MEMORANDUM

TO: Larry Waters, P.E., DEQ Wastewater Program Manager, State Office, Boise
Daniel Redline, Coeur d'Alene DEQ Regional Office Administrator
Matthew Plaisted, P.E., Coeur d'Alene DEQ Regional Engineering Manager
Adam Bussan, P.E., DEQ Reuse Program Coordinator, State Office, Boise

FROM: Taylor Enos, Coeur d'Alene DEQ Regional Office

DATE: January 24, 2020

SUBJECT: **Wildwood Park Road and Sewer Association, Inc., M-102-04**
Staff Analysis Supporting Reuse Permit Issuance

Executive Summary

The Idaho Department of Environmental Quality (DEQ) received a permit application from Wildwood Park Road and Sewer Association, Inc. (WPRSA) on October 10, 2019 requesting renewal of the existing municipal treatment and recycled water system permit (LA-000102-03) which is now owned and operated by WPRSA. WPRSA consultant, T-O Engineers (TO), submitted a report to DEQ on October 10, 2019 titled *"Technical Report for Municipal Wastewater Reuse Permit No. LA-000102-03 Renewal"* which contains the technical information for the renewal request along with requests for modifications to the existing permit. Modifications requested to the WPRSA recycled water permit conditions and requirements that are outlined in the permit renewal application are as follows:

- Changes to the Facility Information including Responsible Official
    - Staff changed the facility information as requested
- Adjust the hydraulic loading limits from 4.6 inches per growing season to substantially at or below the irrigation water requirement (IWR)
    - Staff changed the hydraulic loading rate permit limit as requested (see Section 4.7.2)
- Increasing the permit cycle from five (5) years to ten (10) years
    - Staff agreed that this change is appropriate

Annual reports during the LA-000102-03 permit cycle demonstrated that the WPRSA recycled water system is in substantial compliance with the existing permit conditions. This staff analysis memorandum provides the technical evaluation of the WPRSA request to renew their municipal recycled water system permit and their proposed modifications. With this memorandum, it is DEQ's recommendation to approve the proposed modifications as well as issue the municipal recycled water system permit M-102-04 (previously LA-000102-03).

1 Introduction

The purpose of this memorandum is to satisfy the requirements of the *Recycled Water Rules* (IDAPA 58.01.17.400) for issuing reuse permits. The principal facts and significant questions considered in preparing the draft permit and a summary of the basis for the draft permit conditions are provided.

This memorandum addresses the Reuse Permit M-102-04, for the municipal treatment and recycled water system owned and operated by Wildwood Park Road and Sewer Association, Inc. The current reuse permit (LA-000102-03) was issued to Wildwood Park Company (WIPCO) on January 14, 2010 and expired on January 14, 2015. On October 28, 2014, DEQ issued a permit modification extending the permit expiration date by one (1) year to January 14, 2016. On October 19, 2015, DEQ issued an additional permit modification extending the permit expiration date by two (2) years to January 14, 2018. During 2018, WIPCO processed and transferred ownership of the entire municipal treatment and recycled water reuse system to WPRSA. A pre-application conference was conducted at the DEQ Coeur d'Alene Regional Office on May 7, 2019. TO submitted WPRSA's permit application and required documentation to DEQ on October 10, 2019. DEQ followed up with an application completeness determination letter to WPRSA sent on October 16, 2019. A preliminary decision letter to issue the reuse draft permit was sent to WPRSA on November 15, 2019. As required by the *Recycled Water Rules*, the draft permit will be presented, along with staff analysis memorandum, for a public comment period. After the comment period has closed, DEQ will provide written responses to all relevant comments and prepare a final permit for the WPRSA recycled water system.

2 Site Location and Ownership

The WPRSA wastewater system is located along the west shore of Bloomsburg Bay on the west side of Lake Coeur d'Alene; just eight (8) miles east of Worley, Idaho. The legal description for the site is the Northwest Quarter of Section 12, Township 41 North, Range 4 West, Boise Meridian. The recycled water facility is located within the Coeur d'Alene Tribe Reservation boundaries. WPRSA owns the property occupied by the existing treatment facility and irrigation area. Figure 1 below is a map showing the WPRSA wastewater treatment facility and its recycled water land application site.

