2018 Facility Plan Update

City of Coeur d'Alene, Idaho

City of Coeur d'Alene
IDAHO

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FINAL

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Contents

Tables

Figures

Executive Summary

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The City of Coeur d'Alene's (City) wastewater program is progressing according to plans developed in the 2012 Update to the 2009 Wastewater Facilities Plan Amendment. These previous plans have been focused on implementing tertiary treatment facilities to achieve compliance with the final effluent limits for phosphorus, ammonia nitrogen, and carbonaceous biochemical oxygen demand (CBOD) for discharge to the Spokane River.

The objective of this 2018 Facility Plan Update is to prepare a plan that meets the requirements of the Idaho Department of Environmental Quality (IDEQ) regulations (Idaho Administrative Code IDAPA 58.01.16) and addresses the capacity and condition of various treatment facility processes and components, as well as key operational, maintenance and infrastructure issues identified by the City. Since several individual studies and analyses have been completed on different subparts and processes of the treatment facility in recent years, a comprehensive facility plan update was needed to synthesize the existing data, as well as evaluate other components not recently reviewed, and prepare for future needs.

As the City has grown over the past decades, wastewater treatment capacity requirements have increased, along with more demanding performance requirements for effluent quality, including disinfection and control of toxics and nutrients. The modern era of wastewater planning in Coeur d'Alene was driven by several key factors; City growth, septic system abatement over the Rathdrum Prairie Aquifer, aging condition of the existing treatment facility, compliance deficiencies, increasingly restrictive discharge requirements for the Spokane River, and changes in the neighborhood surrounding the treatment facility.

Water quality conditions in the Spokane River and downstream in Long Lake (now Lake Spokane) drove the most recent wave of City planning and treatment plant improvements. In 2010, the Washington State Department of Ecology dissolved oxygen total maximum daily load (TMDL) for the Spokane River was completed and approved by EPA. This resulted in more restrictive effluent discharge limits for phosphorus, carbonaceous oxygen demand, and ammonia nitrogen for the City in the National Pollutant Discharge Elimination System (NPDES) permit that was finalized by EPA in 2014. The City's discharge permit also includes new toxics management requirements for PCBs (Polychlorinated biphenyls) and TCDD (Tetrachlorodibenzo-p-dioxin).

The Phase 1 Tertiary Treatment improvements to meet the final effluent limits for phosphorus and ammonia included in the City's 2014 NPDES permit were completed in 2015, and a Phase 2 Tertiary Treatment improvement for full plant capacity was completed in 2019. The Phase 1 project was a $13 million investment in advanced treatment. The Phase 2 project represented an additional $17.7 million investment in advanced treatment. Effluent performance is excellent and complies with both the interim and final limits in the City's NPDES discharge permit. The City is ahead of schedule since the City wasn't required to complete construction until November 30, 2022 and then gather two years of operating data prior to full compliance with final effluent limits by November 30, 2024.

This 2018 Facility Plan Update provides the City with a long-term master plan for ultimate expansion of the facilities, while identifying a program for immediate upgrade of the plant for permit compliance and to meet near-term capacity requirements. It is anticipated that this recommended plan will address the City's wastewater management needs for the next 10 to 20 years.

The contents of this 2018 Facility Plan Update are presented in chapters designed to present updates to previous planning work with contemporary analysis of the recently completed improvements:

Chapter 1 introduces the plan with a summary of wastewater management history and facility improvements.

Chapter 2 presents the basis of planning with an updated analysis of wastewater flows and loadings, along with future projections.

Chapter 3 covers the many regulatory requirements that govern operation and performance of the City's treatment facility. It includes a summary of regulatory requirements impacting the City's effluent discharge to the Spokane River, as well as a discussion of emerging regulatory challenges linked to facilities planning considerations.

Chapter 4 is focused on the existing assets of the advanced treatment facility. This chapter includes an evaluation of the condition and performance of existing facilities with an appendix that includes an asset inventory and details of the condition assessment. The results of this assessment indicate that the facility has a minimal number of assets that require immediate attention, or assets that require critical improvements. Some of the key equipment items that were evaluated need to be included in planning for routine replacement. This was due to a projected future deficiency based on the current condition and the age of the asset compared to its estimated useful life.

Chapter 5 presents the evaluation of alternatives approaches to treatment for the facility now and into the future. This includes an analysis of each individual treatment unit processes and an evaluation of whole plant alternatives to meeting future wastewater flow and loading capacity requirements. An economic and noneconomic scoring comparison was used to select the preferred treatment alternative. The City is fortunate in that multiple competitive treatment process alternatives are available, and all could be effective in meeting the City's future needs. The preferred options appear to be either continuing with the current treatment process train for future expansion or continuing that approach with the modification of including a side stream treatment process focused on the recycle from solids processing. The results of the alternative analysis are presented in Chapter 5 and further refined for the recommended plan in Chapter 7. Growth in wastewater flows and loadings, in particular ammonia nitrogen loadings, will be the key trigger for future treatment process capacity expansion.

Chapter 6 is focused on master planning considerations for the treatment facility site and the interface with the surrounding neighborhood. Chapter 6 addresses issues that include aesthetics, odor control, and the treatment facility relationship with the local community. Land use in the neighborhood has changed dramatically over the past 40 years from the time when the treatment facility was surrounded by industrial uses with the Stimson Mill, railroad, and native forest land. The facility is now surrounded by far more diverse land uses, including the Education Corridor and the Centennial Trail. That brings the public into much closer proximity with the wastewater facility, which may introduce new expectations. The City also has an opportunity for community enhancement by recycling to conserve potable water resources by substituting reclaimed water for outdoor irrigation. The City's facility can produce 1 million gallons per day (mgd) of Class A reclaimed water suitable for non-potable reuse applications in areas open to public access, such as along the Centennial Trail, Education Corridor, and nearby cemetery.

The recommended plan is presented in Chapter 7. This includes a discussion of the preferred approach to treatment and site planning to best position the City to meet current and future capacity needs and regulatory requirements. The range of projects presented in Chapter 7 were identified as part of the condition assessment, the site master plan, and the treatment process alternatives analysis. The recommended plan provides a flexible management strategy for the City, while identifying a phased implementation program to meet capacity and treatment requirements into the future. The plan encompasses the following components:

- Renewal and replacement of aging equipment and improvement of existing processes.
- Expansion of the secondary treatment process.
- Production of highly treated effluent to meet permit requirements for discharge to the Spokane River.
- Preparation of a reclaimed water distribution program that identifies reuse customers, sites, water demands, and distribution system infrastructure required for potential implementation.
- Beneficial reuse of biosolids

An environmental assessment is presented in Chapter 8 as an update to historical assessments. The intent is to address IDEQ review requirements and support potential City pursuits of external state and federal funding assistance. For the facilities improvements included in the recommended plan presented in Chapter 7, most will have minimal environmental impacts. IDEQ staff have reviewed Chapter 8 and indicated that they will reaffirm previous determinations of a Finding of No Significant Impact (FONSI) at this time for plant modifications within the plant site. For larger scale improvements, such as the addition of new treatment reactors, or potentially modifications to the solids building and/or construction near the Spokane River flood control levee, or extension of the outfall diffuser, further environmental review may be needed to support a FONSI. Expansion of the City's effluent reclamation and recycling program outside of the existing facility site and along the Centennial Trail, may introduce other considerations that require an environmental assessment at such time as when the City develops a reuse plan and permit.

Chapter 1 - 2018 Facility Plan Update

Introduction

Chapter 1 Introduction

The City of Coeur d'Alene (City) wastewater program is progressing according to plans developed in the 2012 Update to the 2009 Wastewater Facilities Plan Amendment. These plans have been focused on implementing tertiary treatment facilities to achieve compliance with the final effluent limits for phosphorus, ammonia nitrogen, and carbonaceous biochemical oxygen demand (CBOD) for discharge to the Spokane River. The Phase 1 Tertiary Treatment improvements to meet the final effluent limits for phosphorus and ammonia included in the City's 2014 NPDES permit were completed in 2015 and the Phase 2 Tertiary Treatment improvement for full plant capacity were completed in 2019. Effluent performance has been excellent and complies with both the interim and final limits in the City's National Pollutant Discharge Elimination System (NPDES) discharge permit.

The City owns and operates the Advanced Wastewater Treatment Facility (AWTF) which provides treatment for municipal, commercial, and industrial wastewater prior to discharge to the Spokane River. The US EPA Region 10 issued the City's NPDES permit (ID-0022853) effective December 1, 2014 with an expiration date of November 30, 2019. The discharge permit includes a compliance schedule that requires the City to complete final construction of facilities necessary for compliance with Spokane River requirements by November 30, 2022 and gather 2 years of operating data prior to full compliance with the final effluent limits by November 30, 2024.

Since 2014 when EPA Region 10 issued the City's NPDES permit, the state of Idaho has taken primacy over municipal discharge permits to surface water under the Clean Water Act (CWA) in Idaho in a new Idaho Discharge Permit Elimination System (IPDES) permitting program. The City's permit renewal process will be initiated with an application for renewal in the new IPDES program that must be submitted by June 3, 2019.

1.1 Objectives

The objective of this Facility Plan Update is to prepare a wastewater plan that meets the requirements of Idaho Department of Environmental Quality (IDEQ) regulations (Idaho Administrative Code IDAPA 58.01.16) and address the capacity and condition of the various plant processes and components, as well as key operational, maintenance, and infrastructure issues identified by the City. Since a number of studies and reports have been completed on different subsections and processes of the plant in recent years, it is desired that a comprehensive facility plan be compiled to synthesize the existing information, as well as evaluate other components of the facility that have not been reviewed recently.

City input on goals and objectives for the Facility Plan were discussed in Workshop No. 1 Project Kickoff held on January 9, 2018. This included a discussion of overarching principles that guide City decision making and specific measurable steps towards the City's goals. Wastewater Department Staff provided input on key plan drivers and prioritized those drivers based on their influence on facility planning. The top drivers were identified to be the following:

- Receiving Water Regulatory Requirements.
- Community and Neighborhood.
- Resiliency and Reliability.
- Sustainability.
- Operations.

Wastewater program risks were discussed and a number of potential considerations were identified, including the following:

- Plant Location & Surrounding Neighborhood.
  - The surrounding neighborhood has changed significantly over the past 40 years as land use in the surrounding neighborhood has transitioned from industrial with saw mills, to campuses in the Education Corridor. The Centennial Trail has also brought the general public into close proximity with the treatment facility.
- Odor & Aesthetics.
  - Expectations for the visual appearance of the treatment facility and level of odor control have increased as land use in the surrounding neighborhood has changed.
- Spokane River Discharge Issues.
  - Historically, Spokane River water quality requirements have driven the need for many improvements to the wastewater treatment process. Effluent limits for ammonia nitrogen have long been a challenge, as has compliance for cadmium, lead, and zinc. Most recently, dissolved oxygen impacts downstream in Washington have driven very restrictive control over phosphorus, ammonia, and carbonaceous biochemical oxygen demand (CBOD) discharges. Polychlorinated Biphenyl (PCB) contamination of the river and recent Idaho rulemaking on human health water quality standards for toxics may create new compliance challenges for the river discharge.
- Resiliency, Natural Disasters, Flood, Drought, Seismic, etc.
  - The location of the treatment facility along a flood control dike on the Spokane River waterfront has long been a vivid illustration of one risk factor, but it is not the only factor worthy of consideration. Other key factors include weather and climate change, which may impact the reliability of electrical utility power, access to the plant site, etc.

Wastewater Department Staff were asked to provide input and direction for the extent regulatory agency engagement preferred. Various levels of potential engagement were discussed, ranging from passive and reactive, to more progressive approaches of selective engagement on key topics of concern to the City and assertive engagement on all regulatory issues.

1.2 Historical Wastewater Planning

As the City has grown over the past decades, wastewater treatment capacity requirements have increased, along with more demanding performance requirements for effluent quality, including disinfection and control of toxics and nutrients. The modern era of wastewater planning in Coeur d'Alene was driven by several key factors; City growth, septic system abatement over the Rathdrum Prairie Aquifer, aging condition of the existing treatment facility, compliance deficiencies, increasingly restrictive discharge requirements for the Spokane River, and changes in the neighborhood surrounding the treatment facility.

In the late 1970's, the Idaho Division of Environment Quality (now Department of Environmental Quality IDEQ) conducted an analysis that identified capacity limitations and led to a moratorium on new connections to the City's collection and treatment system. A 1980 Facilities Plan and a federal Environmental Impact Statement (FEIS) were produced to address these conditions and support the City's pursuit of Clean Water Act grant funding in the EPA Construction Grants program for improvements to the treatment plant. An EPA Step 1 Planning Grant supported preparation of the facilities plan and the City received a Step 2 Design Grant offer. However, the EPA Construction Grants program was winding down in the early 1980's and no Step 3 Construction Grant was available to the City. As a consequence, the City used the Step 2 Design Grant funds for both design and construction of the Phase 1 Improvements to the treatment plant to bring the facility into compliance and alleviate the moratorium on new connections in 1983.

Water quality conditions in the Spokane River and downstream in Long Lake (now Lake Spokane) drove the next wave of City planning and treatment plant improvements. Phosphorus enrichment resulted in eutrophication and algal blooms in Long Lake that led to a phosphorus wasteload allocation strategy for ten municipal and industrial dischargers in Washington and Idaho, including Coeur d'Alene. In 1989, the City entered into a voluntary agreement to reduce the phosphorus concentration in the plant effluent for water quality protection in Long Lake downstream. The City's NPDES permit included effluent limitations for phosphorus for 85 percent removal, or 1 mg/l, whichever is greater, seasonally during the critical water quality period of March 1 through October 31. Phosphorus removal was implemented at the City's treatment plant by alum addition to the existing treatment process and cumulative river loadings to Long Lake were tracked annually.

The Spokane River Association challenged the City's 1989 discharge permit, contending that the permit did not account for the cumulative impact of multiple Idaho dischargers to the Spokane River. Ultimately the Ninth Circuit Court of Appeals remanded the permit to the EPA for further consideration. The Idaho segment of the Spokane River was listed as impaired under section 303(d) of the Clean Water Act and included in Idaho's 303(d) list as not meeting standards for temperature and metals (specifically, cadmium, lead, and zinc). In addition, concerns regarding algal growth in the River prompted formation of the Spokane River Technical Advisory Committee (TAC) to address nutrients (phosphorus and nitrogen) in the River. Idaho DEQ followed with a draft of a "Phased Approach for a Phosphorus Total Maximum Daily Load (TMDL)" that was widely criticized and ultimately was not finalized.

In 1994, a consortium of Idaho dischargers known as the "Kootenai Regional Wastewater Coordinating Committee" undertook a Regional Facility Plan and Environmental Impact Statement (EIS). The committee included Coeur d'Alene, Post Falls, Rathdrum, Hayden, Hayden Lake, Kootenai County, IDEQ, and the Panhandle Health District. The purpose of the effort was to consider creation of a regional wastewater treatment facility. This culminated in the 1997 Kootenai Regional Long-Range Wastewater Facilities Plan and Environmental Impact Statement. The conclusion from this planning effort was that maintaining the three individual utilities and their treatment plants discharging to the river was the best option and that combining into a single regional facility was not preferred. Further, options to divert effluent from the river to seasonal storage and land application were not feasible. It was recognized that additional treatment improvements would be necessary at the individual treatment plants to provide higher levels of treatment, such as ammonia removal facilities. The recommended plan included flexibility to upgrade facilities should water quality studies of the Spokane River indicate additional treatment was needed.

In 1998, the Washington Department of Ecology (DOE) determined that dissolved oxygen (DO) standards were not being met in the Spokane River and in particular Lake Spokane. That required the preparation of a Total Maximum Daily Load (TMDL) to limit oxygen demanding organics (CBOD), ammonia nitrogen, and phosphorus. At that time, the City operated under an administrative extension of an expired NPDES permit. EPA Region 10 issued a draft NPDES permit in the late spring of 1999, triggering a dialogue of review and response with the City extending into the summer of 1999. A new NPDES permit was issued on September 30, 1999 with an effective date of November 2, 1999 and an expiration date of November 2, 2004.

The 2000 Wastewater Facilities Plan was prepared to address high peak flows, regulatory changes, aging facilities, rapid growth, and encroaching development in the neighborhood surrounding the City's wastewater treatment facilities. The plan identified the need for reliable compliance with ammonia nitrogen limits of particular importance. To meet capacity and effluent quality requirements, the recommended plan included a blend of treatment technologies new to Coeur d'Alene and technologies already in use. The most notable new technologies included activated sludge to meet increasingly stringent ammonia-nitrogen limits and the use of centrifuge dewatering to improve performance and reduce the cost of the biosolids composting operation. The 2000 plan was also intended to provide flexibility to incorporate future process changes such as effluent filtration, ultraviolet (UV) disinfection, or alternative methods for Class A sludge production should future conditions prove these approaches to be necessary.

In 2005, a Wastewater Treatment Process Review was conducted in anticipation that water quality studies on the Spokane River in Washington State would result in the most restrictive effluent phosphorus discharge limits in the nation. The treatment process review was focused on updating process considerations to provide the City with a long-term treatment and effluent management program to sustain future utility operations.

The 2009 Wastewater Facilities Plan Amendment was prepared to address changing effluent discharge conditions in the Spokane River and new regulatory requirements driven by water quality impairment in the Spokane River and Lake Spokane (Long Lake reservoir). The draft dissolved oxygen TMDL prepared by the Washington Department of Ecology was leading to very restrictive effluent limits. These changing effluent discharge conditions were key to informing the effluent limits for phosphorus, ammonia, and CBOD in the City's 2007 draft NPDES permit and drove a re-examination of the 2000 Wastewater Facilities Plan. The 2009 Wastewater Facility Plan Amendment called for improvements to be in place when the nominal plant wastewater flow reached 4.2 million gallons per day (mgd) since that was the estimated threshold for flows and loadings to meet summer effluent ammonia nitrogen discharge limitations within the existing treatment process.

Flexibility was incorporated into the final recommendations for the preferred tertiary treatment process in the 2009 Wastewater Facilities Plan Amendment to allow time to conduct tertiary treatment technology pilot testing. Earlier small scale pilot testing in 2006 was expanded upon in a larger scale, longer duration demonstration scale pilot testing program to evaluate three key technologies identified in the 2009 Amendment. Pilot testing was conducted in 2011 and 2012 that resulted in the selection of Tertiary Membrane Filtration (TMF) as the preferred approach to meeting the low effluent phosphorus requirements resulting from the Spokane River Dissolved Oxygen TMDL. The pilot testing program showed that the TMF option would provide the City with effective tertiary treatment for both ammonia and phosphorus at a substantially lower cost than other options.

In 2010, the Washington dissolved oxygen TMDL (Ecology 2010) was finally completed and approved by EPA. Discharge permit renewal discussions and unique combinations of phosphorus, ammonia, and CBOD were analyzed for individual Spokane River dischargers using the water quality model of the river to customize effluent limits in discharge permits. The City's draft 2007 NPDES permit was eventually finalized by EPA in 2014.

Section II.B of the 2014 permit required a "Phosphorus Management Plan" to be submitted by December 20, 2015. Section II. Special Conditions of the NPDES permit requires that annual reports be submitted in Part II.B. Phosphorus Management Plan each year by December 20th.

Section I.D. Interim Requirements for Schedules of Compliance of the 2014 permit requires annual progress reports to be submitted to EPA and IDEQ which outline the progress made toward achieving compliance with the final phosphorus, CBOD, and ammonia effluent limitations. Annual reports were required beginning on November 30, 2016 and continuing until November 30, 2023. The reports are specified to include an assessment of the previous year of effluent data with a comparison to the interim and final effluent limitations, a report on progress made toward meeting the final effluent limits, and further actions and milestones targeted for the upcoming year.

Section II.I of the permit requires "Best Management Practices for PCBs and 2,3,7,8 TCDD", in addition to permit required influent, effluent, and receiving water monitoring. The permit requires monitoring, development of a Toxics Management Plan (TMP), and an update to the quality assurance project plan (QAPP) to reflect the PCB and TCDD (Tetrachlorodibenzo-p-dioxin) sampling and monitoring. The City is required to develop an annual report documenting the toxics reduction activities, sampling results, and toxics management program plan for the subsequent year.

The 2012 Update to the 2009 Wastewater Facilities Plan Amendment incorporated the findings from the low phosphorus pilot studies into the phased implementation of the liquid stream treatment improvements for tertiary membrane treatment that have been completed. The 2018 Facility Plan will provide the City with a long-term master plan for ultimate expansion of the facilities, while identifying a program for immediate upgrade of the plant for permit compliance and to meet near-term capacity requirements. Completion of an approved Facility Plan also allows the City to pursue various funding opportunities, including the low-interest State Revolving Loan program administered by the Idaho Department of Environmental Quality. It is anticipated that the recommended plan will address the City's wastewater management needs for the next 10 to 20 years.

1.3 Historical Facility Improvements

The City's original secondary treatment facility was first commissioned in 1939 with primary clarification and secondary treatment in a rock media trickling filter followed by secondary clarification. Plant improvements completed in 1973 included a chlorine contact tank for disinfection, a gravity thickener for primary sludge, an anaerobic digester for solids stabilization, and rehabilitation of the hydraulic capacity of the rock media trickling filter. A 1979 analysis by the Idaho Division of Environment Quality (now IDEQ) concluded that the plant had reached its hydraulic capacity and this eventually led to a moratorium on connections to the City's sewage collection system.

Plant improvements have been planned and implemented as "phased" construction projects over a lengthy period of time extending from 1981 to present in response to population grown, regulatory requirements, and the availability of funding. The moratorium on connections to the sewer system was lifted with the completion of the Phase 1 improvements to the secondary treatment system with a new secondary clarifier in 1983. Construction of Phase 2 improvements began in 1984 and included a new anaerobic digester, solids handling building with dewatering, an additional secondary clarifier, chlorine contact tank, and a new effluent discharge outfall into the Spokane River.

Phase 3A improvements were completed in 1988 and added a second primary clarifier. Phase 3B improvements were completed in 1990 and included influent pumping improvements, preaeration grit removal, and gravity thickeners. The Phase 3C construction began in 1991 and included a chemical systems center for alum addition for phosphorus removal and a chlorine gas leak scrubbing system, two plastic media trickling filters to replace the original rock media trickling filter, a trickling filter pumping station, a solids contact tank and sludge reaeration basin, an additional anaerobic digester, and an additional solids dewatering belt filter press. Phase 3C construction was interrupted by a construction claims lawsuit which delayed the completion of improvements until 1995.

The City conducted an odor control study in 1998 and implemented foul air treatment with a compost biofilter that was completed in 2000.

Phase 4A improvements were completed in 2003 and included chlorine disinfection control improvements and solids contact aeration improvements. Phase 4B improvements were completed in 2005 and included a new influent sewage headworks and pumping station, a centrifuge for solids dewatering, and covers for the primary clarifiers for odor control and aesthetic improvements.

Phase 5A in 2008 added fabric media Integrated Fixed-film Activated Sludge (IFAS) units to the Solids Contact Tank to bolster nitrification capacity in the interim period as the Spokane River Dissolved Oxygen Total Maximum Daily Load (TMDL) was being prepared. Phase 5B improvements included a fifth anaerobic digester, a digester control building, a biogas control building, a Collections System Shop, and an Administration Building with an Analytical Laboratory.

A tertiary treatment technology pilot testing facility was constructed in 2010 to investigate the feasibility of three candidate processes to meet the low effluent phosphorus requirements resulting from the Spokane River Dissolved Oxygen TMDL. The three technologies were Membrane Bioreactor (MBR), Tertiary Membrane Filter (TMF), and moving bed dual sand filtration. Pilot testing was completed in 2012 and resulted in the selection of the TMF for full scale implementation.

Phase 5 improvements were designated Phase 1 and 2 Tertiary Treatment for full scale implementation of facilities designed to meet the very low effluent phosphorus, ammonia nitrogen, and CBOD requirements of the Spokane River Dissolved Oxygen TMDL. The Tertiary Phase 1 improvements to meet the final effluent limits for phosphorus and ammonia included in the City's

2014 NPDES permit were completed in 2015 for full scale demonstration of performance of the nitrifying tertiary membrane filtration system. The Phase 1 Tertiary Treatment project was a $13 million investment in advanced treatment. Effluent performance was excellent and satisfied both the compliance schedule dates and interim limits in the City's NPDES discharge permit for the Spokane River TMDL. This served as proof of concept for scaling up the pilot testing results to full scale and full plant capacity in the Phase 2 Tertiary Treatment project.

The second phase of tertiary treatment was completed in 2019. The Phase 2 Tertiary Treatment project represents an additional $16 million investment in advanced treatment to expand membrane filtration capacity to 5 mgd. The discharge permit requires the City to complete final construction of improvements necessary to satisfy the Spokane River TMDL by November 30, 2022 and gather 2 years of operating data prior to full compliance with the final effluent limits for phosphorus, ammonia, and CBOD by November 30, 2024. The City is ahead of schedule in addressing these compliance requirements. This provides the opportunity in the intervening period prior to final compliance with effluent limits to pursue further optimization of the operation of the tertiary facilities, controls, chemicals, membrane maintenance, etc.

1.4 Contents of the 2018 Wastewater Facility Plan

The structure of the 2018 Facility Plan is based upon the 2009 Wastewater Facility Plan Amendment, with chapters and subject matter summarized as follows:

Executive Summary

- Summary of 2018 Facility Plan analysis, findings, and recommendations.

Chapter 1 – Introduction

- Summary of wastewater planning history and plant improvements.
- Summary of the City's goals and objectives.

Chapter 2 – Basis of Planning

- Updated analysis of wastewater flows and loadings with future projections

Chapter 3 – Regulatory and Permitting Review

- Summary of regulatory requirements impacting the City's effluent discharge to the Spokane River, as well as a discussion of emerging regulatory challenges linked to facilities planning considerations.

Chapter 4 – Existing Resources

- Evaluation of the condition and performance of existing wastewater treatment facilities with an appendix that includes an asset inventory and assessment.

Chapter 5 – Alternatives Evaluation

- Analysis of individual treatment unit processes and an evaluation of whole plant alternatives to meeting future wastewater flow and loading capacity requirements.

Chapter 6 – Site Master Planning

- Planning for the treatment plant site and interface with the surrounding neighborhood, including potential enhancements, including potential beneficial reuse of recycled water.

Chapter 7 – Recommended Plan

- Identification and discussion of the preferred approach to treatment and site planning in a recommended plan.

Chapter 8 – Environmental Assessment

- An update to historical environmental assessment to address IDEQ review requirements and support City funding assistance.

1.5 References

Ecology, 2010. Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load: Water Quality Improvement Report. (Spokane DO TMDL).

Chapter 2 - 2018 Facility Plan Update

Basis of Planning

Chapter 2 Basis of Planning

Wastewater influent flows and loads were evaluated to establish a planning basis for development of future improvements for the City of Coeur d'Alene's Advanced Wastewater Treatment Facility (AWTF). Historical data was provided by the City and were used to develop the observed influent wastewater characteristics. Data from a five year period (2013 to 2017) were analyzed to determine the baseline conditions for projecting future wastewater flow and loadings to the plant. Future plant flows and loads projections were developed in five year increments for the 20 year planning horizon.

2.1 Definitions

The following definitions summarize the terminology of flow parameters used throughout this chapter.

- Average Annual (AA): average daily influent wastewater.
- Maximum Month (MM): The log normal distribution 91.7 percent probability (11/12) occurrence in the daily influent wastewater.
- Maximum Week (MW): The log normal distribution 98.1 percent probability (51/52) of occurrence in the daily influent wastewater.
- Maximum Day (MD): The log normal distribution 99.7 percent probability (364/365) of occurrence in the daily influent wastewater.

2.2 Historical Flows and Loads

Historical flows and loads dating back to 2000 were reviewed for the long term trends for influent flows and strength. The long term trends inform the future projection as it reflects the history of the service area with regards to growth, local climate, infiltration and inflow (I&I), and water conservation. Data from the most recent five years are used to establish the design influent composition, as well as the baseline influent flows and loads for future projections.

Since 2000, plant effluent flow increased approximately 30 percent in 2011, and then decreased more recently (see Figure 2-1). Most of the increase occurred in the mid-2000s and since 2009 the growth in flows have been flat. Influent flow recording started in 2011 and has remained essentially the same through 2017. The recent lack of an increase in flow however, is not indicative of the absence of service area growth, which after a slow down during the national economic recession, has returned to pre-recession levels. This is evident in the historical trends of the plant influent loadings.

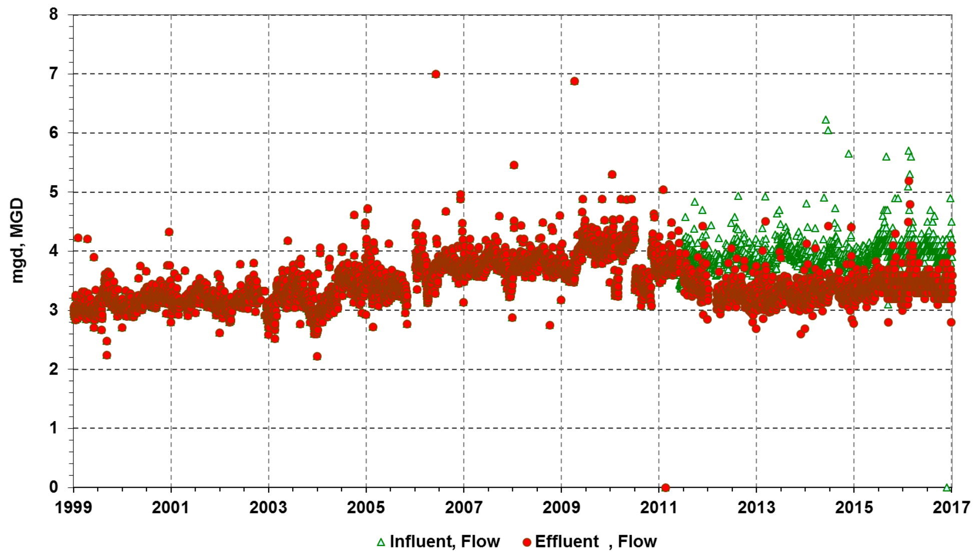

Figure 2-1: Plant Flow 2000 through 2017

The period of 2013 through 2017 was selected to represent the current influent conditions. The statistical analysis of five years of data are provided in Appendix A. Service area growth is evident in the data (gradual annual increase), but the difference between the overall averages and the maximum values from the individual years are fairly close. Peaking factors for the conditions were developed by calculating the ratio between each design condition and the annual average.

Historical peak hour flow projections, design criteria, and data were reviewed to determine a baseline peak hour flow. A summary of the findings is listed in Table 2-1. Project design criteria for the most recent project, 2018/2019 Tertiary Treatment Phase 2, is linked to the peaking factor established in the 2009 Phase 5 Expansion Preliminary Design Report (PDR). In 2009 the peaking factor of 3.17 for an annual average flow of 6 mgd was selected as basis of design. Recorded annual average flows have been lower than the historical projections leading to a reduction in design annual average flow over time to 5 mgd in the 2015 Tertiary Treatment Phase 2 Preliminary Engineering Report. At 5 mgd, the peaking factor for peak hour flow remained constant at 3.17. Two years (4/17/2015 to 3/7/2017) of recorded hourly plant influent and effluent data was also reviewed. The highest peak flow recorded was on June 1, 2015 at 33.9 mgd. However, the validity of the recorded data was discussed with plant operations staff. The staff mentioned that the very high peak recordings are the result of instrumentation or operational issues and should not be used as reference points for peak flow analysis. The staff mentioned that the highest historical peak hour flow is between “9 and 10 mgd” based on their experience and monitoring of peak flow events. Based on the review of the historical peak flow conditions, a current peak hour flow of 12.0 mgd was selected for this planning document. This estimate is based on staff observations and a reasonable peaking factor of approximately three times the average annual flow.

Table 2-1: Peak Hour Flow Review

Source	Peak Hour Flow (mgd)	Comment
2009 Wastewater Facility Plan dated Oct. 2009	19.66	At annual average flow of 5.69 mgd (2020 low density projection)
Phase 5 Expansion PDR dated May 2009	19.02	At annual average flow of 6 mgd with 3.17 peaking factor
2012 Update to 2009 Wastewater Facility Plan Amendment dated May 2012	15.9	At annual average flow of 5 mgd with 3.17 peaking factor (per Phase 5 Expansion PDR)
Wastewater Collection System Master Plan dated March 2013	-	Inconclusive on peak hour flow to WWTP
Tertiary Treatment Phase 2 PER dated Nov. 2015	15.85	At annual average flow of 5 mgd with 3.17 peaking factor (per Phase 5 Expansion PDR)
Maximum recorded influent flow peak hour on 6/1/2015	33.9*	4/17/2015 to 3/7/2017 influent flow hourly data set. *Data point not valid due to surcharging of the Parshall flume from flooded influent pump station wet well
Maximum recorded effluent flow peak hour on 11/17/2015	18.6*	4/17/2015 to 3/7/2017 effluent flow hourly data set. *Data point not valid due to instrument cleaning.
Tertiary Treatment Phase 2 Conformed Drawings dated Feb. 2016	15.85	Per Tertiary Treatment Phase 2 PER dated Nov. 2015
Discussion with Operations Staff on 7/23/2018	9.0 to 10.0	Maximum peak hour flow estimated by plant staff based on historical knowledge and plant experience

Note: *Data point not valid due to incorrect measurement

Figure 2-2 shows the influent ammonia nitrogen (NH_4-N) load trend since 2000. All loads since 2011 are calculated using the influent flow measurements. The load has increased from approximately 800 pounds per day (lb/d) in 2000 to 1,100 lb/d in 2014. This load increase of 37% matches the population increase from 35,000 to 47,000 (35%) over the same time period. This suggests that reductions in the per capita water consumption rate is likely compensating for the population growth, resulting in little to no net increase in wastewater flow. Many reference utilities in other locations with lower population growth rates observe overall reduction in influent wastewater flows. More on this subject can be found in Section 2.5. The long term ammonia nitrogen load trend is best suited as a gauge for service area growth since it is soluble and least likely to be influenced by sampling location or method.

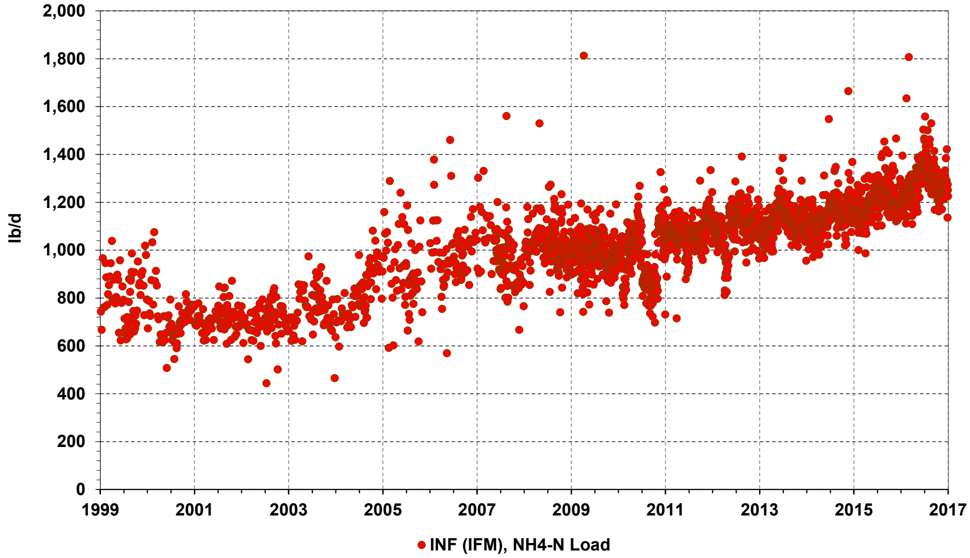

Figure 2-2: Influent NH_4-N Load 2000 to 2017

The long term trends for influent cBOD and TSS (see Figure 2-3) are similar to ammonia. In 2011 a change in the influent sampling method resulted in a reduction in influent cBOD relative to TSS. Potential causes of the change were investigated. Influent flow measurements and sampling were found to be accurate. In September 2018 the City conducted comparison sampling of the influent to determine if there were potential inaccuracies due to the location of the composite sampler. Alternative sampling locations were established upstream and downstream of the current composite sampler intake, which is located slightly upstream of the Parshall flume. The comparison of cBOD and TSS concentrations are in Figure 2-4 and Figure 2-5, respectively. Table 2-2 summarizes the result of the sampling, which do not appear to show patterns or trends that contradict the influent sampler data. The analysis did not establish a basis to believe that the influent cBOD and TSS are the result of a sampling measurement error or skewed as a result of the sampling location.

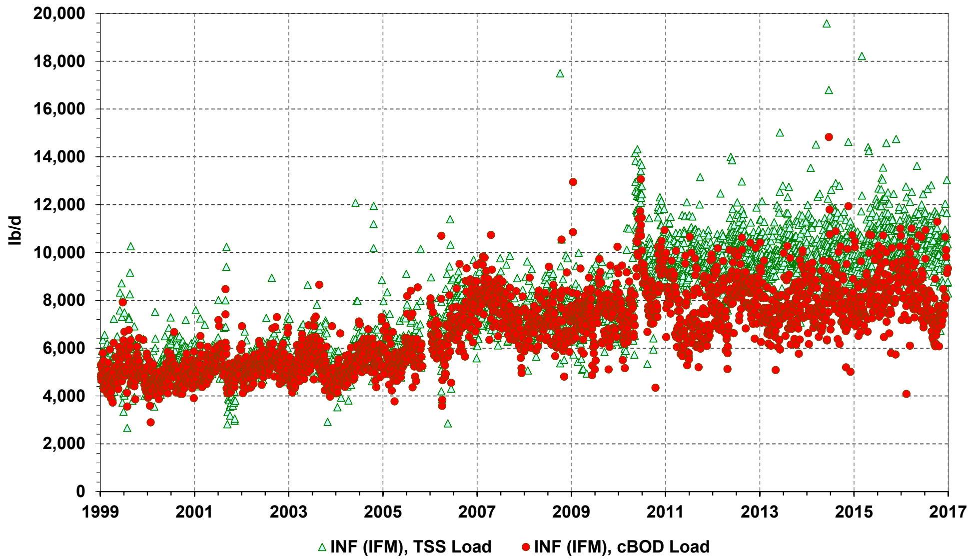

Figure 2-3: Influent cBOD and TSS Load 2000 to 2017

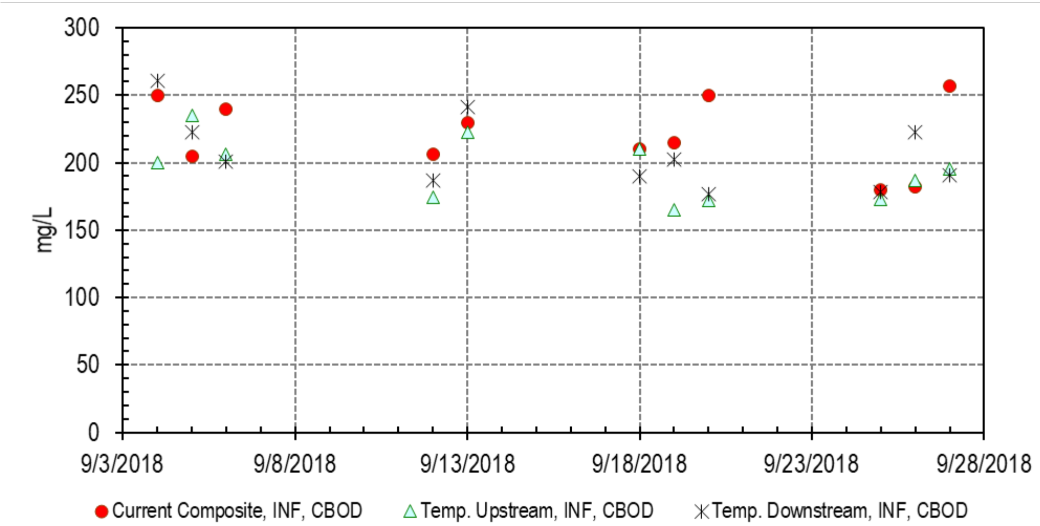

Figure 2-4: Influent cBOD Comparison Sampling

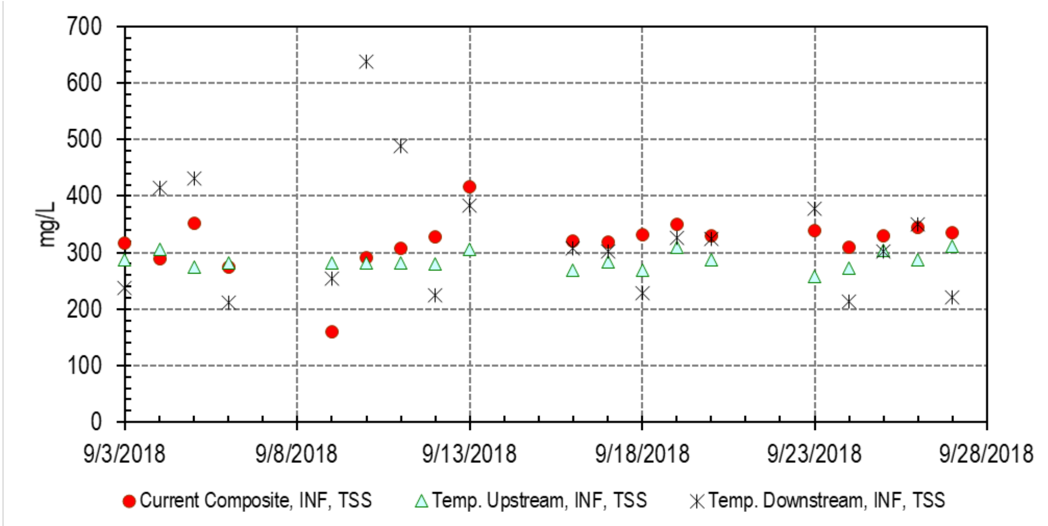

Figure 2-5: Influent TSS Comparison Sampling

Table 2-2: Influent cBOD and TSS Comparison Sampling Variation

Parameter	Composite Sample	Upstream Temporary Sample	Downstream Temporary Sample
Influent cBOD			
Average	220 mg/L	195 mg/L	207 mg/L
Standard Deviation	26.9	22.7	27.1
Coefficient of Variation	0.12	0.11	0.13
Influent TSS			
Average	318 mg/L	284 mg/L	324 mg/L
Standard Deviation	47.2	16.9	109.2
Coefficient of Variation	0.15	0.06	0.34

Note: Coefficient of variation = standard deviation over average

The ratio of BOD to ammonia (Figure 2-6) provides some insight into the wastewater measurements and characteristics. The ratio has remained consistent over the past 17 year time period and there is no trend that would suggest any changes in the influent wastewater characteristics. According to City staff, the plant has a service population of approximately 50,000 people. Using a typical per capita loading factor of 77 grams per capita per day (gpcd) (WEF MOP 8, Chapter 2), an influent BOD load around 8,800 lb/d would be expected. In 2017, the City annual average influent BOD was 8,100 lb/d. The use of garbage disposals in kitchens can affect the per capita BOD contribution, ranging from 60 gpcd (ATV 131E) with no garbage disposals, to 90 gpcd with disposals (WEF MOP 8, Chapter 2). These per capita BOD references conclude that the City annual average influent BOD is within a reasonable range for the service population size.

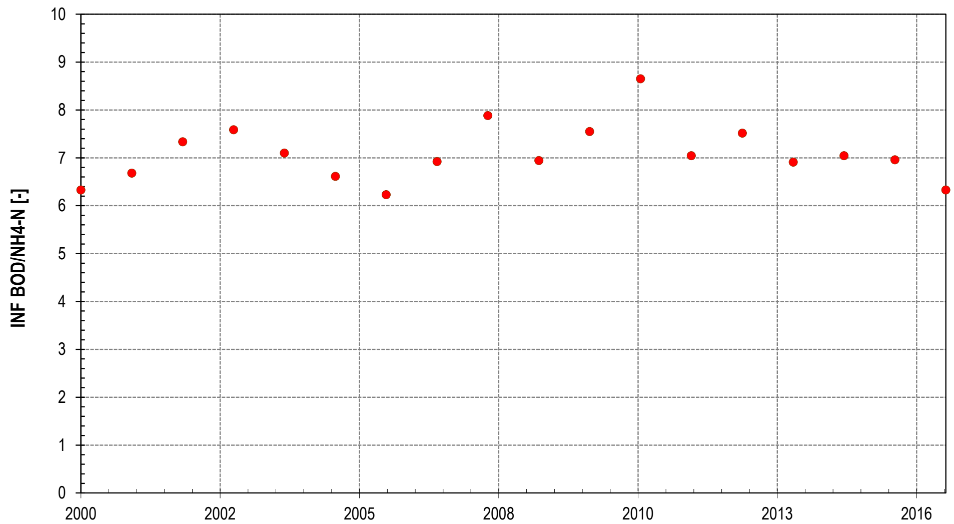

Figure 2-6: Annual Average cBOD:NH_4-N Ratio (2000 to 2017)

The historical influent total phosphorus load trend is shown in Figure 2-7. Since 2000, the influent total phosphorus followed an increasing pattern of loadings until 2009, when a steep decline occurred. This reduction in influent phosphorus corresponds to a ban on the use of phosphates in dishwashing detergent that was signed into law in Washington State and mimicked in more than a dozen other states. In more recent years, the influent total phosphorus is typically in the range of 2.5% to 3% of the cBOD load, or expected 200 lb/d to 240 lb/d TP for the average cBOD of 8,100 lb/d. The measured average influent phosphorus over the past three years was 230 lb/d, which supports that the influent characterization is consistent over the past three years.

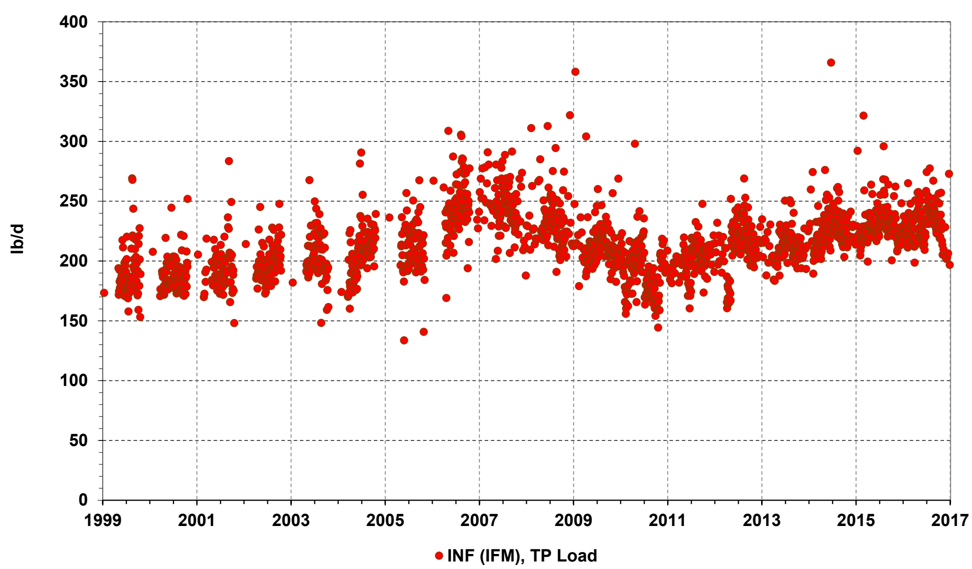

Figure 2-7: Influent Total Phosphorus Load 2000 to 2017

A statistical analysis of the historical influent wastewater flow and loading from 2013 to 2017 was conducted to develop a baseline condition for future projections. The maximum annual average condition value and maximum peaking factors of the years analyzed (see Appendix A for annual breakdown) was selected as the baseline for future projections. Table 2-3 summarizes the statistical analysis. The baseline peak hour flow is estimated based on discussions with operations staff. The peaking factors are summarized in Table 2-4.

Table 2-3: 2017 Baseline Flows and Loads (2013 – 2017)

Parameter	Unit	Annual Average	Maximum Month	Maximum Week	Maximum Day	Peak Hour
Flow	mgd	4.1	4.5	4.7	4.9	12.0*
BOD	lb/d	8,390	10,240	13,920	21,020	-
TSS	lb/d	10,440	12,420	16,280	23,270	-
NH_4-N	lb/d	1,290	1,460	1,750	2,220	-
TP	lb/d	232	264	323	419	-
Concentrations						
BOD	mg/L	245	275	354	512	-
TSS	mg/L	305	333	414	556	-
NH_4-N	mg/L	38	39	44	54	-
TP	mg/L	6.8	7.1	8.2	10.2	-

Note: See Appendix A for detailed annual statistical analysis.
*Conservative peak hour flow estimated based on discussion with operations staff.

Table 2-4: 2017 Baseline Flows and Load Peaking Factors (2013 – 2017)

Parameter	MM:AA	MW:AA	MD:AA	PH:AA
Flow	1.09	1.15	1.20	2.93
BOD	1.22	1.36	1.51	-
TSS	1.19	1.31	1.43	-
NH_4-N	1.13	1.2	1.27	-
TP	1.14	1.22	1.3	-

Note: See Appendix A for detailed annual statistical analysis.

