September 9, 2011

**MEMORANDUM**

TO: Todd Crutcher, P.E.
Engineering Manager, Boise Regional Office

FROM: Stephanie Carroll, P.E.
Technical Services

SUBJECT: Staff Analysis for Draft Wastewater Reuse Permit LA-000199-02 (Municipal Wastewater), Rivervine Water and Sewer, LLC.

## 1.0 PURPOSE

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17 (*Recycled Water Rules*) for issuing wastewater reuse permits. It states the principal facts and significant questions considered in preparing the draft permit conditions and a summary of the basis for approval with references to applicable requirements and supporting materials.

## 2.0 SUMMARY OF EVENTS

The first wastewater reuse permit (LA-000 199-01) was issued to Castle Rock Development, Inc. for the Rivervine Subdivision on December 17, 2004, and expired on December 17, 2009. On November 2, 2004, the Idaho Secretary of State's office issued filing/ organization number W34299 to Rivervine Water and Sewer, LLC [1]. A permit renewal application was received by DEQ on December 1, 2009. Rivervine Water and Sewer, LLC has requested to be the permittee.

## 3.0 PROCESS AND SITE DESCRIPTIONS

The Rivervine Subdivision in Ada County is located approximately 3.5 miles west of Eagle, ID and 0.25 miles south of Highway 44. The site is bounded on the north side by Moon Valley Road and by Pioneer Canal on the south side. There are currently three homes in the Rivervine Subdivision and three homes from a neighboring subdivision that discharge to the wastewater treatment plant, which consists of two Sequential Batch Reactors (SBR) followed by coagulation, sand filtration, and chlorine disinfection. The treated effluent is then discharged to an on-site unlined pond (Pond #2) or fed directly to an irrigation system for a five acre golf driving range. The treated effluent in the pond is mixed with irrigation water during irrigation season and used for irrigation purposes throughout the subdivision.

### 3.1 Process Description

Individual lift stations are used to send wastewater from each home through a pressurized collection system to the wastewater treatment plant. This wastewater is discharged into an aerated equalization tank and then treated in one of two sequencing batch reactors (SBR). The effluent from the SBRs is coagulated, filtered through a sand filter, and disinfected with chlorine. Finally, the disinfected effluent can either be sent directly to the Hydraulic Management Unit (HMU), which is a five acre golf driving range to the north of the treatment plant, or to the 4.3 million gallon (MG) unlined pond

(Pond #2) that is located directly east of the plant. Pond #2 is connected via a pipe to Pond #1, which is 15.94 MG and also unlined. The treated effluent mixes with ground water in Pond #2 all year as well as supplemental irrigation water from the adjacent irrigation canal during irrigation season. The combined water is then used for irrigation of the driving range and other common areas and private home landscaping in the subdivision. It appears that the water in Pond #1 can also be used for firefighting purposes.

Section H of the current permit requires that the permittee submit an Annual Wastewater-Land Application Site Performance Report (Annual Report) prepared by a competent environmental professional no later than January 31 of each year which covers the previous year. The Annual Report is required to include the results of monitoring required in Section G, status of compliance activities, and an interpretive discussion of monitoring data with particular respect to environmental impacts by the facility. The permittee has not submitted any Annual Reports and a very minimal permit renewal application was submitted. The operator was able to provide minimal historical wastewater data upon request. As such, the permit renewal analysis is based on the Civil Engineering Design Report [2], the Pilot Test Results (Pilot Test) prepared by Advanced Wastewater Inc. and Intermountain Sewage Systems, LLC dated July 2005 [3], and the limited wastewater data provided by the operator. Staff recommends that the Boise Regional Office and the State Office Wastewater Program evaluate the aforementioned non-compliance and take appropriate action.