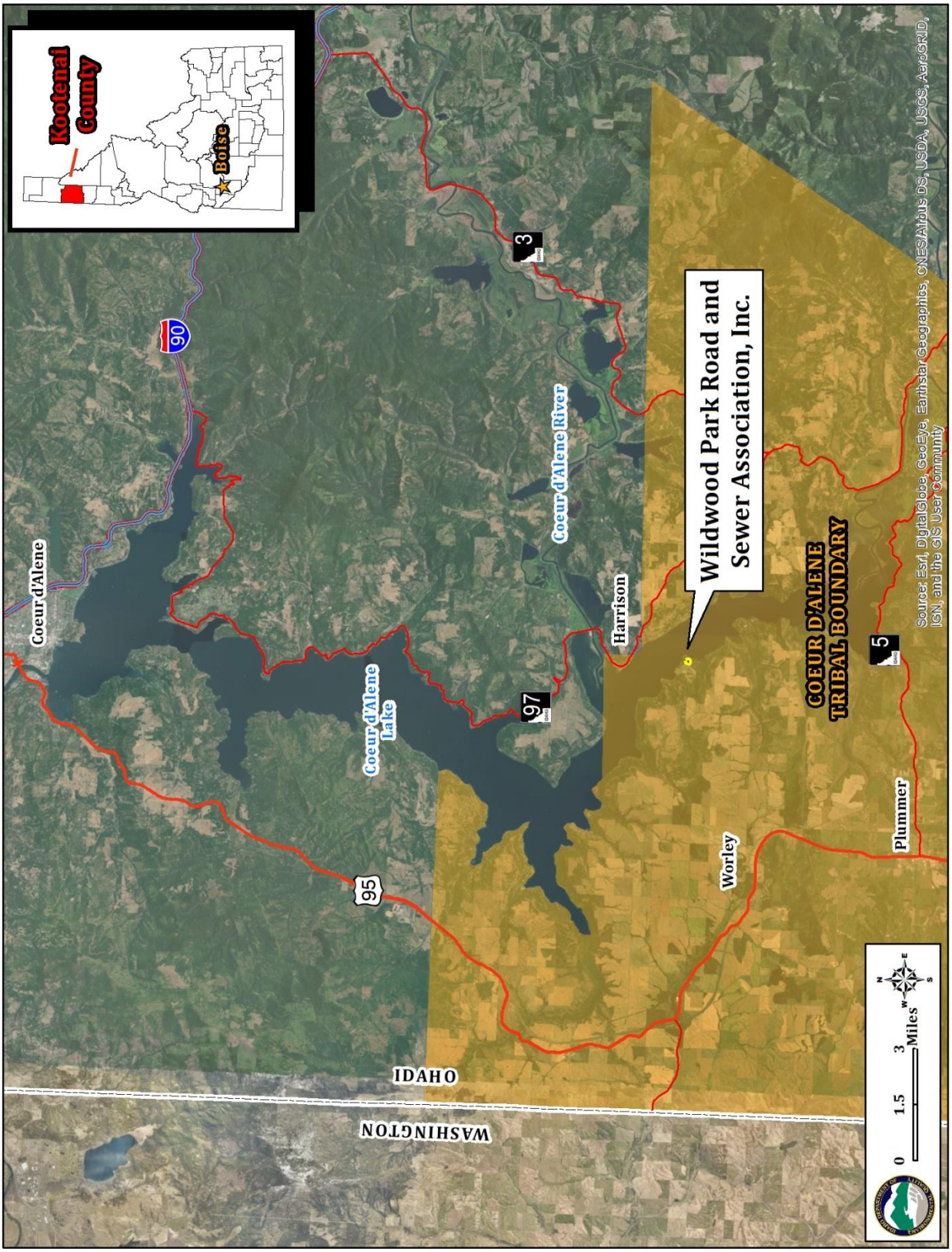


Figure 1: Wildwood Park Road and Sewer Association, Inc. Recycled Water System Vicinity Map

3 Process Description

The WPRSA wastewater system serves 23 equivalent residential units (ERUs), all of which are occupied seasonally. Individual residential septic tank effluent is pumped into a 12,000 gallon steel storage tank. Storage tank effluent is then pumped to the recycled water land application site using two (2) submersible pumps. During the non-growing season (NGS), WPRSA is permitted through Panhandle Health District (PHD) to use an adjacent drain field for residential wastewater disposal.

The irrigation area is a one (1) acre hydraulic management unit (MU) consisting of a black cherry tree crop cultivated for timber use only. The irrigation system at the MU consists of an above surface gravity drip micro irrigation system.

4 Site Characteristics

The following sections outline the site conditions and terms of the draft permit, based on the *Recycled Water Rules,* the *DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater,* as well as any other applicable regulatory standards.

4.1 Site Management History

The WPRSA irrigation site was clear cut of brush and timber for farming grain and hay around 1949. The irrigation site continued to be harvested for grain and hay until 1959 when the site was enrolled in the Soil Bank Program; a federal program authorized by the Soil Bank Act, P.L. 84-540, Title I which paid farmers to retire land from production for 10 years (WIPCO 2008).

From 1970 until 1990, the irrigation site was cropped with hay, grain or grass seed. During the time period from 1990 to about 2000, the WPRSA irrigation site was used as a septic tank effluent drain field; no crop harvesting took place during this time period (WIPCO 2008).

Then, in the spring of 2000, black cherry trees were planted on the irrigation site. The following year, the irrigation site was increased to just less than one (1) acre and multiple tree stands were replaced due to wildlife damage. Due to the increase of wildlife damage to the black cherry trees, a seven (7) foot high chain link fence was constructed in 2003. This chain link fence also created a distinct separation barrier from the public which, in turn, contributed to the reduction in disinfection requirements for the wastewater effluent (WIPCO 2008).

4.2 Climatic Characteristics

The closest weather station to the facility with long-term meteorological and irrigation evapotranspiration data is Coeur d'Alene 1E. The Coeur d'Alene 1E Weather Station (101956) has a longitude of 116° 45´ West and latitude of 47° 41´ North. The average annual precipitation is 25.26 inches per year of which 16.81 inches occur during the non-growing season (October 1 through March 31). Average snowfall is 46 inches. The annual average maximum temperature is 59°F, and annual average minimum is about 37°F. The altitude is 2,160 feet above sea level.

Additional meteorological data can be found at: http://wrcc.dri.edu/summary/climsmid.html (WRCC 2013).

Evapotranspiration (ET) and precipitation deficit (P_{def}) data for the facility were taken from the Coeur d'Alene 1E station found at the ET_{Idaho} website located at http://data.kimberly.uidaho.edu/ETIdaho/stninfo.py?station=25 (Allen, Richard G. and Clarence W. Robinson, 2017).

4.3 Soils

The April 1981 Kootenai County Soil Survey identifies the soils in the land application site as Chatcolet-Rubson silt loam (Chatcolet soil makes up about 55 percent of the map unit, and the Rubson soil about 35 percent). Test pits throughout the reuse site indicated that silt reached a depth of three and one-half (3.5) feet and decomposed basalt beyond three and one-half (3.5) feet.

The available water holding capacity for this series of soils is high. No active erosion or soil hazards were found when the 2015 Wildwood Reuse Permit Inspection was conducted.

Facility soil data combining all three sampling depths indicated in the permit for the operating years of 2010 and 2014 are summarized below in Table 1.

Table 1. WPRSA soil analyses summary for 2010 and 2014

Parameter	Mean	Median	Maximum	Minimum	Standard Deviation
EC (µS/cm)	0.14	0.16	0.17	0.08	0.03
Nitrate-N (mg/kg)	1.38	1.30	2.20	0.72	0.61
Ammonium-N (mg/kg)	1.82	1.50	3.40	1.00	0.85
Plant Available Phosphorus (mg/kg)	5.90	6.10	7.00	3.90	1.25
pH (standard units)	5.95	5.75	6.80	5.70	0.43

4.4 Ground Water

From well logs found online at http://www.idwr.idaho.gov/wells/find-a-well.html, the average static water depth surrounding the WPRSA recycled water system is between 15 and 82 feet below ground surface.

The current recycled water permit for WPRSA does not require ground water monitoring at the irrigation site. Ground water monitoring is not required in the draft reuse permit. The reason for this can be found below, which was taken from Section III. Site Characteristics of the LA-000102-03 Application for Permit Renewal:

> *"The geology of the reuse site consists of less than 10 feet of soil overlaying over 200 feet of basalt. Water moves downward through the entire profile because there is no indication of perched water tables and no seep areas on the steep slopes above the lake.*

There is an aquifer slightly above the lake level in which two wells have been drilled approximately 600 feet northeast of the site. These are the only wells within ¼ mile of the site. This aquifer is confined beneath a clay layer at the location of the wells. The aquifer material is highly fractured basalt. There has been no groundwater modeling or monitoring. One of the wells has been checked for biological contamination several times and is clean."

No evidence of a shallow seasonal water table was observed in any of the test pits during initial irrigation site consideration (WIPCO 2008). With WPRSA loading recycled water to the MU at such de minimus loading rates, it is recommended that the addition of ground water monitoring not be required in the WPRSA draft permit.

4.5 Surface water

The WPRSA recycled water system is located near two bodies of surface water, both of which are a part of Coeur d'Alene Lake. Bloomsburg Bay and Browns Bay are approximately 900 feet to the north and 500 feet to the east-southeast, respectively.