2.2.1 Influent Wastewater Characterization

The 2017 flows and loadings serve both as the baseline for the future projections and to establish the design influent wastewater composition. The influent wastewater characterization is summarized in Appendix B. The 2017 influent characteristics for the different design conditions were determined using statistical analysis for AA, MM, MW, and MD. Since not all relevant influent parameters are routinely measured at the plant, some assumptions are made and typical ratios are used. In contrast with many biological nutrient removal facilities, the exact influent characterization with respect to the readily biodegradable fraction (filtered flocculated COD [ffCOD], volatile fatty acids [VFA], soluble

BOD [sBOD]) is not as critical in Coeur d'Alene because phosphorus is removed through chemical addition and dentrification is not required.

Due to diverging growth rates for flow and load it is expected that the future design influent composition will be more concentrated. Section 2.3 provides a detailed discussion of the flows and loading projections, and Section 2.3.2 presents the selected future design flows and loads.

2.3 Flows and Loads Projections

The most recent complete flow and load projection for the plant was completed in the 2000 Wastewater Facility Plan. The 2009 Amendment and the 2012 Update documents included comparisons of the then observed data and the 2000 projections. Table 2-5 shows the comparison of the 2000 Facility Plan projections and the actual observed data during the corresponding years. While the majority of the parameters were over predicted in 2000, the TSS was underestimated. The projections made in 2000 over-predicted the 2017 data for flow, BOD, ammonia nitrogen, and phosphorus by between 34 and 61 percent. In contrast, the 2000 projections underestimated TSS by 3.7 percent.

The over-estimated flows in the 2000 Wastewater Facilities Plan (and subsequent projections based on this plan) supports the common trend of reduction in per capita water usage. Residential water use based on data from December 2016 to March 2017 results in a 61 gallon per capita per day (gpcd). The 2013 Wastewater Collection System Master Plan reported a use of 69 gpcd based on 155 gpd per equivalent residential unit (ERU) and 2.25 persons per ERU. In comparison, the 2000 Facility Plan estimated water usage at 83 gpcd based on winter water use data at that time. An increase in wastewater strength per capita would be the expected result of lower per capita water use. This information shows an increase in wastewater strength over time. It is anticipated that this trend will continue into the future.

Table 2-5: Comparison of 2000 Facility Plan Projections with Observed Data

Parameter	2000		2005		2010		2017		
	Projected	Actual	Projected	Actual	Projected	Actual	Projected	Actual	% Diff. Actual v. Projected
AA Flow (mgd)	3.35	3.1	4.22	3.35	5.08	3.45	5.34	4.1	-30%
BOD (lb/d)	6,980	5,070	8,800	5,420	10,590	7,460	13,130	8,140	-61%
TSS (lb/d)	5,340	5,400	6,720	5,790	8,090	7,600	10,030	10,420	+3.7%
NH_4-N (lb/d)	920	815	1,160	825	1,400	990	1,730	1,290	-34%
TP (lb/d)	200	190	250	204	300	220	370	230	-61%

Note: 2000 Wastewater Facility Plan based on medium density projections. 2017 determined by interpolation.

2.3.1 Population Growth Rates

The 2000 projections assumed low and medium density average population growth rates for service area population and development. The comparison to actual observed data shows that these previous projections were conservative and over-estimated anticipated changes to influent conditions to the plant. Table 2-2-6 lists the US Census Bureau population data for the City of Coeur d'Alene and Kootenai County from 1990 to 2016. Population forecasts were analyzed in the 2013

Wastewater Collection System Master Plan. In addition to the Census Bureau, the Master Plan discusses additional population projections developed by Avista Utilities and the Kootenai Metropolitan Planning Organization (KMPO). Avista Utilities predicts a range of 0.8 to 1.4% growth annually, with a 1.2% average. KMPO assumes a 2.5% annual growth for Coeur d'Alene. The 2013 to 2017 five year data from the City AWTP was reviewed to determine the change in flow and load per year observed during this time period (see Table 2-7). Given the range of population growth rates, three levels of potential wastewater flow and loading growth rates were identified. A low, medium, and high range of growth rates were selected to bracket the planning period projections (see Table 2-8). Three rates were established to cover the range of possible growth for each wastewater characteristic.

Table 2-6: US Census Bureau Population Data for Coeur d'Alene and Kootenai County

Year	Coeur d'Alene Population	Coeur d'Alene Annual Growth Rate	Kootenai County Population	Kootenai County Annual Growth Rate
1990	24,563	-	69,795	-
2000	34,514	3.5%	108,695	4.5%
2010	44,137	2.5%	138,494	2.4%
2016	50,285	2.2%	-	-

Sources: 2013 Wastewater Collection System Master Plan and the US Census Bureau website

Table 2-7: 2013 to 2017 Annual Average Flow and Loading Changes

Parameter	Change per year
Flow (mgd)	+1.1%
BOD (lb/d)	-0.4%
TSS (lb/d)	+1.4%
NH_4-N (lb/d)	+3.9%
TP (lb/d)	+2.0%

Table 2-8: Selected Growth Rate Projections

Growth Trend Assumption	Value
Low	1.0
Medium	2.0
High	4.0

2.3.2 Design Flows and Loads

The baseline annual average flow and loads from Table 2-3 were used as the 2017 starting condition for the future projections. The Table 2-4 peaking factors were used to determine the corresponding MM, MW, and MD conditions for 2017. Growth rates from Table 2-8 were applied to the 2017 baseline annual average to determine the projected influent conditions.

The high growth rate is not considered for the flow projections determined (Table 2-2-9) since it is unlikely that this condition would occur given the decreasing trend in per capita water consumption as water conservation measures continue to be implemented. Figure 2-8 illustrates the projected growth in City of Coeur d'Alene population from 2017 to 2037 at a rate of 2.2 percent annually, matching observed growth from 1990 to 2016. The figure also shows the declining trend projected in per capita water use over the future period declining at 1 percent per year. Peak hour flow projections are based on the medium growth rate and are the same for both low and medium conditions. The peak hour peaking factor of 2.93 is successively reduced in each future year based on the assumption that sewage flows will increase but that the sources of storm influenced inflow will remain relatively constant (i.e. peak flow projections increase but at a more modest rate than annual average sewage flows).

The load projections are presented in Tables 2-10 through 2-13.

Table 2-9: Plant Flow Projections

Parameter	2017	2022		2027		2032		2037	
		Low	Med.	Low	Med.	Low	Med.	Low	Med.
AA (mgd)	4.10	4.31	4.53	4.53	5.00	4.76	5.52	5.00	6.09
MM (mgd)	4.47	4.70	4.93	4.94	5.45	5.19	6.01	5.45	6.64
MW (mgd)	4.72	4.96	5.21	5.21	5.75	5.47	6.35	5.75	7.01
MD (mgd)	4.92	5.17	5.43	5.43	6.0	5.71	6.62	6.00	7.31
Peak Hour* (mgd)	12.0	12.89		13.73		14.61		15.52	

Note: *Based on medium growth rate. Peaking factor for peak hour projections reduced each future year by 0.02.

Table 2-10: cBOD Load Projections

Parameter	2017	2022			2027			2032			2037		
		Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
AA BOD (lb/d)	8,390	8,820	9,260	10,210	9,270	10,230	12,420	9,740	11,290	15,110	10,240	12,470	18,380
MM BOD (lb/d)	10,240	10,760	11,300	12,450	11,310	12,480	15,150	11,880	13,780	18,430	12,490	15,210	22,430
MW BOD (lb/d)	13,920	14,630	15,370	16,940	15,380	16,970	20,610	16,160	18,740	25,070	16,990	20,690	30,500
MD BOD (lb/d)	21,020	22,090	23,210	25,570	23,220	25,630	31,120	24,400	28,290	37,860	25,650	31,240	46,060

Table 2-11: TSS Load Projections

Parameter	2017	2022			2027			2032			2037		
		Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
AA TSS (lb/d)	10,440	10,970	11,530	12,700	11,530	12,730	15,450	12,120	14,050	18,800	12,740	15,510	22,880
MM TSS (lb/d)	12,420	13,060	13,720	15,120	13,720	15,140	18,390	14,420	16,720	22,370	15,160	18,460	27,220
MW TSS (lb/d)	16,280	17,110	17,970	19,800	17,980	19,840	24,090	18,900	21,900	29,310	19,860	24,180	35,660
MD TSS (lb/d)	23,270	24,460	25,700	28,320	25,710	28,370	34,450	27,020	31,320	41,910	28,400	34,580	50,990

Table 2-12: NH_4-N Load Projections

Parameter	2017	2022			2027			2032			2037		
		Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
AA NH_4-N (lb/d)	1,290	1,360	1,420	1,570	1,430	1,570	1,910	1,500	1,740	2,320	1,570	1,920	2,830
MM NH_4-N (lb/d)	1,460	1,530	1,610	1,770	1,610	1,780	2,160	1,690	1,960	2,630	1,780	2,170	3,190
MW NH_4-N (lb/d)	1,750	1,840	1,930	2,130	1,930	2,130	2,590	2,030	2,350	3,150	2,130	2,600	3,830
MD NH_4-N (lb/d)	2,220	2,340	2,450	2,700	2,450	2,710	3,290	2,580	2,990	4,000	2,710	3,300	4,870

Table 2-13: TP Load Projections

Parameter	2017	2022			2027			2032			2037		
		Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
AA TP (lb/d)	232	244	256	282	256	283	343	269	312	418	283	345	508
MM TP (lb/d)	264	278	292	322	292	322	391	307	356	476	323	393	580
MW TP (lb/d)	323	339	356	393	356	393	478	375	434	581	394	479	707
MD TP (lb/d)	419	441	463	510	463	511	621	487	565	755	512	623	919

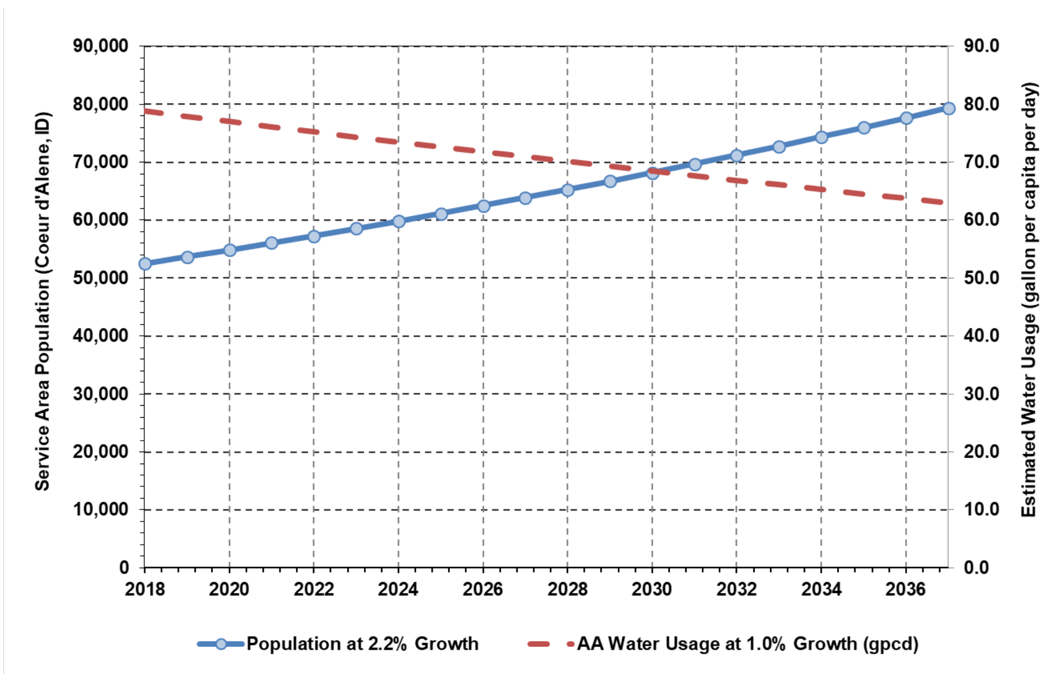

Figure 2-8: Population and Water Usage Projections

2.4 Unit Process Design Parameters

This section documents and/or establishes the current design and loading parameters used to assess the capacity of existing unit processes for design of new facilities. The values listed for the existing unit processes are from existing design data sheets and planning documents. The tables in this section are for the existing processes. Additional unit process information can be found in Chapter 4 Existing Resources.

The values in Table 2-2-14 and Table 2-2-15 present the design parameters of the liquid and solids unit processes, respectively. Unit processes with potential excess capacity are identified in the condition review of Chapter 4 Existing Resources. Regulatory requirements for redundancy, and City policy or engineering Best Practices for utility resiliency, may factor into the net capacity by defining specific standby requirements. These objectives are discussed in Chapter 3 Regulatory and Permit Review.

Table 2-14: Liquid Treatment Unit Process Design Parameters

Parameters	Unit	Existing
Grit Removal HRT at 6.0 mgd	mins	18
Primary Clarifier HLR at 5.0 mgd	gal/sf/d	560
Primary Clarifier HLR at 15.25 mgd	gal/sf/d	1,800
Trickling Filter Loading Rate	lb BOD/1,000 cf	50
Solids Contact MLSS Concentration	mg/L	2,500
Secondary Clarifier MM SLR	lb/sf/d	25
Secondary Clarifier Peak Hour HLR	gal/sf/d	1,200
RAS Rate at MM	%	50
TMF Membrane AA Flux at 12°C	gfd	11.7
TMF Membrane Peak Hour Flux at 12°C	gfd	20.4
Chlorine Contact Tank HRT at 6.0 mgd	min	60

Note: HRT = hydraulic retention time, HLR = hydraulic loading rate, SLR = solids loading rate, AA = annual average, MM = maximum month

Table 2-15: Solids Treatment Unit Process Design Parameters

Parameters	Unit	Existing
Drum Thickener Firm Capacity	gpm	130
Gravity Thickener MM SLR	lb/sf/d	25
Digester MM HRT	d	20
Digester Maximum Total Solids	%	2.5
Dewatering Centrifuge Loading Rate	lb/hr	2,200
Dewatering Belt Filter Press Loading Rate	lb/hr	1,100
Dewatering Run Time	hr/days per week	8 / 7

Note: HRT = hydraulic retention time, HLR = hydraulic loading rate, SLR = solids loading rate, MM = maximum month

2.5 Water Conservation Impacts

Reduced water consumption has obvious conservation benefits such as energy savings and addresses drought related concerns. Reduced water consumption also has direct and indirect impacts on the wastewater conveyance and treatment infrastructure. As described in Section 2.2, reduced flow and growing loads results in increased wastewater concentrations. More concentrated wastewater could lead to new compliance challenges such as increases in total and refractory nitrogen, soluble nonreactive phosphorus, total dissolved solids (TDS), and increases in the concentrations of toxics and emerging contaminants of concern. Numeric effluent requirements may be more difficult to achieve as influent concentrations increase. Total dissolved solids (TDS) are receiving more attention as it relates to soil accumulation in recycled water systems and for direct and indirect water reuse.

The impact of water conservation is further amplified by infiltration and inflow (I&I) control measures. I&I reduction has the negative side effect of further reducing the flow within the collection system. As a consequence, sewers may not reach scour velocities and greater solids deposition may occur. Drought conditions can accelerate flow reduction through declining ground water levels (leading to less I&I) as well as mandatory or voluntary water use reduction. This can impact utilities financially through an unrecoverable loss of revenue in a flow based user charge structures. Fortunately for Coeur d'Alene, infiltration has not been a significant contribution to extraneous flow rates and the City's user charge structure is not based exclusively on flow, but it also includes wastewater strength characteristics.

Water conservation will change the flow and pollutant concentrations of the influent to the City's facility. Tracking and reviewing influent data over short and long time periods is recommended for monitoring of trends. Having accurate and reliable data is key to understanding potential impacts to the operation of the plant and final effluent quality, and to make appropriate adjustments in the operating strategy. Reduction in City potable water usage will also reduce the available alkalinity that is required for the phosphorus and ammonia treatment processes. Chemical usage for alkalinity needs are already high, so tracking alkalinity changes and reducing alkalinity consumption within the treatment process is also important. It is also recommended that the impact of water conservation on wastewater user rates be tracked to avoid revenue shortfalls.

2.6 Climate Change

According to the National Climate Assessment, precipitation and temperature has generally increased in the Northwest. According to EPA, changes in average annual precipitation in the Northwest are likely to vary over the next century. Summer precipitation is projected to decline by as much as 30 percent, with less frequent but heavier downpours (EPA 2016). Looking ahead, higher temperatures are expected to increase rain and decrease snowfall and snowpack. This change will most likely affect mid-elevation areas that typically have snow as the principal winter precipitation (USGCRP 2014). Precipitation is likely to change with more severe highs and lows. Tracking storm events and rainfall trends should be incorporated into future reviews of influent flows. Changes would likely have the biggest influence on influent peak hour flow projections, which typically control the hydraulic capacity design criteria.

2.6.1 Observational Weather Change

The discussion of the future impacts of climate change on any hydro-meteorological parameter should begin with an understanding of historic change. Rainfall intensities have changed during the last several decades and are expected to continue to become more variable with changing climate.

In the paper entitled, "Precipitation Extremes and the Impacts of Climate Change on Stormwater Infrastructure in Washington State" Rosenberg, E.A. et al., (Rosenberg 2010) used three benchmark locations, SeaTac Airport (SEA) in Seattle, Spokane Airport (GEG), and Portland International Airport (PDX), to investigate both historic and projected future change in rainfall intensities. Table 2-2-16 identifies the observed change in rainfall intensity, vis-à-vis a comparison of depth duration frequency (DDF) values between two back-to-back 25-year periods (1956-1980 versus 1981-2005). The results show statistically significant changes in the percent change between the two periods that illustrate an increase in peak rainfall events over the past 50 years.

Table 2-16: Distribution of Changes in Fitted 1-Hour and 24-Hour Annual Maxima from 1956–1980 to 1981–2005 at Seattle–Tacoma, Spokane, and Portland Airports

Return Period (Years)		1-hour Storm			24-hour Storm		
		SeaTac	Spokane	Portland	SeaTac	Spokane	Portland
2	% Change	4.80%	6.50%	3.50%	22.90%	4.90%	−2.9%
	1981-2005 Value (in)	1.8	1.7	1.8	1.3	1.7	2.2
5	% Change	4.30%	1.50%	3.60%	29.40%	6.20%	4.30%
	1981-2005 Value (in)	4.3	4.7	4.3	2.1	3.8	4.2
10	% Change	5.80%	−4.1%	4.20%	32.10%	8.20%	9.80%
	1981-2005 Value (in)	8	11.9	8.2	3.1	6.5	6.6
25	% Change	9.10%	−12.6%	5.40%	34.30%	11.50%	17.70%
	1981-2005 Value (in)	17.3	47.9	19	5.7	12.8	11.5
50	% Change	12.60%	−19.3%	6.70%	35.20%	14.50%	24.20%
	1981-2005 Value (in)	30.3	155	35.6	9.3	20.5	17.1

Source: Rosenberg, E.A. et al. (2010)
Note: Yellow highlights call out statistically significant changes at the Spokane Airport.

2.6.1.1 Climate Change

Rosenberg, E.A. et al., (Rosenberg 2010) quantified potential changes in rainfall intensities by utilizing Global Climate Models (GCM) to better understand future variability in rainfall intensities. Two GCMs were used to provide boundary conditions for Regional Climate Model (RCM) simulations to quantify this future change. The Community Climate System Model version 3.0 (CCSM3) with the IPCC A2 emissions scenario, and the Max Planck Institute's ECHAM5 with the IPCC A1B emissions scenario were used to model future conditions. The predicted atmospheric carbon dioxide (CO_2) concentrations are similar in both the A2 and the A1B emissions scenarios up until the 2050. Differences between the findings from each scenario are predicated on the differences in makeup of the GCM. Both CCSM3 and ECHAM5 are considered to be in the middle of the range of existing GCM in their projections of precipitation for the Pacific Northwest (Mote 2005). The Rosenberg study performed downscaling of the GCM to the regional level using the Weather Research and Forecasting (WRF) model.

Table 2-2-17 identifies the projected changes (percent change from 2020 to 2050 using climatology from 1970 to 2000 as a baseline) in annual rainfall maxima for a variety of storm durations. The variation between model output can easily be seen in these findings, but the consensus estimates from this study and others, point to a general increase in rain rates and a particularly strong increase in the intensity of rain events for the Puget Sound region.

Table 2-17: Changes in the Average Modeled Empirical Annual Maxima from 2020 to 2050 Relative to the Average Modeled Empirical Annual Maxima from 1970 to 2000, Using Raw RCM Data

Climate Scenario	CCSM3/A2			ECHAM5/A1B		
Station	**SeaTac**	**Spokane**	**Portland**	**SeaTac**	**Spokane**	**Portland**
1-hour	16.20%	10.30%	10.50%	−4.6%	−6.6%	2.10%
2-hour	16.90%	5.90%	7.00%	−4.3%	−6.4%	3.90%
3-hour	17.50%	6.30%	6.50%	−4.0%	−5.8%	2.90%
6-hour	18.30%	5.40%	3.60%	3.60%	−1.7%	1.20%
12-hour	15.90%	5.50%	−0.5%	9.10%	12.10%	2.10%
24-hour	18.70%	3.90%	4.80%	14.90%	22.20%	2.00%
2-day	11.20%	4.20%	2.00%	13.80%	16.00%	3.10%
5-day	6.30%	3.20%	9.00%	12.20%	8.80%	4.60%
10-day	9.00%	2.30%	7.50%	7.20%	8.90%	11.50%

Source: Rosenberg, et al. (2010).

2.7 References

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Appendix A. Historical Plant Data and Peaking Factors

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Table A-1: Historical Plant Flows and Peaking Factors

Parameter	2013	2014	2015	2016	2017	Avg.	Max.	2013 – 2017 Avg.*
AA (mgd)	3.90	4.00	3.90	4.00	4.10	4.00	4.10	4.00
MM (mgd)	4.20	4.20	4.30	4.30	4.40	4.30	4.40	4.30
MW (mgd)	4.40	4.40	4.50	4.50	4.60	4.50	4.60	4.50
MD (mgd)	4.60	4.50	4.70	4.70	4.70	4.70	4.70	4.70
Peaking Factors								
MM:AA	1.09	1.07	1.09	1.08	1.08	1.08	1.09	1.09
MW:AA	1.14	1.11	1.15	1.12	1.13	1.13	1.15	1.13
MD:AA	1.19	1.15	1.20	1.16	1.17	1.17	1.20	1.18

Note: *Full 5-year data set average. "Max" AA used as Baseline, Table 2-1, with peaking factors, Table 2-4.

Table A-2: Historical BOD Loadings and Peaking Factors

Parameter	2013	2014	2015	2016	2017	Avg.	Max.	2013 – 2017 Avg.*
AA (lb/d)	8,230	7,710	8,100	8,390	8,140	8,110	8,390	8,110
MM (lb/d)	9,620	9,130	9,880	9,900	9,850	9,680	9,900	9,700
MW (lb/d)	10,470	10,000	11,020	10,830	10,940	10,650	11,020	10,700
MD (lb/d)	11,330	10,890	12,190	11,780	12,060	11,650	12,190	11,730
Peaking Factors								
MM:AA	1.17	1.18	1.22	1.18	1.21	1.19	1.22	1.20
MW:AA	1.27	1.30	1.36	1.29	1.34	1.31	1.36	1.32
MD:AA	1.38	1.41	1.51	1.40	1.48	1.44	1.51	1.45

Note: *Full 5-year data set average. "Max" AA used as Baseline, Table 2-1, with peaking factors, Table 2-4.

Table A-3: Historical TSS Loadings and Peaking Factors

Parameter	2013	2014	2015	2016	2017	Avg.	Max.	2013 – 2017 Avg.*
AA (lb/d)	9,860	10,010	10,090	10,440	10,420	10,170	10,440	10,170
MM (lb/d)	11,310	11,280	11,990	12,170	12,050	11,760	12,170	11,810
MW (lb/d)	12,180	12,020	13,170	13,230	13,040	12,730	13,230	12,800
MD (lb/d)	13,040	12,760	14,370	14,290	14,020	13,700	14,370	13,800
Peaking Factors								
MM:AA	1.15	1.13	1.19	1.17	1.16	1.16	1.19	1.16
MW:AA	1.23	1.20	1.31	1.27	1.25	1.25	1.31	1.26
MD:AA	1.32	1.27	1.43	1.37	1.35	1.35	1.43	1.36

Note: *Full 5-year data set average. "Max" AA used as Baseline, Table 2-1, with peaking factors, Table 2-4.

Table A-4: Historical NH_4-N Loadings and Peaking Factors

Parameter	2013	2014	2015	2016	2017	Avg.	Max.	2013 – 2017 Avg.*
AA (lb/d)	1,095	1,120	1,150	1,205	1,290	1,170	1,290	1,095
MM (lb/d)	1,205	1,205	1,295	1,305	1,410	1,285	1,410	1,205
MW (lb/d)	1,270	1,255	1,380	1,360	1,475	1,350	1,475	1,270
MD (lb/d)	1,330	1,300	1,465	1,410	1,540	1,410	1,540	1,330
Peaking Factors								
MM:AA	1.10	1.08	1.13	1.08	1.09	1.10	1.13	1.10
MW:AA	1.16	1.12	1.20	1.13	1.15	1.15	1.20	1.16
MD:AA	1.21	1.16	1.27	1.17	1.20	1.20	1.27	1.21

Note: *Full 5-year data set average. "Max" AA used as Baseline, Table 2-1, with peaking factors, Table 2-4.

Table A-5: Historical TP Loadings and Peaking Factors

Parameter	2013	2014	2015	2016	2017	Avg.	Max.	2013 – 2017 Avg.*
AA (lb/d)	214	212	228	231	232	223	232	224
MM (lb/d)	243	230	255	255	254	247	255	251
MW (lb/d)	260	240	271	268	266	261	271	267
MD (lb/d)	277	249	286	282	278	275	286	283
Peaking Factors								
MM:AA	1.14	1.08	1.12	1.10	1.09	1.11	1.14	1.12
MW:AA	1.22	1.13	1.19	1.16	1.15	1.17	1.22	1.19
MD:AA	1.30	1.17	1.26	1.22	1.20	1.23	1.30	1.26

Note: *Full 5-year data set average. "Max" AA used as Baseline, Table 2-1, with peaking factors, Table 2-4.

Appendix B. 2017 Influent Characterization

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Table B-1: 2017 Influent Characterization

Parameter	Unit	Annual Average	Maximum Month	Maximum Week	Maximum Day
Flow	mgd	4.1	4.4	4.6	4.7
COD*	mg/L	515	567	603	603
sCOD*	mg/L	190	210	223	223
ffCOD*	mg/L	129	142	151	151
BOD	mg/L	245	270	287	287
sBOD*	mg/L	61.3	67.5	71.8	71.8
VFA*	mg/L	10.0	8.0	8.0	8.0
TSS	mg/L	305	332	345	367
VSS*	mg/L	244	266	276	294
NH4-N	mg/L	37.7	38.4	38.4	39.3
TKN*	mg/L	56.3	57.3	57.3	58.7
TP	mg/L	6.8	6.9	7.1	7.3
OP*	mg/L	3.4	3.5	3.6	3.7

Notes: *Values calculated using typical rations: COD/BOD = 2.30, VSS/TSS = 0.70, NH_4-N/TKN = 0.67, OP/TP = 0.50, TP/BOD = 0.025, sCOD/COD = 0.30, sBOD/BOD = 0.20, TKN/BOD = 0.17

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Chapter 3 - 2018 Facility Plan Update

Regulatory and Permitting Review

Chapter 3 Water Quality and Regulatory Requirements

The purpose of this chapter is to identify water quality and regulatory requirements driving treatment, effluent management, and biosolids management decisions. This includes identification of current permit conditions for effluent discharge that are key to facilities planning and preparing for potential future requirements. A spectrum of potential regulatory scenarios that could affect the scope and extent of the treatment facilities will be summarized, along with the likely timeframe in which these scenarios would necessitate treatment modifications.

3.1 Regulatory Trends

The City of Coeur d'Alene (City) discharges treated effluent to the Spokane River, which flows from Idaho into Washington. The Spokane River must meet the water quality standards for both the state of Idaho and the state of Washington. The City's National Pollutant Discharge Elimination System (NPDES) permit authorizes the discharge and requirements for the quality of the effluent.

The current NPDES discharge permit has been administratively extended until the Idaho Department of Environmental Quality (DEQ) is able to provide resources to address the City's application for renewal. The permit originally became effective December 1, 2014 and was set to expire on November 30, 2019. Until recently, the U.S. Environmental Protection Agency (EPA) had regulatory authority and issued the City's NPDES permit. The State of Idaho has now been delegated primacy for discharge permitting and a program for the Idaho Pollutant Discharge Elimination System (IPDES) has been initiated. DEQ became the permitting authority for municipal treatment plants on July 1, 2018. DEQ announced the issuance of its first IPDES permit to the City of Shoshone Wastewater Treatment Plant on April 1, 2019. Since then, DEQ has developed draft IPDES permits for a number of other smaller publicly owned utilities, including the City of Montpelier, City of Cascade, City of Viola, City of Council, City of Soda Springs, City of Grangeville, Santa-Fernwood Sewer District, Princeton-Hampton Sewer District, and Emida Water and Sewer District. DEQ's "IPDES Permit Issuance Plan" (CY2020) dated November 2019 identifies the City's permit as effective in Table A3. Effective Permit List with an expiration date of November 30, 2019.

Historically, the City has been required to treat wastewater to a high level to meet requirements for the Spokane River, including ammonia nitrogen and phosphorus removal. The Washington Department of Ecology's (Ecology) Dissolved Oxygen Total Maximum Daily Load (TMDL) for the Spokane River and Lake Spokane led to very restrictive effluent limits for Carbonaceous Biochemical Oxygen Demand (CBOD), ammonia nitrogen, and phosphorus which were incorporated into the City's 2014 NPDES discharge permit. The City's wastewater program is progressing according to plan in implementing tertiary treatment facilities to achieve compliance with the final effluent limits for CBOD, ammonia, and phosphorus in the NPDES permit. The discharge permit requires the City to complete construction facilities to meet the final effluent limits by November 30, 2022 and gather two years of operating data prior to full compliance with the final effluent limits for ammonia and phosphorus by November 30, 2024. The first and second phases of tertiary treatment have been completed for full scale performance of the nitrifying tertiary membrane filtration (NTF) system for compliance with the final effluent limits in the NPDES permit.

3.2 Permit and Regulatory Issue Summary

Over the past decades, treatment requirements for the City's plant have become more demanding for nutrients, toxic constituents, and disinfection. Table 3-1 presents a summary of the regulatory and permitting issues, with the status of each issue as it applies to the City's facility, and the level of interest or concern for each topic. Treatment plant NPDES discharge permit limits are included, as are related regulatory issues, which may influence planning. Issues with a high level of concern are likely to require action in the near future; a moderate level of concern indicates that regulations affect the operation of the treatment facility, but action is not likely to be required in the near future; and a low level of concern indicates that the issue has little effect on the operation of the wastewater

Discharge permitting in Idaho has also evolved and after decades of EPA permitting, the state of Idaho has now embarked on its own program. On June 5, 2018, EPA approved the IPDES Program and authorized the transfer of permitting authority to the state beginning on July 1, 2018. The IPDES program began with municipal permits and a permit fee for municipal dischargers of $1.74 per equivalent dwelling unit (EDU) to generate revenue from permittees to support the program. IPDES permits must comply with state water quality standards and limit point source discharges into surface waters. DEQ has undertaken a guidance development effort as part of building the new IPDES permitting program.

3.2.1 Effluent Limit Development Guidance Document

DEQ prepared guidance documents related to the implementation of IDAPA 58.01.25 for IPDES permitting. Topics discussed include applying for and composing permits, collecting and submitting information for individual or general discharge permits, and documenting procedures, practices, and requirements for permit writers. A key guidance document is the Effluent Limit Development Guidance (ELDG) that provides Idaho-specific direction for developing effluent limits in IPDES permits and defines requirements for permits. The ELDG is a base guidance document for permit writers when preparing permits and supporting fact sheets.

3.2.2 Supplemental Permit Writers Guidance

DEQ provided public comment opportunities during the development of the ELDG. Comments included requests to provide a sufficient level of detail about Idaho-specific direction for addressing a wide range of complex and evolving issues that the ELDG did not address. In response, the Effluent Limit Development Guidance Supplemental (Supplemental) document was developed. The Supplemental supports the ELDG by addressing special topics not covered within the ELDG. The IPDES program faces challenging and complex permitting issues (e.g., toxics, temperature, and nutrients) and the Supplemental addresses some of these challenging topics by providing additional guidance to IPDES permit writers.

3.2.3 IPDES Application Process

The User's Guide to Permitting and Compliance Volume 1 and Volume 2—Publicly Owned Treatment Works provides information about the application process. Additional information is in the IPDES POTW Permit Application Instructions.

DEQ developed an online system for accepting information from permittees and applicants. This web-based system allows users to register accounts, associate the accounts with facilities, submit information, and track progress on draft permit development. The IPDES E-Permitting system is the main venue for permittees to provide application and supplemental information to DEQ permit writers and documents required by the permits for compliance.

3.2.3.1 Schedule for Coeur d'Alene Permit Application

The City's 2014 NPDES permit included the schedule that required the renewal application be submitted by June 3, 2019. The City made a timely application for the permit renewal. If a permittee intends to continue an activity regulated by a permit after the expiration date, the permittee must apply for and obtain a new permit.

3.2.3.2 Review and Lead Times for DEQ

DEQ plans to publish a Permit Issuance Plan (PIP) each calendar year. The PIP is DEQ's plan for drafting and issuing permits and covers a 2-year period. DEQ has a prioritization matrix for scheduling and assigning permit applications to its permit writers. However, DEQ has not made this information public, so the prioritization criteria are unknown. The City did not appear on the 2018 PIP. The City does appear on the 2020 IPDES PIP dated November 2019 that refers to the Coeur d'Alene permit in a "Listing of Effective IPDES Permits" with an expiration date of November 30, 2019.

Table 3-1: Summary of Anticipated Regulatory and Permitting Issues

Regulatory Issue/Parameter	NPDES Permit Limitations and Issues	NPDES Permit Limits[1]	Importance to Planning
Effluent Discharge			
Flow	The December 2014 NPDES permit uses a design flow of 6 mgd. (p. C-2). The NDPES Permit identifies two plant effluent flow conditions: $Q_e \leq 4.2$ mgd and $Q_e > 4.2$ mgd. Permit limits have been calculated at 6 mgd for CBOD, TSS, residual chlorine, lead, and zinc. Permit limits have been calculated at 4.2 mgd and 6 mgd for total ammonia-N, copper, and silver. Continuous monitoring and reporting is required for effluent flow. Key Spokane River flow conditions for effluent discharge permit calculations from October - June are 1Q10 of 890 cfs and 7Q10 of 1030 cfs, and the low flows from July – September are a 1Q10 248 cfs and a 7Q10 of 292 cfs.	N	High
BOD	Comments received during the 2007 public comment period regarding the calculation of phosphorus, ammonia, and $CBOD_5$ limits, changes to the Washington water quality standards, and the EPA approval of the *Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load: Water Quality Improvement Report* (DO TMDL), led to a change in the effluent limits for phosphorus, ammonia and $CBOD_5$ in the current permit. The December 2014 NPDES permit limits for Carbonaceous Biochemical Oxygen Demand (CBOD) limits CBOD to the following: November to January - Average monthly: 25 mg/L, 1251 lb/day, and 85% removal. Average weekly: 40 mg/L, and 2002 lb/day). Effluent $CBOD_5$ limits are subject to a compliance schedule for the February to October timeframe. By November 30, 2024 the NPDES permit specifies the following limits be met for $CBOD_5$: February to March - Average monthly: 25 mg/L, and 85% removal. Average weekly: 40 mg/L. Seasonal average limit: 226 lb/day April to October – Average monthly: 25 mg/L, and 85% removal. Average weekly: 40 mg/L. Seasonal average limit: 203 lb/day In the interim, the following permit limits must be met: February to October – Average monthly: 25 mg/L, 1250 lb/day, and 85% removal. Average weekly: 40 mg/L and 2000 lb/day	C,M	High
TSS	Secondary treatment standards continue (Average monthly: 30 mg/l, 1,501 lb/d and 85% removal. Average weekly: 45 mg/l and 2,252 lb/d).	C,M	Moderate
Phosphorus	Comments received during the 2007 public comment period regarding the calculation of phosphorus, ammonia, and $CBOD_5$ limits, changes to the Washington water quality standards, and the EPA approval of the *Spokane River and Lake Spokane Dissolved Oxygen*	C,M	High

Table 3-1: Summary of Anticipated Regulatory and Permitting Issues

Regulatory Issue/Parameter	NPDES Permit Limitations and Issues	NPDES Permit Limits[1]	Importance to Planning
	Total Maximum Daily Load: Water Quality Improvement Report (DO TMDL), led to a change in the effluent limits for phosphorus, ammonia and $CBOD_5$ in the current permit. The December 2014 NPDES permit limits for total phosphorus (TP) limits TP to the following: November to January – monthly and weekly averages have required monitoring and reporting. Effluent TP limits are subject to a compliance schedule for the February to October timeframe. By November 30, 2024 the NPDES permit specifies the following limits be met for : February to October – average monthly and weekly concentrations must be monitored and reported. Seasonal average: 3.17 lb/day. In the interim, the following permit limits must be met: February to October – Average monthly: 1.0 mg/L and 50 lb/day. Average weekly: 1.6 mg/L and 80 lb/day. The permit also stipulated that the permittee must submit to EPA and IDEQ a Phosphorus Management Plan within 1 year of the permit issuance and must provide written notice within 180 days that the management plan has been implemented.		
Ammonia Nitrogen	Comments received during the 2007 public comment period regarding the calculation of phosphorus, ammonia, and $CBOD_5$ limits, changes to the Washington water quality standards, and the EPA approval of the *Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load: Water Quality Improvement Report* (DO TMDL), led to a change in the effluent limits for phosphorus, ammonia and $CBOD_5$ in the current permit. The December 2014 NPDES permit limits ammonia to the following: November to February – monthly averages and daily maximum concentrations have required monitoring and reporting. Effluent ammonia limits are subject to a compliance schedule for the March to October timeframe. By November 30, 2024 the NPDES permit specifies the following limits be met for ammonia : March to October – seasonal average of 272 lb/day March to June – monthly averages and daily maximum concentrations have required monitoring and reporting. Average monthly loading limit: 649 lbs/day. Maximum daily loading limit: 1547 lbs/day July to September – Average monthly limit: 6.59 mg/L and 330 lb/day. Daily maximum load: 15.7 mg/L and 786 lb/day October - monthly averages and daily maximums concentrations and loads have required monitoring and reporting.	C,M	High

Table 3-1: Summary of Anticipated Regulatory and Permitting Issues

Regulatory Issue/Parameter	NPDES Permit Limitations and Issues	NPDES Permit Limits[1]	Importance to Planning
	In the interim, the following permit limits must be met: February to October – Average monthly: 1.0 mg/L and 50 lb/day. Average weekly: 1.6 mg/L and 80 lb/day.		
Total Nitrogen	No current limitations. DEQ pursuing "preventative TMDL" for Spokane River. (Future issues: Water quality studies indicating nitrogen limitation requirements (Not currently considered probable.)	N	High
Chlorine Residual	The December 2014 NPDES permit limits identifies total residual chlorine limit for July - September (Average monthly: 39 µg/l and 2 lb/d. Maximum daily 102 µg/l and 5.1 lb/d) and October to June (Average monthly: 150 µg/l and 7.5 lb/d. Maximum daily 390 µg/l and 20 lb/d). The average monthly limits for July – September are not quantifiable using EPA-approved methods. Permittee is considered compliant if monthly average is 50 µg/l and the average loading is less than 2.5 lb/day.	C,M	Moderate
Bacteria	The December 2014 NPDES permit limits E. Coli. to the following: Average monthly: 126/100 mL. Maximum instantaneous 406/100 mL.	C	Moderate
Metals	Reporting and monitoring is required for monthly and daily averages for cadmium, copper, lead, zinc and silver per the December 2014 NPDES permit. TMDL for Pb, Zn, and Cd prepared by DEQ and approved by EPA in August 2000. Effluent hardness may mitigate need for treatment removal. BMPs required for local commercial/industrial sources. Local limits in Industrial Pretreatment program.	C,M,R Y	High
Copper	The December 2014 NPDES permit calls for monitoring and reporting.	C,M	Low
Lead	The December 2014 NPDES permit calls for monitoring and reporting	C,M	Moderate
Silver	The December 2014 NPDES permit identifies effluent limits for total recoverable silver for October – June Q_e > 4.2 mgd (Average monthly: 8.01 µg/L and 0.401 lb/day) and requires monitoring and reporting in July – September and October – June $Q_e \leq 4.2$ mgd.	C,M	Moderate
Zinc	The December 2014 NDPES Permit identifies effluent limits for total recoverable zinc (Average monthly: 135 µg/l and 6.76 lb/d. Maximum daily: 168 µg/l and 8.42 lb/d).	C,M	Moderate
Biomonitoring	The December 2014 NPDES Permit requires whole effluent toxicity testing semi-annually.	Y	Low
Polychlorinated Biphenyls (PCBs)	The December 2014 NPDES Permit requires the permittee to analyze and report influent and effluent samples for PCBs	N	High
Biosolids	Biosolids management must meet 40 CFR 503 Subparts A, B and D.	Y	Moderate

Table 3-1: Summary of Anticipated Regulatory and Permitting Issues

Regulatory Issue/Parameter	NPDES Permit Limitations and Issues	NPDES Permit Limits[1]	Importance to Planning
	The December 2014 NDPES Permit Fact Sheet states that EPA Region 10 may issue a sludge-only permit to a facility at a later date. Until issuance of a sludge-only permit, sludge management activities continue to be subject to the national standards and any requirements of the State's biosolids program.		
Pretreatment Requirements	The City must sustain its Industrial Pretreatment Program per 40 CFR 403, any categorical pretreatment standards promulgated by the EPA, and any additional requirements imposed by the City of Coeur d'Alene as part of its approved pretreatment program or sewer ordinance. Pretreatment reports must be submitted annually. The December 2014 NPDES permit called for a Local Limits Evaluation to be conducted and submitted to EPA within 1 year of the effective date of the permit. It also calls for annual analysis to determine whether influent pollutant loadings are approaching the maximum allowable headworks loadings calculated in the permittee's most recent local limits calculations	Y	High
Operations and Maintenance	The December 2014 NPDES permit called for an Operations and Maintenance Plan to be developed and implemented, with written notice to EPA, within 180 days of the effective date of the permit..	Y	Low
Temperature	No current discharge permit limitations on temperature. Monitoring of temperature is required for monthly and daily averages. (Future issues: Potential for future Endangered Species Act considerations to increase scrutiny of receiving water conditions related to temperature.)	N	Moderate
Virus Control	May have stricter requirements in the future as analytical methods improve.	N	Moderate
Infiltration/Inflow	Inflow reduction targets pursued in Comprehensive Sewer Plan to control peak flows. Little, if any, infiltration in system. Inflow to the sewer system drives peak flows at the treatment plant and stresses peak capacity of unit processes. Inflow removal drives infrastructure needs for stormwater management.	N	High
Air Emissions			
Air Toxics	Regulations apply to VOCs, H_2S, Cl_2; but not likely to be considered major sources. Clean Air Act Section 112r Risk Management Plan (RMP) requirements had a compliance deadline of June 21, 1999.	N N	Low High
Odor Control	Maintenance of good neighbor policy has high priority. Odor containment and treatment facilities commissioned in 1999. No specific regulatory requirements apply; subject to local standards.	N	High

Table 3-1: Summary of Anticipated Regulatory and Permitting Issues

Regulatory Issue/Parameter	NPDES Permit Limitations and Issues	NPDES Permit Limits[1]	Importance to Planning
Visual Appearance	Maintenance of good neighbor policy has high priority. No specific regulatory requirements apply; subject to local standards. Defacto neighborhood standards may dictate acceptable architectural appearance.	N	High
Noise Control	Maintenance of good neighbor policy has high priority. No specific regulatory requirements apply; subject to local standards.	N	Low
Endangered Species			
ESA Listings	U.S Fish and Wildlife Service identified the threatened species (Canada lynx, bull trout, water howellia, and Spalding's catchfly) and proposed designated habitat (bull trout) in Kootenai County. The National Marine Fisheries Service stated that there are no threatened or endangered species under its jurisdiction in the Spokane River, however several species of salmonids listed as endangered are present downstream in the Columbia River. EPA determined that the 1999 NPDES permit would not impact bull trout.	N	Low
Bull Trout	Bull trout identified as "threatened species" in July 2009 listing. U.S Fish and Wildlife Service have indicated that bull trout cannot pass Post Falls dam and those present in the Spokane River may be transient from Lake Coeur d'Alene. For bull trout spawning and juvenile rearing, EPA has developed standards for Idaho (10 degree C; June, July, August, September; specific locations.) Idaho DEQ developing bull trout criteria. (Future issues: Potential for increased scrutiny of water quality criteria in consideration of ESA listings.)	N	Moderate
Groundwater Protection	Continue to extend sewer service and limit construction of new septic systems to one per five acres. Limited septage, non-domestic pumpable sludge disposal sites may drive loadings to wastewater treatment plant.	N	High
Effluent Reclamation and Reuse	Idaho DEQ Reuse Regulations and permits are required. Effluent reuse may be a management tool for load diversion from the Spokane River.	Idaho DEQ Reuse Regulations	High
Stormwater	EPA Phase II Stormwater Permitting program has designations for small urban areas with populations of 10,000 or more and includes the City of Coeur d'Alene. Regulated small municipal separate storm sewer systems have permits required by May 31, 2002 and were required to have programs developed and implemented by 2007. The City of Coeur d'Alene's current MS4 stormwater permit became effective January 1, 2009 and has been administratively extended. Stormwater loadings to the Spokane River consume shared assimilative capacity. Inflow reduction efforts to reduce peak wastewater loadings increase stormwater loadings and infrastructure requirements.	NPDES Stormwater MS4 Permit	High

[1] December 1, 2014 NPDES discharge permit, coded as follows:

Y, Yes included

Table 3-1: Summary of Anticipated Regulatory and Permitting Issues

Regulatory Issue/Parameter	NPDES Permit Limitations and Issues	NPDES Permit Limits[1]	Importance to Planning

N, No, not included
C, Concentration Limit
M, Mass Limit
S, Supplementary Condition
R, Potential Re-Opener Clause

3.2.4 Spokane River Regional Toxics Task Force

The Spokane River Regional Toxics Task Force (SRRTTF) has been working to find and reduce toxic compounds in the Spokane River since a 2012 memorandum of agreement. The 2011 Washington NPDES wastewater discharge permits issued by the Department of Ecology for facilities discharging into the Spokane River introduced the requirement for creation of a Regional Toxics Task Force (Task Force). These permits state that the Task Force membership should include the NPDES permittees in the Spokane River Basin, conservation and environmental interests, the Spokane Tribe of Indians, Spokane Regional Health District, Ecology, and other appropriate interests.

The goal of the task force is to develop a comprehensive plan to bring the Spokane River into compliance with water quality standards for PCBs (polychlorinated biphenyls). These pollutants exceed water quality standards in several segments of the river. The Spokane River Regional Toxics Task Force was working to:

- Further analyze the existing and future data to better characterize the amounts, sources, and locations of PCBs and other toxics entering the Spokane River.
- Prepare recommendations for controlling and reducing the sources of toxics in the Spokane River.
- Review proposed Toxic Management Plans, Source Management Plans, Best Management Practices (BMPs), and data to be used to develop performance-based limits.
- Monitor and assess the effectiveness of toxic reduction measures.

Every three years Ecology is to produce a measurable progress report on toxics. Measurable progress reflects the SRRTTF success in reducing PCBs in the Spokane River and towards achieving applicable water quality criteria for PCBs. This document was prepared in 2014. The SRRTTF has been preparing an annual summary report to assist Ecology with documenting measurable progress.

If the SRRTTF approach is not successful at achieving measurable progress, other means and methods will be employed, including a PCB TMDL. Ecology published its definition of measurable progress on July 17, 2014. The definition consists of an ongoing series of actions, results, and environmental outcomes. Ecology is obligated to pursue other means and methods, including a PCB TMDL option if the SRRTTF fails to make "measurable progress" toward achieving the PCB water quality criteria in the Spokane River.

In the 2014 document, Ecology concluded that, during the assessment period of January 1, 2012 through December 31, 2014, the Task Force made measurable progress towards meeting applicable water quality standards. The SRRTTF has documented the removal of 265 pounds of PCBs from soil, wastewater and stormwater, and eliminated the potential for another 18 pounds from reaching the river. The SRRTTF continues to meeting, approximately monthly, to work towards the goals set to reduce toxics in the Spokane River.

3.2.5 National Climate Assessment

The Fourth National Climate Assessment published in November 2018 provided a thorough examination of the effects of climate change on the United States (USGCRP 2018). This assessment helped inform decision-makers, utility and natural resource managers, public health officials, emergency planners, and other stakeholders. The report includes national topics such as water, as well as chapters on geographic regions of the United States highlighting climate impacts.