According to the Design Report, the wastewater treatment facilities were designed for an ultimate build-out of 16 homes that produced an estimated total flow of 4,800 gallons of wastewater per day (1.75 MG/year). At the time that the draft permit was written, there were three homes constructed and occupied within the Rivervine Subdivision plus three homes from an adjacent subdivision that were discharging into the wastewater treatment system. The residences currently connected produce an estimated wastewater flow of 1,800 gallons per day (gpd) and approximately 657,000 gallons per year. As residences outside of the Rivervine subdivision have been allowed to connect to the Rivervine wastewater system, it is recommended that an annual declining balance report of the wastewater treatment system capacity be required to be included in the annual report submittal to ensure that the system's treatment capacity is not exceeded.

The following table shows the minimum, average and maximum concentrations for nitrogen, phosphorous and total coliform from the Pilot Test and the sporadic sample data recorded between September 22, 2007 and February 18, 2011 that was provided by the operator.

| | Total Nitrogen mg/L | Total Phosphorous mg/L | Total Coliform CFU/100 mL |
|---|---|---|---|
| Pilot Test – Average | 4.20 | 1.23 | <2 |
| Pilot Test – Minimum | 2.75 | 0.14 | <2 |
| Pilot Test – Maximum | 5.29 | 2.75 | <2 |
| Sample Data – Average | 12.60 | 2.34 | <2 (median) |
| Sample Data – Minimum | 2.14 | 0.28 | <2 |
| Sample Data – Maximum | 30.69 | 6.11 | >2400 |

Table 1: Treatment Plant Effluent Concentrations

It is noted that the average Total Nitrogen concentration from the sample data is 12.60 mg/L, which is greater than the recommended permit limit of 10 mg/L (see Section 4.2.3). The effluent concentration limit in the permit is an average concentration of the weekly samples collected each month. The historical data provided was from 25 months sporadically collected between September 2007 to January 2011. Three of the 25 months had results from two sets of samples, the rest of the months only contained results from one sample. Therefore, based on the pilot test data and the fact that 61% of the sample concentrations were less than 10 mg/L, it appears that the wastewater treatment plant is able to produce wastewater effluent that has a Total Nitrogen concentration of 10 mg/L or less.

## 3.2 Site Description

The following is a discussion of the hydrogeology, ground water, soils, and surface water on or near the site.

### 3.2.1 Hydrogeology and Ground Water

The previous permit required quarterly sampling of three ground water monitoring wells for the following constituents: total coliform, chloride, nitrate-n, nitrite-n, TDS, sodium, potassium, calcium, magnesium, carbonate, bicarbonate, static water level, total iron, total manganese, and pH. The previous permit also required sampling of domestic and municipal wells within 1/4 mile of all land application acreage. However, it does not appear that ground water monitoring data was collected, and therefore no historical ground water data for the site was available at the time of this permit renewal. As such, determining whether the last six years of reuse activity has had an impact on local ground water supplies is not possible.

At the extremely low hydraulic loading rates to the irrigation areas and the high dilution ratio in Pond #2, a quantifiable ground water impact from ground water monitoring data is considered unlikely. Therefore, staff does not consider ground water monitoring to be necessary at this time, and these requirements were not included in the draft permit. However, the facility is required to comply with IDAPA 58.01.11, *Ground Water Quality Rule*, and the effluent limits and treatment requirements included in the draft permit, as discussed in Section 4.2, are believed to be protective of ground water.

### 3.2.2 Soil

According to the Nutrient Pathogen Study Resource Inventory submitted by Materials, Testing, and Inspection, Inc. (MTI) on February 23, 2004 [4], soils at the irrigation site consist of Moulton fine sandy loam and Baldock loam. Moulton fine sandy loam is described to have moderately rapid permeability and the hazard of erosion is slight. Baldock loam is described as having moderate permeability and the hazard of erosion is slight. Soil sampling was not required in the previous permit and therefore no site specific soil information exists. Soil sampling is not considered necessary due to the relatively small amount of wastewater applied to the HMU and the low constituent concentrations in the effluent.