The Coeur d'Alene Lake Management Plan (LMP) was developed in 2009 with the Coeur d'Alene Tribe in an effort to protect and improve lake quality by limiting nutrient input from various activities within the basin. Nutrient loading at or below agronomic rates and maintaining the existing, vegetative horizontal buffer between the lake and the reuse site is an effective agriculture best management practices (BMPs) identified in the LMP.

4.6 Hydraulic Management Unit Configuration

WPRSA irrigates one (1) reuse field known as a hydraulic management unit (MU). The current MU which recycled water is being applied can be seen below in Table 2.

Table 2. WPRSA hydraulic management unit

Serial Number	Description	Acres
MU-102-01	Area #1	1.0

The MU covers approximately one (1) acre and is applied with Class E recycled water using a gravity powered drip irrigation system. The recycled water land application site for WPRSA is a forested area consisting of grassy brush, or "understory", vegetation and mostly black cherry trees.

4.7 Recycled Water Characterization and Loading Rates

The soil type at a land application site is one very important aspect of determining the capability of the recycled water system parameters. Another equally vital understanding of the system is associated with the hydraulic and constituent loading of the treated wastewater. Reuse sites must

be carefully examined in order to recognize the balance between crop uptake, soil absorption, and the potential environmental impacts that may occur due to the loading of excessive nutrients.

4.7.1 Recycled Water Characterization

Nitrogen (N) and phosphorus (P) are two constituents of concern for land application of treated municipal wastewater.

Total nitrogen includes nitrate-nitrogen, nitrite-nitrogen, ammonia-nitrogen, and organic nitrogen. Total Kjeldahl nitrogen (TKN) analysis measures ammonia-nitrogen and organic nitrogen in water. The average total nitrogen concentration measured in WPRSA recycled water from 2010 to 2018 is 64.37 mg/L. The average total phosphorus concentrations in WPRSA recycled water from 2010 through 2018 is 8.65 mg/L.

Average annual nitrogen and phosphorus data recorded by WPRSA is shown in Table 3.

Table 3. WPRSA recycled water constituent concentrations

Year	Total Nitrogen	Total Phosphorus
	(milligrams/liter)	
2010	56.85	7.58
2011	75.30	9.30
2012	87.05	10.48
2013	50.59	8.93
2014	49.10	7.62
2015	59.50	7.66
2016	64.60	8.05
2017	60.20	8.31
2018	76.15	9.95
Average	64.37	8.65

As mentioned above in Section 4.6, WPRSA disinfects the effluent wastewater to Class E standards. Required monitoring, which is discussed in Section 6.1, can be found in Subsection 602.03 of the *Recycled Water Rules* (IDAPA 58.01.17).

4.7.2 Hydraulic Loading Rates

The historical average hydraulic loading rate (HLR) for the management unit in the current permit cycle compared to the site specific irrigation water requirement (IWR) is shown below in Figure 2.

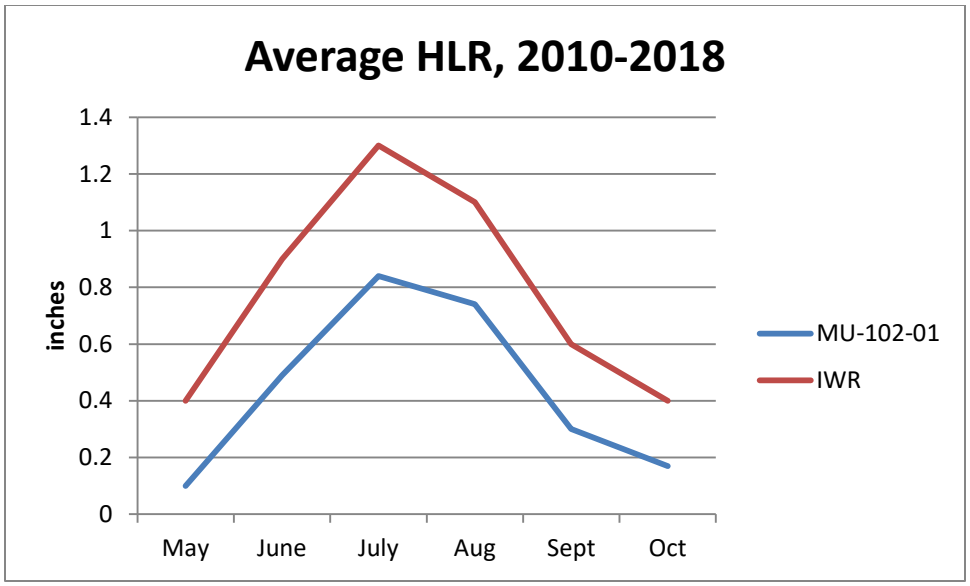


Figure 2. Average hydraulic loading rate from 2010 through 2018 in inches

Hydraulic loading limits are typically based on calculated IWR values taken from the ET_{Idaho} website (http://www.kimberly.uidaho.edu/ETIdaho/). There is no established IWR available for natural forests. However, DEQ is in the process of developing a guidance to estimate an IWR for forested sites.

Reassessment of the P_{def} values for the forested reuse areas is required due to more recent 30-year average meteorological data being available. Recalculation of application rates based upon revised P_{def} values was done to help optimize the WPRSA recycled water systems' efficiency. The revised calculations use ET and P_{def} data for "Orchards – Apples and Cherries with ground cover" from the nearest weather station with similar geographical characteristics (e.g., irrigated crops, elevation, latitude, etc.). The Coeur d'Alene 1E weather station's (101956) ET and P_{def} data at 80% exceedance was used for the WPRSA irrigation sites. Table 4 below shows the ET_{Idaho} data used when analyzing the HLR for WPRSA.

Table 4. Precipitation deficit (P_{def}) Data for WPRSA – 80% Exceedance

Month	Forest P_{def} Orchards w/ Cover	
	mm/day	in/month*
April	0.090	0.106
May	1.640	2.002
June	2.520	2.976
July	4.990	6.090
August	3.550	4.333
September	1.860	2.197
October	0.010	0.012

*Calculated value (((ET_{Idaho} data in mm/day) / (25.4 mm/in)) * (#days in month))

The purpose of using 80% Exceedance P_{def} data is to allow the recycled water system to irrigate at a rate that not only attempts to ensure a healthy crop, but also distributes treated wastewater in a conservative manner that minimizes potential for environmental impact. Although forested sites are not necessarily "crops", recycled water systems are still required to irrigate to limit the effect on the surrounding environment (e.g., ET, soil absorption capacity, runoff potential, etc.).

ET_{Idaho} defines 80% Exceedance P_{def} values as a value that "represents the *value* for the parameter that has an 80% chance of being exceeded that month during any particular year. Conversely, there is a 20% chance that the parameter value will be less than the *value* shown." Ultimately, this definition states that the P_{def} values listed in Table 4 take into account the probability of irrigation rates exceeding the values listed and are adjusted conservatively enough so that irrigation rates fall substantially at or below the consumptive use. This approach is used by DEQ to allow the recycled water system to efficiently discharge treated wastewater while also not harming the "crop" or surrounding environment.