> *"Changes in the frequency and intensity of climate extremes relative to the 20th century and deteriorating water infrastructure are contributing to declining community and ecosystem resilience. Climate change is a major driver of changes in the frequency, duration, and geographic distribution of severe storms, floods, and droughts. In addition, paleoclimate information (reconstructions of past climate derived from ice cores or tree rings) shows that over the last 500 years, North America has experienced pronounced wet/dry regime shifts that sometimes persisted for decades. These shifts led to protracted exposures to extreme floods or droughts in different parts of the country that are extraordinary compared to events experienced in the 20th century. Operational principles for engineering, design, insurance programs, water quality regulations, and water allocation generally have not factored in these longer-term perspectives on historical climate variability or projections of future climate change. While there has been much discussion on the need for climate adaptation, the design and implementation of processes that consider near- and long-term information on a changing climate are still nascent."* (USGCRP 2018)

The regional summary for the Northwest from the National Climate Assessment includes the following:

> *"The extreme weather events of 2015 provide an excellent opportunity to explore projected changes in baseline climate conditions for the Northwest. The vast array of climate impacts that occurred over this record-breaking warm and dry year, coupled with the impacts of a multiyear drought, provide an enlightening glimpse into what may be more commonplace under a warmer future climate. Record-low snowpack led to water scarcity and large wildfires that negatively affected farmers, hydropower, drinking water, air quality, salmon, and recreation. Warmer than normal ocean temperatures led to shifts in the marine ecosystem, challenges for salmon, and a large harmful algal bloom that adversely affected the region's fisheries and shellfish harvests."*

> *"Strong climate variability is likely to persist for the Northwest, owing in part to the year-to-year and decade-to-decade climate variability associated with the Pacific Ocean. Periods of prolonged drought are projected to be interspersed with years featuring heavy rainfall driven by powerful atmospheric rivers and strong El Niño winters associated with storm surge, large waves, and coastal erosion. Continued changes in the ocean environment, such as warmer waters, altered chemistry, sea level rise, and shifts in the marine ecosystems are also expected. These changes would affect the Northwest's natural resource economy, cultural heritage, built infrastructure, and recreation as well as the health and welfare of Northwest residents."* (USGCRP 2018)

3.2.6 Flows and Conservation Impacts

Water use has been declining due to more efficient appliances and increased awareness of water usage. While this process is beneficial in terms of water conservation, it can impact wastewater infrastructure. Water conservation results in more concentrated influent, solids settling in collection systems due to low flows, a loss of income due to rates based on flows as opposed to loading, and inappropriately sized treatment equipment. Higher influent concentrations of problematic parameters (such as total and refractory nitrogen, soluble nonreactive phosphorus, total dissolved solids (TDS), PCBs, and other emerging contaminants) that are expensive to treat, or for which treatment technologies are unavailable, make compliance difficult as the increased influent concentration pass through the process to the effluent. The expense for compliance with restrictive limits on these problematic parameters is often compounded with falling income due to decreasing wastewater flows. Changes in influent concentration ratios can also affect treatment. For example, increased hydrolization and fermentation in collection systems can result in a higher ratio of soluble species to the total concentration. This results in decreased removal during primary treatment and a resulting consumption of capacity in secondary treatment. This affects the effluent and creates problems when limits are based on concentration or loads.

TDS in treatment processes can be expected to increase proportionally to other fractions. This increase can affect reuse planning. Chloride, sulfate, and TDS water quality standards are already controversial in many agriculture states and restrictions on reclaimed water salinity may be anticipated. This is compounded by the fact that many areas with limited water supplies subject to shortages during droughts are encouraging reuse applications.

Reduced influent alkalinity (a function of the source water), can affect nitrification and nitrogen removal processes. High influent Total Kjeldahl Nitrogen (TKN) can require multi-stage nitrogen removal. Increased refractory nitrogen concentrations can make compliance with strict effluent limits technically infeasible and may require regulatory solutions or alternative compliance tools, such as variances. Fortunately, water quality conditions in the Spokane River have not resulted in total nitrogen effluent limitations for Coeur d'Alene.

Low phosphorus limits (below 0.05 mg/L TP) can also be technically infeasible with increases in soluble nonreactive phosphorus concentrations that cannot be removed in treatment. Even with load based limits, higher influent concentrations can greatly affect treatment efficiencies, requiring additional treatment stages and thereby increasing costs. Long-term planning should include adjusting for decreasing flow and higher strength influent.

3.2.7 Plant Effluent and Spokane River Flows

For the December 1, 2014 permit, the fact sheet includes seasonal Spokane River low flows for October through June, July through September, and July through September (FERC license). These receiving water flow values are used in establishing dilution factors for conventional parameters and toxics. The 1Q10 flows are 890, 248, and 500 cfs, respectively. The 7Q10 flows 1,030, 292, and 500 cfs, respectively. The 30Q10 flows are 1,270, 363, and 500 cfs, respectively. The various Spokane River flows are used in mixing zone dilution factor calculations for acute and chronic aquatic toxicity (1Q10 and 7Q10), chronic ammonia toxicity (30Q10), and human health non-carcinogens and carcinogens (30Q5 and harmonic mean).

The discharge permit effluent limits for conventional parameters and toxics are based on an annual average effluent design flow of 6.0 mgd. Permit limits have been calculated at 6 mgd for CBOD, TSS, ammonia, residual chlorine, lead, and zinc. Seasonal mass effluent loading limits for CBOD, ammonia, and phosphorus have also been established based upon the Spokane River dissolved oxygen TMDL. The seasonal average loads of CBOD, ammonia, and phosphorus are necessary to meet Washington's water quality criterion for dissolved oxygen in Lake Spokane. For Coeur d'Alene, the seasonal mass limits for the TMDL were based on calculations using a future planning effluent flow rate of 7.6 mgd that was utilized in the TMDL modeling scenarios.

The 1999 permit (as modified in 2004) included effluent limits for zinc. The EPA has determined that the concentration effluent limits for zinc in the 1999 permit (as modified in 2004) are not stringent enough to ensure compliance with Idaho's water quality criteria. Therefore, the EPA has included more-stringent effluent limits for zinc in the 2014 permit.

3.2.8 Phosphorus

For historical background, in 1989, the City entered into a voluntary agreement to reduce the phosphorus concentration in the plant effluent for water quality protection in Long Lake downstream. At that time, the discharge permit was based upon sustaining this limitation on effluent phosphorus and tracking the response of Long Lake. The effluent limitation for phosphorus was 85 percent removal, or 1 mg/l, whichever is greater, seasonally during the critical period of March 1 through October 31.

In February 2007, EPA issued a draft NPDES permit in the midst of Washington Department of Ecology's Spokane River TMDL process that called for the City to produce an effluent with an average monthly phosphorus concentration of less than 50 µg/L and a mass discharge of 2.50 lbs/day from June through September. Weekly phosphorus limits were also proposed and were based on effluent concentration of 75 µg/L and 3.75 lbs/day from June through September. Effluent phosphorus mass loadings were based on a Coeur d'Alene plant flow of 6 mgd. In the spring and fall "shoulder months," the proposed phosphorus limits were not as restrictive. March and October limits were based on a monthly average of 1 mg/l and 50 lbs/day with weekly limits of 1.5 mg/l and 75.1 lbs/day. April through May limits were a monthly average of 12.5 lbs/day (250 µg/L at 6 mgd) with weekly limits of 18.8 lbs/day (375 µg/L at 6 mgd).

Significant progress was made in improving the draft 2007 permit to result in the final permit issued in 2014 with seasonal mass loading limits for CBOD, ammonia, and phosphorus to meet Washington's water quality criterion for dissolved oxygen in Lake Spokane. Seasonal mass loading limits were customized for each of the Spokane River dischargers to be equivalent to the TMDL scenario and better match the characteristics of individual treatment facilities. For Coeur d'Alene, the seasonal mass limits for the TMDL were based on calculations using a future planning effluent flow rate of 7.6 mgd that was utilized in the TMDL modeling scenarios. The treatment performance target for very low effluent phosphorus concentration was assumed to be 0.050 mg/L. This resulted in the seasonal mass loading limit of 3.17 lbs/day for phosphorus from February through October on a seasonal average basis. Effluent phosphorus limits were established to take effect earlier in the season than other TMDL parameter and begin in February in order to postpone effluent CBOD and ammonia limits until March and still be equivalent to the TMDL scenarios. The associated CBOD limits are 226 lbs/day for February through March and 203 lbs/day for April through October on a seasonal average basis. The ammonia effluent limits are 272 lbs/day on a seasonal average basis for March through October.

Interim limits have been established for the CBOD, ammonia, and phosphorus parameters included in the Spokane River TMDL with a compliance schedule for attainment of the final effluent limits described above. The interim phosphorus limits retain the average monthly 1 mg/L effluent limit from the 1999 permit, with a monthly average mass limit equal to the mass loading of phosphorus that the

City could have discharged under the 1999 permit. The interim ammonia and CBOD5 limits are identical to the ammonia limits in the 1999 final permit.

3.2.8.3 Phosphorus Management Plan

The 2014 NPDES permit includes Section II.B. Phosphorus Management Plan which required the preparation and submittal of a Phosphorus Management Plan to EPA and IDEQ by December 20, 2015 and notification of implementation by June 20, 2016. The City was also required to submit annual reports to EPA and IDEQ beginning on December 20, 2016. These reports have been made by the City, as have the 2017 and 2018 annual reports on phosphorus.

The Phosphorus Management Plan was conceived by EPA Region 10 with the belief that phosphorus loadings would be controlled by reductions in the influent wastewater, or by optimization of the City's treatment facilities by benchmarking against similar facilities, or by water conservation, or re-use, or staff training, etc. The 2014 NPDES specified the phosphorus management plant include the following elements:

- Compilation of influent and effluent phosphorus data for the treatment plant
- Evaluation of the potential of the treatment plant for phosphorus removal
    - Comparison of phosphorus concentrations with typical values for other treatment plants using similar technology
    - Investigate the cause of higher than typical levels, if that is the case
- Set phosphorus reduction goals
    - Goals must be consistent with the interim or final goals of the permit
    - Set an influent phosphorus reduction goal
- Evaluate the potential for phosphorus reduction of non-domestic users of the treatment plant
    - Plan must list the non-domestic users of the plan in a variety of categories (agriculture, car/truck washing, dairies, food processing, meat packing, metal finishing, nursing homes, restaurants, schools, others contributing >5% of influent phosphorus load)
    - Evaluate those with the greatest opportunity for phosphorus reduction
    - Work with businesses to develop a phosphorus reduction goal
- Provide written notice to EPA and IDEQ of implementation of the phosphorus management plan within 18 months of the effective date of the permit
    - List the strategies that will be used to meet the phosphorus reduction goal
    - For each group of phosphorus contributors, consider the strategies to be employed to reduce phosphorus (source recovery, best practices, education, training, pretreatment, monitoring, reuse, etc.)
- Revise the phosphorus management plan whenever it is found to be ineffective

In the City's 2019 permit renewal application, a request was made for reconsideration of the annual Phosphorus Management Plan requirement because a separate report on phosphorus is redundant with other annual reporting requirements and the plan envisioned by EPA in the 2014 permit is not considered realistic. The City operates one of the lowest effluent phosphorus treatment facilities in the nation and the City's focus on phosphorus management is on the tertiary treatment systems implemented at significant cost and expertly operated by the City's staff. Control of municipal wastewater phosphorus content from distinct sources, such elimination of phosphate from laundry detergent and dishwasher detergent, has already occurred on a national scale and at least part of that source control effort was originated by stakeholders on the Spokane River. Further source control reductions are unlikely since the influent wastewater at the Coeur d'Alene facility reflect largely residential customer contributions of phosphorus. Continuation with annual reports on phosphorus alone is unnecessary and does not provide any additional information that is not otherwise available in other annual reporting required by the permit.

3.2.9 Ammonia Nitrogen

There is a long history of ammonia limits in the City's NPDES permit that have evolved over time with changes in federal criteria, Idaho standards, and most recently, Washington Department of Ecology's Spokane River Dissolved Oxygen TMDL. Ammonia is included in the TMDL along with phosphorus and CBOD. Since ammonia is both toxic to aquatic life and exerts an oxygen demand on receiving waters, the City's 2014 NPDES permit includes effluent limits based on both toxicity control and compliance with the TMDL. To facilitate compliance with the TMDL, seasonal mass loading limits were negotiated for inclusion in the NPDES permit for the periods March through June (649 lbs/day), July through September (6.59 mg/L and 330 lbs/day), and March to October (272 lbs/day for 5.4 mg/L at 6 mgd or 4.29 mg/L at 7.6 mgd). Concentration limits based on acute toxicity standards to protect aquatic life result in maximum daily effluent limits for July through September (15.7 mg/L).

For historical background, EPA added a mass limit for ammonia-nitrogen to the City's NPDES discharge permit in 1999. In the 1999 NPDES permit, EPA significantly lowered the monthly-average mass limit for ammonia, added a daily mass limit, and added monthly and daily concentration limits for this parameter. The 1999 NPDES permit established a two-year compliance schedule for ammonia-nitrogen that required the City to be in compliance by November 2, 2001.

3.2.9.1 Ammonia Nitrogen Standards Issues

Water quality criteria for ammonia nitrogen have been evolving over a number of years with modifications by EPA in 1984, 1997, 1999, and 2013. On December 22, 1999 EPA published new recommended ammonia criteria in the federal register. The 1999 Update of Water Quality Criteria for ammonia contained EPA's most recent freshwater aquatic life criteria for ammonia at that time and reflected research and data since 1984. As a result of those revisions, the acute criterion for ammonia was dependent on pH and fish species, and the chronic criterion was dependent on pH and temperature. At lower temperatures, the dependency of the chronic criterion was also dependent on the presence or absence of early life stages of fish (ELS). The other significant revision in the 1999 criteria update was EPA's recommendation of 30 days as the averaging period for the ammonia chronic criterion. EPA recommended the 30Q10 (the lowest thirty-day average flow based on a ten-year return interval) as opposed to the lower 7Q10 flows used in earlier Coeur d'Alene permit calculations. EPA also recommends that no 4-day average concentration exceed 2.5 times the chronic criterion.

On August 22, 2013 EPA published the final 2013 revised federal freshwater ammonia nitrogen criteria in the Federal Register. The 2013 federal ammonia criteria are lower concentrations than the 1999 criteria upon which the Coeur d'Alene permit is based. The 2013 criteria are based upon toxicity to freshwater mussels and snails, which are more sensitive than the juvenile salmonids that were the basis of the 1999 criteria. Freshwater mussels are widely distributed throughout the Northwest. The 2013 acute values are about 29% lower and the chronic values are about 58% lower than the 1999 criteria at a neutral pH.

In Idaho, the currently adopted water quality standards remain based on EPA's 1999 aquatic life toxicity criteria for ammonia. These were adopted by IDEQ and approved by EPA Region 10 in 2002. Since that time, the adopted and approved criteria have been used to derive water quality based effluent limits (WQBELs) for a number of municipal NPDES permits (e.g., Boise, Idaho Falls, Pocatello, Coeur d'Alene, etc.). EPA Region 10 issued these permits because Idaho did not yet have NPDES primacy. At present, DEQ has no definitive schedule for revisions to the Idaho ammonia criteria.

3.2.9.2 Spokane River Site Specific Criteria for Ammonia

The State of Idaho Board of Health and Welfare adopted a temporary rule for a "Spokane River, Site Specific Criteria for Ammonia" on April 20, 2000 effective on April 24, 2000. This temporary rule adopted the recommended ammonia criteria that EPA published on December 22, 1999 in the federal register. The State of Idaho Board of Environmental Quality adopted the "Spokane River, Site Specific Criteria for Ammonia" on October 18, 2000 and the rule became final in 2001 after adoption by the legislature. Adopted by the State of Idaho as a water quality standard, EPA's 1999 recommended criteria significantly relaxed existing effluent discharge limitations. The new criteria significantly increased the allowable ammonia discharge from the Coeur d'Alene plant.

3.2.10 Bacteria and Chlorine Residual

The City's 1999 discharge permit included more stringent compliance standards for both bacteriological quality and for chlorine residual, the chemical used to disinfect the effluent. A two-year schedule was established for compliance with the daily fecal coliform bacteria limits. The City improved monitoring and control equipment to allow staff to achieve simultaneous compliance with competing objectives: maximum bacteria kill and minimum chlorine residual.

The City's 2014 discharge permit retained the revised chlorine residual limits and changed the bacteriological limits from fecal coliform to E. coli. DEQ changed state bacteria criterion from fecal coliform to E. coli in 2000 to protect contact recreation beneficial uses (IDAPA 58.01.02.251.01). The Idaho water quality standards specify that waters of the State of Idaho that are designated for recreation are not to contain E. coli bacteria in concentrations exceeding a geometric mean of 126 organisms per 100 ml based on a minimum of five samples taken every three to seven days over a thirty day period. Therefore, the draft permit contains a monthly geometric mean effluent limit for E. coli of 126 organisms per 100 ml, and a minimum sampling frequency of five grab samples per month (IDAPA 58.01.02.251.01.a.). The Idaho water quality standards also state that a water sample that exceeds certain "single sample maximum" values indicates a likely exceedance of the geometric mean criterion. For waters designated for primary contact recreation, the "single sample maximum" value is 406 organisms per 100 ml (IDAPA 58.01.02.251.01.b.ii.).

3.2.11 Metals

There is a long history of effluent limits for metals in the City's discharge permit with several revisions spanning multiple permits. The Spokane River is 303(d) listed as impaired for cadmium, lead, and zinc and the river has no assimilative capacity to dilute these metals in an effluent discharge. In August of 2000, the EPA approved a TMDL submitted by the State of Idaho for metals in the Coeur d'Alene River Basin, which included the Spokane River. However, in 2003, the Idaho Supreme Court determined that the TMDL was invalid. Even though the Idaho Supreme Court invalidated the Coeur d'Alene River Basin TMDL under state law, the Spokane River remains listed in the state integrated report as being impaired for cadmium, lead, and zinc. Future discharge permit renewals are likely to again revisit the potential need for effluent metals limits, as described in the following paragraphs.

The 1999 permit established "criteria end-of-pipe" water quality-based effluent limits for lead and zinc based on applying the receiving water quality standards as effluent limits with no mixing zone. In 2004, the EPA modified the metals limits in the City's permit, deleting the lead limits and relaxing the zinc limits.

For the 2014 permit renewal, EPA determined effluent limits for zinc in the 1999 permit, as modified in 2004, were not stringent enough and recalculated the concentration effluent limits for zinc. EPA's analysis for cadmium and lead found that there was not reasonable potential to cause or contribute to excursions above water quality standards. EPA also determined that there was not reasonable potential to exceed water quality standards for copper. For silver, EPA determined that the 1999 permit limits for silver from October through June, when effluent flows are greater than 4.2 mgd, were are not stringent enough and EPA calculated more-stringent water quality-based effluent limits for silver for this period when effluent flows are greater than 4.2 mgd.

3.2.12 Crite Health Toxics

The City's 2014 permit includes new toxics monitoring and reporting requirements. Section II.I of the permit requires "Best Management Practices for PCBs and 2,3,7,8 TCDD", in addition to permit required influent, effluent, and receiving water monitoring. The permit requires monitoring, development of a Toxics Management Plan (TMP), and an update to the quality assurance project plan (QAPP) to reflect the PCB and TCDD sampling and monitoring. Following the first year of the permit, the City was required to develop an Annual Report documenting the toxics reduction activities, sampling results, and program plan for the following years.

The specific requirements in NPDES permit Section II. Special Conditions I.2.for PCBs and 2,3,7,8 TCDD are as follows:

> Beginning December 20, 2016, the permittee must submit an annual report to EPA and IDEQ as an electronic attachment to a DMR. Each annual report must contain the following information:
>
> a) Monitoring results for PCBs and 2,3,7,8 TCDD for the previous 12-month period, including laboratory data sheets.
>
> b) Copies of education materials, ordinances (or other regulatory mechanisms), inventories, guidance materials, or other products produced as part of the TMP.

c) A description and schedule for implementation of additional actions that may be necessary, based on monitoring results, to ensure compliance with applicable water quality standards.

d) A summary of the actions the permittee plans to undertake to reduce discharges of PCBs and 2,3,7,8 TCDD during the next reporting cycle.

e) A summary of the actions taken to reduce discharges of PCBs and 2,3,7,8 TCDD during the previous 12-month period.

3.2.12.1 Coeur d'Alene PCB Monitoring

One component of the permit is to conduct sampling and testing for polychlorinated biphenyls (PCBs) in both the effluent and the Spokane River. The PCB monitoring requirements are shown in Table 3.2. Monitoring was conducted to understand the characteristics of PCBs in the collection system and the effects of the wastewater facility.

Table 3-2: NPDES Permit PCB Monitoring Requirements

Parameter	Units	Effluent Limits			Monitoring Requirements		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Location	Frequency	Sample Type
Polychlorinated Biphenyl (PCB) Congeners	pg/L	Report	--	Report	Influent	½ months	24-Hr. Comp.
PCB Congeners	pg/L	Report	--	Report	Effluent	1/quarter	24-Hr.
Source: NPDES Permit ID0022853 Table 1: Final Effluent Limits and Monitoring Requirements for Outfall 001							

Parameter	Sample Locations	Sample Frequency	Sample Type	Maximum ML
PCB Congeners	Upstream and Downstream	2/year	Grab	Note 3
Source: NPDES Permit ID0022853 Table 4: Surface Water Monitoring Requirements				

3.2.13 Constituents of Emerging Concerns

In recent years, a topic of growing public and political interest is the presence of constituents of emerging concerns in public waters. These compounds are commonly referred to as trace organic compounds, pharmaceuticals, and personal care products, endocrine disrupting compounds, micronutrients, and micropollutants.

Trace organic compounds originate from different sources such as pharmaceuticals, personal care products, and food products. Wastewater effluent, stormwater, and agricultural runoff are typical sources of these compounds in waterways. There are currently few water quality standards to control the discharge of trace organic compounds. However, there are many efforts underway to establish standards to reduce risks to public health and aquatic life that could limit discharges in the future.

3.2.14 Perfluoroalkyl Substances

Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are fluorinated organic chemicals that are part of a larger group referred to as perfluoroalkyl substances (PFASs) that have been used in industry and consumer products since the 1950s. They are persistent and do not degrade in the environment. Some PFASs are no longer used; however, products may still contain PFAS, including the following:

- Food-packaging materials
- Nonstick cookware
- Stain-resistant carpet treatments
- Water-resistant clothing
- Cleaning products
- Paints, varnishes, and sealants
- Firefighting foam
- Some cosmetics

The EPA has issued a health advisory based on studies of the effects of PFOA and PFOS on laboratory animals and epidemiological studies of humans that exposure over time may result in adverse health effects. People are exposed to PFASs through food, disposal of consumer products that contain PFAS, and drinking water.

The EPA established a health advisory level of 70 parts per trillion for the combined concentrations of PFOA and PFOS in drinking water. EPA has not set national primary drinking water regulations for PFOA and PFOS, and is evaluating PFOA and PFOS as drinking water contaminants in accordance with the Safe Drinking Water Act (SDWA).

The EPA announced four actions at a May 22, 2018 PFAS National Leadership Summit:

- They will initiate steps to evaluate the need for a maximum contaminant level for PFOA and PFOS. It will convene federal partners and examine everything known about PFOA and PFOS in drinking water.
- They are beginning the necessary steps to propose designating PFOA and PFOS as "hazardous substances" through one of the available statutory mechanisms, including potentially CERCLA Section 102.
- They are currently developing groundwater cleanup recommendations for PFOA and PFOS at contaminated sites and will complete this task by fall 2018.
- They are taking action in close collaboration with federal and state partners to develop toxicity values for GenX and PFBS. EPA's comment period closed on January 22, 2019. EPA will consider the comments, revise the draft documents, as appropriate, and then publish final toxicity assessments.

3.3 Surface Water Quality Standards - Beneficial Uses

The Spokane River flows from the outlet of Coeur d'Alene Lake westward across the Idaho/Washington border, and then takes a northwesterly course through the City of Spokane, Washington, into Lake Spokane, and finally to the Columbia River. The river currently supports beneficial uses in the reach between Coeur d'Alene Lake and the state border, however concerns have arisen about maintaining river quality and protecting beneficial uses.

The river in Idaho can be divided into two reaches: 1) The outlet of Lake Coeur d'Alene down to the Post Falls dam (Reach I); and 2) the dam to the Idaho/Washington state border (Reach II). Reach I is largely a backwater from the Post Falls dam and the dam controls the level of Coeur d'Alene Lake during the summer. Reach II is free flowing and has a pool and riffle character.

The reach of the river upstream of the Post Falls dam is used for swimming, water skiing, recreational boating, fishing, and as a water supply to some of the homes along the river. This reach is a warm/cool water fishery and is unable to support a cold water fishery all year because of water temperatures. The reach upstream of the dam is designated as salmonid spawning waters in the regulations, but the dam prevents salmon from moving upstream to spawn. Land-locked Kokanee and Chinook salmon do spawn in Coeur d'Alene Lake, but are not known to move down the river. The first 1 to 2 miles of the upper end of Reach I serve as feeding grounds for cutthroat trout; the trout spawn in the lake and then move downstream in May and June when the outflow of food from the lake is high, yet river flow is relatively low.

Reach II has cooler waters and supports a year-round rainbow and brown trout fishery. A Spokane River Fishery Evaluation conducted by the State of Idaho in 1990-91 indicates that conditions are marginal for supporting a cold water fishery. They recommended maintaining minimum stream flows in the reach at 6,000 cfs from April 1 through June 30 to protect the remaining trout populations.

Reach II is also used for swimming, recreational boating, and fishing. Its use as a domestic water supply is unknown.

Regulatory beneficial uses of the Spokane River are outlined in Idaho's Water Quality Standards and Wastewater Treatment Requirements. The beneficial use classifications and descriptions for the Spokane River are shown in Table 3-3.

Table 3-3: Beneficial Uses of the Idaho Reach of the Spokane River

Designated Use	Description of Use
Domestic Water Supply	Suitable or intended to be made suitable for drinking-water supply
Agricultural Water Supply	Irrigation Stock water
Cold Water Biota	Aquatic organisms with optimal growth below 18°C
Designated Use	**Description of Use**
Salmonid Spawning	Self-propagation of salmonid fish
Primary Contact Recreation	Swimming, water skiing, skin diving Ingestion of small quantities probable
Secondary Contact Recreation	Fishing, boating, wading Ingestion of water not probable

Various beneficial uses drive specific water quality standards. The water quality parameters associated with each beneficial use are shown in Table 3-4.

Table 3-4: Beneficial Uses and Water Quality Parameters

Designated Use	Water Quality Parameters
Domestic Water Supply	Toxics, suspended solids, bacteria
Agricultural Water Supply	Toxics, suspended solids, bacteria
Cold Water Biota	Toxics, pH, dissolved oxygen, temperature, suspended solids
Salmonid Spawning	Dissolved oxygen, temperature
Primary Contact Recreation	Bacteria, aesthetics
Secondary Contact Recreation	Bacteria, aesthetics

As required by the Clean Water Act, every two years the State of Idaho must report to EPA the water quality status of all waters in Idaho. Idaho's most recent version is the 2016 Integrated Report, approved by EPA on June 25, 2019. The integrated report includes both the current conditions of all waters, referred to as the §305(b) list and a listing of those waters that are impaired, referred to as the §303(d) list. Waters are considered impaired if water quality standards for one or more designated beneficial uses for one or more pollutants are not met. In Idaho these are considered Category 5 waters and constitute the §303(d) list of impaired waters. Category 5 waters require the development and implementation of water quality improvement plans, Total Maximum Daily Loads (TMDLs) to protect water quality and achieve federal and state water quality standards.

The 2016 Integrated Report includes the Upper Spokane River (subbasin 17010305) on the §303(d) list. Two river segments are identified: Coeur d'Alene Lake to Post Falls Dam (9.04 miles) and Post Falls Dam to Idaho/Washington border (5.67 miles). The unsupported beneficial use is cold water aquatic life and pollutants identified as preventing attainment of water quality standards are: lead, zinc, and total phosphorus.

Removal of the Upper Spokane River from the §303(d) list will likely require the development of a TMDL. Other possible methods, although less common, include the demonstration that changes to correct water quality problems have been completed, changes in the water quality standards, or removal of designated uses through a use attainability analysis (UAA). The development of a TMDL requires determination of wasteload allocations for the parameters that cause the impairment. These wasteload allocations determined in a future TMDL will be considered when developing effluent limits in future NPDES permits.

3.4 Surface Water Quality Standards

Water quality standards are made up of designated uses, water quality criteria, and antidegradation policy. Allowable concentrations of chemical species in surface water are based on the water quality standards necessary to protect the beneficial uses of natural water sources.

3.4.1 Antidegradation

Early in the permit development process, a permit writer is to check the state's antidegradation policy and implementation methods to determine what tier(s) of protection, if any, the state has assigned to the proposed receiving water for the parameter(s) of concern. The State of Idaho has an Antidegradation Policy in IDAPA 58.01.02 Section 051. It has two parts that are applicable to the Spokane River:

- Maintenance of Existing Uses for All Waters (Tier I Protection). The existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
- High Quality Waters (Tier II Protection). Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the Department finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the Department's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the Department shall assure water quality adequate to protect existing uses fully. Further, the Department shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source control. In providing such assurance, the Department may enter together into an agreement with other state of Idaho or federal agencies in accordance with Sections 67-2326 through 67-2333, Idaho Code.

3.4.2 Mixing Zones

Mixing zones are defined as "an area or volume of the receiving water surrounding or adjacent to a point source discharge where the receiving water, as a result of the discharge, may not meet all applicable water quality criteria or standards" (IDAPA 58.01.02.010.61). Idaho's mixing zone rules were recently revised since the previous policy was out dated (1991) and contained language that was no longer relevant. Idaho's final rule was submitted to EPA on December 22, 2016 and EPA approved the final rule package on December 16, 2019.

DEQ has prepared Idaho Mixing Zone Implementation Guidance (DEQ 2016) as a reference for complying with the mixing zone provisions in Idaho's "Water Quality Standards" (WQS), IDAPA 58.01.02 Section 060. A regulatory mixing zone is a location within a water body where certain water quality criteria are allowed to be exceeded. The boundary of the regulatory mixing zone is defined as that location where pollutant concentrations must achieve a level that meets water quality criteria. Toxic pollutants can have an acute zone in which the acute criteria (i.e., criterion maximum concentration, or CMC) may be exceeded and a chronic zone where the chronic criteria (i.e. criterion continuous concentration, or CCC) may be exceeded. Mixing zones are to be no larger than necessary and should not exceed 25% of the low flow for dilution and 25% of the width of the receiving water. No mixing zone is available in impaired water bodies, however DEQ may authorize a mixing zone when the permitted discharge is consistent with an approved TMDL allocation or other applicable plans or analyses.

Since the attainment of water quality standards often depends on adequate mixing, it is important to assess the effects of mixing gained from outfall diffusers. Based on current regulatory requirements and flow projections, the existing outfall configuration appears satisfactory. The reasonable potential analysis for the City's 2014 NPDES allowed a mixing zone for ammonia, pH, TSS, silver, copper, chlorine, and nitrate plus nitrite. However, no mixing zone was allowed for cadmium, lead, and zinc because the Spokane River is considered impaired for those metals. The Spokane River outfall will need to be inspected periodically and maintained to provide adequate hydraulic capacity and the physical dilution assumed in the reasonable potential analysis calculations for the discharge permit.

3.4.3 Criteria

The general surface water quality criteria for Idaho specify that surface waters must be free of hazardous materials; toxic substances; floating, suspended, or submerged matter; excess nutrients; oxygen-demanding materials; and sediment in concentrations which impair the designated or actual uses of the river. Specific water quality criteria for protecting the Spokane River's beneficial uses are listed Table 3-5.

The State of Idaho incorporates 40 CFR 131.36(b)(1) in its water quality standards for the regulation of toxic substances in surface water. This section will only address those substances, which are typically of concern in wastewater treatment plants. Separate criteria have been established for the protection of aquatic organisms inhabiting state waters and for protecting human health against the ingestion of water and fish tissue that has significant toxic contamination. Toxic metals criteria are shown in Table 3-6. Some of these concentrations are based on the river hardness, and thus are specific to the Idaho reach of the Spokane River. Federal 40 CFR 131 is incorporated in Idaho's water quality standards, with the exception that dissolved criteria are to be used. IDAPA 16 Title 1, Chapter 2, Section 250.07 gives correction factors that apply to the criterion from 40 CFR 131.

The regulation of toxic metals by EPA and the states has been problematic. Much of the problem hinges on EPA having established the toxics criteria based upon limited laboratory research. EPA now recognizes that metals toxicity is significantly affected by site-specific factors and that these site-specific factors should be considered in the establishment of metals limits. Factors that should be considered include: toxicity specific to effluent chemistry; toxicity specific to ambient water chemistry; different patterns of toxicity for different metals; and the fate and transport of metals in the receiving water. There are also concerns by EPA and other agencies that much of the analytical data collected for assessing metals toxicity is invalid due to possible sampling and analytical contamination. Clean and ultra clean sampling and analytical protocols have been developed to reduce the risk of contamination and to improve the accuracy of the laboratory analyses for detecting low level concentrations of metals.

Table 3-5: Water Quality Criteria in Idaho

Beneficial Use	Regulated Parameter	Water Quality Criteria
Primary Contact Recreation (May 1 – September 30)	E. Coli bacteria	Geometric mean < 126 organisms/100 ml based on 5 samples taken every 3 to 7 days over a 30 day period Additional samples if a single sample > 406 organisms/100 ml Additional samples, if public swimming beach and a single sample > 235 organisms/100 ml
Secondary Contact Recreation	E. Coli bacteria	Geometric mean < 126 organisms/100 ml based on 5 samples taken every 3 to 7 days over a 30 day period Additional samples if a single sample > 576 organisms/100 ml
Aquatic Life		
General Criteria	pH	6.5 to 9.0
	Total dissolved gas	110% saturation at atmospheric pressure
	Total chlorine residual	19 µg/l one-hour average 11 µg/l four-day average
	Toxic substances	See 40CFR 131.36(b)(1)
Cold Water Biota	Dissolved Oxygen	Over 6 mg/l
	Water Temperature	$22^{o}C$ or less, with maximum daily average no greater than $19^{o}C$
	Unionized Ammonia (as N)	One-hour average concentration varies from 0.01 to 0.22 mg/l depending on temperature and pH Four-day average concentration varies from 0.00 to 0.03 mg/l depending on temperature and pH
	Turbidity	Not to exceed background below the mixing zone by more than 50 NTU instantaneously or by 25 NTU for more than 10 consecutive days.
Salmonid Spawning	Intergravel Dissolved Oxygen	5.0 mg/l one-day minimum 6.0 mg/l seven-day average
	Water Column DO	One-day minimum of greater of 6.0 mg/l or ninety percent of saturation
	Temperature	Less than $13^{o}C$ with maximum daily average no greater than $9^{o}C$
	Unionized Ammonia	Same as for Cold Water Biota
Domestic Water Supply	Toxic Substances	See 40CFR 131.36(b)(1)
Agricultural Water Supply	All water quality parameters are satisfied by the general water quality criteria	
Other Criteria	Biochemical Oxygen Demand	30-day average concentration of 30 mg/l
	Total Suspended Solids	30-day average concentration of 30 mg/l

Table 3-6: Water Quality Criteria for Metals

Compound	Aquatic Life Acute, µg/l	Aquatic Life Chronic, µg/l	Human Health, µg/l
Arsenic	340	150	10
Cadmium*	0.67	0.33	**
Chromium (III)*	483.70	57.65	**
Copper*	4.07	3.12	1300
Cyanide	22.00	5.20	3.9
Lead*	11.20	0.45	**
Mercury	**	**	0.14
Nickel*	378.75	41.92	58
Silver*	0.28	NA	NA
Zinc*	31.19	28.25	870

*Indicates hardness-based water quality criteria

**No criterion adopted, narrative criteria apply.

3.4.3.2 Metals Total Maximum Daily Load for the Coeur d'Alene River Basin

Information in this section is presented for historical background on regulatory issues that emerged in the past and then were set aside. They may emerge again in the future and some background may be useful in future planning efforts and discharge permitting. On August 18, 2000 EPA and DEQ established a TMDL for metals in the surface waters of the Coeur d'Alene River Basin that was later set aside. This was the culmination of a multi-year effort with extensive stakeholder commentary. This TMDL allocated loads for dissolved cadmium, lead, and zinc. Since much of the Coeur d'Alene River Basin is impacted by historical mining activities, there are significant sources of metals distributed throughout the watershed. These sources include discrete point sources, such as wastewater treatment plants, and a variety of nonpoint sources including mining piles and leaching from sediments.

The TMDL established a wasteload allocation for the Spokane River with concentration values for total recoverable cadmium, lead, and zinc for the Coeur d'Alene, Post Falls, and Hayden wastewater treatment plants as shown in Table 3.7. However, in 2003, the Idaho Supreme Court determined that the TMDL was invalid and the wasteload allocation has not been implemented. The Spokane River remains listed in the state integrated report as being impaired for lead and zinc.

Table 3-7: Monthly Average Effluent-Based Criteria for Spokane River Metals Wasteload Allocation from Invalidated Coeur d'Alene River Basin TMDL

Wastewater Facility[a]	Total Recoverable Cadmium, µg/l	Total Recoverable Lead, µg/l	Total Recoverable Zinc, µg/l
Coeur d'Alene [b]	1.3[c]	3.3[d]	132[e]
Post Falls	1.0	2.4	101
Hayden	1.0	2.3	97

[a]"Total Maximum Daily Load for Dissolved Cadmium, Dissolved Lead, and Dissolved Zinc in Surface Waters of the Coeur d'Alene River Basin," August 2000 establishes these concentrations

[b]The Coeur d'Alene minimum effluent hardness is 132 mg/l as $CaCO_3$.

[c]The current effluent performance level for cadmium at the Coeur d'Alene plant is 0.2 µg/l. The November 2, 1999 Coeur d'Alene NPDES discharge permit does not include limits on cadmium.

[d]The current effluent performance level for lead at the Coeur d'Alene plant is 2.3 µg/l. The November 2, 1999 Coeur d'Alene NDPES Permit identifies effluent limits for total recoverable lead (Average monthly: 2.5 µg/l and 0.13 lb/d. Maximum daily: 5.8 µg/l and 0.29 lb/d).

[e]The current effluent performance level for zinc at the Coeur d'Alene plant is 72 µg/l. The November 2, 1999 Coeur d'Alene NDPES Permit identifies effluent limits for total recoverable zinc (Average monthly: 99 µg/l and 5 lb/d. Maximum daily: 150 µg/l and 7.5 lb/d).

3.4.3.3 Dissolved Oxygen Total Maximum Daily Load for the Coeur d'Alene River Basin

Information in this section is presented for historical background on regulatory issues that emerged in the past and then were set aside. They may emerge again in the future and some background may be useful in future planning efforts and discharge permitting. DEQ was scheduled to develop a TMDL for water temperature and nutrients for the Idaho portion of the Spokane River in 2007 based on a lawsuit settlement agreement in 2002. In that same period of time, Washington Department of Ecology had begun a dissolved oxygen TMDL study in 2000 for the Washington state portion of the Spokane River.

City of Coeur d'Alene staff were active contributing participants in the collaborative TMDL process for the Spokane River in Washington from its inception in 2005. As a part of the collaborative process, Coeur d'Alene, EPA Region 10, and Ecology agreed to recognize the role of Idaho discharges and non-point source contributions to the phosphorus loading problems in the Spokane River in Washington. In acknowledgement of this agreement, EPA agreed to postpone re-issuance of expired Idaho municipal NPDES permits for the participating Idaho municipal dischargers until the TMDL process was finished. Ultimately, Ecology's Dissolved Oxygen Total Maximum Daily Load (TMDL) for the Spokane River and Lake Spokane was completed in 2010 (Ecology 2010). The City worked with EPA and Ecology to develop equitable discharge reduction requirements for all dischargers to the Spokane River in Idaho and Washington to meet the objectives of the TMDL.

3.4.4 Site Specific Water Quality Standards

The State of Idaho allows for and has developed procedures for establishing site-specific surface water quality criteria. These procedures are in IDAPA 58 Title 1, Chapter 2, Section 275.01. Site-specific criteria can be developed if:

- The resident species of a water body are more or less sensitive than those species used to develop a water quality criterion,
- Biological availability and/or toxicity of a pollutant may be altered due to differences between the physicochemical characteristics of the water in a water body and the laboratory water used in developing a water quality criterion,
- The effect of seasonality on the physicochemical characteristics of a water body and subsequent effects on the toxicity of a pollutant may justify seasonally dependent site-specific criteria.

Site-specific criteria must not impair designated or existing beneficial uses year-round and shall prevent acute and chronic toxicity outside of the mixing zone.

3.4.5 Variances

The State of Idaho also allows for variances from meeting certain water quality standards. These variances may be granted by the Department consistent with requirements listed in IDAPA 58 Title 1, Chapter 2, Section 260.01. A discharger must demonstrate that meeting the standard is unattainable based on one or more of the following six factors:

1. Naturally occurring pollutant concentrations prevent the attainment of the standard.
2. Natural, intermittent, or low flow conditions or water levels prevent the attainment of the standard.
3. Human caused conditions or sources of pollution prevent the attainment of the standard and cannot be remedied or would cause more environmental damage to correct than to leave in place.
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the standard, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in attainment of the standard.
5. Physical conditions related to the natural features of the water body, unrelated to water quality, preclude attainment of the standard.
6. Controls more stringent than technology-based effluent limitations would result in substantial and widespread economic and social impact.

Any variances granted by the Department must be included within the rules and remains in effect for a period of five years or the life of the permit. Upon expiration of the five year time period or permit, the discharger must either meet the standard or must re-apply for the variance. DEQ will require the discharger to demonstrate reasonable progress towards meeting the standard in the event of a re-application for a variance.

3.5 Biomonitoring and Whole Effluent Toxicity Testing

Biomonitoring and whole effluent toxicity testing are methods of examining the impact of discharge from wastewater treatment facilities on water quality. Biomonitoring is "the use of a biological entity as a detector and its response as a measure to determine environmental conditions" (IDAPA 58 Title 1, Chapter 25, Section 105.12). As the regulatory approach shifts from technology based permitting to water quality based permitting, biomonitoring and whole effluent toxicity tests are likely to increase in importance in the permitting and operation of wastewater treatment facilities. These biological tools can be used to develop specific chemical criteria for pollutants not addressed directly in the Idaho rules, or to demonstrate a difference between the perceived toxicity of a chemical and the actual toxicity in a specific receiving stream.

The City of Coeur d’Alene is currently required to follow a program of chronic and acute whole effluent toxicity tests. These tests are included in the NPDES permit requirements to determine if the effluent affects the survival of certain test organisms. Initial short term tests are to be performed with the water flea, Ceriodaphnia dubia (survival and reproduction test), the fathead minnow, Pimephales promelas (larval survival and growth test), and a green alga, Selenastrum capricornutum (growth test). After the initial screening period, monitoring must be conducted using the most sensitive species. None of the initial or screening tests performed by Coeur d’Alene have demonstrated effluent toxicity problems.

3.6 Infiltration and Inflow Control

Infiltration to the Coeur d’Alene collection system is not a major concern and an evaluation in 1995 showed that infiltration is negligible. The Coeur d’Alene facility experiences wet weather peak flows that are three to four times the average dry weather flow. Much of the peak flow is due to inflow via direct connections of stormwater to the sanitary sewer. Inflow to the sewer system drives peak flows at the treatment plant and stresses peak capacity of unit processes. The City is pursuing further analysis, tracing, and elimination of inflow sources in an on-going collection system management effort.

3.7 Groundwater Protection and Impacts on Unsewered Areas

Idaho designated groundwater according to the uses for which they are presently suitable or intended to become suitable. These include agricultural, domestic, industrial, and/or potable use. This section describes the regulations protecting groundwater, and the wastewater disposal practices that are affected by these regulations. The disposal of biosolids from wastewater treatment facilities is addressed separately in the following section.

3.2.8 General Groundwater Protection Regulations

The Rathdrum Prairie Aquifer has been designated by EPA as a sole source aquifer under Section 1424 (e) of the Safe Drinking Water Act (SDWA). This requires that the siting, design, and operation of projects receiving federal funding that might affect groundwater quality are subject to EPA review. Based upon that review, EPA may require modifications prior to gaining financial assistance or may deny federal funding assistance. EPA typically regards drinking water supply as the highest beneficial use and evaluates proposed projects over sole source aquifers with a view toward protecting water quality so that it at least meets federal drinking water standards.

3.7.1 Groundwater Quality Rule (IDAPA 58.01.11)

IDAPA 58 Title 1, Chapter 11, Section 200 establishes groundwater quality standards for groundwater of the state. The Rathdrum Prairie Aquifer has been designated by the Department as a sensitive resource water. In addition to the ground water quality standards in Section 200, the following narrative standard applies to Rathdrum Prairie Aquifer (IDAPA 58.01.11.300.01):

> "the aquifer shall not be degraded, as it relates to beneficial uses, as a result of point source or nonpoint source activity unless it is demonstrated by the person proposing the activity that such change is justifiable as a result of necessary economic or social development."

Aquifers in the Sensitive Resource category are to be managed in a manner which maintains or improves existing groundwater quality through the use of best management practices and best available methods. Numerical and narrative standards apply to aquifers categorized as a Sensitive Resource, as well as stricter numerical and narrative standards determined on a case-by-case basis for specified constituents.

3.7.2 Regulation of Sewage/Septage/Pumpable Sludge Disposal

Panhandle Health District (PHD) and the State of Idaho, Department of Environmental Quality share responsibilities for regulating the protection of the Rathdrum Prairie Aquifer. PHD regulates the use of on-site sewage disposal systems but DEQ has the authority to enforce the protection of water quality, assess penalties, and require remediation of any damage.

PHD's policy regarding subsurface sewage disposal on the Rathdrum Prairie is outlined in the section 41.1.110 of its Environmental Health Code. This code states that no subsurface sewage disposal systems may be constructed on less than five acres over the Rathdrum Prairie Aquifer unless the following conditions apply:

- The parcel is within the boundaries of an area where an approved Sewage Management Plan has been adopted which will result in "the construction and operation of or connection to a central sewage treatment plant,"
- The parcel was acquired or established prior to December 20, 1977, and meets all other regulations governing individual and subsurface sewage disposal systems, or
- One subsurface sewage disposal system is replacing another with no increase in loading, providing the development includes a dry or wet sewer system with necessary laterals.

In all cases, the Health Officer has the right to require the owner of a parcel of land with a subsurface sewage disposal system to disconnect the system and connect the building sewer to a collection and treatment system when such a system becomes available.

The City of Coeur d'Alene has completed its septic tank abatement projects and the City no longer has a Sewage Management Agreement (SMA) with PHD.

Subsurface disposal of non-domestic wastewater is addressed separately in PHD's *Disposal Options for Commercial/Industrial Facilities Over the Aquifer*. This policy states that non-domestic wastewater produced inside structures at new facilities may not be disposed of on site, and may not be stored in a holding tank unless "the most current criteria in the Technical Guidance Manual can be met." Existing facilities are allowed to continue on site disposal of non-domestic wastewater produced inside a structure if a permit was issued for such disposal. However, if the wastewater is disposed of in an unapproved manner or the waste stream is new, the waste stream will be treated as if from a new facility, and will be subject to regulations governing the disposal of non-domestic wastewater produced inside structures at new facilities.

The disposal of domestic septage and non-domestic pumpable sludge is a significant problem facing the communities in northern Idaho. The Round Mountain facility has historically been the only disposal site in the county allowed to accept domestic septage, and is approximately twenty miles from Coeur d'Alene. The Round Mountain special use permit expired in 1998 and an extension request was denied.

Non-domestic pumpable sludge must be hauled to facilities outside of the County. Under some conditions dewatered sludge may be accepted by landfills, but these occurrences are rare. A high priority in northern Idaho is to determine a way to dispose of domestic septage and non-domestic pumpable sludge while protecting groundwater quality in the area. Panhandle Health District generally opposes siting septage disposal facilities over the Rathdrum Prairie Aquifer, but all proposed sites are considered on a case-by-case basis.

3.8 Biosolids Management

Idaho's IPDES permits must include requirements under the Clean Water Act section 405 governing the disposal of sewage sludge from publically owned treatment works (POTWs). Section 405 sets the framework for sewage sludge (biosolids) regulations and in 1993 brought the management of residuals under the National Pollutant Discharge Elimination System permit program and the Part 503 Standards for the Use or Disposal of Sewage Sludge. Regulations regarding biosolids management are outlined in 40 CFR 503 - Standards for the Use or Disposal of Sewage Sludge. The Part 503 regulations are self-implementing, which means that facilities must comply with them whether or not a permit has been issued. Chapter 503 gives general requirements, pollution limits, management practices, operating standards, and monitoring and reporting requirements for land application and surface disposal of biosolids.

The disposal of biosolids produced in the treatment process varies from community to community. Solids from Coeur d'Alene undergo anaerobic digestion and dewatering prior to processing at a compost facility. Regulations regarding general requirements and management practices exclude "sewage sludge sold or given away in a bag or other container for land application" (40 CFR 503.10(e)), and thus would not apply to compost. However, biosolids sold or given away in such a form still must meet the pollutant concentration requirements in section 503.13.

3.8.1 NPDES Permit Requirements

The City's 2014 NPDES permit prepared by EPA Region 10 significantly streamlined the biosolids requirements that had been incorporated into previous discharge permits. The 1999 permit was titled Authorization to Discharge and Compost Sewage Sludge (Biosolids) Under the National Pollutant Discharge Elimination System. That permit included an entire Section III. Sludge (Biosolids) Management Requirements that described in detail the requirements for the City to transfer biosolids to any Class A processing facility for composting prior to land application in accordance 40 CFR 503.