### 3.2.3 Surface Water

Surface waters that cross or are adjacent to the site are both seasonal and continuous in nature. These waters include the gravel pit ponds (which includes Pond #2) within the development, the Boise River, and the Pioneer Canal. The canal is seasonal and transects the property from east to west, approximately 600 feet south of Moon Valley Road. The Boise River forms the southern boundary for the development. The Boise River flows north-northwest when it first encounters the property, and arcs through a 60° counterclockwise arc until it trends directly west at the development's western border. The Boise River is approximately 1200 feet south of Moon Valley Ranch Road. The wastewater land application area is located in the northwest quadrant of the development. Pond #2 forms the eastern border of the recycled water application site. The southern border of the recycled water application site has a 50 foot setback to accommodate the Pioneer Canal.

## 4. PERMITTING DISCUSSION

### 4.1 Permit Limit and Conditions

The treated effluent from the wastewater treatment plant is either sent directly to the HMU or to Pond #2. The pond is unlined and therefore the effluent must be highly treated to ensure protection of the groundwater and the public. Recommended permit limits and conditions for the use of the treated effluent are discussed below.

### 4.1.1 Hydraulic Loading

The previous permit specified a growing season hydraulic loading rate no greater than the irrigation water requirement (IWR) of the crop and a non-growing season hydraulic loading rate of 50% of the Available Water Column for the site's Moulton soil. The draft permit recommends that irrigation of the HMU only be allowed during the growing season since the permittee has the alternative option of discharging to the pond; however, no hydraulic loading rate is specified for the application of treated wastewater to the HMU. A hydraulic loading rate is not specified for the HMU since the wastewater is required to have a monthly average concentration of no more than 10 mg/L of total nitrogen (see Section 4.2.3) and the amount of treated wastewater produced by the system is significantly lower than the lowest IWR specified in the previous permit. At full build-out, the system is estimated to produce 4,800 gallons/day and the lowest IWR month (October) requires 14,820 gallons per day.

### 4.1.2 Constituent Loading

DEQ recommends removing the nitrogen, phosphorous and COD loading limits in the new permit for Class A effluent. Instead, DEQ recommends that the facility monitor the wastewater treatment plant effluent concentrations of total nitrogen and total phosphorous to ensure adequate treatment of the wastewater for the allowed uses.

### 4.1.3 Wastewater Treatment System Parameters

As stated previously, the draft permit includes effluent concentration limits from the wastewater

treatment plant instead of constituent loading limits. The draft permit includes a maximum average monthly concentration limit of 10 mg/L of total nitrogen, a maximum average monthly concentration of 5 mg/L of BOD5, pH between 6 and 9, an instantaneous maximum turbidity measurement of 5 NTU, and a maximum 24-hour average turbidity measurement of 2 NTU. The recommended effluent concentration limits were based on the Class A effluent requirements in the *Recycled Water Rules*. In addition to hydraulic and constituent loading limits, the previous permit also included limits for the wastewater treatment plant system. The previous permit specified that the maximum domestic wastewater flowrate to the SBR treatment facility was 5,400 gallons per day. The previous permit also specified weekly average concentration for BOD5, total suspended solids (TSS) and Total Nitrogen as well as average removal efficiencies for each constituent. The *Recycled Water Rules* do not require weekly average limits for any constituents nor do they specify treatment efficiency requirements for the wastewater treatment system. Limits for TSS are not recommended for the permit as the permit contains turbidity limits for the wastewater treatment system effluent.

### 4.1.4 Disinfection

It is recommended that the median number of total coliform organisms does not exceed 2.2/100 ml, as determined by the bacteriological results of the last seven days for which analyses have been completed, and does not exceed 23/100ml in any confirmed sample. The recommended disinfection level is based on the allowed uses for the Class A recycled water. The draft permit also includes the Class A disinfection requirements from the *Recycled Water Rules*, which include either chlorine disinfection that provides a concentration/contact time of 450 mg-min/L with a modal contact time of not less than 90 minutes, or a disinfection process demonstrated to achieve 5-log inactivation of virus.