The WPRSA recycled water MU is made up of mostly black cherry trees with a small amount of grassy understory. If the irrigation site was made up of only trees and no understory, a canopy density correction factor would be used to adjust the hydraulic loading rate to a more accurate rate for the sites' physical environment. Since the MU contains trees and understory, a canopy density correction factor is not required. For the WPRSA recycled water application area, a close look at the ratio of trees to understory is necessary to weigh the P_{def} values accordingly as to not load the sites in a manner that isn't unique to the WPRSA recycled water system.

Since the WPRSA recycled water irrigation site has such a high ratio of trees to understory, the MU is only characterized as one type of vegetation with slight ground cover (as seen in Table 4) to better model the WPRSA irrigation site.

From Table 4-12 of the *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*, the system efficiency was estimated to be 90% for surface drip irrigation systems. In order to represent the application system effectively and obtain an accurate IWR for the WPRSA recycled water system, the values in Table 4 are divided by the efficiency of the distribution system and the resulting values are given in Table 5.

Table 5. IWR* for the WPRSA recycled water reuse system

Month	Hydraulic-Loading Allowances[1]	
	mm/day	in/month
April	0.1000	0.1181
May	1.8222	2.2240
June	2.8000	3.3071
July	5.5444	6.7668
August	3.9444	4.8141
September	2.0667	2.4409
October	0.0111	0.0136
Wastewater applied total	16.2889	19.6846

* Based on precipitation deficit data from http://data.kimberly.uidaho.edu/ETIdaho/stcvrstats.py?station=25&cover=19&stats=Deficit

[1] Table 4 values divided by a factor of 0.9 (90% irrigation efficiency)

The IWR is intended to serve as a guide for the application of water to the "crop" during the growing season. The non-growing season (November through March) values have not been included. Table 8 below shows the IWR for the WPRSA recycled water land application sites' growing season as well as the WPRSA consultant recommended HLR.

Table 6. IWR for the WPRSA recycled water reuse system permit M-102-04

Month	Calculated Hydraulic Loading Allowances	
	in/month	gallons/acre*
April	0.118	3204
May	2.224	60390
June	3.307	89798
July	6.767	183751
August	4.814	130719
September	2.441	66283
October	0.014	380
Total	**19.685**	**534526**

*Based upon conversion factor of 27,154 gallons per acre-inch

Actual application rates during the growing season are required to be substantially at or below the IWR values which are calculated above in Table 6, allowing for recycled water application adjustments during variations in yearly precipitation. The draft permit eliminates specific HLR limits for each month that are included in the current permit and instead requires the HLR to be substantially at or below the estimated IWR for the particular month. Requiring the HLR to be substantially equal to or below the IWR, rather than setting specific HLR permit limits is consistent with other permits for forested sites recently issued by DEQ.

For this permit cycle, the permittee has requested adjusting the HLR limits from 4.6 inches per growing season to substantially at or below the IWR. As shown in Figure 2, the average HLR for WPRSA between 2010 and 2018 has been considerably less than the IWR established in the current permit. WPRSA does not anticipate providing services to other connections as the system has reached build-out (TO 2019). It is recommended that the draft permit set the HLR permit limit as equal to or below the recalculated IWR (Table 6) of the orchard site.

4.7.3 Constituent Loading Rates

The current permit establishes loading limits for nitrogen at 75 pounds per acre-year (lbs N/acre). No loading limits were established for phosphorus (DEQ 2010, Section F).

The average total nitrogen and phosphorus loading rates for the years 2010 through 2018 are shown in Table 7.

Table 7. WPRSA average annual constituent loading rates

Year	Nitrogen Loading (lbs/acre)	Phosphorus Loading (lbs/acre)
2010	42.84	5.70
2011	56.58	6.96
2012	44.35	4.45
2013	9.51	1.68
2014	30.60	4.75
2015	26.35	3.40
2016	45.30	5.65
2017	30.95	4.25
2018	33.10	4.30
Mean	35.51	4.57

In the 2009 Staff Analysis for the current permit, the estimated annual nitrogen loading rate for the black cherry trees was 75 lbs N/acre to provide enough nitrogen to meet the estimated 67.5 lbs N/acre annual nitrogen uptake rate (DEQ 2009). All annual nitrogen loading rates have been less than this estimated uptake rate (see Table 7).

DEQ currently uses more site-specific nitrogen loading recommendations for native conifer forests covered in the *Guidance for Forested/Poplar Site Nutrient and Hydraulic Loading* (DEQ 2012). The guidance considers factors such as the age of the trees, the type of trees, the density of understory vegetation coverage and the amount of tree canopy coverage. For field crops, nitrogen loading limits are calculated based on the amount of nitrogen removed from the management unit in plant tissue from each cutting. General rates for field crop nitrogen loading have typically been 150% of crop uptake. This approach is somewhat general and allows for a 50% loss of nitrogen through various pathways including volatilization, denitrification, microbial/biomass fixation, and leaching.

The WPRSA WLAP site is unique in the sense that it is a "hybrid" crop; a deciduous tree fruit. At the time the current permit was issued, information regarding the constituent uptake for cherry trees was not widely available. DEQ is proposing to use a "hybrid" approach to calculating the constituent loading limit for the WPRSA WLAP draft permit; using both literature values as well as typical crop yield for the crop in the nearby region.

Recent research suggests design values for nitrogen uptake for cherry trees are estimated to be between 8.8 and 12 lbs N/ton of fruit harvested (Sallato et al. 2018). According to the *2019 Idaho Annual Statistical Bulletin* compiled by the USDA National Agricultural Statistics Service – Northwest Regional Office, the median yield of sweet cherries between 2009 and 2015 was approximately 3.73 tons/acre. Equation 1 is used to calculate the example nitrogen loading rate:

Eq. 1:

$$\boldsymbol{N_{rate} = N_{demand} * C_{yield} * 150\%}$$

where:

N_{rate} = nitrogen loading rate (lbs/ac-year)
N_{demand} = nitrogen demand of deciduous crop (lbs N/ton)
C_{yield} = median region crop yield (tons/acre)

It is assumed that the N_{demand} is the average cherry tree fruit demand between 8.8 and 12 lbs N/ton. Values are then substituted into Equation 1:

$$N_{rate} = N_{demand} * C_{yield} * 150\% = \left(10.4\ \frac{lbs\ N}{ton}\right) * \left(3.73\ \frac{ton}{acre}\right) * (150\%)$$

$$= \mathbf{58.188}\ \frac{\boldsymbol{lbs\ N}}{\boldsymbol{acre}} \cong \mathbf{58}\frac{\boldsymbol{lbs\ N}}{\boldsymbol{acre}}$$

The current permit nitrogen loading rate limit is 75 lbs N/acre-year, but the average loading rate has been around 35.5 lbs N/acre-year. Although the mean nitrogen loading rate is far less than the permit limit, continued soil sampling for nitrogen would help to determine if there are any trends of increasing soil nitrogen concentrations compared to historical concentrations. Specific soil sampling and monitoring related to nitrogen will be discussed further in Section 6.2.