The 1999 NPDES called preparation of a contingency plan for an alternate disposal option and annual reports be submitted to EPA by February 19th of each year that included the following:

- Results of biosolids sampling and analysis.
- Identification of the receiving facility and the company that transfers the biosolids to the receiving facility (City transportation and composting operation).
- A report of any times that biosolids were stockpiled or disposed of in a manner other than authorized in the NPDES permit.

For the 2014 permit renewal, EPA Region 10 separated wastewater and sludge permitting. EPA has the authority under the Clean Water Act to issue separate sludge-only permits for regulating biosolids and noted in the 2014 Permit Fact Sheet that EPA may issue a sludge-only permit at a later date. Further, the 2014 Permit Fact Sheet stated that until future issuance of a sludge-only permit, sludge management and disposal activities continue to be subject to the national sewage sludge standards at 40 CFR Part 503 and any requirements of the State's biosolids program.

3.8.2 40 CFR 503 - Standards for the Use or Disposal of Sewage Sludge

Pollution limits for land application of biosolids in 40 CFR Part 503 are given for arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. Ceiling concentrations are given for sludge sold or given away in bags or other containers, while cumulative pollutant loading rates, pollutant concentrations, and annual pollutant loading rates apply to sludge applied to agricultural land, forest, a public contact site, or a reclamation site. The annual application rate is also limited to the agronomic nitrogen requirement for the crop or vegetation grown on the land application site. Finally, pathogen requirements and vector attraction reduction requirements must be met prior to land application of municipal biosolids.

Biosolids regulations have been developed by many states as well. These regulations vary considerably from state to state. The objective in these states is to derive the maximum resource benefits of the biosolids land application while protecting the environment and public health.

3.8.3 Idaho Regulatory Guidance

Biosolids disposal regulations are listed IDAPA 58.01.16 Section 650 Sludge Usage of the Idaho Wastewater Rules. This section states that biosolids can be utilized as soil augmentation but must conform either to a disposal plan approved by the State, or with practices approved by the State on a case-by-case basis. Specific requirements of sludge disposal plans are not given. Section 650.03 requires that plans must "at a minimum" provide:

a. That only stabilized sludge will be used.
b. The criteria utilized for site selection, including:
   i. Soil description;
   ii. Geological features;
   iii. Groundwater characteristics;
   iv. Surrounding land use;
   v. Topography; and
   vi. Climate.
c. A description of the application process.
d. A statement detailing procedures to prevent application which could result in a reduction of soil productivity or in the percolation of excess nutrients.

e. Identification of potential adverse health effects in regard to the sludge and its proposed use.

f. Delineation of methods or procedures to be used to alleviate or eliminate adverse health effects."

DEQ prepared Guidance for Land Application of Municipal Biosolids (DEQ 2011). An approved biosolids management plan (equivalent to a sludge disposal plan referenced in IDAPA 58.01.16.650) is required before land application of biosolids. Responsibility for approving the plan may rest with either DEQ or a public health district according to a memorandum of understanding between DEQ and Idaho's public health districts. DEQ has waived the management plan requirement for land application of bagged biosolids that meet Class A Exceptional Quality requirements.

3.9 Endangered Species

Please refer to Chapter 8 Environmental Information Document for a detailed discussion on the Threatened and Endangered Species and how they are affected by the proposed project.

3.10 Air Toxics

3.10.1 The Clean Air Act and Rules for the Control of Air Pollution in Idaho

The emission of air pollutants is regulated under the Clean Air Act, the Clean Air Act Amendments of 1990, and the Rules for Control of Air Pollution in Idaho (IDAPA 58.01.01). The Clean Air Act is implemented and enforced by the state with oversight from EPA. Title V of the Clean Air Act requires any major stationary source of air pollution to submit a permit application and conform to certain regulations regarding the control of emissions from the source. The Coeur d'Alene wastewater treatment plant is not regarded as a major source and is not subject to Title V permitting.

The Clean Air Act includes national air quality standards for criteria pollutants including nitrous oxides (NO_x), volatile organic compounds (VOCs), particulate matter of diameter less than 10 μm (PM_{10}), total suspended particulate (TSP), sulfur oxides (SO_x), ozone (O_3), carbon monoxide (CO), and lead (Pb). Idaho does not include VOCs in its list of criteria air pollutants, but instead designates ozone, of which VOCs are often used as potential indicators, and fluorides. Hazardous air pollutants which "present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects or adverse environmental effects" are also included in section 112(b)(2) of the Clean Air Act. Hazardous air pollutants that may routinely be released from wastewater treatment facilities include hydrogen sulfide (H_2S), chlorine, and specific VOCs such as benzene. Other criteria pollutants can be of concern when engine generators are present.

Idaho requires permit applications to be filed for Tier I sources, which are sources located at major facilities. A facility is defined as "All of the pollutant-emitting activities which belong to the same industrial grouping, are located on one (1) or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control)" (IDAPA 58.01.01, Section 006.40). A facility is considered major if it emits or has the potential to emit 10 tons per year or more of any hazardous air pollutant, 25 tons per year or more of any combination of hazardous air pollutants, or 100 tons per year or more of any regulated air pollutant (IDAPA 58.01.01, Section 008.10). The Idaho Criteria Air Pollutants are any of the following: PM10, PM2.5, sulfur oxides, ozone, nitrogen dioxide, carbon monoxide, and lead. Permits must be obtained for the operation of a

Tier I facility, or for modification and construction which would cause a facility to qualify as a Tier I facility.

To examine the applicability of the state air quality rules to wastewater treatment facilities, the potential emissions of H_2S, chlorine, and VOCs were examined in previous City facilities planning. These calculations remain the same as reported previously and remain relevant to the conclusion that the City's facility does not exceed the criteria pollutant emission threshold or the hazardous air pollutant criteria.

To calculate the potential VOC emissions, an influent concentration was assumed, and current design and projected flows were used to estimate the VOC emissions if all VOCs were stripped from the influent wastewater. Based on Metcalf and Eddy (1991), an influent concentration of 0.4 mg/l was used. Using Coeur d'Alene as an example, the current design flow to the facility is 6.0 mgd. The following calculation produces the annual VOC emissions from the facility, in tons/year:

$$\frac{(6.0mgd)(0.4mg/l)(8.34l*lb/mg*10^\wedge 6gal)(365days/year)}{2000lb/ton} \quad (1)$$

Using the design capacities and projected wastewater flows for the year 2015 and saturation produced in the population and flow projections, the anticipated VOC emissions for each facility are as shown in Table 3-8.

Table 3-8: Potential VOC Emissions from the Coeur d'Alene Wastewater Treatment Plant

Facility	VOC emissions at design flow, tons/year	VOC emissions in 2015, tons/year	VOC emissions at saturation, tons/year
Coeur d'Alene	3.7	3.3	7.4

This table shows that based on VOCs alone, the emission limit for permit requirement is not met. The projected emissions in 2015 for Coeur d'Alene are lower than the emissions at design flow because the average projected flow for the year 2015 is lower than the current design capacity of 6.0 mgd. Since the VOCs are addressed in two sections of code, as criteria pollutants with a 100 ton/year emission limit and as aggregate hazardous air pollutants with an emission load limit of 25 tons/year, the most stringent limit of 25 tons/year applies. The Coeur d'Alene facility does not reach this threshold criteria.

Hydrogen sulfide emissions from the facilities are dependent on the influent H_2S concentration, the influent dissolved oxygen concentration, and the unit processes in the treatment stream. The influent H_2S concentration is itself a factor of the ambient temperature in the collection system, since the metabolic rate of bacteria producing H_2S decreases as temperature decreases.

Since the Coeur d'Alene treatment plant uses large amounts of chlorine for disinfection and process uses, the potential to emit chlorine may appear to be high. However the likelihood of significant chlorine emissions from the wastewater treatment facilities is low as long as chlorine is properly applied. Chlorine application at the facilities ranges from 6 mg/l to 12 mg/l. The solubility of chlorine in water at 85^oF and one atmosphere is roughly 5,600 mg/l (White 1992), and increases with decreasing temperature. Therefore, if the maximum concentration in the wastewater process streams is 12 mg/l, it is unlikely that the chlorine will volatilize.

The calculations and discussion above show that it is unlikely that the Coeur d'Alene treatment facilities will meet either the criteria pollutant emission threshold of 100 tons/year or the hazardous air pollutant criteria of 10 tons/year for a single hazardous air pollutant, or 25 tons/year for aggregate. There are currently no municipal facilities in Idaho that are regulated for the emission of air pollutants. In addition, H_2S has recently been removed from the list of hazardous air pollutants in the Clean Air Act. It is still considered a hazardous pollutant by the State, however it will be important to monitor the status of H_2S in future amendments to the State air quality rules.

If the Coeur d'Alene plant were regulated as a major source, some method of emission reduction would need to be employed. The required emission reduction measures for major sources are not clearly outlined in IDAPA 58.01.01. However, Section 112 of the Clean Air Act addresses this issue, stating:

> "The maximum degree of reduction in emissions that is deemed achievable for new sources in a category or subcategory shall not be less stringent than the emission control that is achieved in practice by the best controlled similar source, as determined by the Administrator. Emission standards promulgated under this subsection for existing sources in a category or subcategory may be less stringent than standards for new sources in the same category or subcategory but shall not be less stringent, and may be more stringent than:
>
> (A) The average emissions limitation achieved by the best performing 12 percent of the existing sources [with some restrictions on sources considered], in the category or subcategory for categories and subcategories with 30 or more sources, or
>
> (B) The average emission limitation achieved by the best performing 5 sources in the category or subcategory for categories or subcategories with fewer than 30 sources."

The emission standards enforced under Section 112 of the Clean Air Act are referred to as MACT (maximum available control technology) standards, and take into consideration the cost of achieving the emissions and the non-air quality health and environmental impacts and energy requirements. The EPA issued the POTW standards for hazardous air pollutants (HAP) in 1999 and final rule amendments were issued on October 21, 2002. On October 16, 2017, EPA finalized amendments to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Publicly Owned Treatment Works (POTW) to address the results of the residual risk and technology review (RTR) conducted under section 112 of the Clean Air Act. The EPA has determined that the risks resulting from emissions from this source category are acceptable and there are no new developments in processes, practices, or procedures.

3.10.2 Clean Air Act Risk Management Plans

Section 112(r) of the Clean Air Act requires that provisions be made for risk management plans to prevent and minimize consequences of any release of a hazardous substance. The regulation was codified on June 20, 1996 as 40 CFR Part 68 and titled Accidental Release Prevention Provisions. The regulation established a Risk Management Plan submittal deadline of June 21, 1999. Facilities which store any of the following regulated chemicals above the threshold quantity are subject to the rule:

- Anhydrous ammonia
- Sulfur dioxide
- Aqueous ammonia
- Chlorine
- Ethylene oxide
- Methane
- Nitric acid
- Propane

3.10.3 Chlorine-Specific Regulations

Due to its properties as an oxidant and a toxic chemical, several regulatory bodies have provisions related to the use, storage, and release of chlorine.

Regulation: 40 CFR 68 Chemical Accident Prevention Provisions

Requirements: Requires that an accidental release prevention program be maintained for the release of over 1,000 lbs of chlorine. The threshold quantity is waived if the toxic chemical comprises less than one percent by weight of the released substance.

Regulation: NFPA 820 - Fire Protection in Wastewater Treatment and Collection Facilities, 1992

Requirements: Chlorine gas is considered a strong oxidizer with a health hazard ranking of 4, meaning that short exposure could result in death or major residual injury. No specific requirements are given, but it is recommended that fire and explosion hazards be mitigated with "a commonly preferred method of copious flushing with air (ventilation)" (NFPA 820, Section 5-4).

Regulation: Uniform Fire Code, Article 80 -Hazardous Materials

Requirements: Under the UFC, chlorine gas is a toxic chemical due to its health hazard and oxidizing properties, and is regulated when stored above the exempt amounts listed in Table 3-9.

Table 3-9: Exempt Amounts of Compressed Gases

Conditions	Exempt Amount (ft^3 at STP)
Unprotected by sprinklers, gas cabinets or separate rooms	650
Within gas cabinets in unsprinklered building	1,300
In sprinklered building, not in gas cabinets or separate rooms	1,300
In sprinklered building, within gas cabinets	2,600

Regulation: Uniform Fire Code, Section 80.303.6(a)-(c)

Requirements: Ventilation must be provided through "ventilated storage cabinets, exhausted enclosures, or within a separate ventilated room without other occupancy or use." Where gas cabinets are used, they must operate at negative pressure and provide limited access ports with average face ventilation velocity at the access port of no less than 200 feet per minute and a minimum at any point of the window of no less than 150 feet per minute. Access ports must be provided with self-closing doors and connected to an exhaust system. When separate gas storage rooms are used, they must also operate at a negative pressure and direct the exhaust to an exhaust system.

Regulation: Uniform Fire Code, Section 80.303.6(d)

Requirements: "Treatment systems shall be capable of diluting, adsorbing, absorbing, containing, neutralizing, burning or otherwise processing the entire contents of the largest single tank or cylinder of gas stored or used." By requiring owners or operators to use the maximum flow from the largest tank for designing scrubber systems, this regulation determines the flow requirements for scrubbers in wastewater treatment facilities. Coeur d'Alene has a chemical scrubber to contain catastrophic chlorine releases.

Regulation: Uniform Fire Code, Sections 80.303.7 and 80.307.8

Requirements: A facility storing chlorine gas must be equipped with a continuous gas detection system with visible and audible alarms, and with emergency power for the gas detection system, emergency alarm system, temperature control system, and exhaust ventilation.

Title 29, Part 1910 of the Federal Register regarding process safety management of highly hazardous chemicals is often referenced by OSHA to regulate the use of chlorine in wastewater treatment facilities with storage or use above the threshold quantity of 1,500 lbs. This regulation requires employers of non-exempt facilities to compile written process safety information and conduct a process hazard analysis which is updated every five years. A team knowledgeable in engineering and process operations must then review this analysis, and the results of the analysis implemented as quickly as possible. Finally, Part 1910 requires the employer to develop and implement operating procedures for safe practices regarding each covered process, provide employee training, and investigate incidents which "resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemicals in the workplace."

3.11 Odors

Odor control is a concern at any wastewater treatment facility and maintenance of a good neighbor policy is given a high priority in operation of the Coeur d'Alene facility. Odor containment and treatment facilities were commissioned at the Coeur d'Alene plant in 1999 targeting emissions from high odor potential areas. Foul air from the plant headworks, preliminary treatment, sludge thickening, anaerobic digestion, solids dewatering, and the trickling filters is routed to a compost biofilter for odor scrubbing.

No specific regulatory requirements apply to odor control other than nuisance standards. City of Coeur d'Alene Code includes a clause stating that "the emission of any noxious, odorous matter which produces a public nuisance or hazard beyond lot lines is prohibited."

The most common odor-producing gases are hydrogen sulfide (H_2S) and volatile organic compounds. Hydrogen sulfide is formed when anaerobic organisms reduce sulfate to sulfide, producing a characteristic rotten egg odor. Other common odor-producing chemicals in wastewater are listed in Table 3-10.

Table 3-10: Odorous Compounds Associated with Untreated Wastewater

Odorous Compound	Chemical Formula	Odor Quality
Amines	$CH_3NH_2(CH_3)H$	Fishy
Ammonia	NH_3	Ammonia
Diamines	$NH_2(CH_2)_4NH_2$, $NH_2(CH_2)_5NH_2$	Decayed flesh
Hydrogen Sulfide	H_2S	Rotten eggs
Mercaptans (methyl and ethyl)	CH_3SH, $CH_3(CH_2)SH$	Decayed cabbage
Mercaptans (butyl and crotyl)	$(CH_3)_3CSH$, $CH_3(CH_2)_3SH$	Skunk
Organic Sulfides	$(CH_3)_2S$, $(C_6H_5)_2S$	Rotten cabbage
Skatole	C_9H_9N	Fecal matter

Metcalf & Eddy, 1991

While these odorous compounds do not have strong health effects at low concentrations, they can have physical and psychological effects. For this reason, DEQ regulates the emission of odor from wastewater treatment facilities. The state's general rules regarding odor control (IDAPA 58.01.01 Section 776) state that "no person shall allow, suffer, cause or permit the emission of odorous gases, liquids or solids into the atmosphere in such quantities as to cause air pollution." The enforceability of this regulation is limited, however, due to the difficulty in quantitatively measuring an increase in air pollution due to odor emissions. Often the enforcement of odor control regulations is left at the discretion of the DEQ's inspector, with consideration given to the amount of effort taken to control odor emissions from the facility.

It is important to note that jurisdictional regulations are often not the driving factor for odor control. Regardless of the loadings to the facilities and local rules, the communities and neighbors are sensitive to odors from wastewater treatment facilities. The control of nuisance odors is an important element in the system's capital and operating budgets.

3.12 Virus Control

DEQ changed state bacteria criterion from fecal coliform to E. coli in 2000 to protect the contact recreation beneficial use (IDAPA 58.01.02.251.01). Consequently, the City's 2014 discharge permit changed the bacteriological limits from fecal coliform to E. coli. EPA is in the process of evaluating coliphage-based ambient water quality criteria for recreational waters. Coliphage is a type of bacteriophage that infects E. coli. Viruses cause the majority of illnesses associated with primary contact recreation in surface waters impacted by human sources. EPA has found that coliphages are equally good indicators of fecal contamination as EPA's currently recommended criteria for E. coli and enterococci, plus they are better indicators of viruses in treated wastewater than bacteria. Coliphages are useful as an indicator because they are easily counted, similar to viruses but are non-pathogenic, and they show correlations to gastrointestinal illness. Future EPA completion of coliphage criteria and state adoption as water quality standards may impact design and operation of disinfection systems, although it should be noted that chlorination is very effective in inactivation of viruses.

3.13 Noise

Regulations pertaining to noise are not likely to be a concern in future modifications to, or construction of, wastewater treatment facilities. The City of Coeur d'Alene's code requires that "the use of property shall not create a noise level for residentially zoned property" in excess of 65 decibels during the daytime (7:00 a.m. to 10:00 p.m.) and 55 decibels during the nighttime. The current zoning of the core 4 acre wastewater treatment plant site is Residential R-7 with the treatment facility allowed as a *Special Use for Essential Services*. The current zoning for the Harbor Center property is Commercial C-17 with a potential for townhomes and office buildings. Regardless of regulations, it is important that the wastewater utility work with the surrounding community to manage noise levels and maintain the relationship with nearby neighbors.

3.14 Effluent Reclamation and Reuse

Many states recognize the value of treated municipal wastewater as a nonpotable water source. Reclaimed water has been used to serve agricultural needs, as industrial process water, and for nonpotable services in large business complexes. Switching from potable to nonpotable water for industrial uses can be very expensive, due to the need for retrofitting an existing facility with dual piping for potable and nonpotable water. However, if the savings in potable water is large enough or if the system is part of a new construction project, water reuse can meet both water conservation and pollution abatement needs.

Currently, there are no federal regulations directly governing water reuse practices in the United States. In 2012, EPA published Guidelines for Water Reuse to serve as a reference on water reuse practices. The document provided information related to indirect potable reuse (IPR), and briefly describes direct potable reuse (DPR). Because of increased interest in pursuing potable water reuse, EPA has issued the 2017 Potable Reuse Compendium to outline key science, technical, and policy considerations regarding this practice. This 2017 Compendium supplements the 2012 Guidelines for Water Reuse to inform current practices and approaches in potable reuse, including those related to direct potable water reuse. In this compendium, EPA recognizes the recent water reuse publications from the World Health Organization (WHO), the National Research Council of the National Academies of Science, the Water Environment and Reuse Foundation (WE&RF), and the Water Environment Federation (WEF). Specific knowledge and experience are drawn from case studies on existing reuse approaches.

In February 2020, EPA announced the release of the National Water Reuse Action Plan: Collaborative Implementation (Version 1). The National Water Reuse Action Plan (WRAP) is a coordinated and collaborative effort across the water user community to advance consideration of water reuse to ensure the security, sustainability, and resilience of our nation's water resources. The Action Plan seeks to promote the consideration of water reuse as a tool to improve the resiliency, security, and sustainability of the Nation's water.

3.14.1 Idaho Regulatory Guidance

Water reuse regulations have, however, been developed by many states. These regulations vary considerably from state to state. Some states, such as Arizona, California, Florida, Oregon, Texas, and Washington have developed regulations that strongly encourage water reuse as a water resources conservation strategy. These states have developed comprehensive regulations specifying water quality requirements, treatment processes, or both for the full spectrum of reuse applications. The objective is to derive the maximum resource benefits of the reclaimed water while protecting the environment and public health. Idaho also has regulations that govern the reclamation and reuse of municipal and industrial wastewater in IDAPA 58.01.17 Recycled Water Rules.

In terms of regulatory review and approval, effluent reuse is a permitted process in the State of Idaho and guidance is provided in The Guidance for Reclamation and Reuse of Municipal and Industrial (DEQ 2007). A DEQ water reuse permit and annual reporting is required for the use of reclaimed water. The reuse permit application process begins with a meeting with DEQ to discuss application requirements. The Recycled Water Reuse Permit Application includes site-specific information, facility and topographic maps, and wastewater reuse-specific information. Upon receipt of the application, DEQ reviews the applicant's information and, if all requirements have been met, issues a completeness determination within 30 days. If the application is determined to be complete, DEQ will then set the effective date of the application. Within 30 days following the effective date of the application, DEQ will issue a preliminary decision to prepare a draft permit or deny the application. Following a decision to prepare a draft permit, DEQ will prepare the draft permit within 60 days. The public is then notified that a draft permit has been issued and is given an opportunity to comment.

A water reuse permit from DEQ does not supersede any other regulatory permit requirement that may apply to reclaimed water reuse, including:

- NPDES discharge permitting requirements
- Idaho Department of Water Resources requirements related to water rights
- Local planning and zoning requirements

The regulations that apply to the quality of reclaimed water used for nonpotable services depend on the intended water use. Water used for application to public lands or food crops to be consumed without extensive processing must meet more stringent water quality standards than water used for forest irrigation or other applications where the chance of human contact is low. The State of Idaho requires the conditions shown in Table 3-11 to be met for various types of reclaimed water applications.

On January 1, 1995, the Spokane Valley-Rathdrum Prairie Aquifer was designated as a special resource ground water in Idaho. A special guidance document has been developed that has specific recommendations for wastewater-land application treatment systems on this aquifer. The Special Supplemental Guidelines for Spokane Valley- Rathdrum Prairie Aquifer Wastewater Land Application can be found in the Guidance for Reclamation and Reuse of Municipal and Industrial Section 12.11.1. Wastewater Land Application Sites Overlying Designated Special Resource Water (DEQ 2007).

Table 3-11: Reclaimed Water Treatment Requirements

Reclaimed Water Use	Quality and Treatment Requirements
Unrestricted Urban Reuse	Disinfected, oxidized, coagulated, clarified, and filtered Total coliform - 2.2/100 ml (median)
Restricted Urban Reuse	Disinfected and oxidized Total coliform 230/100 ml (median)
Agricultural Reuse - Food Crops	*Consumed Raw:* Disinfected, oxidized, coagulated, clarified, and filtered Total coliform - 2.2/100 ml (median) *Processed foods & orchards & vineyards with no direct contact of reclaimed water:* [1] Unrestricted public access Disinfected primary effluent Total coliform - 230/100 ml [2] Restricted public access Primary effluent
Agricultural Reuse - Non-food Crops	*Unrestricted public access:* Disinfected primary effluent Total coliform - 230/100 ml (single sample) *Restricted public access:* Primary effluent

EPA Manual - Guidelines for Water Reuse

3.15 References

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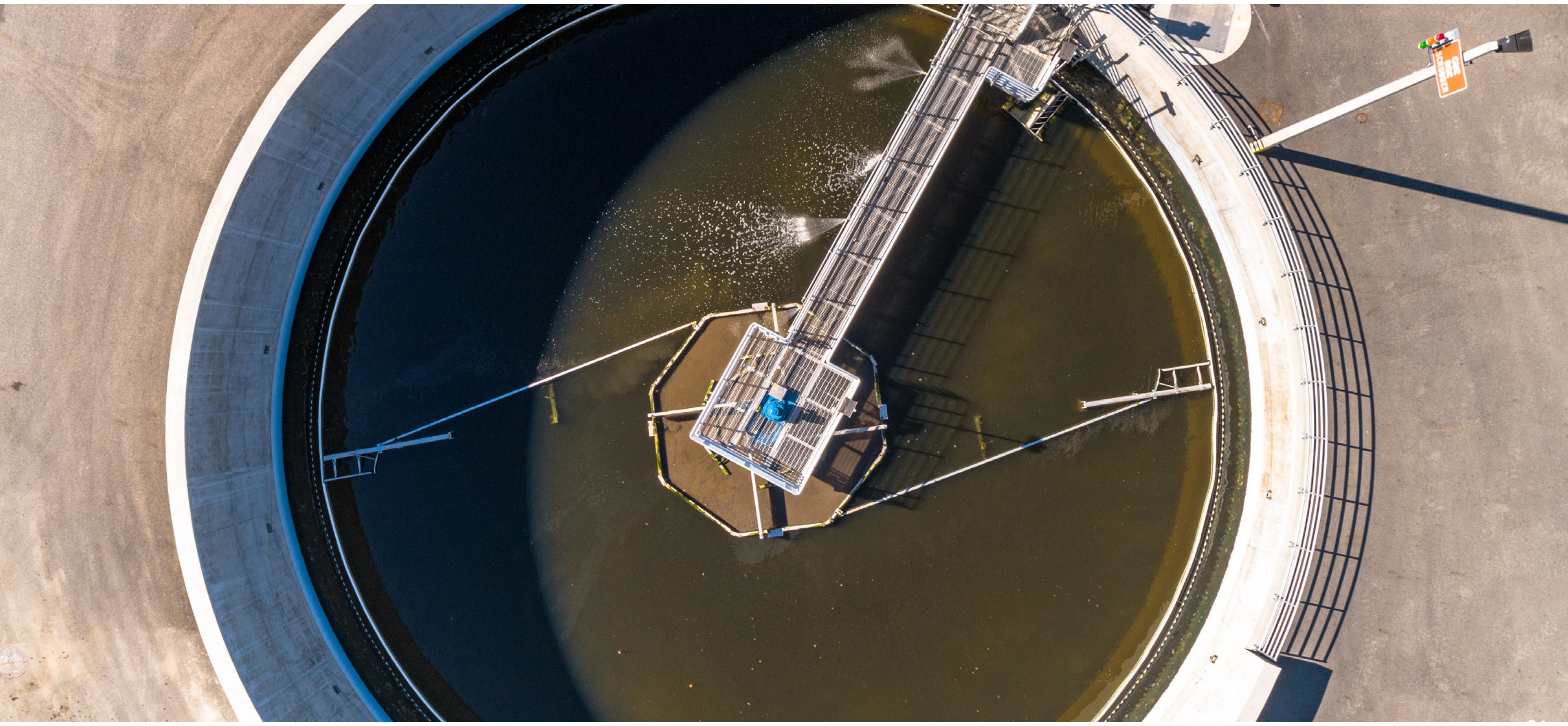
HDR

Chapter 4 - 2018 Facility Plan Update

Existing Resources



Chapter 4 Existing Resources

This chapter describes the treatment systems at the Coeur d'Alene Advanced Water Treatment Facility (AWTF), reviews the plant's expansion history, summarizes the design criteria for major unit processes and associated equipment, and summarizes their general condition.

4.1 Expansion History

The Coeur d'Alene AWTF began operation in 1939. The original treatment plant comprised of primary clarification and a low-rate trickling filter for removal of carbonaceous BOD prior to discharge to the Spokane River. Solids handling consisted of gravity thickening, anaerobic digestion, and land application of liquid sludge. In 1974, the plant was upgraded to provide treatment to an average flow of 2.5 mgd, with grit removal, primary clarification, chlorination, biosolids thickening, an additional anaerobic digester, and the initial laboratory and garage.

Since the early 1980s, the plant has been modified or expanded through a number of construction contracts to produce the current site plan shown in Figure 2-1 for the treatment plant, and Figure 4- for the compost facility. Those modifications with significant impact on operation or capacity are listed below:

- Addition of new, larger secondary clarifier – operational in 1983.
- Phase 2 Expansion: replacement of two raw sewage pumps, initial solids contact tank, secondary control building, second secondary clarifier, chlorine contact tank, chlorine building, effluent pump station, outfall, control building for Anaerobic Digester Nos. 1 and 2, Anaerobic Digester No. 3, solids building including Belt Filter Press – operational in 1985.
- Phase 2A Expansion: garage/shop facility and construction of a laboratory/operator building (now the Operations Center).
- Phase 3A Expansion: primary influent split box, Primary Clarifier No. 2, primary sludge pumping station – operational in 1988.
- Phase 3B Expansion: replacement of comminutor with bar screen, replacement of two raw sewage pumps, pre-aeration/grit removal, dechlorination, Gravity Thickener Nos. 2 and 3 – operational in 1989. This project also included modifications to the primary effluent box.
- Initial Compost Facility – operational in 1989.
- Compost Upgrades – Phase 2A: addition of outside blowers to handle greater sludge generation; Phase 2B: expansion of covered space for compost and bulking agent; and Phase 3: materials handling improvements.
- Phase 3C Expansion: trickling filter pumping station, Trickling Filter Nos. 1 and 2, expanded solids contact/RAS storage tanks, liquid stream alum and polymer feed systems, second belt filter press and polymer feed equipment, Digester No. 4 – operational in 1995.
- Odor Control Modifications and Riverside Sanitary Sewer: new compost filter bed treatment with foul air collection duct – operational in 1999. The Riverside Sanitary Sewer, which is routed through the middle of the treatment plant site, was also constructed in 1999.

- Phase 4A and 4B Upgrades: new bar screens, influent pumping station, primary clarifier covers and centrifuge dewatering – operational in 2007.
- Phase 5A Ammonia Nitrogen Improvement: IFAS modules added to solids contact/reaeration tanks, filler effluent piping modification, centrate return modification, and rotary screen thickening addition – operational in 2009.
- Stormwater Station: stormwater pump station was added – operational in 2009.
- Phase 5B Solids Processing Improvements: Admin/Lab Building, maintenance garage, Digester Control Building, Biogas Control Building, and Anaerobic Digester No. 5 – operational in 2012.
- Tertiary Treatment Phase 1 (Phase 5C.1): Initial Tertiary Membrane Filtration (TMF) and Nitrification Improvements: secondary effluent transfer pump station, TMF process (chemical mixing tanks, membrane tanks, support building) – operational in 2015.
- Tertiary Treatment Phase 2: TMF expansion, Primary Clarifier No. 3, Secondary Clarifier No. 3, Secondary Control Building 2 – completed in 2019.

4.2 Overview of Current Treatment Narrative

The Coeur d'Alene AWTF operates under a National Pollutant Discharge Elimination System (NPDES) permit, which includes year-round effluent limits for carbonaceous biochemical oxygen demand (BOD) and total suspended solids (TSS) limits, among other parameters, and seasonal effluent limits for total phosphorus and ammonia nitrogen. The City received a renewed NPDES permit in December 2014. The new permit has significantly lower effluent limits for total phosphorus and ammonia nitrogen along with extended seasons.

The major liquid treatment processes include influent screening, grit removal, primary clarification, trickling filters, solids contact (previously with integrated fixed film activated sludge system (IFAS) removed in 2019), secondary clarifiers, solids re-aeration, tertiary membrane filtration (TMF) with chemical sludge recirculation, and chlorine disinfection. The trickling filters/solids contact process removes BOD and some ammonia. Chemical phosphorus removal occurs at three different locations: 1) primary clarifiers, 2) secondary clarifiers, and 3) TMF. The TMF facility provides additional ammonia removal capacity and final phosphorus removal.

A flow schematic of the treatment process is shown in Figure 4-.

1. Screening Building
2. Influent Pump Station
3. Standby Generator #1
4. Shop and Garage
5. Operations Control Center
6. Primary Clarifier #1
7. Primary Clarifier #2
8. Gravity Thickener #3
9. Gravity Thickener Control Building
10. Gravity Thickener #2
11. Gravity Thickener #1
12. Anaerobic Digester #3
13. Solids Building
14. Anaerobic Digester #4
15. Centrate Pump Station
16. Digester Control Building #1/Sludge Pump House
17. Sludge Storage Tank
18. Anaerobic Digester #2
19. Centrate Storage
20. Pre-Aeration/Grit Removal
21. Primary Control Building
22. Trickling Filter Pump Station
23. Storage
24. Anaerobic Digester #5
25. Biogas Building
26. Digester Control Building #2
27. Trickling Filter #1
28. Trickling Filter #2
29. South Compost Biofilter
30. North Compost Biofilter
31. Secondary Clarifier #1
32. Secondary Effluent Pump Station
33. Building Removed*
34. Secondary Control Building #1
35. Building Removed*
36. Solids Contact/RAS Storage Basin #1
37. Secondary Clarifier #2
38. Solids Contact/RAS Storage Basin #2
39. Standby Generator #2
40. Chemical Systems Center
41. Chlorine Building
42. Effluent Pump Station
43. Chlorine Contact Tank
44. Collections Storage Building
45. Collection Maintenance Garage
46. Administration/Laboratory Building
47. Membrane Tanks
48. TMF Equipment Building
49. Standby Generator #3
50. Primary Clarifier #3*
51. Secondary Control Building #2
52. Secondary Clarifier #3*

*Note: To be completed in 2019 as part of Tertiary Treatment Phase 2.

Figure 4-9: Plant Aerial Photo (Note that IFAS media removed in 2019)

Figure 4-10: Compost Facility Aerial Photo

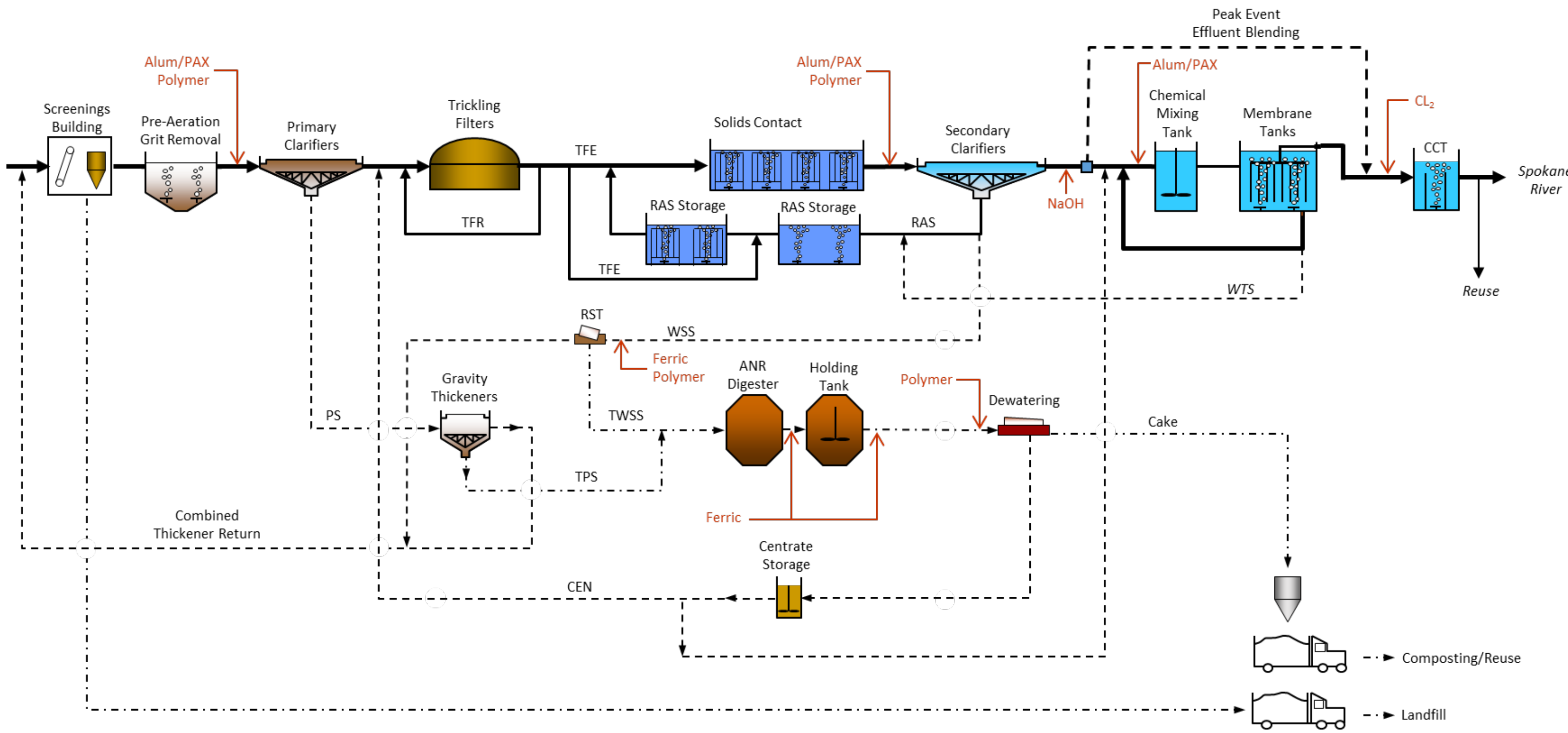


Figure 4-11: Process Flow Schematic

4.3 Facility Assessment

HDR process personnel met with the City's staff on May 22 and 23, 2018 to perform the facility assessment. This assessment included a visual field inspection of the facility components, specifically mentioned in this report, and also included interviews with plant staff and leadership personnel. Additional field visits have also been performed by on-site HDR personnel during the ongoing Tertiary Treatment Phase 2 construction project. The assessment focused on the review of process equipment and general structural condition of the facilities. Because of the limited time available, the scope of the assessment did not include detailed review of heating, ventilation, and air conditioning (HVAC) equipment, and electrical systems.

A rating methodology was developed which considered condition, reliability, and capacity of equipment and structures. Condition rating was based on a range from new or excellent condition to unserviceable. A higher assessment score indicates an asset that should be rehabilitated or replaced soon. A lower score is associated with an asset that should have many years of service remaining. This facility assessment focuses on evaluating the facilities and equipment with continued use expectations, and did not evaluate the new Administration/Laboratory, Collection Maintenance Facilities and Tertiary Treatment facilities since they were recently constructed.

The purpose of the facility assessment was to evaluate the current status of the assets at the AWTF, and excluded evaluation of the City's off-site compost facility. The results of the facility assessment has been compared against the calculated remaining useful life estimates, which are based on the asset installation year and assumed useful life. In some cases, the estimated remaining useful life is modified when items indicating that the asset is near the end of its useful life were observed in the field to be in good working order and the typical life expectancy could be extended. Based on the findings of the facility assessment, recommendations are made for further evaluation, renewal or replacement, and additional improvements. The recommendations will be prioritized according to criticality in maintaining current operations and addressing safety concerns.

The results of this assessment indicated that the AWTF has a minimal number assets that require immediate attention or are considered critical improvements. Some of the key equipment items that were evaluated need to be included in planning for routine replacement. This was due to a projected future deficiency based on the current condition and the age of the asset compared to its estimated useful life. The structures targeted for continued use appeared to be in reasonable condition structurally; with exceptions including the need to further evaluate the existing grit removal facilities and repairs to the effluent outfall.

The facility assessment was used to identify current deficiencies in the facility, and assessment results paired with asset age were used to project future deficiencies. No recommended improvements were identified in this section based on age alone. A discussion on long-term rehabilitation & replacement (R&R) funding requirements is addressed in Chapter 7.

A summary key asset inventory and a facility assessment spreadsheet is included in Appendix A.

4.3.1 Assessment Methodology

A critical first step to completing the facility assessment was the development of an asset registry. An asset registry involves both an inventory of assets as well as the organization of those assets into an asset hierarchy. For the City, an asset registry was developed following the on-site review using notes made on asset condition assessment forms completed during the site visit.

The asset inventory focused on major treatment-related process and structural assets and was based on data collection performed during a two-day site visit to the facility and supplemented with additional data provided by the City including drawings, asset lists and maintenance records. Although electrical and mechanical were not evaluated in detail during the two-day site visit, the general condition of those assets was also considered for development of the condition assessment key findings. City operations staff accompanied the HDR field team which included experienced wastewater treatment engineers. Structural and mechanical components were evaluated in general using the same project team. Over 150 key process and structural assets were evaluated at during the site visit.

Assets not fully captured in the assessment included buried valves and ancillary support systems such as HVAC. When available, detailed asset attribute data were captured, including: asset tag ID, asset type, asset size, asset capacity/horsepower (hp), manufacturer, and asset installation year. Based on the collected asset inventory and the identified asset class for each asset, an assumed useful life was determined for each based on its class and a standard library of useful life assumptions by class. Using the estimated useful life and the installation data for each asset, an estimated remaining useful life value will be determined for each. For example, a pump with a 20-year assumed useful life and installed in 2005, would (in 2018) have an estimated remaining useful life of seven years. The remaining useful life estimates have been calculated to give an indication of where an asset is in its assumed life cycle. The asset inventory and remaining useful life estimates are provided in the facility assessment spreadsheet included in Appendix A.

During the field visit to the facility, a visual condition assessment of above ground facilities utilizing a team of professional personnel familiar with the design and operation of wastewater treatment plants was performed. The HDR field team did not perform any destructive or non-destructive testing, vibration testing, load testing, capacity analysis, infrared inspections, oil sampling, or performance testing during this visit. The intent of the visual condition assessment was to provide a consistent evaluation of asset condition at the City's facilities following a standard HDR condition assessment process. Condition assessment rating forms were completed separately for structural assets. Electrical and mechanical assets were not included.

The condition assessment resulted in a condition rating which ranged from new, or excellent condition, to unserviceable. The rating scale for asset condition consisted of the following:

- New/excellent condition
- Minor defects only
- Moderate deterioration
- Significant deterioration
- Virtually unserviceable

If the equipment or asset did not exhibit any visual indications of a problem, and operations staff did not indicate any functional issues, the equipment was assumed to receive a score of "2 – Minor Defects Only."

In addition to assessing condition, HDR worked with City operations and maintenance staff to receive additional input on conditions. This assessment was based on the staff's experience operating and maintaining plant equipment, as well the operational context of the assets.

The maintenance history (surrogate for reliability) rating scale included the following levels:

- No breakdowns (failure not anticipated)
- Random breakdown (once every 10 years)
- Occasional breakdown (once every 5 years)
- Periodic breakdown (once every 2 years)
- Continuous breakdown (at least 1 per year)

The capacity assessment rating scale included the following levels:

- Exceeds current required capacity
- Meets current required capacity
- Minor capacity/performance Issues
- Significant capacity deficiencies
- Out of service

The three rating scale scores (condition, reliability, and capacity) are summed for each individual asset to provide an overall assessment score, as shown in the following formula:

Assessment Score = Condition Score + Reliability Score + Capacity Score

A higher assessment score indicates an asset with an identified deficiency that should be a priority for a repair, replacement, and/or capital improvement project. In addition to considering the overall assessment score, the individual assessments were also reviewed, specifically for condition, to determine if the individual results warranted rehabilitation or replacement of an asset. For example, an asset with a condition assessment score of 5 (virtually unserviceable) may not be ranked as high as other assets based on its overall assessment score, but clearly based on condition alone it is apparent that it requires rehabilitation or replacement.

The assets evaluated, and their associated Assessment Score, are presented in Table 4-1.