### 4.1.5 Buffer Zones

Based on the advanced treatment of the effluent and the disinfection requirements specified in the draft permit it is recommended that no buffer zone be required between land applied wastewater and inhabited dwellings or the public. A buffer zone of 100 feet from drinking water wells is recommended for Class A effluent. Staff also recommends that the perimeter of the HMU and pond be required to be appropriately posted.

## 4.2 Monitoring and Reporting

The recommended monitoring requirements needed to assess compliance with permit conditions are specified in Section G of the draft permit. In order to ensure that the wastewater treatment plant is producing the high quality effluent that is required for the uses allowed by the permit, several effluent samples are recommended to be required by the draft permit. The following table specifies the recommended effluent monitoring requirements.

| Parameter | Frequency of Monitoring |
|---|---|
| Turbidity | Continuously |
| Chlorine Residual | Continuously |
| Total Coliform | 5 Times Weekly |
| pH | Daily or continuously |
| TKN | Weekly |
| Nitrate+Nitrite Nitrogen | Weekly |
| BOD5 | Weekly |
| Total Phosphorous | Monthly |

Table 2: Recommended wastewater treatment plant effluent monitoring

It is recommended that the monitoring frequency for total coliform be reduced from daily, as required by the *Recycled Water Rules,* to five times per week. *The Recycled Water Rules* allow a decreased monitoring frequency for total coliform based on the volume of recycled water used and point of compliance, among other things. According to the previous permit, the lowest amount of water required for irrigation occurs in the month of October and is approximately 14,820 gpd. This is three times greater than the design build-out capacity of 4,800 gpd. Also, the point of compliance for the disinfection requirement is prior to discharge to the pond or HMU. Once the recycled water is discharged to the pond, it is mixed with ground water and potentially supplemental irrigation water. The Design Report [2] indicates that the pond was sized to provide 30 days of storage for 100:1 dilution of ground water to treated effluent during a worst case scenario. A sampling frequency of 5 times per week allows a maximum of two consecutive days without sampling for total coliform, which, due to the low hydraulic loading rates and point of compliance, would be sufficient to detect an issue with the disinfection system and correct the issue while maintaining adequate protection of human health.

The following monitoring and reporting parameters were removed from the previous permit: amount of supplemental irrigation water applied to the HMU, temperature, precipitation, field conditions of the HMU, influent BOD5 and TSS, COD loading, nitrogen and phosphorous applied to the HMU from treated wastewater and fertilizers, crop yield, crop nutrient uptake, irrigation water requirement for crop grown, and the growing season and non-growing season wastewater loading rates. The hydraulic loading rates were removed from the permit so the amount of supplemental irrigation water that is applied to the site does not need to be reported. Wastewater application to the HMU is no longer allowed during the non-growing season so the field conditions no longer need to be monitored. A specific wastewater treatment efficiency is no longer required and as such the influent BOD5 and TSS no longer need to be reported. The constituent loading rates have been removed which means that the COD, nitrogen and phosphorous loading no longer need to be reported. Finally, the crop yield, crop nutrient uptake and irrigation water requirements were all used to demonstrate compliance with the hydraulic and constituent loading requirements that are no longer required.

## 4.3 Compliance Schedule for Required Activities

Three compliance activities are recommended for inclusion in the draft permit. Condition CA-199-01 in Section E as it appears in the draft permit requires the facility to submit an updated Plan of Operation for DEQ review and approval. A Plan of Operation (also called an Operations and Maintenance Manual) is a living document and is modified as operations and regulatory requirements change. The Plan of Operation should generally include all of the information in the latest revision of the Plan of Operation Checklist found in Section 1.9.3 (page 1-72) of the Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater [5]. The condition, as written in the draft permit, would also require that the plan include a Quality Assurance Project Plan that is intended to insure accurate and consistent sampling.