Phosphorus is a required nutrient for crop growth. In cases of excessive phosphorus loading or sediments having high phosphorus content, in proximity to surface water, can contribute to phosphorus pollution of surface water causing algae blooms, low dissolved oxygen, undesirable plant growth, and fish kill.

Soil plant available phosphorus levels at the WPRSA WLAP site have all been in the low range (See Table 12 below) according to the typical Idaho soil chemistry values from the Stukenholtz Laboratory, Inc. (DEQ 2007, Section 2.5.1); more information regarding the site soil characteristics can be found below in Section 6.2.

The average phosphorus loading for WPRSA during the current permit cycle was approximately 4.57 lbs P/acre-year (See Table 7). Recent research suggests a design value for phosphorus uptake for cherry trees is estimated to be 1.5 lbs P/ton of fruit harvested (Sallato et al. 2018). Using the median yield of sweet cherries from the 2019 Idaho Annual Statistical Bulletin (3.73 ton/acre), the estimated phosphorus loading for cherry trees is approximately 5.60 lbs P/acre.

The permitted site is in proximity to surface water: Coeur d'Alene Lake is approximately 500 feet to the east by southeast (Browns Bay) and 900 feet to the north (Bloomsburg Bay). Nevertheless, given the low phosphorus levels in site soils and deminimus historic and anticipated loading, phosphorus loading at this site is not of regulatory/environmental concern.

It is recommended that the draft permit include a nitrogen loading limit of 58 lbs N/acre. It will also be recommended that monitoring of soil nitrogen and phosphorus is continued. Due to the proximity of Coeur d'Alene Lake, wastewater monitoring for phosphorus is still recommended as well.

5 Site Management

Site management discusses buffer zones, runoff, seepage testing, waste solids management and disposal, cropping plan, grazing, salts, and silvicultural planning.

5.1 Buffer Zones

Depending on the effects that are to be controlled for the wastewater land application permit (WLAP) site, separation distances will vary with the unique ecosystem associated with the recycled water land application surroundings and their ability to receive the treated effluent. Buffer zones for protection of surface water, ground water, drinking water supplies, and the public is required by IDAPA 58.01.17.604.

WPRSA applies Class E recycled water to the one (1) acre of cherry trees adjacent to the septic tank effluent storage tank. There is no total coliform limit for Class E wastewater, per IDAPA 58.01.17.600.07. Currently, the recycled water reuse permit requires cyclone/barbed wire enclosure of the site and signs designating the field as wastewater reuse area or equivalent posted every 500 feet and at each corner.

The approximate distances from the irrigation site to major features nearby is shown below in Table 8.

Table 8. Distance to major features* (in feet)

Feature	Site
WPRSA Public Wells	>1550
Access Road	>230
Inhabited Dwelling	>430
Residential Property Line	>250
Lake Coeur d'Alene	>500
Private Water Supply Well	>440

*At closest point

Although no changes have been made to the WLAP site since the current permit was issued in 2010, changes to the existing buffer distances in the current permit are being proposed for the renewed WPRSA WLAP due to updated municipal reuse system buffer zone guidance values.

Based on the *Guidance for the Reclamation and Ruse of Municipal and Industrial Wastewater* (DEQ 2007, Section 6.5.1) for class E wastewater and drip irrigation, DEQ staff recommends the following buffer zones in Table 9:

Table 9. Required buffer distances (in feet) from all hydraulic management units

Inhabited dwellings	Areas Accessible to the public	Permanent and intermittent surface water	Private water supply wells	Public water supply wells	Fencing and posting
300	50	100	500	1000	See Note [a]

a. Medium security (i.e., 6' woven fence) or equivalent is required. Signs shall read "Warning: Recycled Water - Do Not Enter" or equivalent in English and Spanish. Signs to be posted every 250 feet around the perimeter of the reuse area and at any point of access into the reuse area.

Although WPRSA WLAP site appears to have a distance to private water supply wells slightly less than the recommended buffer distance, the private well location appears to have sufficient buffer distance based on information provided above in Section 4.4, low hydraulic loading rates, and the upgradient proximity of the well in relation to the irrigation site.

5.2 Runoff

Management controls are currently in place to minimize runoff of precipitation influenced by wastewater from the land application site. Irrigation does not take place during periods when rainfall is occurring or when soils are saturated (TO 2019). Visual inspection of land application site for ponding or surface runoff is also done to ensure recycled wastewater does not leave the application site. Additional run-off prevention in the form of a one (1) foot high berm has also been constructed along the south and east sides of the irrigation site.

The current recycled water reuse permit LA-000102-03 has conditions stated in Section F regarding runoff control and ponding prohibition which states, "No runoff of wastewater allowed".

A section addressing runoff control and ponding prohibition is included in the draft permit which requires the WPRSA to manage the reuse permit operations in accordance with the runoff control plan in the plan of operations as well as use Best Management Practices (BMPs) where runoff may potentially occur.

5.3 Seepage Rate Testing

Septic tank effluent is pumped from each residence to a 12,000 gallon steel storage tank containing two submersible pumps which deliver the Class E effluent to the MU.

The WPRSA recycled water reuse facility does not utilize a wastewater lagoon for treatment or storage. For this reason, seepage rate testing requirements for lagoons is not applicable to the WPRSA recycled water reuse facility and will not be included in the draft reuse permit M-102-04.

5.4 Waste Solids, Biosolids, Sludge, and Solid Waste

With properly maintained septic tanks, waste solids accumulation in the storage tank should be minimal. The only time waste solids removal from the storage tank should be necessary is during storage tank reconstruction and/or repair. However, at such time when the sludge in the storage tank builds up to the point that solids removal is required, the facility shall submit a solids management plan to DEQ for review and approval.

5.5 Nuisance Odors

The development of nuisance odors have not appeared to present an issue at the WPRSA reuse facility, based upon review of several annual reports (WIPCO 2011 through 2019) as well as WPRSA never receiving an odor complaint. The method of recycled water application at the WPRSA irrigation site through drip irrigation does not appear to create an aerosol drift, typically associated with spray irrigation, which is a factor for odor development. A Nuisance Odor Management Plan was submitted to DEQ in the WPRSA technical report for permit renewal in 2008.

5.6 Cropping Plan

The WPRSA recycled water irrigation site is made up of mostly black cherry trees whose purpose is timber production. No fruit shall be harvested and used for human consumption at the WPRSA WLAP site. The silvicultural plan required as a compliance activity in the draft permit shall include recommendations on the timing to harvest trees for timber production.

5.7 Grazing

This reuse facility is not grazed and a grazing management plan will not be required in the draft permit.