Table 4-1: Asset Evaluation by Process Area

Process ID	Process	Process Unit/Structure/Asset Class	Equipment Description 1	Asset Tag ID	% of Remaining Useful Life	Condition Rating	Reliability Rating	Capacity Rating	Asset Condition	Replace/ Repair	Recommended Replacement/Repair/Upgrade
100	**Bar Screen**	Traveling Rake	Bar Screen 1	BSN-1000	40%	3	2	1	**6**		
100	**Bar Screen**	Traveling Rake	Bar Screen 2	BSN-1005	40%	3	2	1	**6**		
100	**Bar Screen**	Washer	Washer/Conveyor	WHR-1010	40%	3	2	4	**9**	Repair	Grinder Under-sized, passes plastics
100	**Bar Screen**	Washer	Washer/Conveyor	WHR-1015	40%	3	2	4	**9**	Repair	Grinder Under-sized, passes plastics
100	**Bar Screen**	Grit Cyclone	Cyclone Classifier	SEP-1505	12%	4	2	2	**8**	Replace	Significant Wear
100	**Bar Screen**	Grit Cyclone	Cyclone Classifier	SEP-1500	12%	4	2	2	**8**	Replace	Significant wear
100	**Bar Screen**	Crane	OH Crane	CRN-1060	50%	3	1	2	**6**		
100	**Influent Pump Station**	Pump	Influent Pump 1	P-1020	50%	3	1	2	**6**		
100	**Influent Pump Station**	Pump	Influent Pump 2	P-1025	50%	3	1	2	**6**		
100	**Influent Pump Station**	Pump	Influent Pump 3	P-1030	50%	3	1	2	**6**		
100	**Influent Pump Station**	OH Crane	Crane	CRN-1065	50%	3	1	2	**6**		
100	**Influent Pump Station**	Pump	Sump Pump	P-1045	25%	4	2	2	**8**		
100	**Influent Pump Station**	Pump	Sump Pump	P-1046	25%	4	2	2	**8**		
100	**Pretreatment Gallery 1**	Mechanisms	Gravity Thickener 1	T-9101	-40%	5	2	2	**9**		Consider Demolition
100	**Pretreatment Gallery 1**	Mechanisms	Gravity Thickener 2	T-9201	-24%	5	2	2	**9**		
100	**Pretreatment Gallery 1**	Mechanisms	Gravity Thickener 3	T-9301	-24%	5	2	2	**9**		
100	**Pretreatment Gallery 1**	Pump	Grit Pump	P-1615	87%	1	2	2	**5**		Pump recently rebuilt or replaced.
100	**Pretreatment Gallery 1**	Pump	Grit Pump	P-1625	87%	1	2	2	**5**		Pump recently rebuilt or replaced.
100	**Pretreatment Gallery 1**	Pump	Grit Pump	P-1635	87%	1	2	2	**5**		Pump recently rebuilt or replaced.
100	**Pretreatment Gallery 2**	Blower	Pre-Aeration	B-1671	9%	4	3	2	**9**	Replace	Replace this unit?
100	**Pretreatment Gallery 2**	Blower	Pre-Aeration	B-1681	9%	4	3	2	**9**	Replace	Replace this unit?
100	**Pretreatment Gallery 2**	Pump	Sump Pump	P-1641	-55%	5	3	2	**10**	Replace	
100	**Pretreatment Gallery 2**	Pump	Sump Pump	P-1646	-55%	5	3	2	**10**	Replace	
100	**Pretreatment Gallery 2**	Pump	Thickened Solids Pump	P-9421	55%	2	4	2	**8**		High pressure causing accelerated lobe wear.
100	**Pretreatment Gallery 2**	Pump	Thickened Solids Pump	P-9431	55%	2	4	2	**8**		High pressure causing accelerated lobe wear.
100	**Pretreatment Gallery 3**	Compressor	Compressor	CP-1691	-24%	5	3	2	**10**		
200	**Primary Clarifier**	Mechanisms	Primary Clarifier 1	DU-212	80%	1	1	2	**4**		Recommend moving lighting to outside
200	**Primary Clarifier**	Mechanisms	Primary Clarifier 2	DU-222	84%	1	1	2	**4**		Recommend moving lighting to outside
200	**Primary Sludge Pump Station**	Pump	PC#1 Scum Pumps	P-2040/2041	70%	2	2	2	**6**		
200	**Primary Sludge Pump Station**	Pump	PC#2 Scum Pumps	P-2050/2051	70%	2	2	2	**6**		
200	**Primary Sludge Pump**	Pump	Sludge Pump 1	P-231	67%	2	3	2	**7**	Replace	Pump likely has been rebuilt since 1987
200	**Primary Sludge Pump**	Pump	Sludge Pump 2	P-232	67%	2	3	2	**7**	Replace	Pump likely has been rebuilt since 1987
200	**Primary Sludge Pump**	Pump	Sludge Pump 3	P-233	70%	2	3	2	**7**	Replace	Pump likely has been rebuilt since 1987
200	**Primary Sludge Pump**	Pump	Primary Clarifier 3	P-250-04	97%	1	1	1	**3**		
200	**Sump Pump**	Pump	Sump Pump 1	P-241	-60%	5	2	2	**9**	Replace	
200	**Sump Pump**	Pump	Sump Pump 2	P-242	-60%	5	2	2	**9**	Replace	
400	**Trickling Filters**	Pump	Feed Pump 1	P-4112	17%	4	3	4	**11**	Replace	Pump rebuilt since original installation.
400	**Trickling Filters**	Pump	Feed Pump 2	P-4122	17%	4	3	4	**11**	Replace	Pump rebuilt since original installation.
400	**Trickling Filters**	Pump	Feed Pump 3	P-4132	17%	4	3	4	**11**	Replace	Pump rebuilt since original installation.
400	**Trickling Filters**	Pump	Recirculation Pump 1	P-4211	17%	4	3	3	**10**	Replace	Pump rebuilt since original installation.
400	**Trickling Filters**	Pump	Recirculation Pump 2	P-4221	17%	4	3	3	**10**	Replace	Pump rebuilt since original installation.
400	**Trickling Filter 1**	Fan	Odor Control	F-4571	0%	5	3	3	**11**	Replace	Fan at end of useful life.
400	**Trickling Filter 1**	Fan	Odor Control	F-4510	0%	5	2	2	**9**		
400	**Trickling Filter 1**	Fan	Odor Control	F-4500	0%	5	2	2	**9**		
400	**Trickling Filter 2**	Fan	Odor Control	F-4671	0%	5	3	3	**11**	Replace	Fan at end of useful life.
400	**Trickling Filter 2**	Fan	Odor Control	F-4515	64%	2	2	3	**7**		
400	**Trickling Filter 2**	Fan	Odor Control	F-4505	64%	2	2	3	**7**		
500	**Secondary Clarifier 1**	Mechanism/drive	Solids Removal	C-501-01	56%	2	2	2	**6**		Drive recently upgraded.
500	**Secondary Clarifier 2**	Mechanism/drive	Solids Removal	C-501-02	64%	2	2	2	**6**		Drive recently upgraded.
500	**Secondary Clarifier 3**	Mechanism/drive	Solids Removal	C-501-03	100%	1	1	1	**3**		Drive under installation
500	**Secondary Clarifiers**	Pump	Secondary Effluent Transfer Pump 1	P-591-01	97%	1	1	1	**3**		Pump just commissioned.
500	**Secondary Clarifiers**	Pump	Secondary Effluent Transfer Pump 2	P-591-02	97%	1	1	1	**3**		Pump just commissioned.
500	**Secondary Clarifiers**	Pump	Secondary Effluent Transfer Pump 3	P-501-03	97%	1	1	1	**3**		Pump just commissioned.
500	**Secondary Clarifiers**	Pump	Return Secondary Sludge Pump 1	P-530	-7%	5	5	2	**12**	Replace	
500	**Secondary Clarifiers**	Pump	Return Secondary Sludge Pump 2	P-540	-7%	5	3	2	**10**	Replace	

Process ID	Process	Process Unit/Structure/Asset Class	Equipment Description 1	Asset Tag ID	% of Remaining Useful Life	Condition Rating	Reliability Rating	Capacity Rating	Asset Condition	Replace/ Repair	Recommended Replacement/Repair/Upgrade
500	**Secondary Clarifiers**	Pump	Return Secondary Sludge Pump 3	P-550	-7%	5	3	2	**10**	Replace	
500	**Secondary Clarifiers**	Pump	Dewatering Sump Pump	P-001-01	97%	1	1	1	**3**		Pump just commissioned.
600	**Disinfection**	Mixer	Chlorine Induction Unit	CM-501	40%	3	3	2	**8**		
600	**Effluent Pumping Station**	Pump	Effluent Pump	P-610	50%	3	2	2	**7**		
600	**Effluent Pumping Station**	Pump	Effluent Pump	P-611	50%	3	2	2	**7**		
600	**Effluent Pumping Station**	Pump	3W Pump	P-6271	90%	1	3	2	**6**		
600	**Effluent Pumping Station**	Pump	3W Pump	P-6281	90%	1	3	2	**6**		
700	**Anaerobic Digestion**	Feeder	Polymer Feed	PPU-7601	48%	3	3	3	**9**		
700	**Anaerobic Digestion**	Mechanisms	Polymer Makeup Unit	PMU-7603	48%	3	2	2	**7**		
700	**Anaerobic Digestion**	Pump	Polymer Transfer Pump	PTP-7610	48%	3	2	2	**7**		
700	**Anaerobic Digestion**	Pump	Polymer Feed	PSP-7602	48%	3	2	2	**7**		
700	**Anaerobic Digestion**	Pump	Polymer Feed	PSP-7615	48%	3	2	2	**7**		
700	**Anaerobic Digestion**	Tank	Polymer Storage	PSU-7611	48%	3	2	2	**7**		
700	**Anaerobic Digestion**	Centrifuge	Dewatering	CEN-7510	0%	5	3	2	**10**		Unit re-built in 2017
700	**Anaerobic Digestion**	Belt Filter Press	Dewatering	BFP-7815	20%	4	4	3	**11**	Replace	
700	**Old Solids Handling Building**	Grinder	Digester 3	GRD-7861	24%	4	3	2	**9**	Replace	Grinder was moved in 2006
700	**Old Solids Handling Building**	Pump	Digester 3 & 4	P-7511	0%	5	2	2	**9**		
700	**Old Solids Handling Building**	Pump	Digester 3 & 4	P-7531	0%	5	2	2	**9**	Replace	Consider renewal and replacement
700	**Old Solids Handling Building**	Mechanisms	Digester 4	HEX-7502	68%	2	2	2	**6**	Replace	Consider renewal and replacement
700	**Old Solids Handling Building**	Mechanisms	Digester 4	HEX-7503	68%	2	2	2	**6**		
700	**Old Solids Handling Building**	Grinder	Digester 4	GDR-7501	47%	3	4	4	**11**	Replace	High pressure requires different design.
700	**Old Solids Handling Building**	Pump	Digester 3	P-7851	56%	2	2	2	**6**		
700	**Old Solids Handling Building**	Pump	Digester 3	P-7852	52%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Pump	Digester 5	P-78026	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Pump	Digester 5	P-78024	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Mechanisms	Digester 5	HEX-7803	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Mechanisms	Digester 5	GRD-7801	47%	3	2	2	**7**		
700	**Digester Complex-Main Level**	Pump	Digester 5	P-78027	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Pump	Digester 5	P-78029	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Pump	Digester 5	P-78030	70%	2	2	1	**5**		
700	**Digester Complex-Main Level**	Pump	Digester 5	P-78031	70%	2	2	1	**5**		
700	**Digester Complex-Main Level**	Pump	Ferric Feed Pumps	P-7803	40%	3	2	2	**7**		Pump not used.
700	**Digester Complex-Main Level**	Pump	Ferric Feed Pumps	P-7804	40%	3	2	2	**7**		Pump not used.
700	**Digester Complex-Main Level**	Pump	Ferric Pumps	P-7801	40%	3	2	2	**7**		Pump not used.
700	**Digester Complex-Main Level**	Pump	Ferric Pumps	P-7802	40%	3	2	2	**7**		Pump not used.
700	**Digester Complex-Main Level**	Tank	RDT Floc Tank	FL-7801	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Tank	RDT Floc Tank	FL-7802	64%	2	2	2	**6**		
700	**Digester Complex-Main Level**	Tank	Thickened Sludge Tank	TST-7801	70%	2	2	1	**5**		
700	**Digester Complex-Main Level**	Tank	Thickened Sludge Tank	TST-7802	70%	2	2	1	**5**		
700	**Digester Complex-Main Level**	Pump	TS Pump	P-7810	40%	3	2	1	**6**		
700	**Digester Complex-Main Level**	Pump	TS Pump	P-7808	40%	3	2	1	**6**		
700	**Digester Complex-Main Level**	Pump	TS Pump	P-7809	40%	3	2	1	**6**		
900	**Digester Complex-Thickening Platform**	Mechanisms	Rotary Screen Thickener	RST-7801	64%	2	2	2	**6**		
900	**Digester Complex-Thickening Platform**	Mechanisms	Rotary Screen Thickener	RST-7802	64%	2	2	2	**6**		
900	**Digester Complex-Thickening Platform**	Mechanisms	Mixer	MIX-7801	64%	2	2	2	**6**		
900	**Digester Complex-Thickening Platform**	Mechanisms	Mixer	MIX-7802	64%	2	2	2	**6**		
NA	**Stormwater Pump Station**	Pump	SW Pump	P-151	57%	2	2	2	**6**		
NA	**Stormwater Pump Station**	Pump	SW Pump	P-152	57%	2	2	2	**6**		
NA	**Stormwater Pump Station**	Pump	SW Pump	P-153	57%	2	2	2	**6**		

4.3.2 Assessment Summary

The purpose of the facility assessment was to evaluate the current status of the assets at the City's AWTF. The results of the facility assessment were compared against the calculated remaining useful life estimates, which were based on the asset installation year and assumed useful life. In some cases, the estimated remaining useful life was modified when items indicating that the asset is near the end of its useful life were observed in the field to be in good working order and the typical life expectancy could be extended. Based on the findings of the facility assessment, recommendations were made for improvements at each facility.

The general results of this assessment indicated that the AWTF does not have assets requiring immediate attention. A limited number of equipment items need to be planned for routine replacement due to a projected future deficiency based on the current condition and the age of the asset compared to its estimated useful life. Most structures targeted for continued and/or alternate future uses appeared to be in reasonable condition structurally; exceptions are noted in the following sections.

The facility assessment was used to identify current deficiencies, and assessment results paired with asset age were used to project future deficiencies. No recommended improvements were identified in this section based on age alone.

Key condition assessment findings are discussed below by Process Area.

4.4 Liquid Stream

The following section provides descriptions, design information, and condition information of the liquid stream processes. It also incorporates condition assessment findings and recommendations.

4.4.1 Screenings Building

Two influent sewers enter the head of the Screenings Building where flow splits to two screening channels. Each channel contains a traveling rake-type bar screen. Normally, the screens operate continuously and not on differential liquid level, time or flow. Downstream of the two influent channels, the flow recombines in a common channel prior to entering a Parshall flume for influent flow measurement. Debris and material collected from the bar screen is conveyed by sluice to one of two screenings washer/grinders. Screenings are washed, ground, and dewatered and are collected in a dumpster for landfill disposal.

The Screenings Building also contains grit handling equipment. Grit slurry is pumped from the pre-aeration tank (Section 4.4.4) to the grit classifiers/washer. The cyclone separates the majority of the water from the grit and discharges to the influent pump station. Grit is then washed in the classifier tank and dewatered by screw conveyor before discharging to a separate dumpster. A summary of design information for the screening building components is presented in Table 4-2.

Table 4-2: Screening Design Summary

Parameter	Unit	Value
Bar Screens		
Type	-	Traveling Rake
Number	-	2
Screen Spacing	inch	0.25
Capacity, each	mgd	16
Sluice Conveyance		
Diameter	inch	12
Wash Water Flow	gpm	100
Screening Grinder/Washer		
Number	-	2
Capacity, each	cf/hr	25
Grit Classifier/Washer		
Type	-	Cyclone/Conveyor
Number	-	2
Inlet Flow Rate, each	gpm	200
Cyclone Size, each	inch	10
Capacity, each	ton/hr	2

4.4.1.4 Capacity and Redundancy

Each influent bar screen has a rated capacity of 16 mgd for a total screening capacity of 32 mgd. Historical peak flow events recorded are between 10 to 12 mgd. The current screen capacity provides full redundancy and sufficient capacity for the planning period.

Capacity limitations of the screenings grinders have been noted by plant staff.

4.4.1.5 Condition and Operational Issues

- Plastics are passed through screenings grinder units, and accumulate in the digesters and centrate storage facilities. Evaluation of an alternative screenings washing/grinding system is recommended. Alternatively, plastics removal from the dewatering centrate should be considered.
- The grit and screenings storage area floor is heavily corroded due to washed grit drainage from the grit dumpsters. Evaluation of an alternative grit storage, and co-storage with washed screenings, is recommended. Evaluation of a modified floor with added drainage facilities is needed.
- Grit classifier/washer units are approaching the end of their useful life, and the classifier trough section has been replaced. Bearing failure have caused issues with the screw auger. Renewal and replacement of the grit handling equipment should be included in capital improvement planning.

4.4.2 Influent Flow Monitoring

Influent flow monitoring is by a level element measuring the liquid levels through a Parshall flume, which is a fixed hydraulic structure that changes water depth in a specific location upstream of the flume throat. An ultrasonic level element is used to determine water depth. The influent composite sampler draws from just upstream of the flume. A summary of the influent flow design information is presented in Table 4-3.

Table 4-3: Influent Flow Design Summary

Parameter	Unit	Value
Type	-	Parshall Flume
Throat Width	inch	36
Capacity	mgd	32

4.4.2.1 Capacity and Redundancy

The Parshall flume was initially sized for future peak flow conditions that have not been reached. This contributes to inaccuracy in flow measurements at nighttime low flows. There is no redundancy, but since the process is a fixed hydraulic structure there is little concern for failure. The level sensor should be regularly maintained to reduce unexpected downtime.

4.4.2.2 Condition and Operational Issues

- The Parshall flume flow measurement is over-sized for future peak conditions. Influent flow measurement has poor resolution during low flows events. High levels in the influent pump station can also cause surcharging in the flume and result in inaccurate measurements of high flow events. Evaluation of potential adjustments to the influent pump station controls are recommended, as opposed to other options, such as installation of a nested flume with narrower throat section to better match current flows.

4.4.3 Influent Pump Station

The Influent Pump Station is a wet well/drywell pumping station that can accommodate a peak capacity of 34.2 mgd. The station has three centrifugal pumps, with space for a future fourth unit. The pumps discharge to a common header that conveys the flow to the pre-aeration grit basin. Pump speeds are controlled by variable frequency drives (VFDs) based on water level in the wet well. A summary of the Influent Pump Station design information is presented in Table 4-4.

Table 4-4: Influent Pump Station Design Summary

Parameter	Unit	Value
Influent Pumps		
Type	-	Non-Clog Centrifugal, Dry Pit
Number	-	3
Drive		VFD
Size, each	HP	125
Capacity, each	mgd	11.4
Firm Capacity, one unit out of service	mgd	22.8

4.4.3.3 Capacity and Redundancy

The firm capacity of the Influent Pump Station is 22.8 mgd. This is sufficient capacity and redundancy for the current planning period.

4.4.3.4 Condition and Operational Issues

- The station structure is in good condition. Pumping unit renewal and replacement is not required for approximately 7 years. Including the pumping system with associated electrical equipment and controls on a capital improvement schedule is recommended due to the size and high cost of the components.
- The pump station heating system has experienced problems with accelerated degradation of the hot water heating coils that serve the Influent Pump Station and Screenings Building air handlers. Air movement involves 100 percent outside air for the air handlers which creates corrosion problems for the heating coils. Modification of the air movement to include a recycle air stream from the building(s) is recommended to assure tempered air is directed to the heating coils under all conditions.
- Pump controls should be corrected to reduce occurrences of surcharging on the Parshall flume at high flows.

4.4.4 Preliminary Treatment/Pre-aeration

Preliminary treatment consists of one aerated grit basin. Low-pressure air is provided by one of two positive displacement blowers. The grit basin is covered for odor control. The grit basin is divided into three hoppers, each served by a recessed impeller grit pump. The three pumps discharge to a common force main which conveys the grit slurry to grit handling equipment located in the Screenings Building. The grit washer discharges to a commercial dumpster on the ground floor for subsequent haul to a landfill for disposal. A summary of the grit removal design information is presented in Table 2-1.

Table 4-5: Preliminary Treatment/Pre-aeration Design Summary

Parameter	Unit	Value
Grit Removal		
Type	-	Aerated Tank
Number	-	1
Volume	gal	75,000
Maximum Capacity	mgd	6
Grit Pumps		
Type	-	Recessed Impeller
Number	-	3
Capacity, each	gpm	200
Pre-aeration Blowers		
Type	-	Positive Displacement
Number	-	2
Capacity, each	scfm	260

4.4.4.5 Capacity and Redundancy

The pre-aeration grit basin and ancillary equipment were designed to handle a peak flow of 6 mgd. Peak flows above this capacity shifts grit removal to the primary clarifiers. The primary sludge pumps can handle grit; however, the primary sludge cannot be degritted prior to subsequent thickening and digestion. This condition puts excessive wear on the rotary lobe thickened sludge pumps and allows grit into digesters, thereby reducing their capacity over time. Each grit pump is dedicated to a grit hopper and there is no backup pumping capability.

4.4.4.6 Condition and Operation

- The preliminary treatment facilities were constructed prior to 1984 and were modified in 2004 to include odor control. The pre-aeration basin was placed in service in 1989.
- Pre-aeration basin capacity is limited, and added grit removal capacity will be needed for expansion beyond 6 mgd. Evaluation of renewal or replacement of the existing basin is recommended when expansion of grit removal is considered.
- Scum removal at the pre-aeration basin is manually controlled, and is not easy to access under the odor control tank cover. Modification of the scum removal downward acting gate or replacement of the gate with a fast-acting scum removal skimmer is recommended. The skimmer should be configured to provide for significant flushing periodically to enable the scum to be removed from the basin surface.

4.4.5 Primary Clarification

Screened, degritted sewage flows by gravity to a raw sewage split structure, which divides flow between two primary clarifiers. In 2019 the split structure will be modified to distribute flow to a new third primary clarifier. Alum or poly-aluminum chloride (PAX) and polymer is added ahead of the primary clarifiers for phosphorus removal. Sludge from the clarifiers is pumped by recessed impeller pumps in the Primary Sludge Pumping Station to a gravity thickener. Normally, one pump is dedicated to each primary clarifier and runs on a timer. A redundant pump is installed. Scum collection and pumping was updated in 2018. The scum pit for Primary Clarifier No. 2 will be modified to include steep fillets and will be used as a common scum put for Primary Clarifier Nos. 2 and 3. The scum pit of Primary Clarifier No. 1 will also be modified by grouting in steep fillets. Each pit will have a single submersible pump. A summary of the primary clarification design information is presented in Table 4-6.

Table 4-6: Primary Clarification Design Summary

Parameter	Unit	Value
Primary Clarifiers		
Number	-	3
Diameter	ft	60
Side Water Depth	ft	12
Total Hydraulic Loading		
At 5.25 mgd	gal/sf/day	620
Capacity at 2,500 gal/sf/day (peak hour)	mgd	21
Primary Sludge Pumps		
Type	-	Non-Clog Centrifugal
Number	-	4
Capacity, each	gpm	200
Primary Scum Pumps		
Type	-	Grinder
Number	-	2
Capacity, each	gpm	30

4.4.5.1 Capacity and Redundancy

With the completion of the third primary clarifier in 2019, the plant has a total maximum-month capacity of approximately 12.7 mgd based on a conventional overflow rate of 1,500 gal/sf/day. For peak instantaneous flows, the clarifiers will have a capacity of 21 mgd based on a conventional peak overflow rate of 2,500 gal/sf/day.

Typical redundancy criteria requires that the unit process handle maximum-month flows with the largest basin out of service. With the completion of Primary Clarifier No. 3, the plant has sufficient process redundancy through the planning horizon.

4.4.5.2 Condition and Operation Issues

- The primary clarifiers were modified in 2004 to include odor control covers. Clarifier mechanism drives were replaced in 2014 and 2015, and mechanisms were re-coated in 2010. Doors for entrance into the covers were replaced in 2018 and odor control ventilation will be modified to increase continuous air exchange.
- Clarifier mechanisms should be included in the facility renewal and replacement program, with the facility age of 2004 and expected design life of approximately 2024.
- Severe corrosion of electrical systems within the odor control cover were observed. Replacement of all interior electrical conduits, wiring and lighting is recommended. Re-location of electrical control stations (and electrical components to the greatest extent possible) to the clarifier cover enclosure is recommended.
- The Primary Sludge Pumping Building was originally constructed in 1987. Primary scum pumping was removed from the building exterior in 2004. A new primary sludge pump is being installed as part of the 2018/2019 Phase 2 Tertiary Treatment expansion project. No immediate action items were identified.
- The primary sludge pumps appeared to be in good condition, but the pumping units should be added to the facility renewal and replacement program. The pumps were rebuilt or replaced in 2009 (P-231 and P-323) and 2010 (P-233) since their original installation in 1987.

4.4.6 Trickling Filters, Solids Contact and RAS Storage

Secondary treatment is provided by high-rate plastic-media trickling filters followed by a Solids Contact/RAS Storage activated sludge system. Primary effluent is fed to the trickling filters using variable-speed, vertical turbine pumps. A portion of the trickling filter effluent is recycled to the filters to maintain adequate wetting rates. The trickling filters are covered, with ventilation provided by exterior blowers. The trickling filter air supply and ventilation systems have been integrated into the compost bed odor control system. A summary of the trickling filter design information is presented in Table 4-7.

From the trickling filters flow travels to the solids contact tanks. Air for the basins is provided by turbo blowers through fine bubble diffusers. In 2008 and 2009, integrated fixed-film activated sludge (IFAS) media was added to the solids contact basins to increase ammonia-nitrogen removal capacity. IFAS was selected based on the purported ability to enhance the treatment process of the existing system with moderate costs, quick installation, and without the need for new process tankage. The IFAS media was removed in 2019 as it was no longer needed to bolster ammonia removal with the completion of the Phase 2 Tertiary Treatment improvements.

Secondary sludge, referred to either as return activated sludge (RAS) and return secondary sludge (RSS), from the secondary clarifiers is collected in the RAS storage tanks for re-aeration prior to return to the solids contact tanks. A Return Secondary Sludge Transfer Pump provides means to send RAS to the TMF chemical mixing tanks. A summary of the Solids Contact/RAS Storage design information is presented in Table 4-8.

Table 4-7: Trickling Filters Design Summary

Parameter	Unit	Value
Trickling Filters		
Number	-	2
Diameter	ft	60
Side Water Depth	ft	20
Media Volume, total	cf	113,000
2008 Average BOD Loading	lb BOD/ 1,000cf/day	0.5
2008 Average Hydraulic Loading	gal/sf/day	48
Trickling Filter Feed Pumps		
Type	-	Vertical Turbine
Number	-	3
Capacity, each	mgd	6.6
Trickling Filter Recirculation Pumps		
Type	-	Vertical Turbine
Number	-	2
Capacity, each	mgd	2.5
Trickling Filter Effluent Transfer Pump		
Type	-	Non-Clog Submersible
Number	-	1
Capacity, each	gpm	1,050

Table 4-8: Solids Contact and RAS Storage Design Summary

Parameter	Unit	Value
Solids Contact Tank 1		
Side Water Depth	ft	12.5
Volume	cf	43,000
Number of Diffusers	-	308
Solids Contact Tank 2		
Side Water Depth	ft	12.5
Volume	cf	23,000
Number of Diffusers	-	140
RAS Storage Tanks 1 and 2		
Volume, each	cf	11,000
Number of Diffusers, each	-	62
RAS Storage Tank 3		
Volume	cf	60,000
Number of Diffusers	-	378
RAS Storage Tank 4		
Volume	cf	43,000
Number of Diffusers	-	270
RAS Storage Tank Design MLSS	mg/L	2,500
Aeration Blowers – Process		
Type	-	Turbo Blower
Number	-	2
Capacity, each	scfm	2,900
Aeration Blowers – Scour		
Type	-	Rotary
Number	-	1
Capacity, each	scfm	290
Return Secondary Sludge Transfer Pump		
Type	-	End Suction Centrifugal
Number	-	1
Capacity, each	gpm	1,050

4.4.6.1 Capacity and Redundancy

During the summer permit season, the Trickling Filter/Solids Contact (TF/SC) process provides some ammonia-nitrogen removal under current loadings. The completion of the Phase 2 Tertiary Treatment project in 2018/2019 will add additional ammonia removal capacity to the TMF and offload the TF/SC system.

Generally, redundant treatment units are not included with the TF/SC process since they are not prone to mechanical failure; however, reliability is enhanced by providing redundant equipment for critical mechanical components. The remaining life of the trickling filter media is unknown. Testing or investigation and tracking of the media condition should be conducted to better understand the condition of the system over time. The media installed is different in each of the two units: Trickling Filter 1 has American Surfpac media and Trickling Filter 2 has Brentwood media.

4.4.6.2 Condition and Operation Issues

Trickling Filters:

- The Trickling Filter Feed Pump Station was originally constructed in 1995. Pumping units have been restored or re-built since that time. Renewal and replacement of the pumps should be included in the capital replacement program. Current pumping equipment is becoming obsolete.
- Pump station electrical and controls are showing signs of significant corrosion. Control function is poor and the control devices are difficult to replace. Control of pumping at the low end of flow range is difficult. Renewal of all station electrical and controls is recommended.
- Trickling filter recirculation pumping must be maintained at higher flows during low flow conditions through the process, causing a need to operate the recirculation pumps at higher levels than needed to keep the trickling filter distribution arms operating. Modification of the trickling filter distribution arms would enable pump controls to operate at lower pumping rates.
- Trickling filters were constructed in 1994. Trickling filter media condition is unknown, and is subject to buildup of snails within the trickling filter process. Testing of trickling filter media and tracking its condition to assess remaining life expectancy is recommended. The trickling filters were initially designed to be flooded for snail control, however this operating mode is likely not workable in Trickling Filter 1 due to a structural defect that occurred during construction. Trickling filter media replacement should be included in facility renewal and replacement program.
- Trickling filter recirculation air fans were originally installed in 1994. Fans are nearing the end of their useful life and should be replaced.
- Snail buildup within the trickling filters was evaluated approximately 5 years ago and the City implemented process changes, including the use of the dewatering centrate to create an environment that is toxic to the snails to reduce their impact. At this time it is unclear how much the snail accumulation has been reduced. Evaluation of the current buildup of snails within the trickling filters is recommended.
- Trickling filter distribution arms require minimum flow to operate and during low flow periods trickling filter recirculation pumping must be set to higher rate than needed. Evaluation of the installation of electric operators on the trickling filter distribution arms to operate at low flow conditions is recommended.
- Exterior paint coating on trickling filters is showing signs of degradation and should be included in the facility renewal and replacement program.
- No current condition concerns were identified with the trickling filter aluminum covers.

Solids Contact and RAS Storage:

- The solids contact tanks were originally constructed in 1984 and was expanded in 1994 to include added solids contact and RAS storage. IFAS modules were added in 2009 and removed in 2019. Process tankage was observed to be in good condition.
- Air supply piping was observed to be heavily corroded and will be replaced as part of the Phase 2 Tertiary Treatment expansion project.
- The IFAS media was removed since it is not be needed with completion of the tertiary treatment facilities. Removal of the IFAS media should alleviate the accumulation of red worms.
- The aeration basin diffusers were replaced in 2001. Current condition of the diffuser membranes is unknown. The membranes are nearing the end of their useful life and phased replacement of the membranes should be included in the facility renewal and replacement program.

4.4.7 Secondary Clarification

The Secondary Clarifier Influent Splitter Box divides flow from the solids contact between two secondary clarifiers. In the Phase 2 Tertiary Treatment project, the split structure will be modified to distribute flow to a new third secondary clarifier. Alum or PAX and polymer are added ahead of the secondary clarifiers for phosphorus removal and enhanced solids settling.

RSS is returned to the re-aeration storage tanks using variable speed pumps. The RSS flow is either flow-paced based on the plant influent flow or manually adjusted to maintain a reasonable sludge blanket depth in the clarifier to produce the desired underflow percent solids without creating anaerobic conditions that lead to floating sludge. Waste secondary sludge (WSS) is pumped to the rotary screen thickeners using rotary lobe pumps. WSS is withdrawn from a hopper in the secondary clarifier and is wasted as either a calculated volume to maintain a desired solids retention time (SRT), or a preset volume manually entered by the operations staff to control SRT.

Secondary scum collection has been updated as part of the Phase 2 Tertiary Treatment project upgrades. A new Secondary Scum Pump Station has been constructed to pump scum to the digesters. The Secondary Effluent Pump Station sends flow to the TMF facility. The Phase 2 Tertiary Treatment upgrades included modifications to the station with larger pumps and removal of an internal wall. A summary of the secondary clarification design information is presented in Table 4-9.

Table 4-9: Secondary Clarification Design Summary

Parameter	Unit	Value
Secondary Clarifiers		
Number	-	3
Diameter	ft	75
Side Water Depth	ft	16
Design Solids Loading	lb/sf/day	25
Hydraulic Loading at 5.25 mgd	gal/sf/day	400
Capacity at 1,200 gal/sf/day (peak hour)	mgd	15.9

Table 4-9: Secondary Clarification Design Summary

Parameter	Unit	Value
Secondary Scum Pumps		
Type	-	Non-Clog Submersible
Number	-	2
Capacity, each	gpm	98
RSS Pumps		
Type	-	Non-Clog Centrifugal
Number	-	5
Capacity of 3 Pumps, each	gpm	910
Capacity of 2 Pumps, each	gpm	1,100
WSS Pumps		
Type	-	Rotary Lobe
Number	-	3
Capacity, each	gpm	65
Secondary Effluent Pump Station		
Type	-	Non-Clog Submersible
Number	-	3
Capacity, each	gpm	3,650

4.4.7.1 Capacity and Redundancy

With the completion of the third secondary clarifier, the plant will have a total maximum-month capacity of approximately 9.3 mgd based on a conventional overflow rate of 700 gal/sf/day. For peak instantaneous flows, the clarifiers will have a capacity of 15.9 mgd based on a conventional peak overflow rate of 1,200 gal/sf/day.

Typical redundancy criteria require that the unit process handle maximum-month flow with the largest basin out of service. With the completion of Secondary Clarifier No. 3, the plant will have sufficient process redundancy for the future planning horizon.

The Secondary Effluent Pump Station has a firm peak capacity of 7,300 gpm (10.5 mgd). Peak flows greater than the capacity of the pump station will be routed around the TMF system and combined with secondary effluent at the chlorine mixer manhole.

4.4.7.2 Condition and Operation Issues

- The secondary clarifiers were constructed in 1982 and 1984. A third clarifier is being constructed as part of the Phase 2 Tertiary Treatment expansion. The older clarifier mechanisms have been re-coated and the center drive units were replaced in 2008. No upgrades or modifications were identified.

- The Secondary Control Building was constructed in 1984 and more recently upgraded as part of the Phase 2 Tertiary Treatment expansion. No structural condition issues were identified.
- One RSS pump was out of service due to excessive wear, likely due to snails in the solids system. Replacement of the dismantled pump was in progress at the time of the site condition evaluation. The remaining RSS pumps are also at the end of their useful life and should be included in the renewal and replacement program.

4.4.8 Tertiary Membrane Filtration

The TMF facility with chemical sludge recirculation provides nitrification capacity and filtration to meet low effluent phosphorus limits. The full scale TMF has been implemented in two incremental steps: 1) 2013 Phase 1 Tertiary Treatment (Phase 5C.1) improvements with 1 mgd annual average TMF capacity planned for future expansion; and 2) 2018/19 Phase 2 Tertiary Treatment expansion to 5 mgd annual average capacity. As of June 2018, all wastewater flow has been routed through the TMF facility.

Secondary effluent is strained using pressurized, automatic self-cleaning fine screens prior to flash mixing with alum or PAX and return tertiary sludge. A flow split structure is used to control flow to each chemical mixing tank cell. The chemical mixing tanks are aerated to provide both mixing of chemical coagulants and provide oxygen to nitrifying bacteria. Two dedicated turbo blowers are used for the chemical mixing tank aeration. over a broad crested weir at the end of each cell into the membrane tank distribution channel.

Flow from the distribution channel to each membrane tank is provided by openings in the tank walls. The membranes are low pressure, reinforced hollow fiber ultra-filtration membranes (nominal pore size 0.04 microns). The membrane fibers are arranged in membrane modules consisting of 370 sf of membrane surface area per membrane module. There are forty-eight membrane modules in each membrane cassette, and six membrane cassettes per train.

The chemical and biological solids inventory is maintained within the tertiary process to increase phosphorus and ammonia removal. Return tertiary sludge pumps recycle solids from the membrane tanks to the flash mix tank. Solids wasting is typically controlled to maintain a 15 day SRT. Waste sludge pumps send solids to the RAS storage tank for nitrification seeding.

Scour air is provided to continuously clean any solids buildup from the surface of the membrane fibers. Two duty membrane scour turbo blowers are provided to meet the air demands. Permeate pumps are used to draw water through the membranes fibers for filtration. A dedicated permeate pump is provided for each membrane train. The permeate is used for Backwash and Clean-In-Place (CIP) tank fill and permeate storage tank fill for 3W utility water with ultraviolet (UV) light disinfection. The remaining permeate flows to the chlorine mixing manhole for disinfection and discharge to the Spokane River.

The membrane cleaning system includes back pulse pumping and chemical soaking. The TMF uses a combination of citric acid and sodium hypochlorite for chemical cleaning. During a chemical cleaning or backwash event, a backwash pump uses permeate to fill the backwash manifold, then through the membranes in reverse to normal option. For a chemical clean, either the citric acid or hypochlorite pump discharges to the backwash header and is carried to the membrane fibers. Cleaning chemicals are stored in totes on the ground floor of the TMF Equipment Building. The area around the totes is depressed and separate floor drains (one for each chemical) drain to the chemical spill sumps in the basement. A common submersible sump pump is used to pump out either of the chemical spill sumps in the event of a spill.

A summary of the tertiary treatment design information is presented in Table 4-10.

Table 4-10: Tertiary Treatment Design Summary

Parameter	Unit	Value
Secondary Effluent Straining		
Number	-	3
Design Flow (Peak)	mgd	10.5
Screening Capacity, each	gpm	3,650
Flash Mixing Tank		
Type	-	Non-Clog Submersible
Number of Pumps	-	2
Capacity, each	gpm	236
Chemical Mixing Tanks		
Number of Tank Cells	-	3
Volume, total	gal	200,000
SWD	ft	20
HRT at 5.25 mgd	hr	1.5
Operational TSS Range	mg/L	4,000 - 6,000
Maximum TSS	mg/L	8,000
Membranes		
Number of Tanks	-	5
Design Flow (Minimum)	mgd	2.00
Design Flow (Annual Average)	mgd	5.00
Design Flow (Maximum Month)	mgd	8.75
Design Temperature	°C	12
Membrane Tank TSS (Operational)	mg/L	6,000-8,000
Membrane Tank TSS (Maximum)	mg/L	10,000
Flux at 20°C (Annual Average)	gfd	14.1
Flux at 20°C (Peak)	gfd	24.7
Flux at Design Temp (Annual Average)	gfd	11.7
Flux at Design Temp (Peak)	gfd	20.4
Membrane surface area per Module	sf	370
Modules provided per Train	-	288
Cassettes provided per Train	-	6
Membrane Modules Installed	-	1,440
Scour Air		

Table 4-10: Tertiary Treatment Design Summary

Parameter	Unit	Value
Scour Air Demand (Average)	scfm	2,300
Scour Air Demand (Peak)	scfm	6,900
Permeate Pumps		
Type	-	End Suction Centrifugal
Number	-	5
Capacity per Train (Peak)	gpm	1,450
Citric Acid Solution Transfer Pumps		
Type	-	2
Number	-	Air Diaphragm
Capacity, each	gpm	2.9-5.25
Sodium Hypochlorite Solution Transfer Pumps		
Type	-	Air Diaphragm
Number	-	2
Capacity, each	gpm	1.5-13.53
Chemical Spill Sump Pumps		
Type	-	Submersible
Number	-	2
Capacity, each	gpm	50
Aeration Air System		
Type	-	Turbo Blower
Number	-	2
Capacity, each	scfm	525 - 1,125 at 60 psi
Size, each	HP	150
Membrane Scour Air System		
Type	-	Turbo Blower
Number	-	2
Capacity, each	scfm	3,800 at 6.0 psi
Size, each	HP	150
Return Tertiary Sludge Pumps		
Type	-	Propeller
Number	-	3
Capacity, each	gpm	5,830
Waste Tertiary Sludge Pumps		
Type	-	Rotary Lobe
Number	-	2
Capacity, each	gpm	38

4.4.8.1 Capacity and Redundancy

The TMF has an average annual design capacity of 5.0 mgd and a peak flow capacity of 10.5 mgd, based on an allowable peak of 1.75 times the design average annual flow. Secondary effluent flow exceeding this allowable peak flow to the membranes is combined with membrane permeate and routed to the chlorine contact tanks for disinfection and discharge to the Spokane River.

4.4.8.2 Condition and Operation Issues

- No system or facility problems were identified during the condition assessment review. The facility, upgraded in the 2018/2019 Phase 2 Tertiary Treatment project, has significant remaining useful life.

4.4.9 Disinfection and Dechlorination

Disinfection of secondary effluent is achieved using a solution-feed, gaseous chlorine system. The chlorine solution is added to the secondary effluent in a vault upstream of the chlorine contact tanks. A vertical shaft mixer is installed in the vault. The chlorinated flow is then split between two contact basins with length-to-width ratios of approximately 35:1.

All chlorine storage and feed equipment is located in the Chlorine Building. The chlorine storage area is equipped with a ventilation system that exhausts to a caustic soda scrubber system when a chlorine leak is detected. The scrubber is located in the adjacent Chemical Systems Center.

For dechlorination, a similar solution-feed system is provided for sulfur dioxide. Sulfur dioxide can be added near the effluent end of either of the chlorine contact basins, enabling one of the basins to be taken out of service as needed.

The TMF facility includes a new 3W utility water system that provides reuse water throughout the plant, with possibility for future offsite irrigation. The 3W system uses closed-vessel UV light disinfection reactors.

A summary of the disinfection and dechlorination design information is presented in Table 4-11.

Table 4-11: Disinfection and Dechlorination Design Summary

Parameter	Unit	Value
Chlorine Contact Tank		
Number	-	2
Volume, each	MG	0.125
Side Water Depth	ft	12
Peak Flow at 15 min Detention Time	mgd	24
Design Hydraulic Loading at 13.2 mgd	gal/sf/day	1,200
Chlorine Induction Unit		
Type	-	Submersible
Number	-	1
Capacity, each	lb/d	1,000
Chlorine Gas Feeders		
Type	-	Vacuum Operated
Number	-	3
Capacity, each	lb/d	500
Total System Capacity	lb/d	1,000
Dechlorination		
Type	-	Sulfonatio
Number	-	2
Capacity, each	lb/d	500
Residual Analyzers		
Type	-	Chlorine and Sulfur Dioxide
Number	-	1
Range	mg/L	0 to 2.5
3W Pumps		
Type	-	Multi-stage Centrifugal
Number	-	2
Capacity, each	gpm	330
UV Reactor (at TMF)		
Type	-	Closed-vessel
Number	-	2
Capacity, each	gpm	330

4.4.9.3 Capacity and Redundancy

Based on a 60-minute contact time, the disinfection system has an average-flow capacity of 6 mgd. At maximum-day flows, using a 20-minute contact time, the system has a total capacity of 18 mgd. If a basin is needed to be removed from service for an extended period of time, adequate disinfection could be achieved by increasing the chlorine feed rate. The dechlorination system allows this practice without risk of high chlorine residuals in the plant effluent. Dechlorination is nearly an instantaneous reaction; consequently, there is no capacity limit to this unit process provided that adequate mixing takes place.

4.4.9.4 Condition and Operation Issues

- The Chlorine Contact Basin and Chlorine Building were originally constructed in 1984 and were most recently upgraded in 2001 with new chlorinators and chlorine injection. The chlorine controls programmable logic controller was recently replaced. The chlorination feed equipment is nearing the end of its useful life and should be considered for renewal and replacement. Effluent chlorination should be evaluated with alternative means of disinfection.

4.4.10 Effluent Pump Station and Outfall

The effluent flow rate is measured upstream of the effluent pump station using an ultrasonic level element in chlorine contact basin as flow goes over large effluent weirs into the wet well for the effluent pumps.

Normally, plant effluent is discharged to the Spokane River by gravity through a 30-inch diameter outfall. The outfall diffuser consists of ten 10-inch risers that narrow down to 6-inch diameter nozzles. During periods of high flow in the river, the high water-surface elevation in the river prevents gravity discharge. Under this circumstance, the effluent is pumped to the outfall using vertical turbine pumps. A summary of the effluent pump station and outfall design information is presented in Table 4-12.

Table 4-12: Effluent Pump Station and Outfall Design Summary

Parameter	Unit	Value
Effluent Pumps		
Type	-	Vertical Turbine
Number	-	2
Capacity, each	mgd	10.1
Outfall		
Diameter	inch	30
Outlet Nozzles Diameter	inch	6

4.4.10.1 Capacity and Redundancy

A capacity analysis of the existing outfall was last completed in hydraulic analysis of the 2014 Phase 5C Preliminary Engineering Report. At river surface elevations below 2,123 feet, the outfall has a maximum capacity of 15.75 mgd when operating in a gravity mode using the head available in the chlorine contact tank. If the effluent pumps are used, at the 100-year flood elevation of 2,137 feet, the estimated capacity of the outfall is 18.9 mgd.

The effluent pumps each have capacity of 10.1 mgd. Standby power for the effluent pump station is provided by a 100 kW standby generator.

4.4.10.2 Condition and Operation Issues

- The effluent pumping units were replaced in 2004/2005 with only minor modification to the station controls. Pumping controls are erratic and subject to water surface level variations. Control system issues occur under low and high flow conditions. It is recommended that the pumping controls be scheduled for replacement under the facility renewal and replacement program.
- The effluent outfall was not physically inspected, but damage to outfall diffusers is known to have occurred based on a 2002 assessment. Repair of the damaged diffuser sections is needed.
- Capacity of the effluent outfall is limited, particularly if gravity flow of some of the treated effluent is desired from disinfection. Evaluation of an extension of the outfall is recommended with additional diffuser ports to increase hydraulic capacity.

4.5 Solids Stream

The following section provides descriptions, design data, and condition information for the solids stream processes. This section also includes condition assessment findings and recommendations.

4.5.1 Primary Sludge Thickening

Three gravity thickeners are available; however, Thickener 1, the smaller and oldest unit, is not used. The gravity thickeners are used for primary sludge only. Thickener overflow is returned to the screenings building. Thickened sludge is pumped via rotary lobe pumps to the anaerobic digesters. The digester feeding sequence is accomplished through manual valves. The two larger thickeners are covered and foul air incorporated into the plant-wide odor control system.

Thickened primary sludge is removed by rotary lobe pumps. The pumps discharge to the anaerobic digesters. A summary of the primary sludge thickening design information is presented in Table 4-13.

Table 4-13: Primary Sludge Thickening Design Summary

Parameter	Unit	Value
Primary Sludge Thickeners		
Type	-	Gravity Thickening
Number	-	3

Table 4-13: Primary Sludge Thickening Design Summary

Parameter	Unit	Value
Thickener 1 Diameter (not in use)	ft	20
Thickeners 2 & 3 Diameter	ft	25
Total Surface Area (without Thickener 1)	sf	1,000
Design Surface Load	lb/sf/d	25
Maximum Solids Load	lb/d	25,000
Primary Sludge Flow	gpm	160
Primary Sludge Load	lb/d	9,500
Primary Sludge TSS	% TS	0.5
Thickened Primary Sludge Flow	gpm	13.5
Gravity Thickener Overflow	gpm	145
Thickened Primary Sludge Pumps		
Type	-	Rotary Lobe
Number	-	2
Capacity, each	gpm	30

4.5.1.1 Capacity and Redundancy

The capacity of the gravity thickeners is governed by summer conditions when solids loading is increased by addition of alum or PAX to the primary clarifiers for phosphorus removal. The chemical sludge also reduces the allowable unit loading rate to the thickeners since the chemical sludge is more difficult to clarify and thicken.

4.5.1.2 Condition and Operation Issues

- Thickened sludge pumping, located in the Preliminary Treatment Facility basement, is experiencing accelerated wear of the thickened sludge pump lobes (every 2-3 weeks). Discharge pressures exceed 50 psig, which is on the high end of the acceptable range for the rotary lobe pumps. Evaluation of alternative pumping options, hydraulic improvements, and possible heat tracing is recommended.
- Grinding of the thickened sludge, located in the Solids Handling Building Lower Level, has been removed from service due to sludge pressures exceeding the grinder pressure rating. Evaluation of installation of a high-pressure in-line grinder unit is recommended.
- Gravity Thickener No. 1 is not in service and generally is not used. Consideration should be given to demolition of Gravity Thickener No. 1 if added space is needed for added grit removal facilities, or re-purposing the tankage for other potential process needs.

4.5.2 WSS Thickening

Rotary screening sludge thickening was added in 2009 and 2013 in the Digester Control Building. Each rotary screen includes a separate flocculation tank for sludge conditioning. The rotary screen thickener consists of an internally-fed cylindrical screen with an integral ridge inside the screen for transporting thickened solids out of the screen.

Thickened WSS sludge is conveyed by rotary lobe pumps. The pumps discharge to the anaerobic digesters. A summary of the WSS thickening design information is presented in Table 4-14.

Table 4-14: WSS Thickening Design Summary

Parameter	Unit	Value
WSS Thickening		
Type	-	Rotary Screen
Number	-	2
Capacity, each	gpm	130
WSS Flow	gpm	60
WSS Load	lb/d	7,470
WSS TSS	% TS	1
Thickened WSS Flow	gpm	9
RST Thickened Sludge Pumps		
Type	-	Rotary Lobe
Number	-	3
Capacity, each	gpm	130

4.5.2.1 Capacity and Redundancy

The addition of the rotary screens separated primary and WSS thickening. The gravity thickeners may still be used as a backup for secondary sludge.

4.5.2.2 Condition and Operation Issues

- No system or facility problems were identified during the condition assessment review. The facility last upgraded in 2009 has significant remaining useful life.

4.5.3 Anaerobic Digesters, Sludge Storage, and Digester Control Buildings

The anaerobic digesters are configured into an old and a new complex. The old complex includes three tanks ranging in age from 30 to 60 years. Digester 1 is no longer used as a digester and is presently used for dewatering centrate storage to equalize ammonia loadings on the secondary treatment process. Digester 2 is heated and mixed via a center draft tube. The third tank in the old complex is used to store digested sludge prior to dewatering. It is mixed by both a center draft tube and an external pump. All three tanks have fixed steel covers. A heat exchanger is to be added to the Sludge Storage Tank as part of the 2018/2019 Phase 2 Tertiary Treatment project.

The new digester complex includes two 40-foot diameter tanks. Digester 3 was constructed in the mid 80's and Digester 4 was built in 1995. The digesters are gas-mixed, heated, and equipped with fixed metal covers. Digester 5, with pumped mixing, and Digester Control Building 2 were added in 2012.

Two boilers, located in the Digester Control Building 2, provide heat for the entire digester process. The boilers are fueled by digester biogas when possible and at other times they operate on natural gas. Excess biogas is flared in a waste gas burner.

A 1,300 MBH, natural gas boiler was installed on the ground level of Secondary Control Building 2 to serve as a jockey boiler in the existing hot water loop system. The boiler provides supplemental heat to the Administration & Laboratory Building, Maintenance Collections Garage, and Secondary Control Building 2 during high demand colder months. The boiler has a modulating burner with 5:1 turndown and separate combustion air and combustion gas vents piped to the exterior of the building. The boiler hot water piping is connected to the main plant hot water loop.

Foul air from the digesters and the control buildings are connected to the plant-wide odor control system.

A summary of the anaerobic digestion design information is presented in Table 4-15.

Table 4-15: Anaerobic Digestion Design Summary

Parameter	Unit	Value
Anaerobic Digester 2		
Volume	gal	75,000
Side Water Depth	ft	20
Diameter	ft	25
Mixing Type	-	Draft Tubes
Anaerobic Digester 3		
Volume	gal	235,000
Side Water Depth	ft	27
Diameter	ft	40
Mixing Type	-	Gas Mixing
Anaerobic Digester 4		
Volume	gal	231,000
Side Water Depth	ft	27
Diameter	ft	40
Mixing Type	-	Gas Mixing
Anaerobic Digester 5 Volume		
Volume	gal	470,000
Side Water Depth	ft	30
Diameter	ft	50
Mixing Type	-	Pumped Mixing
Total Anaerobic Digester Volume	MG	1.01
Anaerobic Digester Load	lb/d	13,690

Table 4-15: Anaerobic Digestion Design Summary

Parameter	Unit	Value
Anaerobic Digester Feed Flow	gpm	23
Anaerobic Digester Feed TSS	% TS	5.4
VSS Reduction	% VSD	55
SRT, total	day	32.4
SRT, firm	day	17.3
Digested Sludge Storage Tank		
Volume	gal	71,000
Side Water Depth	ft	19
Diameter	ft	30
Digested Sludge Flow	gpm	23
Centrate Storage (old Digester 1)		
Volume	gal	105,000
Side Water Depth	ft	20
Diameter	ft	30

4.5.3.3 Capacity and Redundancy

The digesters typically operate with either Digesters 3 and 4, or Digester 5 in service at a time. The digestion process target is 20-day solids retention time (SRT). With respect to redundancy, maintenance can be performed during the winter when sludge production rates are lower.

4.5.3.4 Condition and Operation Issues

Digester Control Building 1:

- The Digester Control Building No. 1 was constructed in 1984, and modified in 2004.

Digesters and Sludge Storage

- Digester 2 and sludge storage tank covers were recently upgraded. No condition problems were identified. The building electrical systems are at the end of their useful life and evaluation for renewal and replacement should be planned.
- The sludge storage tank, where biosolids are stored prior to dewatering, is currently not heated or mixed. Heating and mixing of the dewatering feed solids has been designed and equipment has been procured. This project was scheduled to be completed in 2019. This enhancement will improve consistency of the sludge feed to the dewatering process.
- Digester 5 was constructed in 2010 and has significant remaining useful life.
- Ventilation of the Digester 5 cupola area was identified to be limited at the time of the site investigation. The ventilation fan sheave settings were adjusted to increase fan speed and ventilation rate. This addressed the pressure loss in the odor control treatment system air manifolds.

- The Digester 5 pumped mixing system has experienced plugged nozzles on the recirculation system. The recirculation system grinder should be evaluated for proper operation.
- Digester 5 is fitted with a pressure sensor in a deep stilling well. Plant operations have experienced problems with the level element. Digesters 3 and 4 utilize pipeline mounted pressure sensors on the pump recirculation lines. Evaluation of an alternative level element (pressure transducer on piping within the digester complex basement) is recommended.