The second compliance activity, Condition CA-199-02 in Section E as it appears in the draft permit, requires that the permittee submit a facility plan that addresses the Class A treatment system disinfection, reliability and redundancy requirements in IDAPA 58.01.17, *Recycled Water Rules*. The system was constructed and started treating wastewater prior to enactment of the current rules that now regulate the use of recycled water for ground water recharge and residential irrigation. As such, in order to ensure continued protection of human health and the environment, the permittee must evaluate the current rule requirements and address any differences between the current requirements and the wastewater treatment facility within the required facility plan. The plan should be prepared in accordance with the facility plan requirements for existing system in IDAPA 58.01.16, *Wastewater Rules*. The plan should also include a proposed schedule for implementing any necessary improvements to the facility based on the requirements, or provide justification that without the improvements the wastewater reuse activities will not have a detrimental effect upon existing water quality, that beneficial uses will be adequately protected, and that human health will be protected. The facility plan is required to be submitted within twelve (12) months of permit issuance.

The third compliance activity, Condition CA- 199-03 in Section E as it appears in the draft permit, requires that a permit renewal application be submitted to DEQ six (6) months prior to the permit expiration date if the facility will continue to use recycled wastewater.

## 5.0. Recommendations

The following recommendations fall into three major areas. They include loading rate related recommendations, monitoring related recommendations and buffer zone related recommendations.

### 5.1. Loading Rate Related Recommendations

1) It is recommended that land application only be allowed during the growing season.

2) A total nitrogen, phosphorous, or COD loading limit is not recommended.

### 5.2. Buffer Zone Recommendations

1) No buffer zone is recommended between the hydraulic management unit and public access.

2) A buffer zone of 100 feet to drinking water wells is recommended.

3) It is recommended that the perimeters of both the pond and hydraulic management unit be appropriately posted and that all new Class A water uses be constructed in accordance with the requirements of the *Recycled Water Rules*.

**5.3. Monitoring Related Recommendation**

1) It is recommended that the wastewater treatment plant effluent be sampled for various parameters to demonstrate adequate treatment is being achieved by the treatment process.

2) It is recommended that the amount of recycled water discharged directly to the HMU and to Pond #2 be monitored.

3) It is recommended that the frequency of Total Coliform sampling be five times per week.

4) Soil monitoring and ground water monitoring is not recommended due to the relatively low amount of wastewater that is applied to the HMU and pond at design capacity and the fact that the wastewater is highly treated.

5) It is recommended that a declining balance report that addresses the capacity of the treatment system as equivalent dwelling units (EDUs), number of EDUs connected to the system, and number of EDUs remaining be submitted annually.

6) It is recommended that the monitoring requirements specified in Section G of the draft permit be used to assess compliance with permit conditions.

**References**

[1] Idaho Secretary of State, Filing/Organization Number W34299, November 2, 2004 (http://www.sos.idaho.gov/)

[2] CSHQA, February 18, 2004. Civil Engineering Design Report Rivervine Subdivision Ada County, ID

[3] Advanced Wastewater Solutions, Inc and Intermountain Sewage Systems, LLC, July 2005. Rivervine Subdivision Wastewater Treatment Plant, Eagle, ID, Pilot Test Results, July 2005.

[4] Materials Testing and Inspection, October 6, 2000. Nutrient Pathogen Study Resource Inventory Proposed Moon Valley Road

[5] Idaho Department of Environmental Quality, September 2007. Guidance for the Reclamation and Reuse of Municipal and Industrial Wastewater. Available online at http://www.deq.idaho.gov/water/permitsforms/permitting/guidance.cfm

[6] Idaho Department of Environmental Quality, September 17, 2004. Staff Analysis for the Rivervine Subdivision Wastewater Land Application Permit Request, LA-000199-01 (Municipal Wastewater)