5.8 Salts

Salt loading is not anticipated to cause adverse salinity in soils or cause significant degradation of ground water or nearby surface water due to the generally low salt concentration in domestic wastewater. The reuse site is in an area of very high precipitation, which further reduces risks mentioned. Submittal of a salt loading management plan is not included in the draft permit.

5.9 Silvicultural Plan for Forest Sites

A silvicultural plan for the WLAP site was developed by WIPCO and their consulting silviculturalist in 2013 for the recycled water irrigation site (WIPCO 2016). The silvicultural plan includes the nutrient and water requirements, pruning, and lumber harvesting.

The draft permit includes soil monitoring to determine any impacts to the soils and vegetation due to irrigation activities. Soil monitoring is discussed further in Section 6.2. The draft permit

also includes a compliance activity requiring a follow-up silvicultural report to be prepared by a professional silviculturist within five (5) years of permit issuance. This report should include a harvest schedule and recommendations for land management activities that will maximize ET and nutrient uptake.

6 Monitoring

Compliance with permit limits can be determined by the monitoring requirements detailed in the following subsections. All monitoring will be conducted in accordance with the facility's Quality Assurance Project Plan (QAPP). Many of the proposed monitoring requirements have not been changed from the previous permit as the monitoring is current with DEQ's monitoring objectives.

6.1 Recycled Water Monitoring

The current permit requires the facility to monitor microbial and constituent concentrations as well as recycled water flows.

Current monitoring for treated effluent requires two annual grab samples (July and October) for total nitrogen and total phosphorus when irrigating. Grab samples are obtained at the point of application of the recycled water (WIPCO 2012a).

Recycled water flow monitoring is required daily when land applying to the MU. There is one flow meter which measures flow from the influent storage tank to the land management unit.

In order to remain consistent with similar permits issued in the area, the draft permit will require monthly monitoring of recycled water for total nitrogen and total phosphorus when irrigating.

6.2 Soil Monitoring

WPRSA is required to take composite soil samples for constituents in May of 2010 and May of 2014. The constituents being monitored are electrical conductivity, nitrate-nitrogen, ammonium nitrogen, plant available phosphorus, and pH. The current reuse permit conditions regarding soil monitoring requires five (5) locations for the soil monitoring unit (SU) to be sampled. At each location, samples shall be obtained from three depths: 0-12 inches; 12-24 inches; and 24-36 inches or refusal. The five (5) subsamples obtained from each depth shall be composited by depth to yield three composite samples for the soil monitoring unit; one composite sample for each depth (DEQ 2010, Section G. note 6 and note 7).

Soil pH levels can be a predictor of various chemical activities as well as an indicator of the balance for available nutrients. Soil microbes favor more acidic pH levels and are important for converting nutrients into plant-available forms. WPRSA soil samples from 2010 and 2014 averaged an annual pH of around 5.95 (Table 1).

The facility soil sampling indicates that the nitrogen loading rates have resulted in low soil nitrogen levels. Nitrate-nitrogen concentrations are considered to be low to very low for typical Idaho soil (DEQ 2007, Section 2.5.1).
Nitrogen has not been accumulating in the soil and therefore nitrogen migration to ground water is unlikely to occur. Table 10 and Table 11 show soil nitrate-nitrogen levels and ammonium-nitrogen levels for the WPRSA recycled water irrigation site for the current permit cycle, respectively.

Table 10. WPRSA soil nitrate-nitrogen levels in mg/kg

	Area #1		
Year	**0-12"**	**12-24"**	**24-36"**
2010	1.40	1.20	2.20
2014	2.00	0.72	0.78
Mean	1.70	0.96	1.49

Table 11. WPRSA soil ammonium-nitrogen levels in mg/kg

	Area #1		
Year	**0-12"**	**12-24"**	**24-36"**
2010	3.40	2.10	1.50
2014	1.50	1.40	1.00
Mean	2.45	1.75	1.25

On average, the ammonium-nitrogen levels are higher in the top layer of the soil than in the lower layers of the soil profile. This result is expected considering that ammonium-nitrogen attaches to soil; unlike the nitrate-nitrogen which is soluble in water and moves with the water throughout the soil profile.

Phosphorous can be present in soil as orthophosphate (plant-available phosphorus), polyphosphate, and organic phosphate. Levels of plant-available phosphorus for WPRSA range from 3.9 mg/kg to 7 mg/kg (Table 12). Phosphorus can be stored in the soil by precipitation and adsorption to soil particles. With significant loading, phosphorus can migrate to lower soil levels with the risk of breaking through to ground water (DEQ 2007, Section 4.2.2.7), but since most soils have the ability to adsorb phosphate loads, the soil retention helps prevent phosphorus from intruding into ground water that are at levels adequately below the ground surface. Soils ability to retain phosphorus becomes more important than its capacity to handle nitrogen due to phosphorus delivery into soil possibly being greater than the crop uptake ability. The WPRSA plant-available phosphorus levels in recycled water reuse areas can be seen in Table 12.

Table 12. WPRSA soil plant-available phosphorus levels in mg/kg

	Area #1		
Year	**0-12"**	**12-24"**	**24-36"**
2010	7.00	7.00	5.40
2014	5.30	3.90	6.80
Mean	6.15	5.45	6.10

It is recommended that the draft permit continue to include monitoring for soil nitrate-nitrogen, ammonium-nitrogen, electrical conductivity, pH levels, and plant-available phosphorus. It is also recommended that the draft permit includes a requirement for soil monitoring in the spring of the first, fifth and last year of the permit cycle, prior to starting irrigation for the growing season in the management unit.

6.3 Ground Water Monitoring

Ground water monitoring is used to evaluate a facility's impact on ground water quality and also serves to assess compliance with the reuse permit and the *Ground Water Quality Rule* (IDAPA 58.01.11). Section 7.2 of the *DEQ Guidance* (DEQ 2007) also describes elements of a ground water monitoring plan for a reuse site.

The current permit does not require constituent monitoring or sampling in ground water but does require ground water quality to be in compliance with the *Ground Water Quality Rule*.

Usually, when depth to ground water is less than 5 feet below ground surface, the soil phosphorus values at 18 to 24 inches should be less than 20 to 30 mg/kg (dependent on soil pH) to be protective of surface water that has a ground water connection (Sheffield et al. 2008). The recycled water land application site for WPRSA averaged 5.45 mg/kg of soil available phosphorus during the current permit cycle between 12 and 24 inches (Table 12), which falls within the allowable range of soil phosphorus values when depth to ground water is less than 5 feet. WPRSA soil phosphorus levels, along with low phosphorus loading of the irrigation site (Table 7), lead to the assumption that the facility's land application of recycled water is not a detriment to ground water quality.

At this time, the draft permit will not include the requirement to monitor ground water.

6.4 Supplemental Irrigation Water Monitoring

WPRSA does not use supplemental irrigation in their land application system.