Centrate Storage:

- Digester 1 was re-purposed to serve as the centrate storage and equalization. The tank is currently not covered and is a moderate source of odors. Covering the tank should be considered as a future improvement.
- The centrate return pumping is not currently metered. Addition of flow metering should be considered for a more refined process control and reduced impact on the liquid stream treatment process.
- Micro plastics collected in the centrate storage tank are returned back to the treatment plant influent. The plastics are thought to originate from the plant screenings grinding and washing/compacting, and pass through the solids dewatering centrifuge. Removal technologies should be evaluated at the screenings grinders.

Digester Control Building #2:

- No system structural problems were identified. The facility, constructed in 2010 has significant remaining useful life.
- Digester feed sludge grinder operation is questioned by operations personnel and the condition of the grinders should be evaluated. Although only in operation for approximately 7 years, the grinder wear may be significant.
- The hot water heating system boilers are located in Digester Control Building #2. The steam boilers were replaced prior to 2010 and were re-located to the Digester Control Building in 2010. Significant cycling of the boiler operation occurs at over 200 starts per day. The boilers are controlled on steam pressure and the hot water system is controlled from the hot water loop temperature. Modification of the boiler master controls is recommended. The boiler system controls should be placed on a master control panel and additional temperature transmitters should be evaluated to improve boiler operation. The City is currently investigating and implementing improvements to the boiler controls.

Biogas Control Building:

- No system or facility problems were identified. The facility constructed in 2010 has significant remaining useful life.

4.5.4 Biosolids Dewatering/Solids Building

Liquid biosolids are pumped from the storage tank through in-line grinders to one of two dewatering units; a belt filter press (BFP) or centrifuge. Normally the centrifuge is operated as it produces a drier cake which is preferred for compost facility operation. Polymer is added to aid in solids flocculation. Sludge cake drops directly into a truck bed and is hauled to the composting facility. Dewatering centrate is collected in the former Digester 1. This allows equalization of the ammonia load returned to the secondary treatment process. A summary of the dewatering design information is presented in Table 4-16.

Table 4-16: Dewatering Design Summary

Parameter	Unit	Value
Centrifuge		
Number	-	1
Capacity, Solids Load	lb/hr	2,200
Capacity, Flow	gal	150
Capacity, Maximum Solids Load (8/5 operation)	lb/d	630,000
Belt Filter Press		
Number	-	1
Capacity, Solids Load	lb/hr	1,100
Capacity, Flow	gal	73
Capacity, Maximum Solids Load (8/5 operation)	lb/d	315,000
Digested Sludge Pumps		
Type	-	Rotary
Number	-	2
Capacity, each	gpm	200
Type	-	Plunger
Number	-	1
Capacity, each	gpm	130
Centrate Pumps		
Type	-	Non-clog Centrifugal
Number	-	2
Capacity, each	gpm	170

4.5.4.1 Capacity and Redundancy

The centrifuge has a rated capacity of 2,200 lbs of dry solids per hour. The centrifuge is used as the primary unit and the BFP is only used as backup. The BFP has a 1.5 meter belt width with a rated capacity of 1,100 lbs of dry solids per hour. The dewatering process requires the presence of operating staff. To reduce staffing requirements, the process is operated 8 hours per day, 5 days per week. Based on this operating strategy, the centrifuge has the capacity of 630,000 lb/day.

4.5.4.2 Condition and Operation Issues

- The Solids Handling Building was originally constructed in 1984 with significant upgrades completed in 2004. No structural deficiencies were noted.
- The existing BFP is nearing the end of its useful life and should be evaluated for renewal or replacement. Alternative means of dewatering should be considered.

- The dewatering centrifuge was installed in 2006 and parts of the equipment were rebuilt in 2017. Additional wear parts that were not addressed in 2017 should be included in the facility renewal and replacement program. Backup dewatering should be evaluated to provide needed redundancy to the centrifuge unit.
- The dewatering polymer system is setup to primarily use emulsion polymer. Storage for emulsion polymer is limited. Additional polymer storage and upgrades to the emulsion delivery should be evaluated.
- The dewatered biosolids truck loadout facility is open-air and a source of site odors. Expansion and enclosure of the dewatering truck haul bay with ventilation to odor control facilities is recommended.

4.6 Composting Facility

Dewatered biosolids are composted at an 18-acre site on Julia Street. Dewatered sludge is hauled by truck from the treatment plant to the compost site. Composting is practiced using the aerated static pile method. The initial stages of processing are performed within an enclosed building, with final processing occurring in an exposed area outside the building. The building has a dedicated aeration area measuring 125 feet by 70 feet with provisions for ten parallel compost piles. Outside (uncovered) areas provide space for up to nine additional piles when sludge production is high. Aeration is supplied through perforated aeration pipes in each pile. Aeration may be accomplished by blowing air through the piles or by withdrawing air from under the piles, pulling outside air through the compost material. When the later approach is used, the withdrawn air is routed through compost biofilters for odor scrubbing.

Following composting, the material is screened to remove amendment material and placed in curing piles. A new screening unit was purchased in 1998 for this purpose. Recovered screenings are recycled for further use. New amendment material is stored in a covered shed.

The finished product is sold to a private vendor who removes the compost from the site and sells it as a landscaping material.

4.6.1.3 Capacity and Redundancy

The capacity of the compost facility depends on the capabilities of the sludge dewatering equipment and the size or capacity of key facilities. The compost facility has a single screening machine, which is not unusual because redundant equipment is generally not provided for an operation of this type. Reliability is achieved by maintaining an adequate stock of spare parts. The screening unit has a throughput of 150 cubic yards per hour.

4.6.1.4 Condition and Operation Issues

- The condition of the Compost Facility was performed as part of a separate study by J.U.B. Engineers in August, 2017.

4.7 Support Facilities

In addition to the mainstream liquid and solids treatment processes, the ancillary facilities in the plant are critical to reliable performance. This section reviews the facilities associated with chemical feed, odor control, plant utilities, instrumentation and control, and administration and maintenance.

4.7.1 Chemical Systems

The Coeur d'Alene AWTF includes a number of chemical feed and storage systems for use in the liquid and solids treatment processes. The following discussion describes current systems and highlights critical issues.

4.7.1.1 Alum and PAX Coagulants

As described under each liquid process, alum or PAX is fed to the primary clarifiers, secondary clarifiers and the chemical mixing tank to precipitate phosphorus. Since December 2017, the plant has been operating with PAX-18 instead of alum which was used historically. Coagulant storage and feed facilities are located in the Chemical Systems Center. The feed rate is flow paced and the dosage is manually set. A summary of the coagulant design information is presented in Table 4-17.

Table 4-17: Coagulant Design Summary

Parameter	Unit	Value
To Primary Clarifiers		
Type	-	Peristaltic
Number	-	1
Capacity, each	gal	2.6
Use at 20 mg/L dose (max month)	gal/d	175
To Secondary Clarifiers		
Type	-	Peristaltic
Number	-	1
Capacity, each	gal	2.6
Use at 60 mg/L dose (max month)	gal/d	540
To Tertiary Membrane Filtration		
Type	-	Peristaltic
Number	-	2
Capacity, each	gpm	2.6
Use at 35 mg/L dose (max month)	gal/d	320

Historically, the plant has used alum for phosphorus removal. Since alum consumes alkalinity, caustic is added to the process stream to replenish and ensure presence of sufficient alkalinity before the secondary effluent is routed to the TMF system for nitrification. In 2016, bench-scale testing was conducted to evaluate the efficiency of various coagulants for phosphorus removal. The objective was to identify a coagulant that can effectively remove soluble orthophosphate (sOP) to the desired level with the least total chemical costs. The chemical costs include coagulant plus caustic feed to replenish alkalinity consumed due to coagulant addition. Overall the results concluded the following:

1. All coagulants tested showed better results than alum within the range of doses investigated.
2. Doses below 80 mg/L had minimal impact of pH.

3. A significant reduction in alkalinity was observed with all of the coagulants. Alum showed the most alkalinity consumption.
4. Overall, all of the coagulants investigated had lower total costs than alum. The iron based coagulant, PIX 311, and the aluminum based coagulant, PAX XL-19, had the lowest total chemical costs, with potential cost savings of 60% compared to alum.

Significant cost savings can be achieved with the selection of a coagulant that consumes less alkalinity than alum. Given the results of the bench scale testing, PAX XL-19 was first tried at full scale. The impact did decrease the overall caustic demand, however it required a higher than aluminum to phosphorus (mole/mole) ratio at total phosphorus residual less than 0.1 mg/L. In December 2017, the full scale coagulant was changed to PAX-18 with a positive impact on total phosphorus removal. A comparison of alum, PAX XL-19 and PAX-18 phosphorus removal curves is presented in Figure 4-. Table 4-18 shows the cost comparison between historical alum use and recent full scale operation on PAX-18. It is anticipated that additional cost savings may be achievable as chemical addition is optimized based on the effluent total phosphorus target concentration.

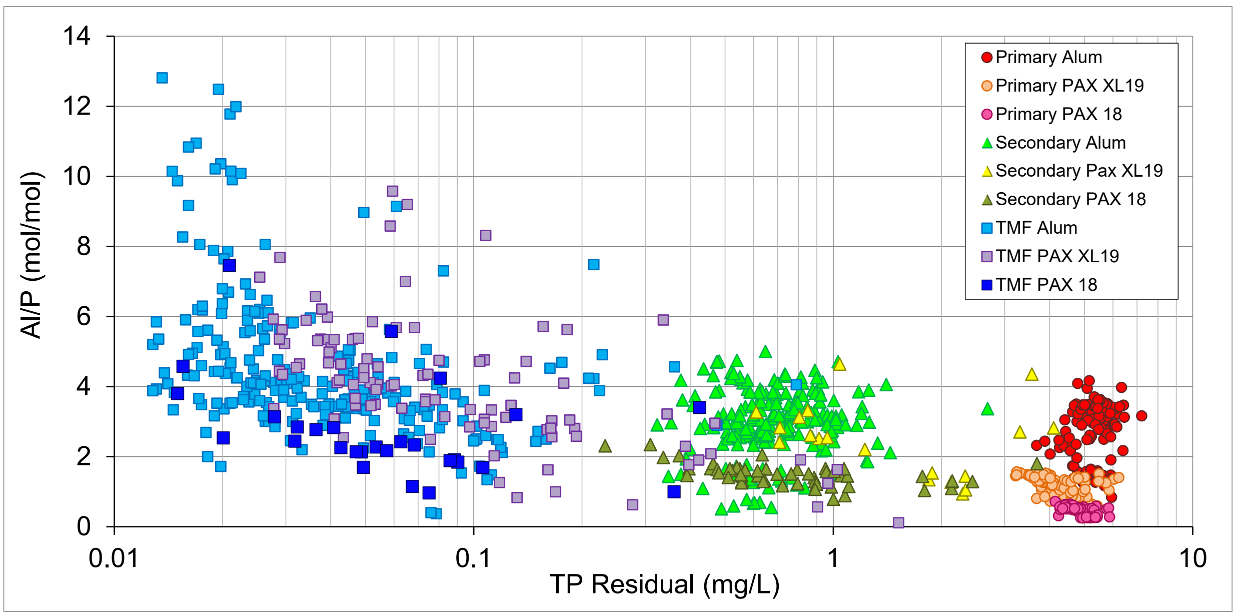


Figure 4-12: Phosphorus Coagulation Removal Curves

Table 4-18: Coagulant Cost Comparison

Parameter	PAX-18	Alum
Date Range Analyzed	June – August 2018	February – October 2015 & 2016
Average Effluent TP	0.08 mg/L	0.47 mg/L
Coagulant Use, all three dosing locations	400 gpd (bulk)	700 gpd (bulk)
Caustic (25%) Use	350 gpd (bulk)	475 gpd (bulk)
Annual Coagulant Cost at Use	$258,600/yr	$382,600/yr

Table 4-18: Coagulant Cost Comparison

Parameter	PAX-18	Alum
Annual Caustic Cost at Use	$231,500/yr	$356,600/yr
Total Annual Cost	**$490,100/yr**	**$739,200/yr**
Savings	**$249,100/yr or 34%**	**-**

4.7.1.2 Caustic

Caustic is added to maintain alkalinity and pH throughout the treatment process. Both coagulant addition and nitrification consume alkalinity. Caustic is currently added to the secondary effluent as it is pumped to the TMF. As part of the Phase 2 Tertiary Treatment project, a second caustic tank will be added. The pumping system is location in the Chemical Systems Center. Typically the plant uses 25 percent bulk caustic solution. A summary of the caustic design information is presented in Table 4-19.

Table 4-19: Caustic Design Summary

Parameter	Unit	Value
To Secondary Effluent		
Type	-	Peristaltic
Number	-	2
Capacity, each	gpm	26
Use at 200 mg/L dose (max month)	gal/d	1,100

4.7.2 Ferric Chloride

Provisions for ferric chloride addition to the solids handling process is available, however the system is not normally used. Ferric chloride is a coagulant that precipitates phosphorus to improve dewaterability of sludge and can reduce hydrogen sulfide concentrations. A summary of the ferric chloride design information is presented in Table 4-20.

Table 4-20: Ferric Chloride Design Summary

Parameter	Unit	Value
To Dewatering		
Dose (max month)	gal/d	226
To Anaerobic Digestion		
Dose (max month)	gal/d	28.2

4.7.2.3 Polymer

Polymer is fed to the primary and secondary clarifiers to improve flocculation and settling of solids. Polymer storage and feed facilities are located in the Chemical Systems Center. The liquid stream feed rate is flow paced, and the dosage is manually set.

Polymer is used to condition digested sludge prior to dewatering. The solids system polymer storage and feed facilities are located in the Solids Building. Both dry polymer and emulsion polymer systems are installed. The emulsion polymer system is preferred by plant staff. A summary of the solids stream polymer design information is presented in Table 4-21.

Table 4-21: Solids Stream Polymer Design Summary

Parameter	Unit	Value
To Sludge Thickening		
Number	-	2
Capacity, each	gpm	4.5
To Sludge Dewatering		
Number	-	2
Capacity, each	gpm	15

4.7.2.4 Chlorine

Gaseous chlorine is used for disinfection. A conventional solution feed system is employed. All chlorine storage and feed equipment is located in the Chlorine Building. The chlorine storage area is equipped with a ventilation system that exhausts to a caustic soda scrubber system if a chlorine leak is detected. The scrubber is located in the adjacent Chemical Systems Center.

In addition to disinfection use, chlorine solution can be piped to the raw sewage pump station, the primary and secondary clarifier weirs, and the RAS piping. Flow split amongst these functions is accomplished manually using valves. There are no rotameters installed to allow precise flow splitting if more than one application point is used.

4.7.2.5 Sulfur Dioxide

Gaseous sulfur dioxide is used for dechlorination of the plant effluent. This system is nearly identical to the chlorine feed system and is housed in the Chlorine Building. It also is connected to the caustic scrubber system.

4.7.2.6 Chemical Systems Condition and Operation Issues

- The Chemical Systems Center was originally constructed in 1993/1994. Significant modifications were completed as part of the Phase 2 Tertiary Treatment expansion in 2018/2019. No structural condition issues were identified.
- The Chlorine Facility emergency chlorine scrubber is installed in this building. Condition of the scrubber and associated pumping units appeared good, but it is uncertain when the chemical pumping units and controls were last tested. The age of the neutralization chemical is unknown. Testing of the emergency scrubber and associated chemicals and controls is recommended.
- Chemical consumption is high, as a result of the Tertiary Treatment system to reduce phosphorus and ammonia, which results in depletion of alkalinity. Continued testing and

optimization of chemical addition is recommended to optimize the liquid stream treatment and reduce chemical costs.

4.7.3 Odor Control

Since 1997, the City has provided foul air collection and odor treatment at the plant. The odor control system has included point source odor collection using process area covers and direct ventilation of odorous air sources, with adjacent process air ventilation and control systems for makeup air for the source areas ventilated. Treatment has been provided by passing the odorous air through the plant trickling filters for initial treatment and oxidation, followed by compost media biofiltration. The original facilities constructed in 1997/1998 have been subsequently modified and expanded during the Phase 4B, Phase 5B and 5C.1 projects. The following process areas and facilities are included in the system:

- Screenings building
- Influent pump station
- Pre-aerated grit removal
- Primary clarifiers
- Trickling filters
- Trickling filter pump station
- Gravity thickeners 2 and 3
- Digesters 3, 4, and 5
- Digester control building
- Solids handling building

A biofilter at the compost facility provides treatment of odorous air from the compost piles at the Julia Street facility. Recent improvements at the compost facility included removing stored leaves and yard debris, upgrading the equipment using for compost screening to reduce carryover of odorous material to the recycled amendment pile, and improving drainage to reduce ponding of odorous leachate.

4.7.3.7 Capacity and Redundancy

The existing two compost biofilter odor treatment beds were upgraded and expanded during the Phase 5B Improvements project. Initially, both filter beds were sized with the same effective treatment area. During the Phase 5B project, Filter Bed 2 was increased to a larger effective treatment area and different air flows were delivered to each bed. The air loading rates (flux) were revised during the Phase 5B project to 3.86 cfm/sf and 4.45 cfm/sf respectively for Bed 1 and Bed 2. These values were increased from the original design flux rate of 3.5 cfm/sf, but close to the original range of 3.5 - 4.0 cfm/sf that was selected during the original planning for the organic media treatment system.

The City has successfully operated the organic media filters for approximately 10 years and has successfully operated Filter Bed 2 at a flux of 4.35 cfm/sf for the past several years. As a result of successful operation and effective performance of the organic media filters, the air flux was revised to an overall 4.25 cfm/sf effective bed area in the Phase 2 Tertiary Treatment expansion project. The compost filter design air flows (flux rate) are presented in Table 4-22.

Table 4-22: Compost Biofilter Bed Airflow Flux Rate Summary

Parameter	Unit	Value
Compost Filter Bed 1		
Active Area	sf	1,850
Air Flow Rate	cfm	7,870
Loading Rate	cfm/sf	4.25
Compost Filter Bed 2		
Active Area	sf	2,525
Air Flow Rate	cfm	10,730
Loading Rate	cfm/sf	4.25
Total Treated Air Flow	**cfm**	**18,600**

4.7.3.8 Condition and Operation Issues

- In 2018 the biofilter beds were exhibiting excessive air flow headloss. The City hydro-jetted the air distribution laterals on the filter beds to restore the diffuser orifice diameters on the laterals. Cleaning restored the air diffusion headloss to acceptable design levels.
- Compost filter bed media replacement is required every 5 years. Bed replacement should be scheduled in the facility capital improvements planning.
- Larger fans at the trickling filer were installed in 2010. Fan replacement should be included in the facility renewal and replacement program, but is not necessary in the near term.

4.7.4 Nonpotable Water

Two nonpotable water systems are provided at the treatment plant. The older 3W utility water loop system improvements were completed in 2002. With the completion of the Phase 1 Tertiary Treatment project, 1 mgd of UV disinfected permeate became available as the primary nonpotable water source. The 3W utility water still remains available as a backup

4.7.4.1 Condition and Operation Issues

- The old 3W vertical turbine utility water pump controls limit operation to 58 Hz speed.
- Automatic backup switching from new TMF permeate to the old 3W system is a recommended enhancement.

4.7.5 Potable Water

Potable water is supplied by the City of Coeur d'Alene via an 8-inch water main at the southeast corner of the AWTP site and a 4-inch water main on the northeast side of the plant. Plant water service is extended from the 8-inch line through a 3-inch service line into the Operations Building and Collections Facility. A 3-inch gate valve is provided for potable water isolation. As part of the

Phase 5B Solids Handling Project, an additional water service and potable water fire pipeline were added to serve the new Administration Building and Collection Maintenance Garage. The potable water service and meter is a 3-inch water service, extended from the 12-inch potable water pipeline located in Hubbard Avenue. Two fire hydrants are provided on site; one is located southwest of Secondary Clarifier 2 and the other is located at the north entrance from Hubbard Avenue near the Administration Complex.

4.7.5.2 Condition and Operation Issues

- There are no condition or operational issues associated with the potable water supply to the treatment plant.

4.7.6 Electrical Power Supply and Standby Power

Electrical service is provided by Avista Utilities. The utility service enters the site from: 1) the north end of the plant site primary feed switchgear; and 2) the south end of the plant site secondary feed switchboard. Both are dual primary feed service. The north end feed is controlled by Avista and the south end feed is controlled by the City.

Standby power is provided by three engine generators at the following locations: 1) Influent Pump station – 250 kW; 2) Effluent Pump Station – 100 kW; and 3) TMF facility – 100 kW.

4.7.6.3 Capacity and Redundancy

The City has reported power outages lasting a few minutes to several hours, including a major outage during the summer of 1999 and an earlier winter ice storm event.

4.7.6.4 Condition and Operation Issues

- Near term electrical system improvement recommendations improvements include: Primary Clarifier 1 and 2 corrosion and hazard mitigation; electrical equipment end-of-life assessment, arc flash and electrical hazard analysis, Chemical Systems Center caustic pump standardization upgrades, Trickling Filter Pump Station electrical controls upgrade, and Effluent Pump Station controls upgrade.
- Long term electrical recommendations include: continued arc flash and electrical hazard analysis and emergency facilities resiliency planning.
- Stand power expansion recommendations include adding standby power for the Administration and Collection Facility, and the Solids Contact Facilities.

4.7.7 Natural Gas Supply

Natural Gas Service is provided by Avista. The natural gas arrangement at the plant was last updated during the Phase 5B project. The natural gas service enter the plant site at the southeast corner and is supplied 50 to 55 psig from a 6-inch mainline in Northwest Boulevard. The 6-inch mainline extends from Northwest Boulevard to the west along Hubbard Avenue to the south plant gate. At the plant, the gas service main extends both to the north along the east side of the plant and along the southern property line with two gas meters.

The north feed is provided from a 2-inch extension from the 6-inch main that follows the old railroad grade. The 2-inch line reduces to a ¾-inch service entrance with a gas meter and pressure reducing station located along the east wall of the Chemical Systems Center. This reduces the medium pressure service to a low pressure service. The lateral also supplies natural gas to the Harbor Center. The other gas piping extension follows the southern property line to the Influent Pump Station. A gas meter and pressure reducing station is located on the west side of the Influent Pump Station. The 4-inch gas line then splits to two laterals; Lateral A serves the Digester Control Building and Lateral B serves the Administration Complex and the Collection Maintenance Garage.

4.7.7.5 Capacity and Redundancy

Avista engineers indicate reserve capacity is available in the gas delivery systems serving the plant and if required, additional service entrances can be installed to site.

4.7.7.6 Condition and Operation Issues

- There are no condition or operational issues associated with the natural gas supply to the treatment plant.

Appendix A. Asset Inventory and Facility Assessment

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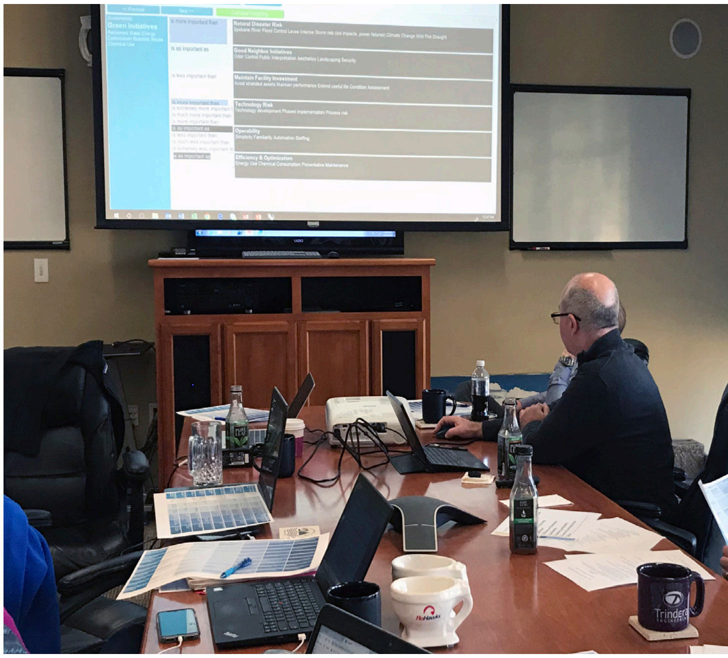
Process ID	Process	Process Unit/Structure/ Asset Class	Equipment Description 1	Asset Tag ID	HP	Installation Year	Original Useful Life	Remaining Useful Life	% of Remaining Useful Life	Condition Rating	Reliability Rating	Capacity Rating	Asset Condition	Replace /Repair	Recommended Replacement/ Repair/Upgrade
100	Bar Screen	Traveling Rake	Bar Screen 1	BSN-1000	5	2004	25	10	40%	3	2	1	6		
100	Bar Screen	Traveling Rake	Bar Screen 2	BSN-1005	5	2004	25	10	40%	3	2	1	6		
100	Bar Screen	Washer	Washer/Conveyor	WHR-1010	10	2004	25	10	40%	3	2	4	9	Repair	Grinder Under-sized, passes plastics
100	Bar Screen	Washer	Washer/Conveyor	WHR-1015	10	2004	25	10	40%	3	2	4	9	Repair	Grinder Under-sized, passes plastics
100	Bar Screen	Grit Cyclone	Cyclone Classifier	SEP-1505	0.5	2004	17	2	12%	4	2	2	8	Replace	Significant Wear
100	Bar Screen	Grit Cyclone	Cyclone Classifier	SEP-1500	0.5	2004	17	2	12%	4	2	2	8	Replace	Significant wear
100	Bar Screen	Crane	OH Crane	CRN-1060	30 Amp	2004	30	15	50%	3	1	2	6		
100	Influent Pump Station	Pump	Influent Pump 1	P-1020	125	2004	30	15	50%	3	1	2	6		
100	Influent Pump Station	Pump	Influent Pump 2	P-1025	125	2004	30	15	50%	3	1	2	6		
100	Influent Pump Station	Pump	Influent Pump 3	P-1030	125	2004	30	15	50%	3	1	2	6		
100	Influent Pump Station	OH Crane	Crane	CRN-1065	30 Amp	2004	30	15	50%	3	1	2	6		
100	Influent Pump Station	Pump	Sump Pump	P-1045	1	2004	20	5	25%	4	2	2	8		
100	Influent Pump Station	Pump	Sump Pump	P-1046	1	2004	20	5	25%	4	2	2	8		
100	Pretreatment Gallery 1	Mechanisms	Gravity Thickener 1	T-9101	1.5	1984	25	-10	-40%	5	2	2	9		Consider Demolition
100	Pretreatment Gallery 1	Mechanisms	Gravity Thickener 2	T-9201	1.5	1988	25	-6	-24%	5	2	2	9		
100	Pretreatment Gallery 1	Mechanisms	Gravity Thickener 3	T-9301	1.5	1988	25	-6	-24%	5	2	2	9		
100	Pretreatment Gallery 1	Pump	Grit Pump	P-1615	7.5	2017	15	13	87%	1	2	2	5		Pump recently rebuilt or replaced.
100	Pretreatment Gallery 1	Pump	Grit Pump	P-1625	7.5	2017	15	13	87%	1	2	2	5		Pump recently rebuilt or replaced.
100	Pretreatment Gallery 1	Pump	Grit Pump	P-1635	7.5	2017	15	13	87%	1	2	2	5		Pump recently rebuilt or replaced.
100	Pretreatment Gallery 2	Blower	Pre-Areation	B-1671	15	1988	34	3	9%	4	3	2	9	Replace	Replace this unit?
100	Pretreatment Gallery 2	Blower	Pre-Areation	B-1681	15	1988	34	3	9%	4	3	2	9	Replace	Replace this unit?
100	Pretreatment Gallery 2	Pump	Sump Pump	P-1641		1988	20	-11	-55%	5	3	2	10	Replace	
100	Pretreatment Gallery 2	Pump	Sump Pump	P-1646		1988	20	-11	-55%	5	3	2	10	Replace	
100	Pretreatment Gallery 2	Pump	Thickened Solids Pump	P-9421	5	2010	20	11	55%	2	4	2	8		High pressure causing accelerated lobe wear.
100	Pretreatment Gallery 2	Pump	Thickened Solids Pump	P-9431	5	2010	20	11	55%	2	4	2	8		High pressure causing accelerated lobe wear.
100	Pretreatment Gallery 3	Compressor	Compressor	CP-1691		1988	25	-6	-24%	5	3	2	10		
200	Primary Clarifier	Mechanisms	Primary Clarifier 1	DU-212	1.5	2014	25	20	80%	1	1	2	4		Recommend moving lighting to outside
200	Primary Clarifier	Mechanisms	Primary Clarifier 2	DU-222	1.5	2015	25	21	84%	1	1	2	4		Recommend moving lighting to outside
200	Primary Sludge Pump Station	Pump	PC#1 Scum Pumps	P-2040/2041	5	2010	30	21	70%	2	2	2	6		
200	Primary Sludge Pump Station	Pump	PC#2 Scum Pumps	P-2050/2051	5	2010	30	21	70%	2	2	2	6		
200	Primary Sludge Pump	Pump	Sludge Pump 1	P-231	7.5	2009	30	20	67%	2	3	2	7	Replace	Pump likely has been rebuilt since 1987
200	Primary Sludge Pump	Pump	Sludge Pump 2	P-232	7.5	2009	30	20	67%	2	3	2	7	Replace	Pump likely has been rebuilt since 1987
200	Primary Sludge Pump	Pump	Sludge Pump 3	P-233	7.5	2010	30	21	70%	2	3	2	7	Replace	Pump likely has been rebuilt since 1987
200	Primary Sludge Pump	Pump	Primary Clarifier 3	P-250-04	10	2018	30	29	97%	1	1	1	3		
200	Sump Pump	Pump	Sump Pump 1	P-241	2	1987	20	-12	-60%	5	2	2	9	Replace	
200	Sump Pump	Pump	Sump Pump 2	P-242	2	1987	20	-12	-60%	5	2	2	9	Replace	
400	Trickling Filters	Pump	Feed Pump 1	P-4112	40	1994	30	5	17%	4	3	4	11	Replace	Pump rebuilt since original installation.
400	Trickling Filters	Pump	Feed Pump 2	P-4122	40	1994	30	5	17%	4	3	4	11	Replace	Pump rebuilt since original installation.
400	Trickling Filters	Pump	Feed Pump 3	P-4132	40	1994	30	5	17%	4	3	4	11	Replace	Pump rebuilt since original installation.
400	Trickling Filters	Pump	Recirculation Pump 1	P-4211	10	1994	30	5	17%	4	3	3	10	Replace	Pump rebuilt since original installation.
400	Trickling Filters	Pump	Recirculation Pump 2	P-4221	10	1994	30	5	17%	4	3	3	10	Replace	Pump rebuilt since original installation.
400	Trickling Filter 1	Fan	Odor Control	F-4571		1994	25	0	0%	5	3	3	11	Replace	Fan at end of useful life.
400	Trickling Filter 1	Fan	Odor Control	F-4510	25	1994	25	0	0%	5	2	2	9		
400	Trickling Filter 1	Fan	Odor Control	F-4500	7.5	1994	25	0	0%	5	2	2	9		
400	Trickling Filter 2	Fan	Odor Control	F-4671		1994	25	0	0%	5	3	3	11	Replace	Fan at end of useful life.
400	Trickling Filter 2	Fan	Odor Control	F-4515	25	2010	25	16	64%	2	2	3	7		
400	Trickling Filter 2	Fan	Odor Control	F-4505	7.5	2010	25	16	64%	2	2	3	7		
500	Secondary Clarifier 1	Mechanism/drive	Solids Removal	C-501-01	0.5	2008	25	14	56%	2	2	2	6		Drive recently upgraded.
500	Secondary Clarifier 2	Mechanism/drive	Solids Removal	C-501-02	0.5	2010	25	16	64%	2	2	2	6		Drive recently upgraded.
500	Secondary Clarifier 3	Mechanism/drive	Solids Removal	C-501-03	0.5	2019	25	25	100%	1	1	1	3		Drive under installation
500	Secondary Clarifiers	Pump	Secondary Effluent Transfer Pump 1	P-591-01	75	2018	30	29	97%	1	1	1	3		Pump just commissioned.
500	Secondary Clarifiers	Pump	Secondary Effluent Transfer Pump 2	P-591-02	75	2018	30	29	97%	1	1	1	3		Pump just commissioned.
500	Secondary Clarifiers	Pump	Secondary Effluent Transfer Pump 3	P-501-03	75	2018	30	29	97%	1	1	1	3		Pump just commissioned.
500	Secondary Clarifiers	Pump	Return Secondary Sludge Pump 1	P-530	10	1987	30	-2	-7%	5	5	2	12	Replace	
500	Secondary Clarifiers	Pump	Return Secondary Sludge Pump 2	P-540	10	1987	30	-2	-7%	5	3	2	10	Replace	
500	Secondary Clarifiers	Pump	Return Secondary Sludge Pump 3	P-550	10	1987	30	-2	-7%	5	3	2	10	Replace	
500	Secondary Clarifiers	Pump	Dewatering Sump Pump	P-001-01	10	2018	30	29	97%	1	1	1	3		Pump just commissioned.
600	Disinfection	Mixer	Chlorine Induction Unit	CM-501	2	2001	30	12	40%	3	3	2	8		
600	Effluent Pumping Station	Pump	Effluent Pump	P-610	60	2004	30	15	50%	3	2	2	7		
600	Effluent Pumping Station	Pump	Effluent Pump	P-611	60	2004	30	15	50%	3	2	2	7		
600	Effluent Pumping Station	Pump	3W Pump	P-6271	25	2016	30	27	90%	1	3	2	6		
600	Effluent Pumping Station	Pump	3W Pump	P-6281	25	2016	30	27	90%	1	3	2	6		
700	Anaerobic Digestion	Feeder	Polymer Feed	PPU-7601	1/x	2006	25	12	48%	3	3	3	9		
700	Anaerobic Digestion	Mechanisms	Polymer Makeup Unit	PMU-7603	1/x	2006	25	12	48%	3	2	2	7		
700	Anaerobic Digestion	Pump	Polymer Transfer Pump	PTP-7610	1/x	2006	25	12	48%	3	2	2	7		
700	Anaerobic Digestion	Pump	Polymer Feed	PSP-7602	1/x	2006	25	12	48%	3	2	2	7		
700	Anaerobic Digestion	Pump	Polymer Feed	PSP-7615	1/x	2006	25	12	48%	3	2	2	7		
700	Anaerobic Digestion	Tank	Polymer Storage	PSU-7611	-	2006	25	12	48%	3	2	2	7		
700	Anaerobic Digestion	Centrifuge	Dewatering	CEN-7510	200 Amp	2006	13	0	0%	5	3	2	10		Unit re-built in 2012
700	Anaerobic Digestion	Belt Filter Press	Dewatering	BFP-7815		1999	25	5	20%	4	4	3	11	Replace	
700	Old Solids Handling Building	Grinder	Digester 3	GRD-7861	15 Amp	2006	17	4	24%	4	3	2	9	Replace	Grinder was moved in 2006
700	Old Solids Handling Building	Pump	Digester 3 & 4	P-7511		1994	25	0	0%	5	2	2	9		
700	Old Solids Handling Building	Pump	Digester 3 & 4	P-7531		1994	25	0	0%	5	2	2	9	Replace	Consider renewal and replacement
700	Old Solids Handling Building	Heat Exchanger	Digester 4	HEX-7502	-	2011	25	17	68%	2	2	2	6	Replace	Consider renewal and replacement
700	Old Solids Handling Building	Heat Exchanger	Digester 4	HEX-7503	-	2011	25	17	68%	2	2	2	6		
700	Old Solids Handling Building	Grinder	Digester 4	GDR-7501	15 Amp	2010	17	8	47%	3	4	4	11	Replace	High pressure requires different design.
700	Old Solids Handling Building	Pump	Digester 3	P-7851	1	2008	25	14	56%	2	2	2	6		
700	Old Solids Handling Building	Pump	Digester 3	P-7852	1	2007	25	13	52%	2	2	2	6		

Process ID	Process	Process Unit/Structure/ Asset Class	Equipment Description 1	Asset Tag ID	HP	Installation Year	Original Useful Life	Remaining Useful Life	% of Remaining Useful Life	Condition Rating	Reliability Rating	Capacity Rating	Asset Condition	Replace /Repair	Recommended Replacement/ Repair/Upgrade
700	Digester Complex-Main Level	Pump	Digester 5	P-78026	25	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Pump	Digester 5	P-78024	25	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Mechanisms	Digester 5	HEX-7803	-	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Mechanisms	Digester 5	GRD-7801	20 Amp	2010	17	8	47%	3	2	2	7		
700	Digester Complex-Main Level	Pump	Digester 5	P-78027	30	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Pump	Digester 5	P-78029	30	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Pump	Digester 5	P-78030	3	2010	30	21	70%	2	2	1	5		
700	Digester Complex-Main Level	Pump	Digester 5	P-78031	3	2010	30	21	70%	2	2	1	5		
700	Digester Complex-Main Level	Pump	Ferric Feed Pumps	P-7803	1/x	2010	15	6	40%	3	2	2	7		Pump not used.
700	Digester Complex-Main Level	Pump	Ferric Feed Pumps	P-7804	1/x	2010	15	6	40%	3	2	2	7		Pump not used.
700	Digester Complex-Main Level	Pump	Ferric Pumps	P-7801	1/x	2010	15	6	40%	3	2	2	7		Pump not used.
700	Digester Complex-Main Level	Pump	Ferric Pumps	P-7802	1/x	2010	15	6	40%	3	2	2	7		Pump not used.
700	Digester Complex-Main Level	Tank	RDT Floc Tank	FL-7801	20 Amp	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Tank	RDT Floc Tank	FL-7802	20 Amp	2010	25	16	64%	2	2	2	6		
700	Digester Complex-Main Level	Tank	Thickened Sludge Tank	TST-7801	-	2010	30	21	70%	2	2	1	5		
700	Digester Complex-Main Level	Tank	Thickened Sludge Tank	TST-7802	-	2010	30	21	70%	2	2	1	5		
700	Digester Complex-Main Level	Pump	TS Pump	P-7810	7.5	2010	15	6	40%	3	2	1	6		
700	Digester Complex-Main Level	Pump	TS Pump	P-7808	7.5	2010	15	6	40%	3	2	1	6		
700	Digester Complex-Main Level	Pump	TS Pump	P-7809	7.5	2010	15	6	40%	3	2	1	6		
900	Digester Complex-Thickening Platform	Mechanisms	RST	RST-7801	20 Amp	2010	25	16	64%	2	2	2	6		
900	Digester Complex-Thickening Platform	Mechanisms	RST	RST-7802	20 Amp	2010	25	16	64%	2	2	2	6		
900	Digester Complex-Thickening Platform	Mechanisms	Mixer	MIX-7801	-	2010	25	16	64%	2	2	2	6		
900	Digester Complex-Thickening Platform	Mechanisms	Mixer	MIX-7802	-	2010	25	16	64%	2	2	2	6		
NA	Stormwater Pump Station	Pump	SW Pump	P-151	15	2006	30	17	57%	2	2	2	6		
NA	Stormwater Pump Station	Pump	SW Pump	P-152	15	2006	30	17	57%	2	2	2	6		
NA	Stormwater Pump Station	Pump	SW Pump	P-153	20	2006	30	17	57%	2	2	2	6		

Chapter 5 - 2018 Facility Plan Update

Alternatives Analysis



Chapter 5 Alternatives Analysis

This chapter presents alternatives analysis for the grit removal, sidestream treatment, secondary process treatment, and disinfection for development of future improvements for the City's Advanced Wastewater Treatment Facility (AWTF). An economic and noneconomic scoring comparison is used to select the preferred treatment alternative. The results of the alternatives analysis is presented in this chapter and further refined for the recommended plan in Chapter 7.

5.1 Grit Removal

The City's AWTF preliminary treatment/pre-aeration facilities were constructed in 1984 with modifications in 2004 to add odor control. The plant utilizes an aerated grit basin, also known as the pre-aeration basin, to settle grit out of the wastewater. The pre-aeration basin capacity is designed to handle 6 mgd and requires expansion to handle future flows effectively.

This section describes the three common grit treatment technologies, evaluates advantages and disadvantages, discusses design considerations, and summarizes the findings and recommendations.

5.1.1 Grit Removal Technology Alternatives

The primary purpose of grit removal at a wastewater treatment plant is to remove abrasive material that can damage downstream equipment, as well as minimize the accumulation of inert materials in solids stabilization facilities. Benefits of grit removal include reduced maintenance on downstream mechanical equipment, such as pumps, valves, and sludge collection mechanisms. Grit removal is a two-step process; the first step removes the abrasive grit material from the wastewater and the second cleans and dewaters the grit slurry that has been removed from the liquid stream.

Grit removal systems rely on gravitational and/or centrifugal forces to physically separate grit from the wastewater stream. While these technologies attempt to retain organics within the wastewater stream, some organics are removed along with the grit and need to be separated in the grit washing step prior to dewatering. Three grit removal technologies commonly used in wastewater treatment are described in the following sections.

5.1.1.1 Aerated Grit Removal

Aerated grit basins use a specific velocity of roll or agitation to keep organics in suspension while settling the grit out of the wastewater. Figure 5-1 depicts a cross section of a typical aerated grit basin. Diffused air is typically injected into the rectangular grit chamber along the bottom of one side of the tank, creating a rising air column that induces a spiral roll pattern. The air rate is adjusted to create a sufficiently low velocity near the floor to allow the grit to settle to the bottom of the basin and into collection hoppers, but retains the organics in suspension. When the air supply is properly adjusted, in a well-designed basin, the aerated grit process can capture fine, slow settling grit. This technology does promote scum formation along the surface of the basins, so scum removal is required as part of the system's operations.

Aerated grit removal is an effective technology and the air added can aid biochemical oxygen demand (BOD) and total suspended solids (TSS) removal in downstream processes. However, aerated grit removal is operationally more complicated and typically has higher operating costs than both forced vortex grit removal and stacked tray grit removal. Generally, aerated grit removal has become a less commonly used technology for new grit removal systems. However, since the City's AWTF already utilizes this technology, expanding the grit removal system with additional grit removal basins provides hydraulic advantages and operational familiarity.

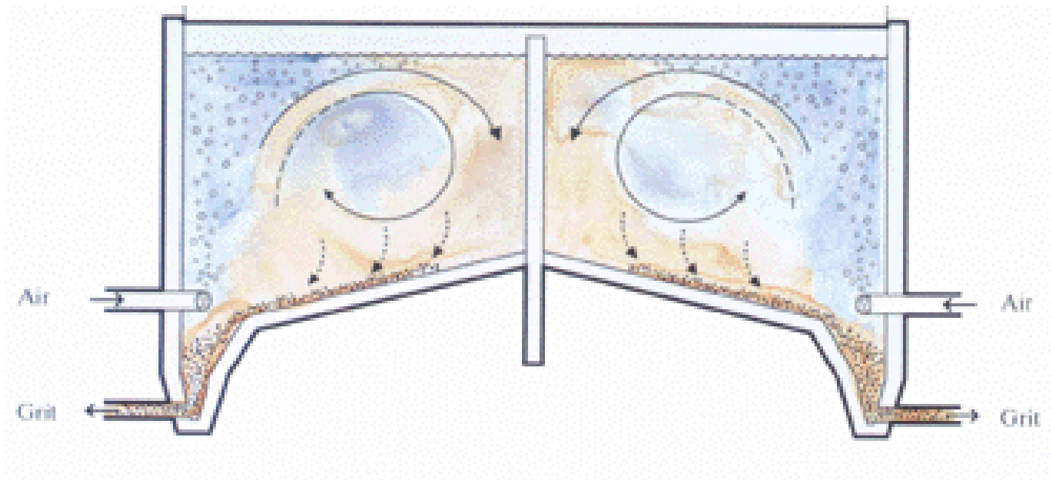


Figure 5-1: Typical Aerated Grit Basin

5.1.1.2 Forced Vortex Grit Removal

Forced vortex grit basins use the principles of gravity and centrifugal action to capture grit in the center hopper of a circular tank. Figure 5-2 shows a typical forced vortex grit basin and the flow pattern inside the basin. The influent enters at a tangent to the outside of the basin producing a spiraling doughnut-shaped flow pattern. The flow pattern in the circular basin pushes the heavier grit particles to the outside where travel times are longer, providing more time for the grit to settle below the "lip" of the outlet opening thus "trapping" the grit. Impellers at the center of the basins cause a lifting action that suspends and lifts the lighter organic material, which is then passed out of the basin through the effluent channel. During a high flow event, there can be short-circuiting of the grit through the basin. This may be controlled by adding baffle walls at the basin inlet and outlet.

The vortex grit removal process provides a simpler, less mechanically intensive method of grit removal than aerated grit removal. Forced vortex grit basins have been used at numerous wastewater treatment plants in the U.S. They generally have a smaller footprint and significantly lower capital and operating costs than aerated grit systems; however, forced vortex grit removal technology has been less effective than other processes in removing slow settling grit particles.

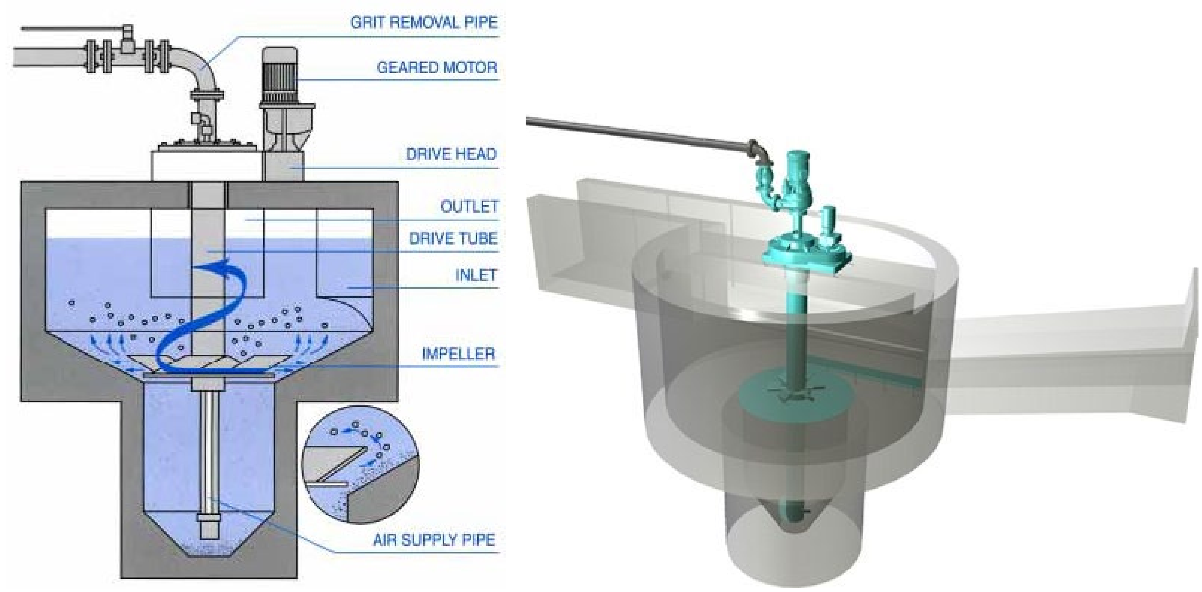


Figure 5-2: Typical Forced Vortex Grit Basin

5.1.1.3 Stacked Tray Grit Removal

The stacked tray or free vortex grit removal process is a modular multiple-tray settleable solids concentrator that can be designed to remove fine grit with low settling velocity. This is a proprietary technology with only one known vendor. Figure 5-3 shows a Eutek Headcell® system. A header evenly distributes the influent flow over multiple conical trays. The tangential feed establishes a vortex flow pattern where solids settle into a boundary layer on each tray and are swept down to the center underflow collection chamber. The settled solids are continuously pumped to a grit separation, classification, and dewatering system. The multi-tray vortex system has a smaller footprint than the other two technologies and requires less mechanical equipment for operation, resulting in a lower operation and maintenance (O&M) cost compared to aerated grit removal. It is a relatively new and proprietary technology, so special attention to operation and maintenance considerations should be included during design.

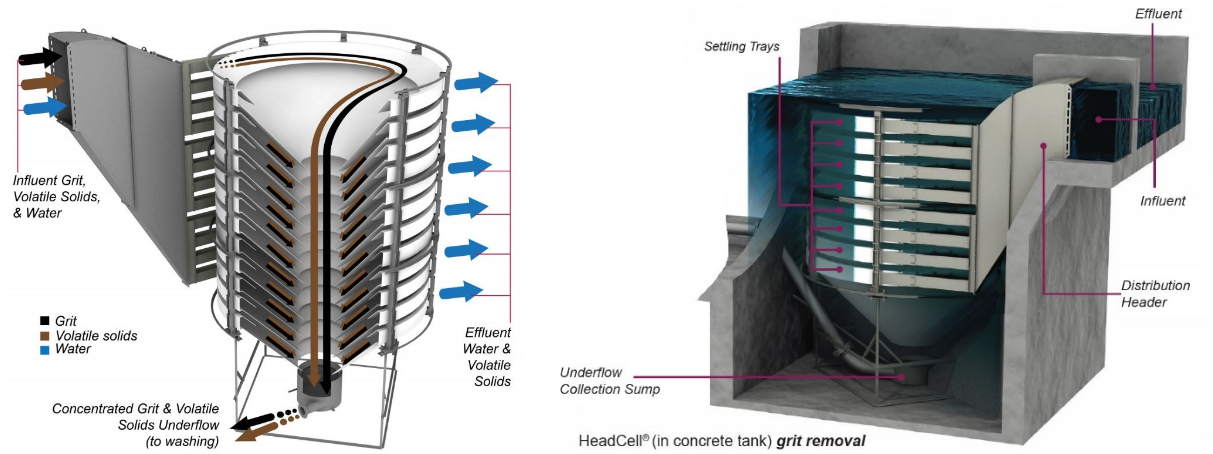


Figure 5-3: Eutek Headcell® Multi-Tray Vortex System

5.1.1.4 Grit Removal Technology Summary

Table 5-1 summarizes the key advantages and disadvantages associated with the three grit removal technologies discussed above.

