing procedures, equipment, measurement methods, and calculation methodology conclusions for DEQ review and approval.

The seepage test procedure, prepared by J-U-B Engineers, Inc. (J-U-B), was submitted to DEQ on May 12, 2014 (Mascareñas 2014b) for review and approval. DEQ approved the seepage test procedure on May 14, 2014 (Rackow 2014a).

Compliance Activity CA-141-03 (August 31, 2014): Upon DEQ approval of the Seepage Testing Procedure (CA-141-02, above), the permittee shall complete seepage testing of CFA STP Lagoons 1 through 3 and submit a Seepage Test Results Report to DEQ no later than August 31, 2014, for review and approval.

In order to raise the water levels in Lagoons 2 and 3, a letter was submitted to DEQ on July 16, 2014, requesting an extension of the seepage test due date to September 30, 2014 (Miller 2014b). During a telephone call on August 7, 2014, DEQ stated that the seepage test extension request should come from J-U-B. On August 11, 2014 (Lewis 2014b), J-U-B submitted the extension request to extend the seepage testing of the lagoons to September 30, 2014. DEQ responded with an approval on August 11, 2014 (Lewis 2014b) that the lagoons could be seepage tested through September. In the approval, DEQ requested data from periods when freezing/icing occurred be excluded from the calculations, but that all raw data should be included in the final report.

The original approval by DEQ of the seepage test plan (Rackow 2014a) allowed 90-days after the seepage tests were completed on the lagoons to submit the seepage test report. The 90-day period to submit the seepage test report following completion of the seepage tests was not changed in the subsequent seepage test extension requests.

The seepage test results report (Miller 2014c) was submitted to DEQ on October 16, 2014 and approved by DEQ on October 21, 2014 (Rackow 2014b).

5.2 Seepage Test Results

J-U-B performed the seepage tests on Lagoons 1, 2, and 3 between August 26, 2014 and September 22, 2014. The seepage tests were performed to meet the requirements of IDAPA 58.01.16.493 and the WRP. For lagoons constructed prior to April 15, 2007, as were the CFA STP lagoons, the allowable seepage rate shall be no more than 0.25 inches/day (IDAPA 58.01.16.493.03.b).

Lagoon 1 was tested at a depth of 8.0 feet, Lagoons 2 and 3 were tested at the 5.5 and 4.75 foot depth, respectively.

No freezing or icing occurred during the testing. During the 24-hour averaging periods used to calculate the seepage rates for the three lagoons, water temperature did not drop below freezing. The minimum evaporation pan water temperature was 38.43^{o}F taken during the test of Lagoon 3.

As shown in Table 1, duration of the tests used in calculating the seepage rates were 3 days (August 27, 2014-August 29, 2014) for Lagoon 1, 4 days (September 5, 2014-September 8, 2014) for Lagoon 2, and 6 days (September 16, 2014-September 21, 2014) for Lagoon 3.

Seepage rates for Lagoons 1 and 2 were below the maximum allowable seepage rate of 0.25 inches/day at 0.083 inches/day and 0.055 inches/day, respectively. At 0.455 inches/day, Lagoon 3 exceeded the maximum allowable seepage.

The excessive seepage rate in Lagoon 3 could be the result of a leaking liner or the valves used to isolate the lagoon. J-U-B is revising the water balance for the lagoons using the new seepage rates and updated influent data. The updated water balance will be used to determine a path forward for Lagoon 3.

Table 1. Central Facilities Area Sewage Treatment Plant seepage test results.

Lagoon	Test Depth (feet)	Average (in/day)	Error (+/-) (in/day)	Allowable (in/day)	Test Duration
1	8.0	0.083	0.010	0.25	3 days
2	5.5	0.055	0.011	0.25	4 days
3	4.75	0.455	0.030	0.25	6 days

DEQ issued their approval of the seepage tests on October 21, 2014 (Rackow 2014b). Lagoons 1 and 2 can continue to operate at the tested depth (Table 1). These two lagoons are required to be tested every 10 years.

Because Lagoon 3 exceeded the allowable seepage rate, the owner of the lagoon, in accordance with a schedule negotiated with and approved by DEQ (Rackow 2014b), is required to:

- Repair the leak and retest for compliance;
- Re-line the lagoon and retest for compliance;
- Drain the lagoon in an approved manner and stop using the lagoon; or
- Determine the impact of the leaking lagoon on the environment based on groundwater sampling and modeling.

DEQ (Rackow 2014b) has requested that INL evaluate the four options listed above and then schedule a meeting with DEQ prior to December 31, 2014 to discuss the preferred option and determine a schedule for implementation.

5.3 Noncompliance Issues

There were no noncompliance issues identified during the 2014 permit year.

5.4 Aquatic Weed Control

Approximately 250 triploid (sterile) 6-in. grass carp were released into the CFA STP lagoons during the summer of 2008. Approximately 240 were released into Lagoon No. 2, and 10 were released into Lagoon No. 3. In May, 2010, 190 grass carp were released into Lagoon No. 2, and 10 more were released into Lagoon No. 3. The carp were approximately 6 inches in length. The grass carp suffered significant mortality in both 2008 and 2010. Few if any were believed to have survived over the winters.

Aquatic weeds have not been an operational issue since the 2011permit year.

It is unlikely that grass carp will be used in future weed control. If weed control is required in the future, other weed control methods will be evaluated.

5.5 Supplemental Water Added to the Lagoons

Beginning in June 2013, supplemental water was added to the lagoons to maintain the water level and the integrity of the clay liners. The supplemental water is added to the system by the production/potable

water wells. In 2014, approximately 12 million gallons of supplemental water was added to the lagoons to raise the water levels in Lagoons 2 and 3 for the seepage test and keep the liners hydrated. For testing, the water level was raised to 5.5 ft in Lagoon No. 2 and 4.75 ft in Lagoon No. 3.

Supplemental water flows to the influent lift station along with the other wastewater. From there, the wastewater discharge from the lift station is monitored with an ultrasonic flow meter.

Having to add supplemental water raised the concern that the CFA STP may be oversized for the current and expected future population. From a sustainability perspective, it is not desirable to add clean water to a wastewater system to maintain the liners. Therefore, INL contracted with J-U-B Engineers, Inc. to perform a study (INL 2013) to evaluate the CFA STP system capacity, operational practices, and potential improvement alternatives. The study was completed in December 2013.

The J-U-B study recommended recalculating the water balance based on the 2014 seepage test results and upon verification of the influent flow meter accuracy. J-U-B expects to reissue the study in November or December 2014 with the revised water balance results.

6. ENVIRONMENTAL IMPACTS

Wastewater has not been discharged to the land application area since permit year 2011.

No waste solids were removed from the lagoons during the permit year. Therefore, there were no waste solids disposal concerns.

Soil samples were not required in 2014. However, based on previous soil sample results and no wastewater applied since 2011, no negative impacts to the soil in the application area are expected.

With the historically low hydraulic and nutrient loading rates, combined with no discharge during the 2012, 2013, and 2014 permit years and the depth to groundwater (approximately 600 feet below land surface), there are no negative impacts expected to the groundwater resource.

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