6.5 Crop Yield and Tissue Monitoring

WPRSA will not be required to calculate nitrogen and phosphorus removal during timber harvest. This calculation would require numerous assumptions and the uncertainty within the estimated values would not be beneficial. Timber harvest and management shall be in accordance with the recommendations of the silvicultural plan which is required to be updated within five (5) years of permit issuance.

6.6 Meteorological Monitoring

Meteorological monitoring will not be required in the draft permit. Meteorological monitoring stations located near the WPRSA WLAP sites provide sufficient amount of data, making the requirement for WPRSA unnecessary. If the permittee wishes to use an IWR other than as described in Section 4.7.1, on-site meteorological monitoring may be required.

6.7 Calculation Methodologies

It is expected that WPRSA and TO will use calculation methodologies substantially like those provided in the DEQ *Guidance for the Reclamation and Reuse of Municipal and Industrial Wastewater* (DEQ 2007: Section 4.2.1.5, calculation methodology introduction; Section 4.2.2.4.2, nitrogen-loading calculations; 4.4.13, loading calculations from flow and concentration data; 4.4.14, example calculations).

Hydraulic loading to the irrigation sites will be measured by flow meters. Hydraulic loading will be reported in both million-gallons (MG) and inches (acre-inches/acre).

7 Quality Assurance Project Plan

The QAPP outlines the procedures used by the permittee to ensure the data collected and analyzed meets the requirements of the reuse permit.

To support its 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. DEQ does not approve QAPPs for the reason that the responsibility for validating the facility's 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 the Assurance and Data Processing sections of the DEQ *Guidance* (DEQ 2007) and EPA QAPP guidance documents located at: http://www.epa.gov/sites/production/files/2015-06/documents/g5-final.pdf

The requirement for WPRSA to prepare an updated QAPP is a compliance condition included in the draft permit.

8 Site Operations and Maintenance

Site operation and maintenance will be described in the plan of operation, which is required as a compliance condition in the draft permit, to be submitted twelve (12) months after reuse permit issuance for review and approval by DEQ. An updated version of the operations and

maintenance procedures was received by DEQ on January 9, 2013. This plan of operation (PO) was also submitted along with the 2012 recycled water reuse permit annual report for WIPCO.

The WPRSA wastewater treatment classifications are Wastewater Collection – Class I and Wastewater Land Application – Class I. Mr. Jeff Goldbloom with WPRSA is the responsible charge operator of the system and holds licenses in Wastewater Collections Operator – Class I (WWC1-13922), Wastewater Treatment Operator – Class I (WWT1-12861), Drinking Water Distribution Operator – Class I (DWD1-12862), and Wastewater Treatment Operator – Land Application (WWTLA-16060).

9 Compliance Activities

The following sections discuss the status of compliance activities in the current permit and provide an itemization of those compliance activities included in the draft permit.

9.1 Status of Compliance Activities in Current Permit

From the current WPRSA reuse permit (DEQ 2010), Table 13 shows what compliance activities are required, and the status is presented here as reported in the 2018 WPRSA Annual Report.

Table 12. Permit LA-000102-03 compliance activities and standing

Compliance Activity	Description	Due Date	Status
CA-102-01	Operator Licensure Requirements	(Not Specified in Permit)	Received January 12, 2011

9.2 Compliance Activities Required in New Permit

The following compliance activities are specified in the draft permit; plan of operation, QAPP, silvicultural management plan, pre-application conference, application for renewal.

CA-102-01 The permittee shall submit for review and approval a PO that reflects current operations and incorporates the requirements of this permit within twelve (12) months of permit issuance. The PO shall comply with the applicable requirements stated in IDAPA 58.01.17.300.05 and shall address appropriate items in the Plan of Operation Checklist in the DEQ *Guidance* (DEQ 2007). The PO shall include the following site management plans, or the permittee may submit the site management plans individually:

- Emergency Operating Plan
- Irrigation Management and Scheduling Plan
- Nuisance and Odor Management Plan
- Runoff Management Plan
- Waste Solids Management Plan

The PO shall be updated as needed to reflect current operations. The permittee shall notify DEQ of material changes to the PO and copies shall be kept on site and made available to DEQ upon request.

CA-102-02 The permittee shall prepare and implement a QAPP that incorporates all monitoring and reporting required by this permit. A copy of the QAPP along with written notice that the permittee has implemented the QAPP shall be provided to DEQ within twelve (12) months of permit issuance.

The QAPP shall be designed to assist in planning for the collection, analysis, and reporting of all monitoring in support of this permit and in explaining data anomalies when they occur. At a minimum, the QAPP must include the following

- Details on the number of measurements, number of samples, type of sample containers, preservation of samples, holding times, analytical methods, analytical detection, and quantitation limits for each target compound, type and number of quality assurance field samples, precision and accuracy requirements, sample preparation requirements, sample shipping methods, and laboratory data delivery requirements.
- Maps indicating the location of each monitoring and sampling point
- Qualification and training of personnel
- Names, addresses, and telephone numbers of the laboratories used by or proposed to be used by the permittee
- Example formats and tables that will be used by the permittee to summarize and present all data in the annual report

The format and content of the QAPP should adhere to the recommendations and references in the Quality Assurance and Data Processing sections of the DEQ *Guidance* (DEQ 2007).

The permittee shall amend the QAPP whenever there is a modification in sample collection, sample analysis, or other procedure addressed by the QAPP. The permittee shall notify DEQ of material changes to the QAPP and copies shall be kept on site and made available to DEQ upon request.

CA-102-03 An updated Silvicultural Plan for the reuse site prepared by a professional silviculturist (forester) shall be submitted to DEQ within five (5) years of permit issuance. The plan must include the dominant vegetation species occupying the application site, estimated percentage of the application site occupied by each of the dominant species, land management activities that will maximize evapotranspiration and nutrient uptake, and harvesting schedules.

CA-102-04 Pre-Application Conference one (1) year prior to permit expiration to discuss the compliance status of the facility, and the content required for the reuse permit application package.

CA-102-05 The permittee shall submit to DEQ a complete permit renewal application package six (6) months prior to permit expiration, which fulfills the requirements specified at the pre-application conference.

10 Recommendations

Staff recommends the draft reuse permit be issued for the duration of ten (10) years. The draft permit specifies hydraulic and constituent-loading limits, compliance conditions to be performed, and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance. Other draft permit limits are included.