Table 5-1: Key Advantages and Disadvantages of Grit Removal Technologies

Technology	Advantages	Disadvantages
Aerated Grit Removal	• Can be sized for a wide flow range • Proven technology • Potential to improve performance of downstream processes • More control of grit removal • Less operator attention needed during flow changes • Grit removal expansion would match existing system's technology	• Energy intensive • Increased O&M attention • Larger footprint than stacked tray grit removal system • Produces more foul air to treat • Higher O&M costs
Forced Vortex Grit Removal	• Can accommodate a wide range of flows • Proven technology • Less energy consumption than other two options • Less O&M attention	• May not be effective for slow settling particles • Larger footprint than stacked tray grit removal system • Grit removal expansion would differ from existing system's technology
Stacked Tray Grit Removal (Eutek Headcell®)	• Accommodates a wide range flow range • No moving parts or blowers • Small footprint • Capable of removing more fine particles than other technologies	• Relatively new in the market • More difficult to inspect • Potentially higher head loss than the other two technologies • Higher organic particle capture • Requires continuous grit pumping • Sole-source procurement • Grit removal expansion would differ from existing system's technology

5.1.2 Grit Removal Summary

Grit removal basins are sized based on a peak day flow condition and in the 20-year planning horizon the AWTF will require additional capacity. Expansion of the grit removal process with a parallel 3 mgd forced vortex process is assumed for planning purposes. This approach keeps the existing aerated grit system, which has remaining useful life and operates well under normal flow conditions. The expansion with the forced vortex process will provide effective grit removal over a wide range of flow conditions in a smaller footprint, with a lower operating cost. Plant site space to the west of the existing pre-aeration tank should be preserved for future grit removal expansion.

To inform the future decision-making process on the best grit removal technology for the plant, it is recommended that a grit characterization study be conducted. A grit characterization study will determine the current removal efficiencies, particle size distribution, and settling velocities for design. It will also help to determine the effectiveness of the alternative removal technologies for Coeur d'Alene site specific conditions and establish the design criteria for the expansion. It is important that the study be conducted at a time when peak flows are expected to verify grit across the range of flows to the plant.

5.2 Sidestream Treatment

Sidestream treatment objectives are to manage the ammonia load that returns to the liquid stream treatment from biosolids treatment, through either flow pacing or removal. While this return flow generally represents only 1 percent of total flow, it normally carries approximately 20 percent of the nitrogen load and approximately 30 percent of the phosphorus load. Sidestream management can be as elementary as an equalization basin and flow pacing. More elaborate sidestream processing ranges from standard nitrification to application of low energy deammonification-based technologies.

The existing solids process digests primary and secondary sludge. Digested sludge is transferred to a holding tank from that feeds a single centrifuge or the backup belt filter press for dewatering. Dewatering centrate or filtrate is equalized in the centrate storage tank and returned during the nighttime hours to the trickling filter recycle pump station. The ammonia-rich recycle stream is utilized for trickling filter snail control. If sidestream ammonia or nitrogen removal is implemented at the AWTF, an alternative method for trickling filter snail control would be required.

This section describes sidestream treatment technologies to be considered, evaluates sidestream treatment alternatives, discusses design considerations, and summarizes the findings and recommendations. Table 5-2 presents the conceptual design parameters for sidestream treatment planning.

Table 5-2: Sidestream Conceptual Design Parameters

Parameter	Units	Values
NH_4-N load	lb/d	300
sBOD	mg/L	< 50
TSS	mg/L	< 1,000
Alkalinity	mg/L as $CaCO_3$	1,100

Note: NH_4-N = ammonia as nitrogen, sBOD = soluble biochemical oxygen demand, $CaCO_3$ = calcium carbonate

5.2.1 Sidestream Management and Treatment Alternatives

5.2.1.1 Sidestream Equalization

Flow equalization is the simplest form of sidestream management alternative for application when dewatering operation is not continuous. The City typically dewaters digested sludge seven days a week during only the day shift. As previously mentioned, the dewatering centrate or filtrate is equalized in the centrate storage tank and is pumped back to the main plant to the trickling filter pump station, plant headworks, or to the tertiary membrane filtration (TMF) facility. When and where the return is pumped is selected by the plant staff based on need or preference. The preferred return location is the Trickling Filter Recycle Pump Station since the ammonia in the recycle is toxic for trickling filter snails and therefore co-functions as snail control.

The centrate can also be pumped to the TMF to provide additional ammonia to grow nitrifiers. These nitrifiers are used to seed the Solids Contact and RSS storage tanks. At the current ammonia loading rates, this operational mode is not required as the plant fully nitrifies without impediment.

The advantage of centrate equalization is that it is simple and applicable to the City's existing facilities. However, it does not provide ammonia load reduction to liquid stream. Equalization is also a prerequisite for any other biological sidestream treatment process in consideration.

5.2.1.2 Nitrifying SBR

Nitrifying sequencing batch reactors (SBRs) are used to reduce the ammonia load to the mainstream aerobic biological processes by sidestream nitrification. These are used in conjunction with sidestream flow equalization basins to accommodate the batch SBR process. Nitrifying SBRs convert most ammonia to nitrate, but do not reduce total nitrogen.

This lack of nitrogen removal is inconsequential from a capacity and compliance perspective, and provides little additional benefit since the plant has ample capacity to nitrify. The potential bio-augmentation of the main stream process does not provide tangible benefits beyond that already available in the existing process with TF/SC and TMF. A sidestream nitrification requires alkalinity supplementation but would not result in additional chemical cost since supplementation is already necessary. Sidestream nitrification would merely move some, or all of the supplemental alkalinity addition, to a different location.

Growing nitrifiers in the sidestream does increase the nitrification resiliency of the overall process since it can reseed the liquid stream after partial, or complete loss of nitrification due toxic or inhibitory substance released to the collection system.

5.2.1.3 Deammonification

Deammonification, also known as Anammox (ANaerobic AMMonia Oxidation), is an efficient and well established technology option to treat high strength ammonia streams. Deammonification combines partial nitritation and anaerobic ammonia oxidation. These two reactions occur simultaneously. Nitritation utilizes ammonia oxidizing bacteria (AOBs) to convert ammonia-nitrogen (NH_4-N) to nitrite-nitrogen (NO_2-N). In the second reaction, anammox bacteria convert ammonia directly to nitrogen gas by using the oxygen in nitrite. The deammonification pathway is illustrated in Figure 5-4.

The main advantages of deammonification include the following:

- No carbon is required for anammox nitrogen removal
- Small foot print space required and fully automated process
- Reduces the overall alkalinity demand by approximately 10 percent
- Reduces the overall aeration energy demand by approximately 6 percent.

From an operational perspective, a deammonification sidestream treatment system does add a new process to operate and maintain separate from the main treatment plant. For smaller facilities the payback time is typically less favorable than at larger facilities.

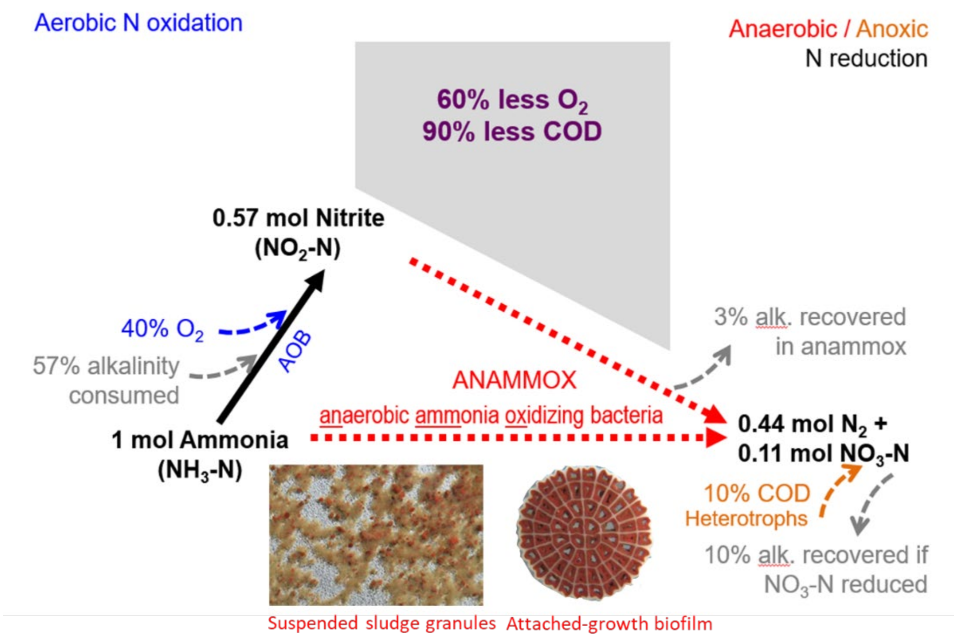


Figure 5-4: Deammonification Pathway

There are multiple venders that offer deammonification processes, all of which achieve similar levels of sidestream nitrogen removal. Veolia's ANITA^{TM} Mox is a continuous flow application that utilizes biofilm carriers (Figure 5-5) similar to moving bed bioreactors (MBBRs). The biofilm process is immune to biomass washout and tolerates solids slugs from dewatering startup and shut downs. It does tend to be have the highest capital cost. Higher volumetric loading rates are possible with the optional integrated fixed film activated sludge (IFAS) configuration, but due to the size of the system it offers little actual benefit.

World Waterworks offers the DEMON® process, which in its latest version is a continuous flow granular deammonification process. The anammox granules are retained through micro screens (Figure 5-6). The granules tend to be small (1 to 2 mm) which makes the process sensitive to the sidestream feed quality. Therefore pretreatment through either straining or belt filtration is recommended.

The third technology option is offered by Ovivo (AnammoPAQ^{TM}), which is also a flow through process based on granules. The granule retention is achieved through upflow separation, which leads to much larger granules (3 to 5 mm, Figure 5-7). Similar to ANITA^{TM} Mox, this process is can handle solids slug loadings from dewatering startup or upsets.

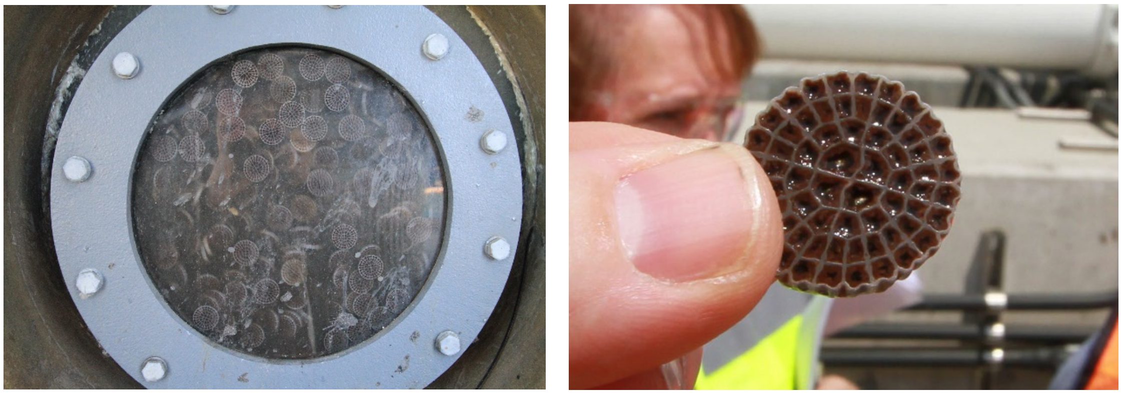


Figure 5-5: ANTIA^{TM} Mox reactor at Sjolunda WWTP in Malmo, Sweden (left) and carrier media with anammox biofilm (right)

Figure 5-6: DEMON® Process - granule retention screen (left), granules sample (right)

Figure 5-7: AnammoPAQ™ granules from Dokhaven WWTP (left) and Olburgen WWTP (right) in the Netherlands

5.2.1.4 Sidestream Management and Treatment Summary

Table 5-3 summarizes the key advantages and disadvantages associated with the three types of sidestream management and treatment alternatives discussed above.

Table 5-3: Key Advantages and Disadvantages of Sidestream Treatment Alternatives

Alternative	Advantages	Disadvantages
Centrate Management	• Diminished ammonia spikes to main plant • Snail control for trickling filters • Low capital cost	• No ammonia load reduction
Nitrifying SBR	• Proven process • Helps to control odors in headworks • Reduces oxygen demands in secondary process • Total nitrogen removal • Possible bio-augmentation	• No alkalinity recovery • High energy demand • Low nitrogen loading
Deammonification (ANITA™ Mox, DEMON® and AnammoPAQ™)	• Low oxygen demand • 85% nitrogen removal from sidestream • Reduced supplemental alkalinity demand • Robust bacteria, once established	• Slow-growing bacteria • Sensitive to cold temperatures

5.2.2 Sidestream Treatment Summary

As discussed above, the AWTF already practices centrate management through equalization and controlled recycle through the plant. The plant does benefit from the snail control in the trickling filters from the high ammonia recycle, however this ammonia must be treated by the main plant. A sidestream treatment process adds an ammonia removal benefit. A deammonification process would also reduce the amount of supplemental alkalinity used at the plant. Operation and dimensional parameters of nitrifying SBRs and deammonification–based processes are shown in Table 5-4.

Table 5-4: Sidestream Treatment Conceptual Design Summary

Technology	SWD (ft)	Volume (MG)	Diameter (ft)	Airflow (scfm)	Alkalinity Demand (lb/d)
Nitrifying SBR[1]	33	0.19	38	170	800
ANITA™ Mox	23	0.028	14	90	-
DEMON®	23	0.030	15	90	-
AnammoPAQ™	23	0.020	12	90	-

Note: [1] Assumes 200 mg/L BOD

While the nitrifying SBR does reduce the ammonia load to the main plant, the process does not provide a reduction in the supplemental alkalinity requirement. The chemical savings gained through the implementation of a deammonification process makes it the preferred sidestream treatment. Deammonification-based sidestream treatment is proposed with Secondary Process Alternatives 3 and 4 discussed below in Section 5.3.

5.3 Secondary Process Treatment

This section describes the five pre-screened alternatives that were evaluated for secondary treatment expansion. Each alternative was developed as an approach to meet the future flow and loading projections. A BioWin treatment process simulation model (Figure 5-8) calibrated to current plant operating conditions was used to compare performance and verify that key unit process loading rates are within typical planning level ranges. Oxygen transfer was identified as the limiting parameter for both the solids contact and RAS re-aeration tanks, as well as the TMF mixing tank.

The Biowin process model, when not constrained by oxygen uptake, suggested high rates of nitrification and oxygen limiting conditions, which given the relatively shallow tanks is plausible. To verify oxygen levels in the solids contact and RAS re-aeration tanks, the City conducted field dissolved oxygen (DO) measurements. However, the field measurements showed sufficient oxygen concentration at levels greater than 4 mg/L DO. It was therefore concluded that these tanks were limited by the actual hydraulic retention time that is likely reduced through short circuiting. For alternatives where the solids contact volume is increased, it is assumed the short circuiting constraint is eliminated by addition of design features.

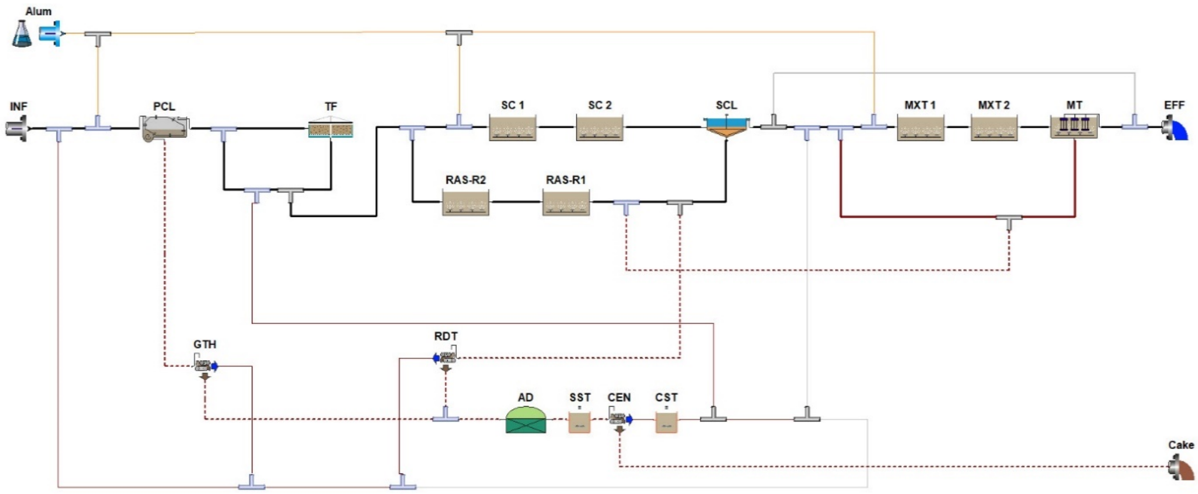


Figure 5-8: Coeur d'Alene AWTF BioWin Model Process Schematic

The following planning considerations and assumptions were applied to the five secondary process alternatives:

- The design target of an effluent ammonia concentration of 0.1 mg/L was used to size basin volumes, alkalinity demand, and aeration systems even though the current NPDES permit does not require full nitrification. This is informed by the fact that the current system nitrifies completely.
- The trickling filters at the current loading rate is assumed to provide little or no contribution to nitrification.
- The trickling filter media will reach the end of its useful life within the planning horizon. While the replacement would occur as need, and the media may last longer, the cost for replacement are included in 2028 for the alternatives that retain the trickling filters. The plant is able to operate with one trickling filter while the other unit is being refurbished.
- The membrane tank volume is not included as part of the reactor volume in process modeling, even though in practice, some treatment occurs within the membrane tank.
- The existing TMF system can receive 19 mg/L of secondary effluent ammonia, which translates into a volumetric loading rate of 3,500 lb N/d/MG of reactor volume. Based on nitrogenous oxygen demand, this results in an oxygen uptake rate of 80 mg/L/hr for full nitrification.
- The TMF expansion assumes an N+2 redundancy. This assumes that treatment capacity is maintained with one membrane tank out of service and one membrane tank in backwash or clean-in-place mode. The current TMF infrastructure includes a spare tank for additional membranes for expansion. Adjacent space is currently available for one additional tank. An N+1 redundancy may be considered during the implementation planning phase. This would result in operating at a higher flux if a basin is out of service. Small short term TMF bypasses could also acceptable and pose little compliance risk.

5.3.1 Alternative 1: Baseline TF/SC with Expanded TMF

In this baseline alternative (Figure 5-9) the existing secondary treatment remains the same with respect to unit process sizes and process configuration upstream of the TMF. Additional treatment capacity is added to the TMF system by expanding the mixing tank and providing additional membranes. It is assumed that the trickling filter/solids contact (TF/SC) process does not contribute to nitrification and the only nitrogen removed is due to biomass growth. Table 5-5 summarizes the conceptual design parameters and assumptions for this alternative.

Since this alterative retains the TF/SC process, it is anticipated that the trickling filter media will need to be replaced within the planning horizon. While the remaining useful life of the media is difficult to predict, the replacement cost will be allocated to year 10 (2028) of the 20 year planning horizon.

The additional mixing tank volume would be constructed at once. Based on the influent loading projections, design for the mixing tank expansion should begin in 2023. The nitrification capacity of the existing mixing tank volume can be also increased by adding additional diffusers to the existing grid. Currently, the diffuser density is at 16 percent and can accommodate an increase in the number of diffusers by 50 percent, to 24 percent density. Interim nitrification capacity could also be gained by utilizing the volume of the sixth membrane tank, which is presently is not in service. The additional membrane surface area would be phased in as flow increases dictate. The conceptual site layout of the alternative is illustrated in Appendix A.

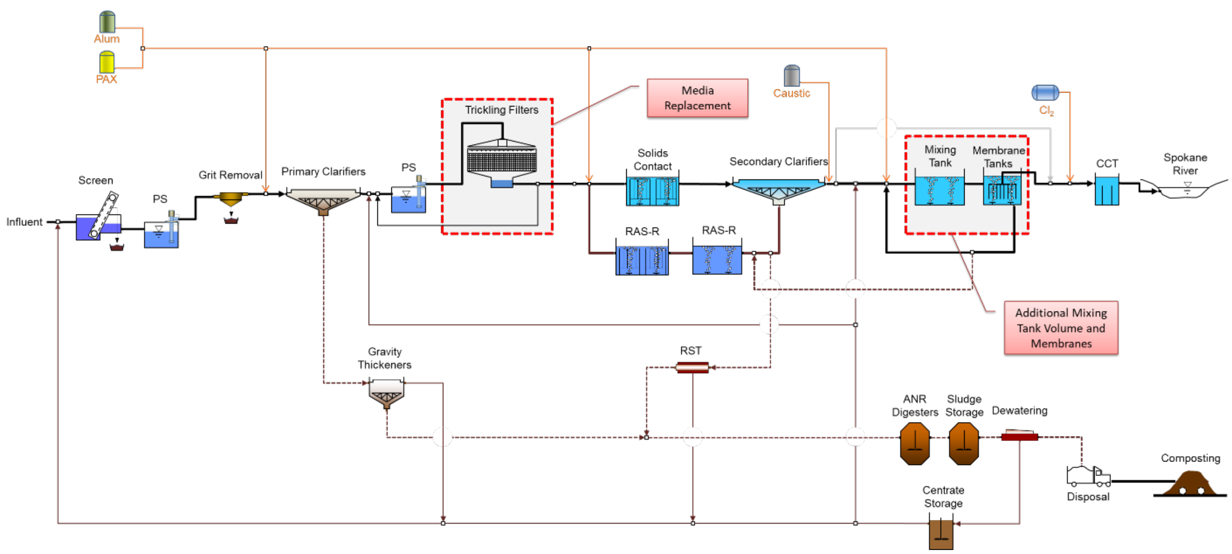


Figure 5-9: Alternative 1 Process Schematic for Couer d'Alene AWWTP

Table 5-5: Alternative 1 – Conceptual Design Summary

Parameter	Units	Value	Notes
Primary Clarifier TSS Removal	%	75	Continue primary alum or PAX addition
Trickling Filter NH_4-N Removal	%	0	No upstream nitrification
Max. Month SE NH_4-N	mg/L	45	No upstream nitrification
Max. SE TP	mg/L	1	
TMF Nitrification Rate	mg N/L/hr	17	Based on max OUR of 80 mg/L/hr
New or Expanded Facilities			
Trickling Filter Media Replacement	1,000 cf	120	
New TMF Mixing/Aeration Volume	MG	0.30	
New TMF Membrane Capacity	mgd	2	Utilize empty membrane tanks
New TMF Membrane Media Surface	sf	213,120	11.7 gfd annual average flux at 12°C

5.3.2 Alternative 2: Trickling Filter/Activated Sludge

The overall process configuration for Alternative 2 (Figure 5-10) is identical to Alternative 1 but differs in the location of where additional reactor capacity is added. This alternative increases the volume of the solids contact and RAS re-aeration tanks to operate as a partially nitrifying activated sludge system. Membrane modules are needed to increase the hydraulic capacity of the TMF, but unlike Alternative 1 the mixing tank volume remains the same. Additional solids contact volume is 0.55 MG, increasing the total solids contact volume from 0.07 MG to 0.62 MG. Additional volume for RAS storage is 0.10 MG, bringing total RAS storage from 0.13 MG to 0.23 MG. Caustic addition will continue at the same dose for supplemental alkalinity.

The solids contact and RAS re-aeration expansion is sized to achieve a secondary effluent ammonia of less than 19 mg/L NH_4-N after seeding with nitrifiers wasted from the TMF to the activated sludge system. Table 5-6 summarizes the conceptual design parameters and assumptions for this alternative.

This alternative also keeps the TF/SC process, so it is anticipated that the trickling filter media will need to be replaced within the planning horizon. While the remaining useful life is difficult to predict, the replacement cost will be allocated to year 10 (2028) of the 20 year planning horizon.

The additional solids contact and RAS re-aeration tank volume would be constructed at one time. Design for the activated sludge expansion should begin in 2023. In the interim, as discussed under Alternative 1, additional nitrification capacity can be gained by increasing the diffuser density in the mixing tank or modifying the open sixth membrane train. Additional membrane surface area capacity would be phased in as increases in plant flow dictate. The conceptual site layout of Alternative 2 is illustrated in Appendix A.

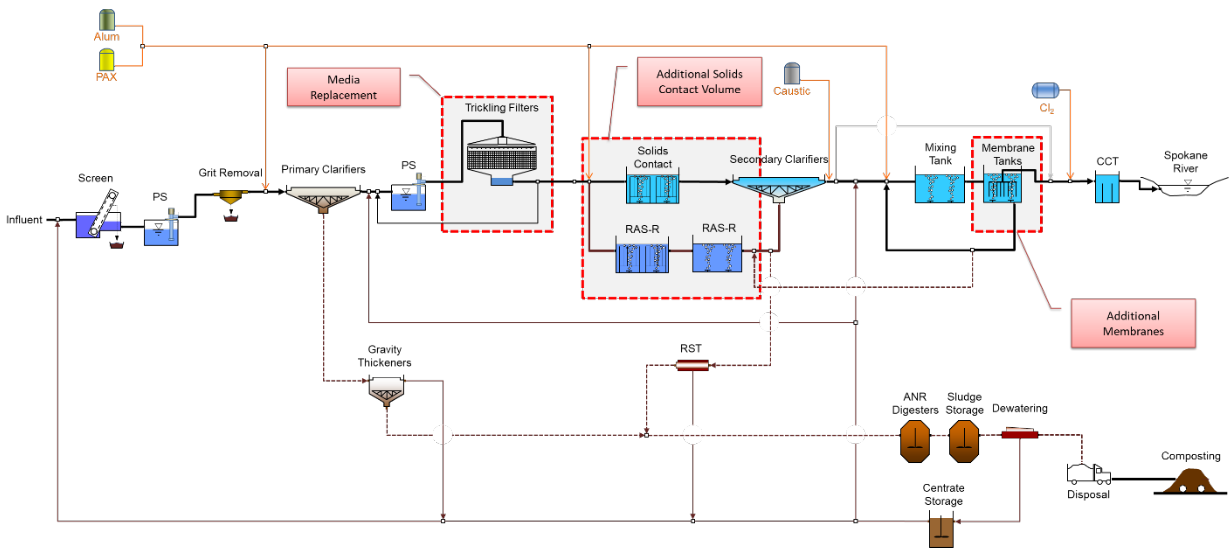


Figure 5-10: Alternative 2 Process Schematic for Couer d'Alene AWWTP

Table 5-6: Alternative 2 – Conceptual Design Summary

Parameter	Units	Value	Notes
Primary Clarifier TSS Removal	%	75	Continue primary alum or PAX addition
Trickling Filter NH_4-N Removal	%	0	No upstream nitrification
Max. Month SE NH_4-N	mg/L	12	No upstream nitrification
Max. SE TP	mg/L	1	
TMF Nitrification Rate	mg N/L/hr	17	Based on max OUR of 80 mg/L/hr
New or Expanded Facilities			
Trickling Filter Media Replacement	1,000 cf	120	
Solids Contact and RAS-R Volume	MG	0.65	
New TMF Membrane Capacity	mgd	2	Utilize empty membrane tanks
New TMF Membrane Media Surface	sf	213,120	11.7 gfd annual average flux at 12°C

5.3.3 Alternative 3: Expanded TMF with Sidestream Treatment

Alternative 3 (Figure 5-11) adds sidestream deammonification to Alternative 1. Since nitrification capacity in the main stream is oxygen transfer limited, the addition of sidestream ammonia removal reduces the required expansion volume of the TMF mixing tank. The reduced mixing tank volume is 0.20 MG which is 70,000 gal less than Alternative 1 that did not include the addition of sidestream treatment.

While the difference in mixing tank volume is small, the long term benefit of the sidestream deammonification process is the reduction of supplemental alkalinity addition. The amount of ammonia removed in the sidestream process is roughly equivalent to the current amount of alkalinity added. Operators are still in the process of optimizing the existing plant process as a result of the

Phase 2 Tertiary Treatment upgrades and coagulant optimization efforts (see Chapter 4 Section 4.7.1 for discussion). It is anticipated that the current rate of chemical addition may decrease. This could extend the return on investment period of a sidestream treatment process beyond the planning horizon, making it less attractive because the reductions in chemical addition alleviate some of the supplemental alkalinity demand. For the alternative analysis, $430,000 per year was assumed for the current average cost of alkalinity supplementation. A summary of conceptual design parameters and required unit processes is provided in Table 5-7.

In addition to the direct economic benefits of sidestream deammonification, an additional benefit is the addition of resiliency to the combined secondary treatment process. The sidestream nitrification process adds protection from inhibition due to influent contamination, reduces the influent ammonia even nitrification capacity is lost in the main plant liquid stream, and can help reseeding the activated sludge process

Similar to Alternative 1, this alternative also keeps the TF/SC process, so it is anticipated that the trickling filter media will need to be replaced within the planning horizon. The replacement cost will be allocated to year 10 (2028) of the 20 year planning horizon. The additional mixing tank volume would be constructed at once. Based on the influent loading projections, design for the mixing tank expansion should begin in 2023. In the interim, as discussed under Alternative 1, additional nitrification capacity can be gained by increasing the diffuser density in the mixing tank or modifying the open sixth membrane train. Additional membrane surface area capacity would be phased in as the flow increases dictate. The conceptual site layout of Alternative 3 is illustrated in Appendix A.

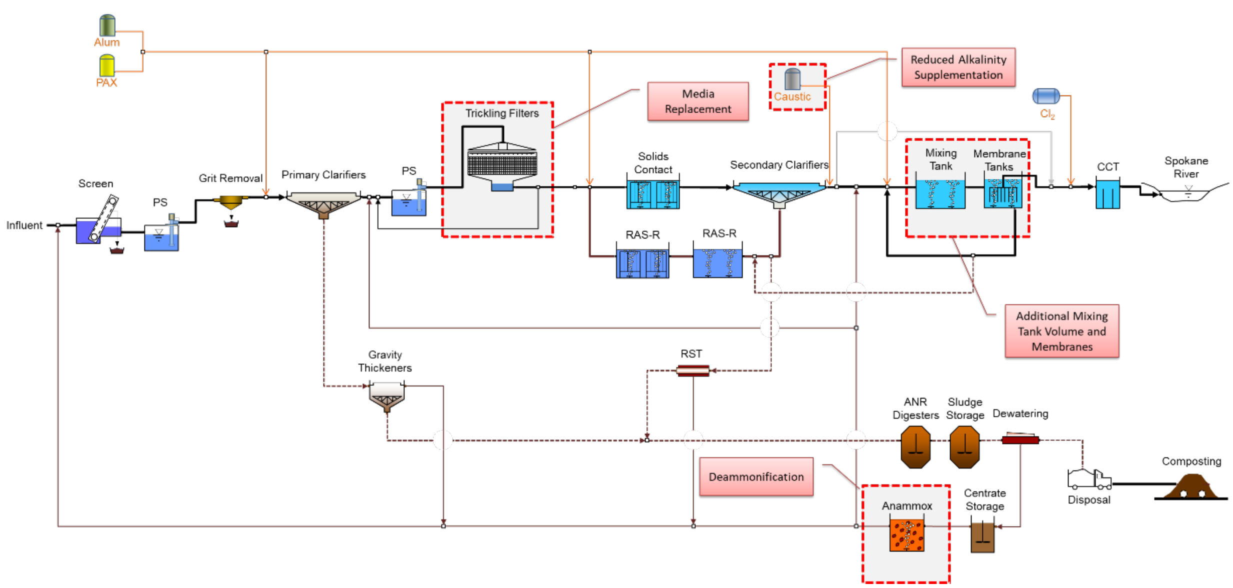


Figure 5-11: Alternative 3 Process Schematic for Couer d'Alene AWWTP

Table 5-7: Alternative 3 – Conceptual Design Summary

Parameter	Units	Value	Notes
Primary Clarifier TSS Removal	%	75	Continue primary alum or PAX addition
Trickling Filter NH_4-N Removal	%	0	No upstream nitrification
Max. Month SE NH_4-N	mg/L	45	No upstream nitrification
Max. SE TP	mg/L	1	
TMF Nitrification Rate	mg N/L/hr	17	Based on max OUR of 80 mg/L/hr
New or Expanded Facilities			
Trickling Filter Media Replacement	1,000 cf	120	
New TMF Mixing/Aeration Volume	MG	0.20	
New TMF Membrane Capacity	mgd	2	Utilize empty membrane tanks
New TMF Membrane Media Surface	sf	213,120	11.7 gfd annual average flux at 12°C
Sidestream Deammonification	MG	0.025	Vender furbished package system, assumes 90% ammonia removal

5.3.4 Alternative 4: Trickling Filter/Activated Sludge with Sidestream Treatment

Alternative 4 (Figure 5-12) adds sidestream deammonification to Alternative 2. The addition of sidestream ammonia removal reduces the required expansion volume of the solids contact and RAS re-aeration tanks. Solids contact expansion volume remains the same as Alternative 2 at 0.55 MG, but does not require any additional RAS re-aeration volume. The reduced combined tank volume is 0.55 MG which is 100,000 gal less than without the addition of sidestream treatment in Alternative 2.

As described in Alternative 3, the long term benefit of implementing a sidestream deammonification process is the reduction of supplemental alkalinity addition. The amount of ammonia removed in the sidestream is roughly equivalent to the current amount of alkalinity added. Operators are still in the process of optimizing the plant as a result of the Phase 2 Tertiary Treatment upgrades and coagulant optimization efforts (see Chapter 4 Section 4.7.1 for discussion). It is anticipated that the current rate of chemical addition may decrease. This could extend the return on investment period for a sidestream treatment process beyond the planning horizon, making itr less attractive. For the alternative analysis, $430,000 per year was assumed for the current average cost of alkalinity supplementation.

The solids contact and RAS re-aeration tank expansion is sized to achieve a secondary effluent ammonia or less than 19 mg/L NH_4-N after seeding with nitrifiers wasted from the TMF to the activated sludge system. Table 5-8 summarizes the conceptual design parameters and assumptions for this alternative.

Similar to Alternative 1, this alternative retains the TF/SC process, so it is anticipated that the trickling filter media will need to be replaced within the planning horizon. The replacement cost will be allocated to year 10 (2028) of the 20 year planning horizon. The additional solids contact volume would be constructed at once. Based on the influent loading projections, design for the mixing tank expansion should begin in 2023. In the interim, as discussed under Alternative 1, additional nitrification capacity can be gained by increasing the diffuser density in the mixing tank or modifying the open sixth membrane train. Additional membrane surface area capacity would be phased in as the increases in flow dictate. The conceptual site layout of the Alternative 4 is illustrated in Appendix A.

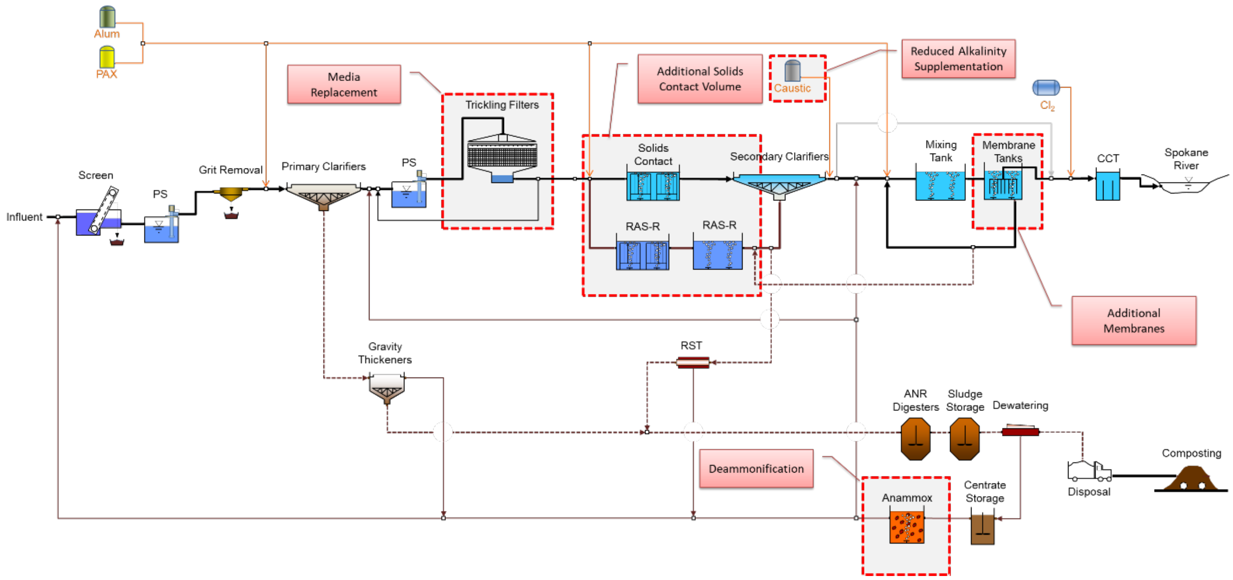


Figure 5-12: Alternative 4 Process Schematic for Couer d'Alene AWWTP

Table 5-8: Alternative 4 – Conceptual Design Summary

Parameter	Units	Value	Notes
Primary Clarifier TSS Removal	%	75	Continue primary alum or PAX addition
Trickling Filter NH_4-N Removal	%	0	No upstream nitrification
Max. Month SE NH_4-N	mg/L	12	No upstream nitrification
Max. SE TP	mg/L	1	
TMF Nitrification Rate	mg N/L/hr	17	Based on max OUR of 80 mg/L/hr
New or Expanded Facilities			
Trickling Filter Media Replacement	1,000 cf	120	
Solids Contact and RAS-R Volume	MG	0.55	
New TMF Membrane Capacity	mgd	2	Utilize empty membrane tanks
New TMF Membrane Media Surface	sf	213,120	11.7 gfd annual average flux at 12°C
Sidestream Deammonification	MG	0.025	Vender furbished package system, assumes 90% ammonia removal

5.3.5 Alternative 5: Biological Nutrient Removal

Alternative 5 (Figure 5-13) discontinues use of trickling filters and incorporates a partial biological nutrient removal (BNR) activated sludge process. More specifically, Alternative 5 changes the secondary process to enhanced biological phosphorus removal (EBPR) with RAS denitrification. The

RAS denitrification is required to enable the EBPR process and it also recovers enough alkalinity from denitrification that alkalinity supplementation is minimized. The EBPR activated sludge process would require the construction of additional basin volume of 1.05 MG.

Since this alternative does not use the trickling filters, they could be repurposed for odor control or the BNR basins could be constructed in their place. The new BNR secondary process will produce less solids and will off-load the solids treatment and handling by approximately 10%. This also results in a reduction in biosolids. EBPR has shown to negatively impact solids dewaterability causing an increase in polymer demand up to 100 percent and lower dewatered cake total solids concentration by three to four percentage points. However, because the plant will continue to rely on tertiary chemical phosphorus removal in the TMF, the impact on solids dewaterability is expected to be less severe than in pure EBPR systems.

Alternative 5 represents a fundamental change of approach to the plant's nutrient removal process through the use of EBPR. EBPR incorporates an anaerobic zone at the head of conventional activated sludge to select for phosphate accumulating organisms (PAOs) which sequester up to five times more phosphorus than normal heterotrophs. PAOs need volatile fatty acids (VFAs) to store as internal substrate in the anaerobic zone, which is then used in the aerobic zone for phosphorus uptake. This alternative eliminates the addition of coagulant to the primary clarifiers, increasing VFA production in the anaerobic zone, and reducing the primary sludge production. Primary sludge gravity thickener overflow typically contains a significant amount of VFAs, which could also be routed directly to the anaerobic zone of the biological treatment process if needed as a carbon supplement. If additional VFAs are needed in the future, one of the three existing gravity thickeners can also be retrofit for fermentation to produce VFAs from the primary sludge. Nitrifiers will be seeded from the TMF to the BNR in order to increase nitrification.

Similar to the other alternatives, additional TMF membrane capacity is required to meet future flow increases. The TMF expansion would include installation of membranes in a manner similar to the other alternatives, but with no additional mixing tank volume. Caustic addition following the secondary clarifiers is assumed to be reduced. Secondary and tertiary coagulant addition will be reduced. Without primary coagulant addition, the assumed primary clarifier solids capture rate is reduced to the typical range of approximately 65 percent. The conceptual site layout of Alternative 5 is illustrated in Appendix A.

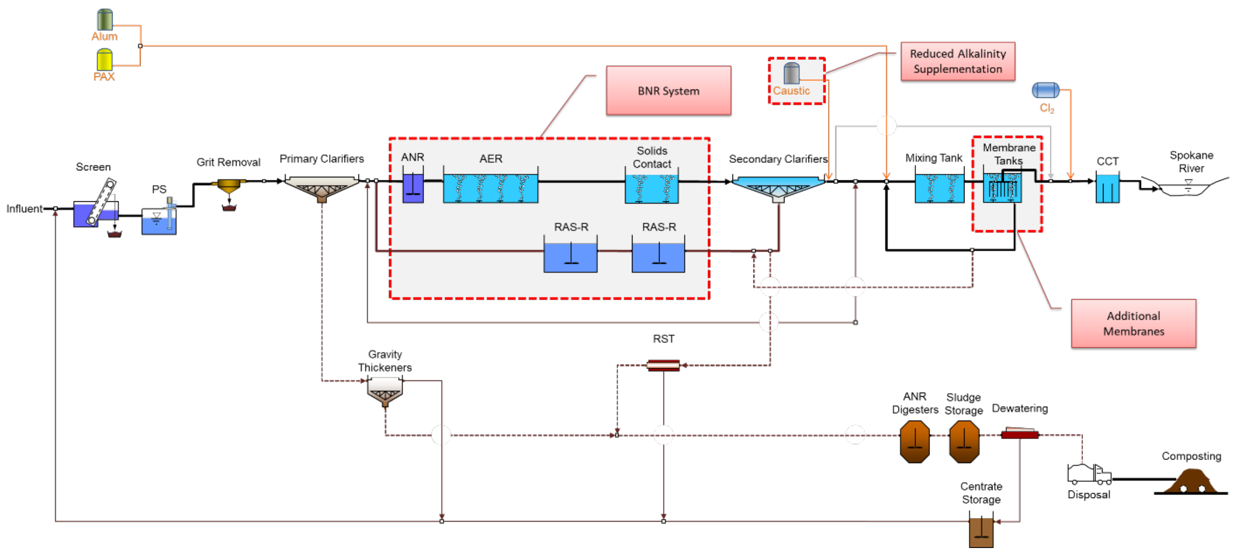


Figure 5-13: Alternative 5 Process Schematic for Couer d'Alene AWWTP

Table 5-9: Alternative 5 – Conceptual Design Summary

Parameter	Units	Value	Notes
Primary Clarifier TSS Removal	%	65	No primary alum or PAX addition
Max. Month SE NH_4-N	mg/L	12	No upstream nitrification
Max. SE TP	mg/L	1	
TMF Nitrification Rate	mg N/L/hr	17	Based on max OUR of 80 mg/L/hr
New or Expanded Facilities			
New BNR Basin Volume	MG	1.05	
New TMF Membrane Capacity	mgd	2	Utilize empty membrane tanks
New TMF Membrane Media Surface	sf	213,120	11.7 gfd annual average flux at 12°C
Sidestream Deammonification	MG	0.02	Vender furbished package system, assumes 90% ammonia removal

5.4 Disinfection

The disinfection system at the AWTF was constructed in 1984. The current process uses gaseous chlorine to create a chlorine solution used for disinfection. While much of the existing disinfection process is in good condition, the review of potential changes to the disinfection system is practical in nature with drivers related to health and safety, reduction in the potential for generation of disinfection by-products, and deactivation of viruses/bacteriophages in response to regulatory requirements.

This section describes three alternative disinfection methods, evaluates advantages and disadvantages, discusses design considerations, and summarizes the findings and recommendations. The design basis for the disinfection system includes regulatory requirements (both for river discharge and recycled water reuse) and facility design criteria.

5.4.1.1 Regulatory Requirements

The City's December 2014 NPDES permit for discharge to the Spokane River includes the limits pertinent to disinfection in Table 5-10.

Table 5-10: Permit Requirements for Discharge to the Spokane River [1]

Parameter	Units	Average Monthly Limit	Maximum Daily Limit
E. Coli	MPN/mL	126 [2]	406
Total Residual Chlorine (October-June)	ug/L	150	390
	lb/day	7.5	20
Total Residual Chlorine (July-September)	ug/L	39	102
	lb/day	2.0	5.1

Note: [1] Limits from 2014 NPDES permit No. ID0022853.
[2] The average monthly effluent E. coli bacteria count must not exceed a geometric mean of 126 per 100 mL based on a minimum of five samples taken every 3 to 7 days within a calendar month.

The City's AWTF is designed to be able to discharge a portion of the effluent flow as Class A reclaimed water for reuse. Idaho Administrative Code (IAC) 58.01.17 outlines the water quality requirements for Class A recycled water as summarized in Table 5-11.

Table 5-11: Class A Recycled Water Requirements

Parameter	Limit
Total Coliform Residual [1]	≤2.2 MPN/100 mL 7-day median
	≤23 MPN/100 mL single sample maximum
Turbidity [2]	<0.2 NTU daily average
	<0.5 NTU instantaneous maximum
Chlorine Disinfection [3]	
CT (Chlorine Residual x Contact Time)	≥450 mg-min/L
Modal Contact Time	≥90 minutes
UV Disinfection [4]	
Virus inactivation	5-log removal (based on secondary effluent virus concentration)

Note: [1] Coliform requirements based on IAC 58.01.17 Section 601.01.a.ii
[2] Turbidity based on membrane filtration limits defined in IAC 58.01.17 Section 601.01.b.i.(2)
[3] Chlorine disinfection requirements based on IAC 58.01.17 Section 601.01.a.i.(1)
[4] UV disinfection requirements base on IAC 58.01.17 Section 601.01.a.i.(2)

5.4.1 Disinfection Treatment Technologies

Disinfection processes are used to partially destroy biological pathogen populations existing in wastewater effluents in order to mitigate public health risks that can occur during human interaction with the receiving water bodies. Disinfection can be accomplished by various means; disinfectants include chemical agents (e.g. chlorine gas, sodium hypochlorite, ozone) as well as physical agents (e.g. ultraviolet radiation).

Three disinfection methods are considered in this evaluation as alternatives to the existing chlorine gas based system are:

- Sodium hypochlorite
- Ultraviolet (UV) disinfection
- UV & sodium hypochlorite hybrid

The use of peracetic acid (PAA) was also briefly reviewed as a disinfection treatment option. PAA is a recent technological application for disinfection in wastewater treatment. PAA is relied upon due to its ability to disinfect without the formation of known harmful disinfection by-products (DBPs). A full review of PAA was not considered for the City's AWTF due to the limited number of full scale reference installations, reduced effectiveness for virus inactivation or bacteriophage reduction, residual quenching requirements, and the potential for organism regrowth which could limit reuse water production opportunities.

5.4.1.1 Sodium Hypochlorite

Sodium hypochlorite added to water transforms into hypochlorous acid and hypochlorite ions, which are strong oxidants that inactivate most pathogens found in wastewater. Chlorination, either with the use of chlorine gas or hypochlorite, is the most common disinfection method used in wastewater treatment in the United States. However, the chlorination process leaves a residual concentration that while beneficial in drinking water systems (as it prevents the growth of pathogens throughout the water delivery system), it is detrimental in scenarios where disinfected wastewater is discharged into biological environments where it can create adverse conditions for the natural aquatic life. In order to reduce environmental impacts, chlorinated wastewater must go through a dechlorination step to remove any chlorine residual.

Although chlorine is a well-established disinfectant, it also is known to create DBPs, which are a result of a series of reactions between free chlorine and specific organic compounds that present in the wastewater. Many of these DBPs are known carcinogens or probable carcinogens which can impact both the aquatic environment and human health. Because of these impacts, future permits may include limits for key DBPs.

A disinfection system operating with sodium hypochlorite would be similar to the current system that uses chlorine gas such that the entire contact basin infrastructure could be reused without major modifications. Only the chemical storage and dosing systems would require modifications and/or replacement. Table 5-12 presents the chlorine contact time with the existing tank infrastructure and estimated sodium hypochlorite demand.

Table 5-12: Hypochlorite and Chlorine Contact Tank Design Summary

Flow Condition	Flow (mgd)	Duty Contact Tanks (No.)	Contact Time Available (min) [1]	Contact Time Required (min)	Meets Class A Reuse [2]	Hypo Demand (lb/d) [3]
2017 Current						
Annual Average	4.1	2	88	60 [4]	No	210
Peak Hour	12.0	2	30	15-20 [5]	No	610
2037 Future Projection						
Annual Average	6.09	2	59	60 [4]	No	310
Peak Hour	15.52	2	23	15-20 [5]	No	790

Note: [1] Each existing tank has a volume of 0.125 million gallons

[2] 90 minute model contact time is required to meet Class A recycled water requirements under Idaho administrative code 58.01.17. Section 601

[3] Based on 6 mg/L dose per industry standard sizing guideline for tertiary treatment (10 State Standards)

[4] This contact time is an industry standard (Washington State Criteria for Sewage Works) design value

[5] This contact time is an industry standard design value (10 State Standards and Washington State Criteria for Sewage Works)

5.4.1.2 UV Disinfection

Specific UV light wavelengths (250 to 270 nm) are capable of inactivating microorganisms by denaturing their DNA and RNA, which prevents replication and results in inactivation. UV disinfection is effective in inactivating most types of pathogens and has been used in many water, wastewater treatment, and reclamation projects. The design of a UV system is determined by the intensity of the light, exposure time, and the UV transmittance of the water (UVT). UV systems are typically more compact than chlorination systems and do not require any additional chemicals to achieve disinfection as UV is a standalone physical process.