11 References

Allen, Richard G. and Clarence W. Robison, 2017. *Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2017,* Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID. Available at http://data.kimberly.uidaho.edu/ETIdaho/. Accessed 31 October 2019. (Allen, Richard G. and Clarence W. Robison, 2017)

Idaho Department of Environmental Quality (DEQ). September 2007. *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*. Available at *http://www.deq.idaho.gov/media/516329-guidance_reuse_0907.pdf*. (DEQ 2007)

Idaho Department of Environmental Quality (DEQ). October 2009. *Wildwood Park Company Staff Analysis for Permit LA-000102-03*. 7 pp. (DEQ 2009)

Idaho Department of Environmental Quality (DEQ). January 2010. *Wastewater Reuse Permit for Wildwood Park Company*. Permit LA-000102-03. 17 pp. (DEQ 2010)

Idaho Department of Environmental Quality (DEQ). July 2012. *Guidance for Forested/Poplar Site Nutrient and Hydraulic Loading*. 14 pp. (DEQ 2012)

Sallato, Bernardita, et al. "Tree Fruit Soil Fertility and Plant Nutrition in Cropping Orchards in Central Washington." Washington State University - Tree Fruit Research and Extension, Oct. 2018, http://treefruit.wsu.edu/orchard-management/soils-nutrition/fruit-tree-nutrition/. (Sallato et al. 2018)

Sheffield, Ron, Brad Brown, Mireille Chahine, Mario de Haro Marti, Christi Falen. August 2008. *Mitigating High Phosphorus Soils*. University of Idaho. BUL 851. Available at *http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0851.pdf*. Accessed 13 April 2018. 30 pp. (Sheffield et al. 2008)

T-O Engineers, Inc. 2019. *Technical Report for Wildwood Park Road and Sewer Association, Inc. Wastewater Reuse Permit No. LA-000102-03 Renewal*. Coeur d'Alene, ID. 72 pp. (TO 2019)

Wildwood Park Company (WIPCO). 2008. *Technical Report for Wildwood Park Company Wastewater Reuse Permit No. LA-000102-02 Renewal*. Worley, ID. 16 pp. (WIPCO 2008)

Wildwood Park Company (WIPCO). 2011. *Wildwood Park Company Wastewater Land Application System 2010 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2011)

Wildwood Park Company (WIPCO). 2012. *Wildwood Park Company Wastewater Land Application System 2011 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2012)

Wildwood Park Company (WIPCO). 2012. *Wildwood Park Company Wastewater Land Application System Operation and Maintenance Manual*. Worley, ID. (WIPCO 2012a)

Wildwood Park Company (WIPCO). 2013. *Wildwood Park Company Wastewater Land Application System 2012 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2013)

Wildwood Park Company (WIPCO). 2014. *Wildwood Park Company Wastewater Land Application System 2013 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2014)

Wildwood Park Company (WIPCO). 2015. *Wildwood Park Company Wastewater Land Application System 2014 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2015)

Wildwood Park Company (WIPCO). 2016. *Wildwood Park Company Wastewater Land Application System 2015 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2016)

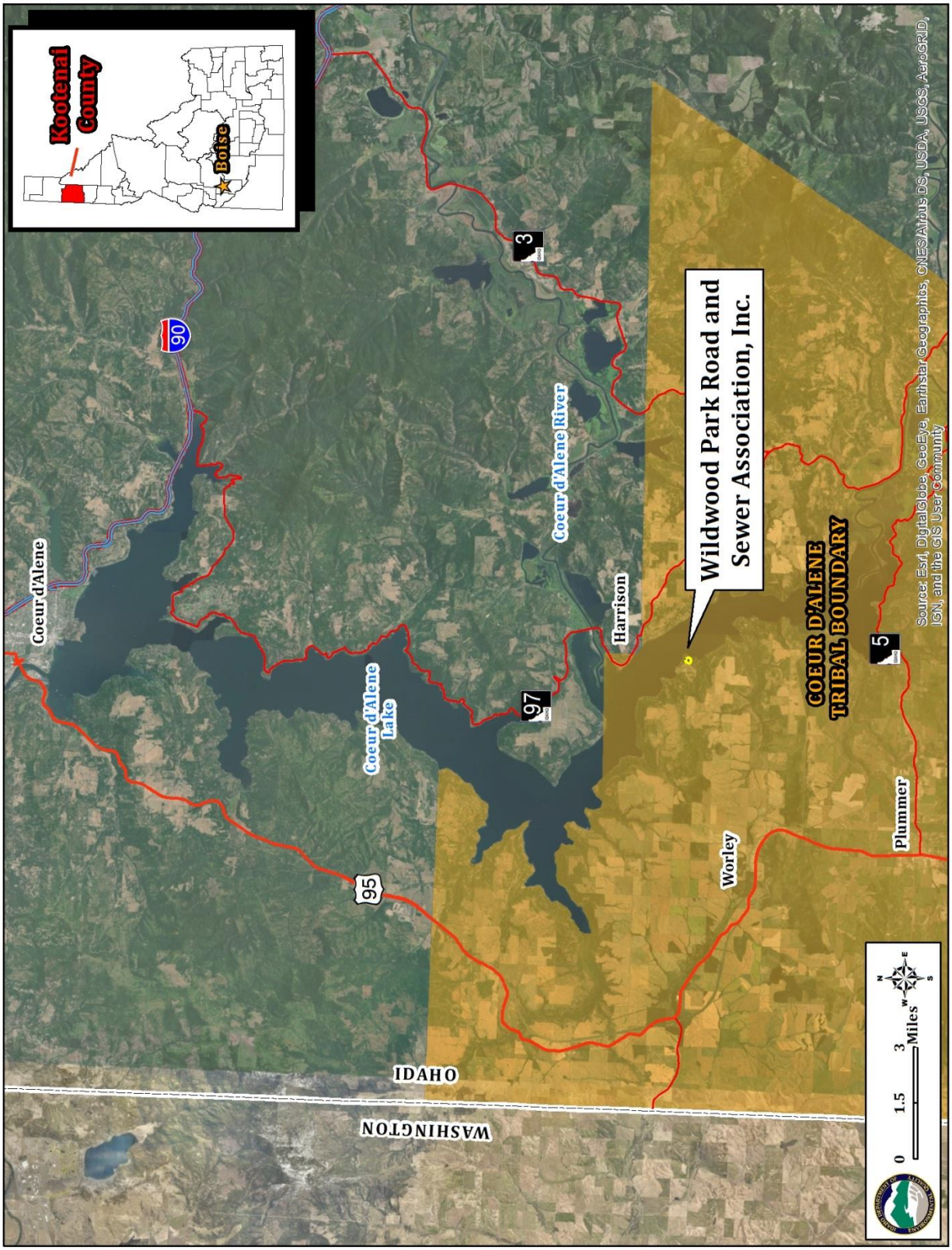
Wildwood Park Company (WIPCO). 2017. *Wildwood Park Company Wastewater Land Application System 2016 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2017)

Wildwood Park Company (WIPCO). 2018. *Wildwood Park Company Wastewater Land Application System 2017 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2018)

Wildwood Park Company (WIPCO). 2019. *Wildwood Park Company Wastewater Land Application System 2018 Annual Report – WLAP No. LA-000102-03*. Worley, ID. (WIPCO 2019)

Western Regional Climate Center (WRCC). 8 April 2013. *Idaho Climate Summaries*. Available at *http://wrcc.dri.edu/cgi-bin/cliMAIN.pl?idsand*. Accessed 26 March 2018. (WRCC 2013)

Appendix A. Site Map



Appendix B. Facility Map