UV systems are available in two different configurations; open channel and closed vessel. The submerged lamps emit the UV radiation to achieve deactivation. Closed systems, like that in the TMF facility, are becoming more prevalent in wastewater applications in recent years. A UV system can be designed as an open channel system so that the existing chlorine contact basins can be retrofitted with UV disinfection equipment. Each basin would have modules installed which carry banks of UV lamps in the narrow channel. There have also been installations of closed channel retrofits as well. Parallel channels could be designed to accommodate peak hour flow and service maintenance.

The major O&M cost of UV disinfection is power consumption for operation of the UV lamps. Regular maintenance and replacement of broken or aged lamps are also significant contributions to the operational costs. Largely, operations and maintenance costs are dependent on the quality of the wastewater being treated. For example, water with high TSS readily shield microorganisms from the emitted UV rays resulting in low inactivation. Water with high alkalinity, hardness, and/or total dissolved solids (TDS) all can impact lamp scaling potential and lead to the formation of solid deposits on the lamp sleeves resulting in lower UV transmittance to the wastewater and lower pathogen inactivation. To make up for decreases in pathogen removal performance, higher UV doses are required. Disinfection system influent water quality should be evaluated to determine the appropriate UV lamp type, as well as an approximate range of UV doses required for effective disinfection. If the fouling potential is high, Low Pressure High Intensity (LPHI) lamps are recommended since they operate at a lower temperature than the medium pressure lamps, which reduces the risk of scaling.

A UV system could be incorporated into the existing chlorine contact basins, or alternatively, a closed vessel system could be installed inside a train of the chlorine contact basins. The conceptual design summary for a UV system are listed in Table 5-13 and are based on similar water quality and permitting limits.

Table 5-13: UV Conceptual Design Summary

Requirements	2037 Annual Average (mgd)	2037 Peak Hour (mgd)	Design UVT (%)	UV Dose (mJ/cm^2)	E. coli Limit (MPN/100mL)
Disinfection	6.09	15.52	65	40	126
Class A Water Reuse [1]	6.09	15.52	65	80	2.2

Note: [1] Based on the National Water Research Institute and the Water Research Foundation "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse" Third Edition dated August 2012 for membrane filtration

5.4.1.3 UV and Sodium Hypochlorite Hybrid

The main drawbacks to a UV disinfection system is its cost to treat peak flows and virus/bacteriophage inactivation. The use of a hybrid disinfection approach of UV and sodium hypochlorite provides a system with the benefits of both treatment technologies. A UV system can then be sized for base flow conditions with use a sodium hypochlorite to handle peak flow events. The sodium hypochlorite system could also be used if there are permitting concerns associated with virus/bacteriophage inactivation.

Arrangement of this hybrid disinfection system could be configured with the closed vessel UV system within a portion of one of the existing chlorine contact tanks while leaving one tank available for sodium hypochlorite treatment. It would require the construction of a new flow split structure to direct flows to each treatment process. The conceptual design summary for a hybrid system is listed in Table 5-14. The use of two disinfection systems may increase O&M given the two separate systems. The sodium hypochlorite system also requires the dechlorination step to remove chlorine residual.

Table 5-14: UV and Hypochlorite Conceptual Design Summary

Parameter	Units	Value	Notes
UV			
Design Flow	mgd	7.3	2037 maximum day flow
Design UVT	%	65	
UV Dose for Disinfection	mJ/cm^2	40	
UV Dose for Class A Water Reuse	mJ/cm^2	80	
Sodium Hypochlorite			
Design Flow	mgd	8.2	2037 peak hour less maximum day flow to UV
Design Dose at Peak	mg/L	6.0	
Hypo Demand at Design Dose	lb/d	420	
Contact Time Available	min	22	OK for peak hour. Assumes 1 contact tank (0.125 MG)

A hybrid system with UV and gaseous chlorine could also be considered as an alternatives or phased approach to implementing a UV/sodium hypochlorite treatment system at the AWTF. While this would not completely eliminate the safety concerns associate with the chlorine gas, it would reduce the amount of onsite storage and deliveries. It would also allow the operations staff to gain familiarization with a new UV system.

5.4.1.4 Disinfection Alternatives Evaluation

Table 5-15 summarizes the key advantages and disadvantages associated with the existing and three disinfection options discussed above.

Table 5-15: Key Advantages and Disadvantages of Disinfection Alternatives

Alternative	Advantages	Disadvantages
Gaseous Chlorine	• Existing process at plant with experienced personnel • Proven effectiveness against most pathogens and virus/bacteriophage	• Risk of accidental release • Created harmful DBPs • Requires dechlorination • Relatively long contact time requirements
Sodium Hypochlorite	• Proven effectiveness against most pathogens and virus/bacteriophage • Can be sized for a wide flow range more effectively than UV systems • More cost effective than UV systems • Ease of conversion of existing infrastructure • Availability for auxiliary uses including odor control and RAS disinfection • Considered safer than chlorine gas	• Creates harmful DBPs • Requires dechlorination • Requires chemical storage and handling that create a safety risk • Relatively long contact time requirements

Table 5-15: Key Advantages and Disadvantages of Disinfection Alternatives

Alternative	Advantages	Disadvantages
UV Disinfection	• Proven effectiveness against most pathogens • No residual toxicity • No formation of DBPs • Requires no chemicals (other than for cleaning) • Improved safety compared to other disinfectants • Requires less space	• Energy intensive • May struggle to reach desired virus inactivation targets • Requires retrofits to existing basins or new infrastructure and hydraulic considerations • Expensive to scale system to meet peak flow treatment requirements
UV and Sodium Hypochlorite Hybrid	• Allows for economy sizing of UV system • Chlorine use for peak flow events or deactivation of viruses/bacteriophages • Considered safer than chlorine gas	• Requires the O&M of two disinfection systems • Requires dechlorination

5.4.2 Disinfection Summary

The current gaseous chlorine system has sufficient capacity to meet disinfection requirements at the future flow projections. The drivers to change the disinfection system are reduction in the health and safety concerns associated with gaseous chlorine and reduction in the potential for disinfection by-products. While a UV system provides these benefits, a complete change in technology is expensive and may struggle providing deactivation of viruses/bacteriophages. For planning purposes it is assumed that a hybrid system with UV and sodium hypochlorite is to be implemented for future disinfection process.

5.5 Solids Processing

Much of the existing solids processing train has been upgraded or expanded in recent years including a new digester and rotating drum thickeners (see Chapter 4 for additional information). For future planning, the capacity of the solid stream treatment system is not impacted significantly by the liquid stream alternative selection. Secondary treatment Alternatives 1 through 4 all have similar future solids yield and Alternative 5 would slightly reduce the solids production through less primary removal and a longer secondary sludge age.

Thickening has sufficient capacity both for separate thickening in gravity thickeners for primary sludge and the rotary screen thickeners (RSTs) for secondary sludge with full redundancy. The RSTs also have enough capacity to permit co-thickening of both primary and secondary sludge. Co-thickening has been tried at the plant in the past using the gravity thickeners and was not successful. Mechanical co-thickening, however, could be more feasible and offers the following advantages:

- Higher combined sludge thickness (digester feed) for increased digester capacity
- Fully enclosed operation with less foul air
- Simplified thickening operation by eliminating one unit process
- Repurposed gravity thickeners or use of their existing footprint for other uses

The main disadvantage of co-thickening is the potential increase in thickening polymer demand. While a potential operating cost concern, the increase is expected to be minor. A simple full scale trial could be used to confirm polymer doses and the operational cost impact. Adding the ability for co-thickening in the RSTs is recommended to improve sludge thickening.

Increasing the solids feed and the operating concentrations of the digesters not only increases the digester capacity, but it also makes the plant more resilient to events that could otherwise constrain solids processing. At the projected future design loadings with continued operation of the digesters at 2.5 percent total solids concentration, the digester solids retention time (SRT) would drop to 11 days when the largest unit is out of service. Increasing the digester total solids to 3 percent raises the SRT to 15 days, while providing full redundancy to take units out of service.

If digester operating conditions are maintained at the current 2.5 percent digester solids concentration and a minimum SRT of 15 days, then a total digester volume of 0.7 MG is required for the future flows and loads. For normal operation, there is sufficient existing digester capacity (1.0 MG). However, with the largest unit out of service (Digester 5 is 0.47 MG), the available volume is reduced to 0.53 MG. While digester shutdowns are infrequent, they can often last several months in duration. To eliminate the need for expansion and meet full redundancy criteria with Digester 5 out of service, the following alternatives have been identified:

- Co-thickening to increase digester total solid above 3 percent
- Direct dewatering and composting of waste activated sludge (WAS) or WAS and tertiary sludge.
- Temporary reduction in digester SRT sending non-Class B solids to the Compost Facility as conditions permit
- Temporary dewatering for a fraction of undigested sludge and disposal to the landfill

Given that these options are available and the ability to compost solids that do not fully meet Class B biosolids criteria at the treatment plant, no additional digesters are included for this planning horizon.

Projected future influent solids loading produce a dewatering feed load of 1,180 lb/hr or 94 gpm with a dewatering operation seven days a week for eight hours. The existing centrifuge, which is the preferred machine for dewatering, has sufficient capacity at 2,200 lb/hr or 150 gpm. The existing belt filter press (BFP) that is used for backup also has sufficient capacity, however as described in Chapter 4, is near the end of its useful life. Therefore, it is anticipated that the BFP will be replaced within the planning horizon to provide redundancy for the dewatering operation. While a second centrifuge is the most expensive equipment choice, it would simplify operation and polymer selection. A new backup machine could be smaller than the existing unit and approximately half the capacity is sufficient. Smaller machines may also be considered if longer operational times are acceptable when the primary machine is down for maintenance.

5.6 Cost Analysis

The economic analysis was conducted using the 20-year net present value (NPV) of the secondary process alternatives, including capital costs and O&M costs per unit process improvement. Capital and O&M costs for the independent projects (grit removal, disinfection, and dewatering) are also developed. All costs are expressed in 2018 dollars. Costs developed are Class 5 estimates as defined by the Association for the Advancement of Cost Engineering (AACE) International and adopted by the American National Standards Institute in Recommended Practice No. 17R-97: Cost Estimate Classification System and Recommended Practice No. 18R-97: Cost Estimating

Classification System as Applied in Engineering, Procurement, and Construction for the Process Industries.

Cost comparisons of the secondary process alternatives are made on the basis of 20-year NPV costs over the planning period. The NPV analyses include an assumed inflation of the annual costs. This stipulation is based on the assumption that prices for treatment and collection facilities will tend to change over time by approximately the same percentage. Changes in the general level of prices will not affect analysis results but will impact the overall funding requirements for the selected secondary process alternative.

Actual construction costs may differ from the estimates presented, depending on specific design requirements and the economic climate at the time a project is bid. An AACE Class 5 estimate is normally expected to be within -50 and +100 percent of the actual construction cost. That is, the final cost may be as much as 50 percent less or 100 percent more than the estimated amount. The final cost of the project will depend on actual labor and materials costs, actual site conditions, productivity, competitive market conditions, bid dates, seasonal fluctuations, final project scope, final project schedule, and other variables. As a result, the final project costs will vary from the estimates presented in this document. The range of accuracy for a Class 5 cost estimate is broad, but these are typical levels of accuracy for planning work and they apply to all projects so that the relative estimated costs of the secondary process alternatives are comparable and can be used for decision making. It is important to communicate this level of accuracy to policy makers and decision makers.

5.6.1 Cost Development

Costs were developed for each unit process improvement using HDR's WaterCost tool. Construction cost curves in the WaterCost tool are developed using default input values for a range of treatment sizes. O&M costs are calculated based on experience and from EPA cost curves. The Engineering News-Record (ENR) Construction Cost Index (CCI) is used to bring historical costs to a common, comparable basis. The ENR CCI tracks costs using a 20-city average of construction, labor, and materials. The costs in this estimate are for the current ENR CCI for December 2018 of 11,186.

Capital costs for each unit process improvement were developed as separate probable cost opinions. Independent projects including grit removal expansion, disinfection upgrades, and dewatering upgrades are separate from the secondary process alternatives, as they would apply to each of the alternatives. The independent projects will be incorporated into the recommended plan in Chapter 7. Unit process improvements for the secondary process alternatives were added to create complete alternatives. Construction and O&M cost opinions allow comparison of secondary process alternatives for the defined planning periods. Total estimated probable project costs include contractor markups, profit, and contingencies. Overall project costs include total construction costs, but also an additional markup to include costs of engineering, legal, and construction management/administration as presented in Table 5-16. Total estimated probable project capital costs for each unit process improvement for the independent projects and secondary process alternatives are provided in Table 5-17 and Table 5-18, respectively.

O&M costs for labor, power, and chemical costs are estimated for each unit process improvement. O&M costs are used in the NPV comparison of the secondary process alternatives. The power and polymer requirements per unit process improvement are estimated based on average influent flow. The labor requirements are selected based on an anticipated number of hours per day of required operator or maintenance staff attention per unit process improvement. Only costs for the new or upgraded facilities were developed using the estimated values presented in Table 5-19. O&M costs are expressed in 2018 dollars and are applied in the year that O&M costs are expected to be incurred. Annual O&M costs are provided in Table 5-20 for the independent projects and Table 5-21 for the secondary process alternatives.

Table 5-16: Illustration of Cost Estimating Procedure

Parameter	Example
Construction Bid Price Subtotal (A)	**$1,000**
Projection to Midpoint of Construction (6% of A)	$60
Construction Contingency (4% of A)	$40
Total Construction Cost (B)	**$1,100**
Engineering (8% of B)	$88
Legal (2% of B)	$22
Construction Administration (8% of B)	$88
Owner Administration (16% of B)	$176
Total Project Capital Cost	**$1,474**

Table 5-17: Summary of Capital Costs for Independent Projects

Unit Process	Total Estimated Project Cost
Grit Removal Expansion	**$2.6 M**
Disinfection Upgrades	**$4.2 M**
Dewatering Upgrades	**$1.3 M**

Note: Costs developed for alternative comparison at a planning level and based on AACE Class 5 estimate. Costs shown in 2018 dollars (ENR CCI December 2018 = 11186). M = million

Table 5-18: Summary of Capital Costs per Secondary Process Alternative

Unit Process	Alt 1 Baseline TF/SC with Expanded TMF	Alt 2 Trickling Filter/ Activated Sludge	Alt 3 Expanded TMF with Sidestream	Alt 4 TF/AS with Sidestream	Alt 5 Biological Nutrient Removal
Trickling Filter Rehab	$6.7 M	$6.7 M	$6.7 M	$6.7 M	0
Solids Contact/RAS Re-aeration Expansion	0	$11.0 M	0	$10.3 M	0
New Activated Sludge Process	0	0	0	0	$26.2 M
TMF Mixing Tank Expansion	$6.8 M	0	$6.2 M	0	0
TMF Membrane Expansion	$5.2 M	$5.2 M	$5.2 M	$5.2 M	$5.2 M
Sidestream Treatment	0	0	$3.2 M	$3.3 M	0
Total Estimated Project Cost	**$18.8 M**	**$22.9 M**	**$21.4 M**	**$25.6 M**	**$31.4 M**

Note: Costs developed for alternative comparison at a planning level and based on AACE Class 5 estimate. Costs shown in 2018 dollars (ENR CCI December 2018 = 11186). M = million

Table 5-19: O&M Cost Assumptions

Parameter	Units	Value
Power	$ per kilowatt per hour ($kWh)	$0.065
Labor	$ per hour ($/hr)	$150
Alum bulk	$ per ton ($/ton)	$270
Caustic, 25%	$ per ton ($/ton)	$390

Table 5-20: Summary of Annual O&M Costs for Independent Projects

Unit Process	Total Estimated O&M Cost
Grit Removal Expansion	$160,000
Disinfection Upgrades	$250,000
Dewatering Upgrades	$300,000

Note: Costs shown in 2018 dollars (ENR CCI December 2018 = 11186). O&M costs based on operation in year 1 (2018). M = million

Table 5-21: Summary of Annual O&M Costs per Secondary Process Alternative

Unit Process	Alt 1 Baseline TF/SC with Expanded TMF	Alt 2 Trickling Filter/ Activated Sludge	Alt 3 Expanded TMF with Sidestream	Alt 4 TF/AS with Sidestream	Alt 5 Biological Nutrient Removal
Solids Contact/RAS Re-aeration Expansion [1]	0	$1,100,000	0	$920,000	0
New Activated Sludge Process [2]	0	0	0	0	$910,000
TMF Mixing Tank Expansion [1]	$1,000,000	0	$900,000	0	0
TMF Membrane Expansion	$280,000	$280,000	$280,000	$280,000	$280,000
Sidestream Treatment	0	0	$40,000	$40,000	0
Total Estimated O&M Cost	**$1.3 M**	**$1.4 M**	**$1.2 M**	**$1.2 M**	**$1.2 M**

Note: Costs shown in 2018 dollars (ENR CCI December 2018 = 11186). O&M costs based on operation in year 1 (2018). M = million

[1] Secondary treatment components associated with expansion including: trickling filter pumping, solids contact/RAS storage, blowers, alum, caustic, TMF mixing/aeration

[2] Secondary treatment components associated with expansion including: activated sludge, blowers, alum, caustic, TMF mixing/aeration

5.6.2 Secondary Process Alternatives Net Present Value

The 20-year NPV was calculated for each secondary process alternative. A preliminary project implementation schedule was developed for each secondary process alterative to determine the sequence for the treatment plant improvements. The preliminary schedules for each alternative were developed for the purpose of developing comparative NPV for the alternatives analysis in Section 5.7. The preliminary implementation schedule will be updated and revised as part of the recommended plan in Chapter 7. The recommended plan will also include the incorporation of the independent projects. Secondary process alternative comparison schedules are presented in Table 5-22. It is assumed that the O&M costs start during the first year of the corresponding unit process project. O&M costs are increased by 1 percent per year.

Total project and O&M costs developed in 2018 dollars are escalated to the year of implementation matching the schedule. An escalation rate of 3.5 percent per year was used. A discount rate of 5 percent per year was applied to reduce future costs back to present value in 2018 dollars for the complete alternative comparison. A summary of the total probable project cost, annual O&M, and NPV analysis is presented in Table 5-23.

Table 5-22: Preliminary Secondary Process Alternative Implementation Schedule for NPV

Unit Process	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031-2038
Alternative 1 Baseline TF/SC with Expanded TMF														
Trickling Filter Rehab											X			
TMF Mixing Tank Expansion						X	X							
TMF Membrane Expansion									X	X				
Alternative 2 Trickling Filter/Activated Sludge														
Trickling Filter Rehab											X			
Solids Contact/RAS Re-aeration Expansion						X	X							
TMF Membrane Expansion									X	X				
Alternative 3 Expanded TMF with Sidestream														
Trickling Filter Rehab											X			
TMF Mixing Tank Expansion						X	X							
TMF Membrane Expansion									X	X				
Sidestream Treatment					X									
Alternative 4 Trickling Filter/Activated Sludge with Sidestream														
Trickling Filter Rehab											X			
Solids Contact/RAS Re-aeration Expansion						X	X							
TMF Membrane Expansion									X	X				
Sidestream Treatment					X									
Alternative 5 Biological Nutrient Removal														
New Activated Sludge Process						X	X							
TMF Membrane Expansion									X	X				

Note: X denotes construction year of unit process. Capital costs split equally over the number of years.

Table 5-23: Summary of Secondary Process Alternatives 20-year NPV

Unit Process	Total Capital Cost (2018 $)	Annual O&M (2018 $)	20-year NPV with O&M (2018 $)
Alt 1 Baseline TF/SC with Expanded TMF	$18.8 M	$1.3 M	$35.9 M
Alt 2 Trickling Filter/ Activated Sludge	$22.9 M	$1.4 M	$41.0 M
Alt 3 Expanded TMF with Sidestream	$21.4 M	$1.2 M	$36.9 M
Alt 4 TF/AS with Sidestream	$25.6 M	$1.2 M	$41.0 M
Alt 5 Biological Nutrient Removal	$31.4 M	$1.2 M	$46.0 M

Note: Costs shown in 2018 dollars (ENR CCI December 2018 = 11186). O&M costs based on operation in year 1 (2018). NPV includes escalation rate of 3.5% and discount rate of 5%. M = million

5.7 Secondary Process Alternatives Analysis

The approach used to facilitate decisions regarding the selection of a preferred plant improvement secondary process alternative considers both economic and noneconomic rating methods. The economic factors are objectively based on estimates of capital and annual costs, reduced to a net present value for comparison purposes. The application of noneconomic criteria provides a systematic means for considering features that are otherwise challenging to objectively quantify. The method used in this analysis is derived from the Analytic Hierarchy Process (AHP), relying on the collaborative judgment of a panel of subject matter experts in a group decision-making session. The AHP structures each decision-making in a hierarchy as shown in Figure 5-14, beginning with goals at the top, evaluation criteria in the middle, and solution alternatives at the lowest level. In this implementation of AHP the criteria are given relative weights using pairwise comparisons. For this project, the group decision-making exercise was facilitated using HDR's decisionSPACES tool.

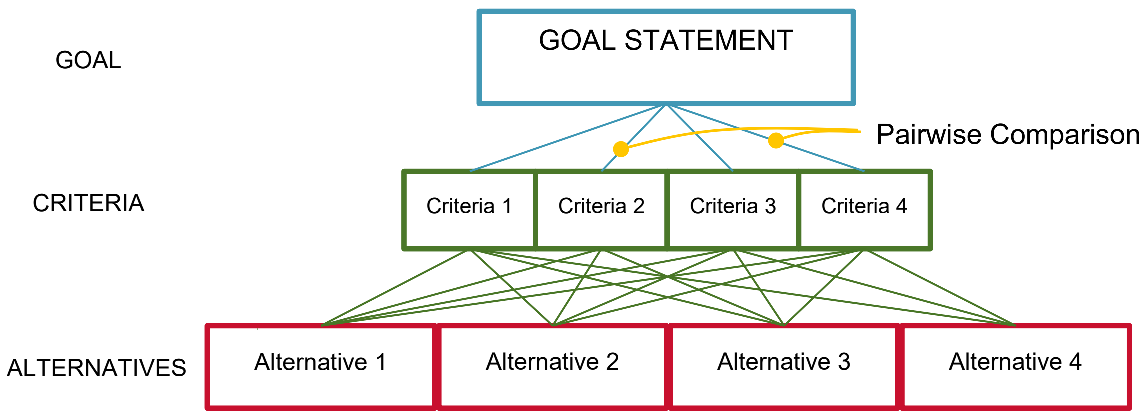


Figure 5-14: AHP Decision-making Hierarchy

The basic approach follows five steps:

1. Selection of planning goals and development of alternative strategies for achieving those goals.
2. Selection of noneconomic criteria that illustrate desired alternative features that support the project goals.
3. Relative weighting of the selected noneconomic criteria through a group pairwise comparison session with subject matter experts.
4. Scoring of each alternative strategy against each of the selected noneconomic criteria and application of the relative criteria weighting to develop an overall noneconomic value score.
5. Presentation of a noneconomic value score verses net present value for each alternative and selection of a preferred alternative based on best value for cost.

5.7.1 Development of Noneconomic Criteria

The noneconomic criteria were selected from the family of criteria typically applied to wastewater facility planning efforts and tailored to specifically address the goal of selecting the optimum facility development alternative for the City. The selected criteria along with key characteristics are presented in Table 5-24. With these criteria established, the AHP hierarchy diagram for this exercise was assembled as shown in Figure 5-15.

Table 5-24: Noneconomic Criteria

Criteria	Characteristics
Address future capacity needs	Anticipates future increases in flow and loading associated with population growth in the community.
Receiving Water Regulatory Requirements	Current and near-term NPDES permit requirements are met and future potential requirements are considered.
Green Initiatives	Reclaimed Water ,Energy Optimization, Biosolids Reuse, Chemical Use
Natural Disaster Risk	Spokane River Flood Control Levee, Intense Storm risk (ice impacts, power failures) ,Climate Change, Wild Fire, Draught
Good Neighbor Initiatives	Odor Control, Public Interpretation, Aesthetics, Landscaping, Security
Maintain Facility Investment	Avoid stranded assets, Maintain performance, Extend useful life, Condition Assessment
Low Technology Risk	Technology development, Phased implementation, Process risk
Operability	Simplicity, Familiarity, Automation, Staffing
Efficiency & Optimization	Energy Use, Chemical Consumption, Preventative Maintenance

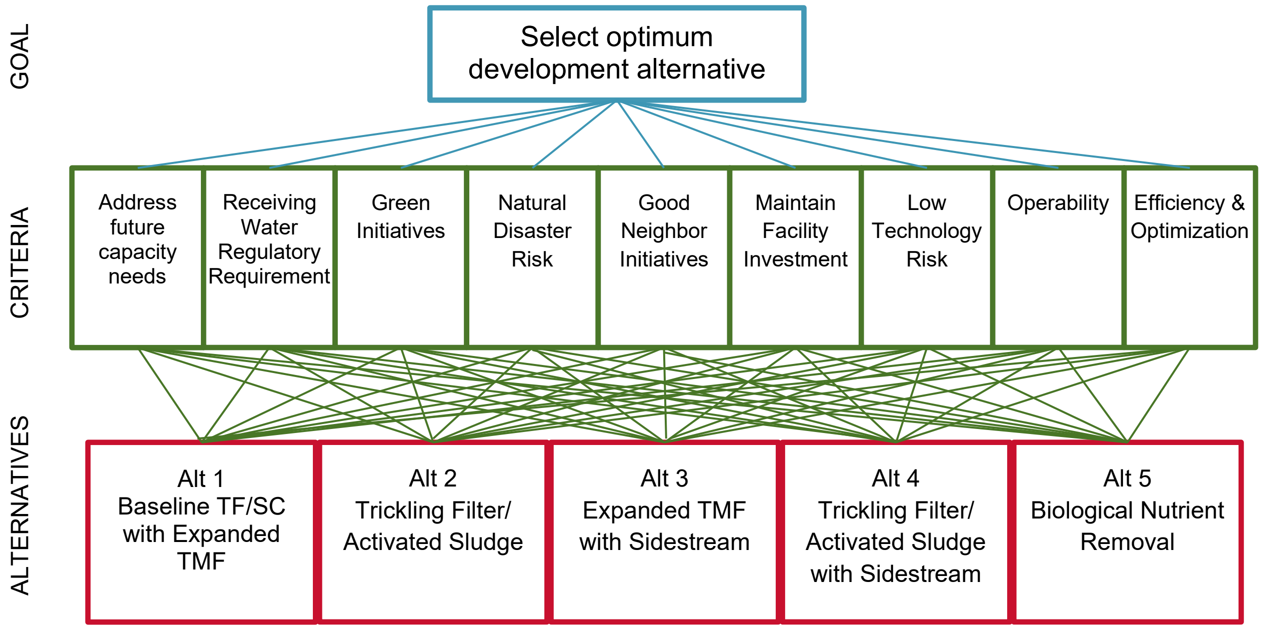


Figure 5-15: Coeur d'Alene AWTF Facility Plan Decision-making Hierarchy

5.7.1.1 Criteria Weighting

Among the noneconomic criteria selected for consideration there exists a range of stakeholder opinions regarding how much an individual criteria should be emphasized or marginalized when evaluating each alternatives. To help distinguish more "important" criteria from the lesser valued factors, each criteria are assigned a value score or "weight" that reflects its relative importance. The process of assigning these relative weights to the criteria was accomplished in a Workshop group exercise with HDR and City staff on December 14, 2018 using a technique called "pairwise comparison."

PAIRWISE COMPARISON

Pairwise comparison is fundamental to the AHP decision-making process. By taking the overall task of judging the relative importance of the decision criteria and breaking it down into individual pairs of comparisons, the judgments are greatly simplified and easier to process. The process includes comparing each alternative against another for each criteria using a pairwise comparison scoring. Table 5-25 provides details on the scoring comparison including the numerical intensity and descriptions.

Final weighting values are calculated by placing the relative comparison scores in a matrix and then computing the matrix's principal right eigenvector. The results of the criteria weighting exercise with the City are presented in Figure 5-16. "Receiving water regulatory requirements" emerges as clearly the most important evaluation criteria while "low technology risk" and "natural disaster risk" are relatively insignificant when compared to the other criterion.

Table 5-25: Pairwise Comparison Scoring for Criteria

Comparison	Numerical Intensity	Description
Extremely less important than…	1/9	Consistent evidence indicates that one criteria captures clearly exceeds the other in consequence
Much less important than…	1/6	Stakeholder expert express direct experience in which one element strongly surpasses the other
Less important than…	1/3	Stakeholder experts consider one element to be slightly favorable over the other
As important as…	1	Elements have an equal contribution to goal
More important than…	3	Stakeholder experts consider one element to be slightly favorable over the other
Much more important than…	6	Stakeholder expert express direct experience in which one element strongly surpasses the other
Extremely more important than…	9	Consistent evidence indicates that one criteria captures clearly exceeds the other in consequence

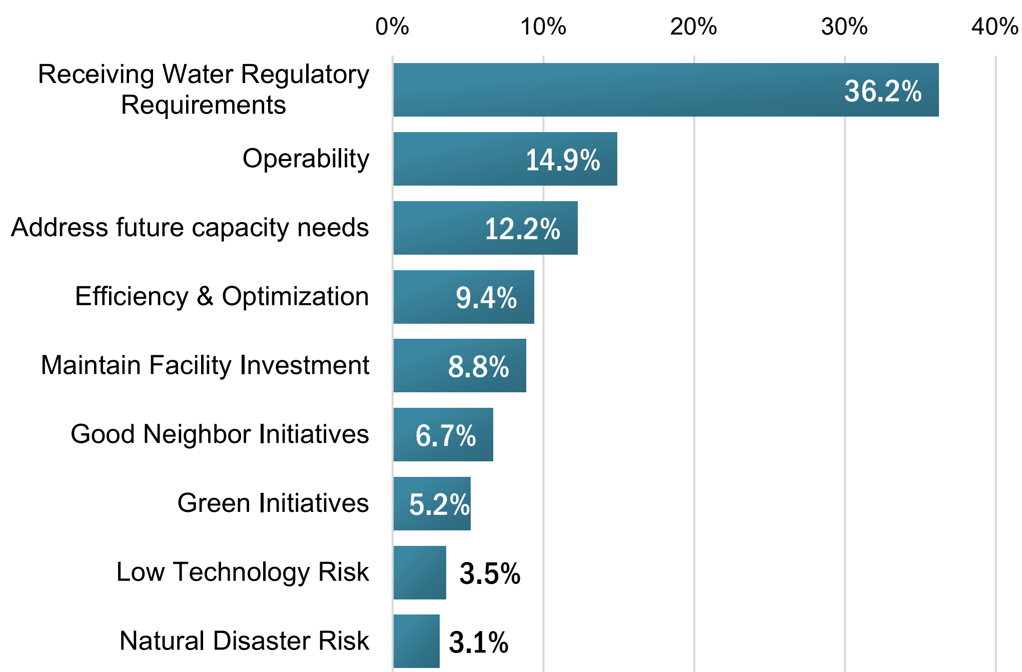


Figure 5-16: Coeur d'Alene AWTF Facility Plan Criteria Driver Weights

Note: Results of pairwise scoring in Workshop on December 14, 2018.

5.7.2 Alternative Scoring against Criteria

Each of the alternatives must also be evaluated for how they perform against each of the noneconomic criteria. This can be accomplished in one of several ways. The relative performance can be scored through another pairwise exercise that takes each pair of alternatives and rates them against each criteria. For this analysis, however, the alternatives were instead scored by the City staff and HDR using a prescribed scoring "yardstick". The yardstick was developed to aid in maintaining consistency during the scoring exercise. The performance yardstick scoring descriptions for each criterion is provided in Appendix B. Similar to the pairwise comparison scores for the criteria, the alternatives were scored using the scale in Table 5-26. Table 5-27 presents the alternative performance scores for each of the criteria as determined during the scoring exercise with the City staff.

Table 5-26: Yardstick Performance Scoring for Alternatives

Score	Numerical Intensity	Description
None	0	Alternative does not contribute to criterion goal
Low	1	Alternative contributes in small or inconsistent way that is not overtly valuable
Moderate	3	Performance provides valuable contribution but may not be consistently obtainable
Strong	6	Alternative consistently performs as expected under the given criteria
Extreme	9	Routinely exceeds expected outcomes under given criteria

Criteria	**Alternative 1** Baseline TF/SC with Expanded TMF	**Alternative 2** Trickling Filter/ Activated Sludge	**Alternative 3** Expanded TMF with Sidestream Treatment	**Alternative 4** Trickling Filter/ Activated Sludge with Sidestream	**Alternative 5** Biological Nutrient Removal
Address future capacity needs	Strong	Strong	Strong	Strong	Strong
Efficiency & Optimization	Low	Low	Strong	Strong	Moderate
Good Neighbor Initiatives	Moderate	Low	Low	Low	Moderate
Green Initiatives	Moderate	Moderate	Strong	Strong	Strong
Low Technology Risk	Extreme	Strong	Moderate	Moderate	Strong
Maintain Facility Investment	Extreme	Moderate	Extreme	Strong	Low
Natural Disaster Risk	Moderate	Moderate	Moderate	Moderate	Low
Operability	Extreme	Strong	Moderate	Moderate	Moderate
Receiving Water Regulatory Requirements	Strong	Strong	Strong	Strong	Strong

Figure 5-17: Coeur d'Alene AWTF Facility Plan Alternatives Performance Scores

Note: Results of scoring in Workshop on December 14, 2018.

Final total scores for each alternative were developed by multiplying the performance numerical intensity score by the criteria weight for each criteria and then summing the resulting values across all criteria. The resulting noneconomical scores are provided in Table 5-27 with the costs developed in Section 5.6.

Table 5-27: Secondary Process Alternative Noneconomical Performance Score and Cost Comparison

Alternative	Score	Annual O&M Cost	Capital Cost	Net Present Value
Alt 1 Baseline TF/SC with Expanded TMF	5.9	$1.3 M	$18.8 M	$35.9 M
Alt 2 Trickling Filter/ Activated Sludge	4.7	$1.4 M	$22.9 M	$41.0 M
Alt 3 Expanded TMF with Sidestream	5.3	$1.2 M	$21.4 M	$36.9 M
Alt 4 Trickling Filter/ Activated Sludge with Sidestream	5.0	$1.2 M	$25.6 M	$41.0 M
Alt 5 Biological Nutrient Removal	4.5	$1.2 M	$31.4 M	$46.0 M

5.7.3 Summary

By plotting the noneconomic performance score against the net present value for each alternative a clearer picture emerges regarding the relative value inherent in each approach. Figure 5-18 illustrates the combined results of the economic and noneconomic evaluation in a single graphical summary. Alternatives with lower overall cost and higher noneconomic criteria scores are considered preferable. This corresponds with alternatives that appear in the lower right-hand figure quadrant. In this case, Alternatives 1 and 3 emerge as preferred options. Alternative 1, the baseline alternative that maintains the existing secondary process and adds capacity to the TMF mixing tank, scored highest on the noneconomic scale and also the lowest net present value. Alternative 3 received the next highest score and is similar to Alternative 1, with the addition of sidestream deammonification.

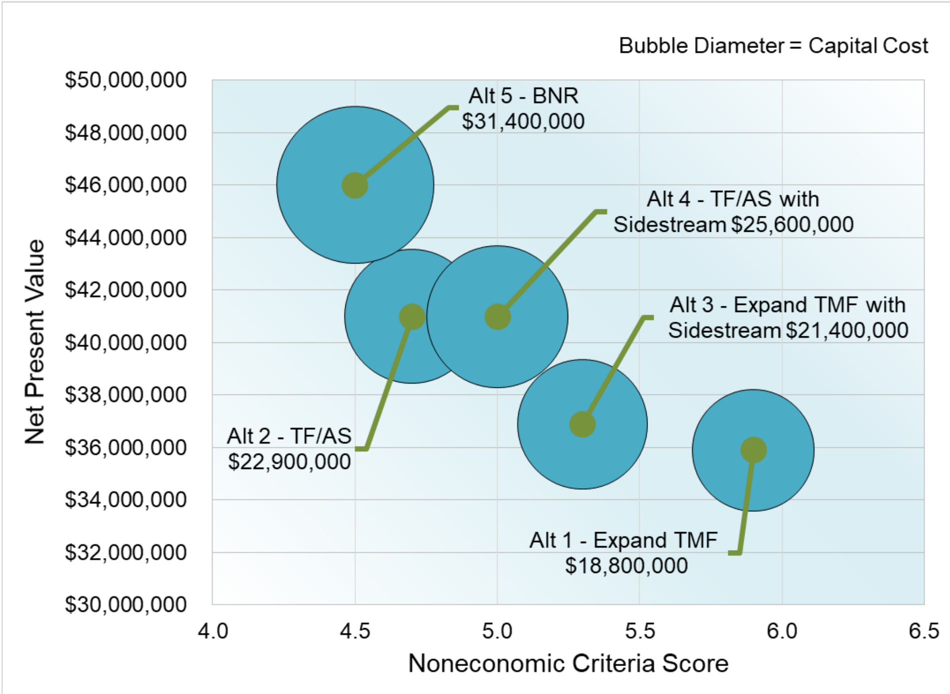


Figure 5-18: Secondary Process Alternative Performance Scores vs. Net Present Value

Appendix A. Secondary Process Alternative Layouts

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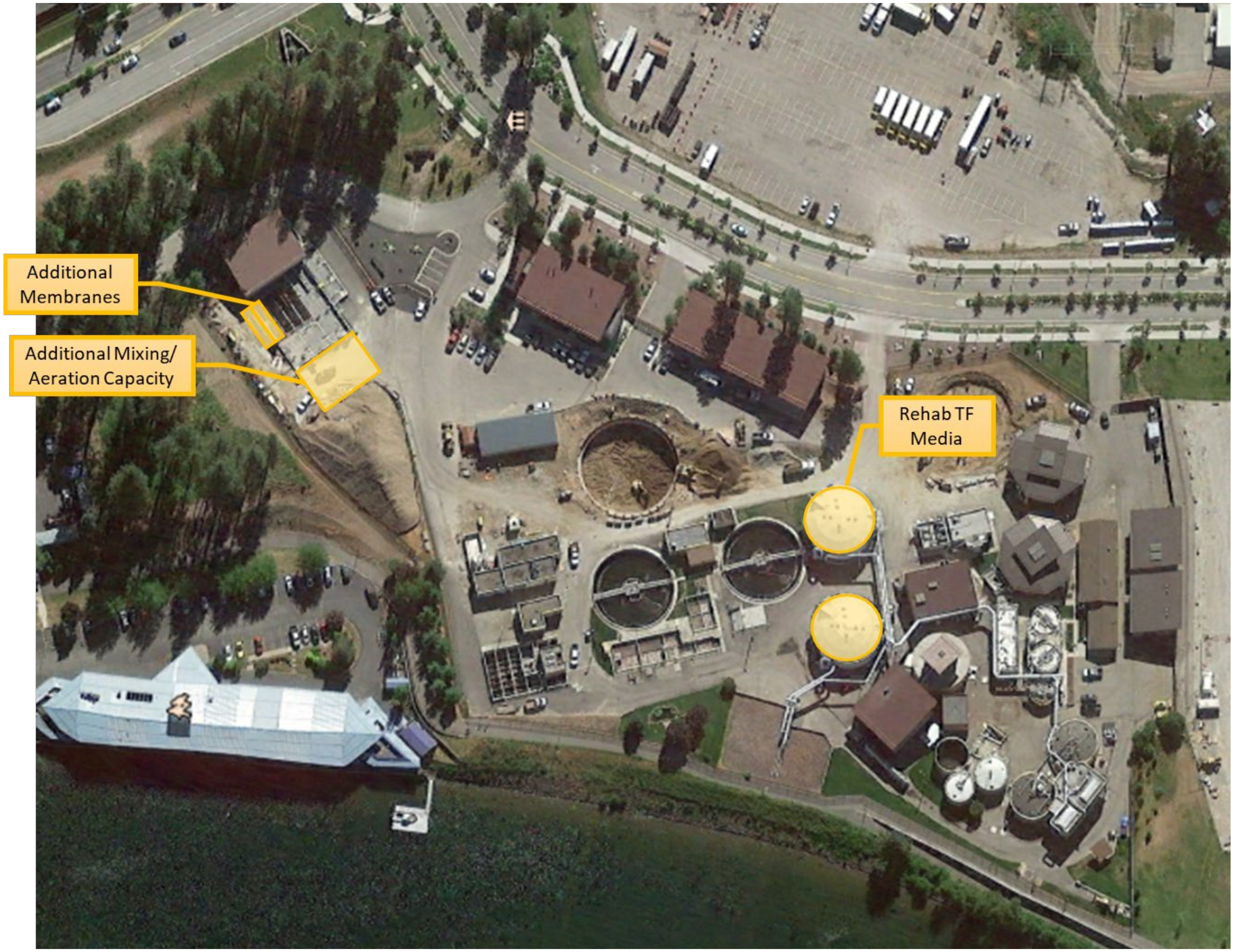

Figure A-1: Site Layout for Alternative 1 - Baseline TF/SC with Expanded TMF

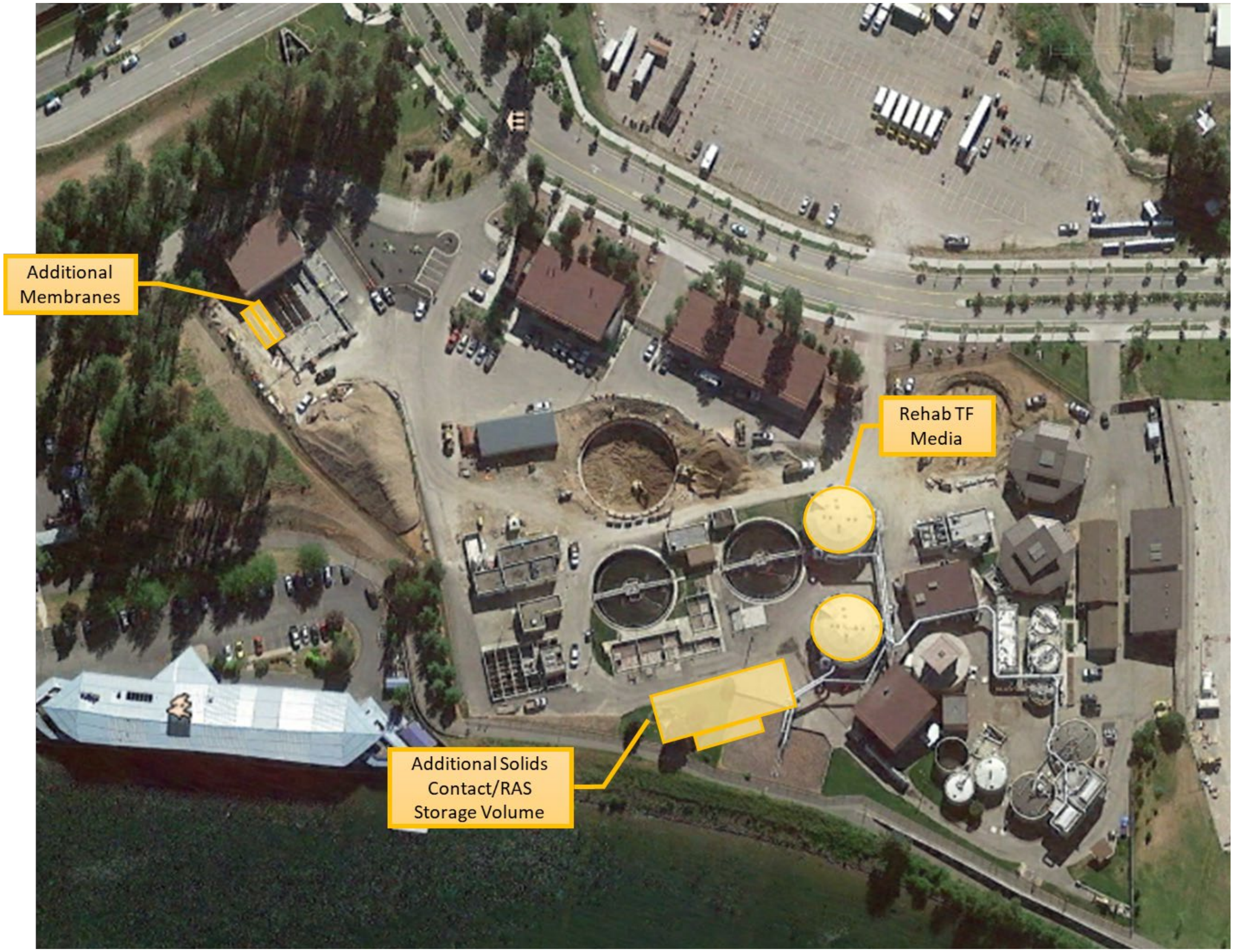

Figure A-2: Site Layout for Alternative 2 – Trickling Filter/Activated Sludge

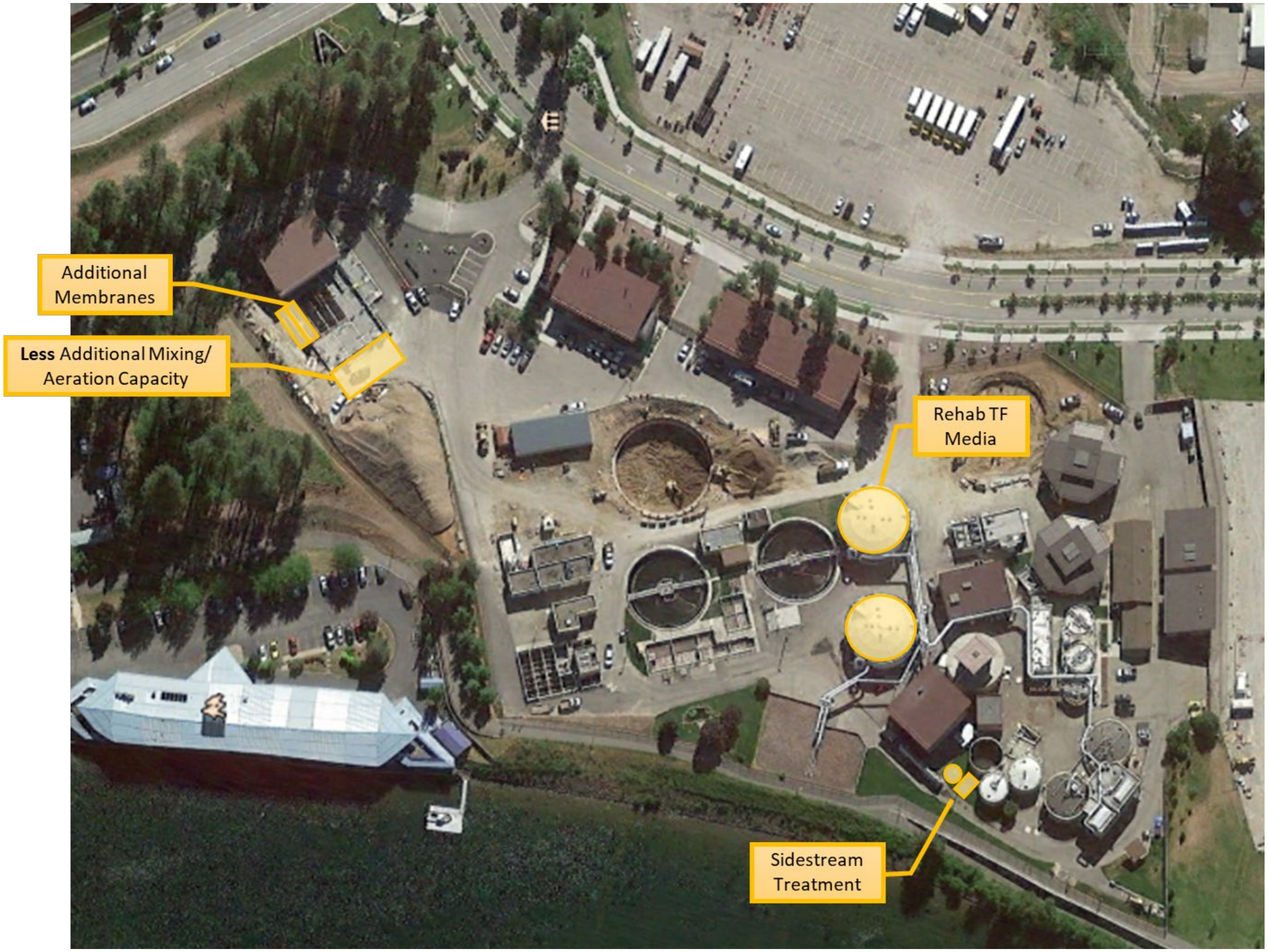

Figure A-3: Site Layout for Alternative 3 - Expanded TMF with Sidestream Treatment

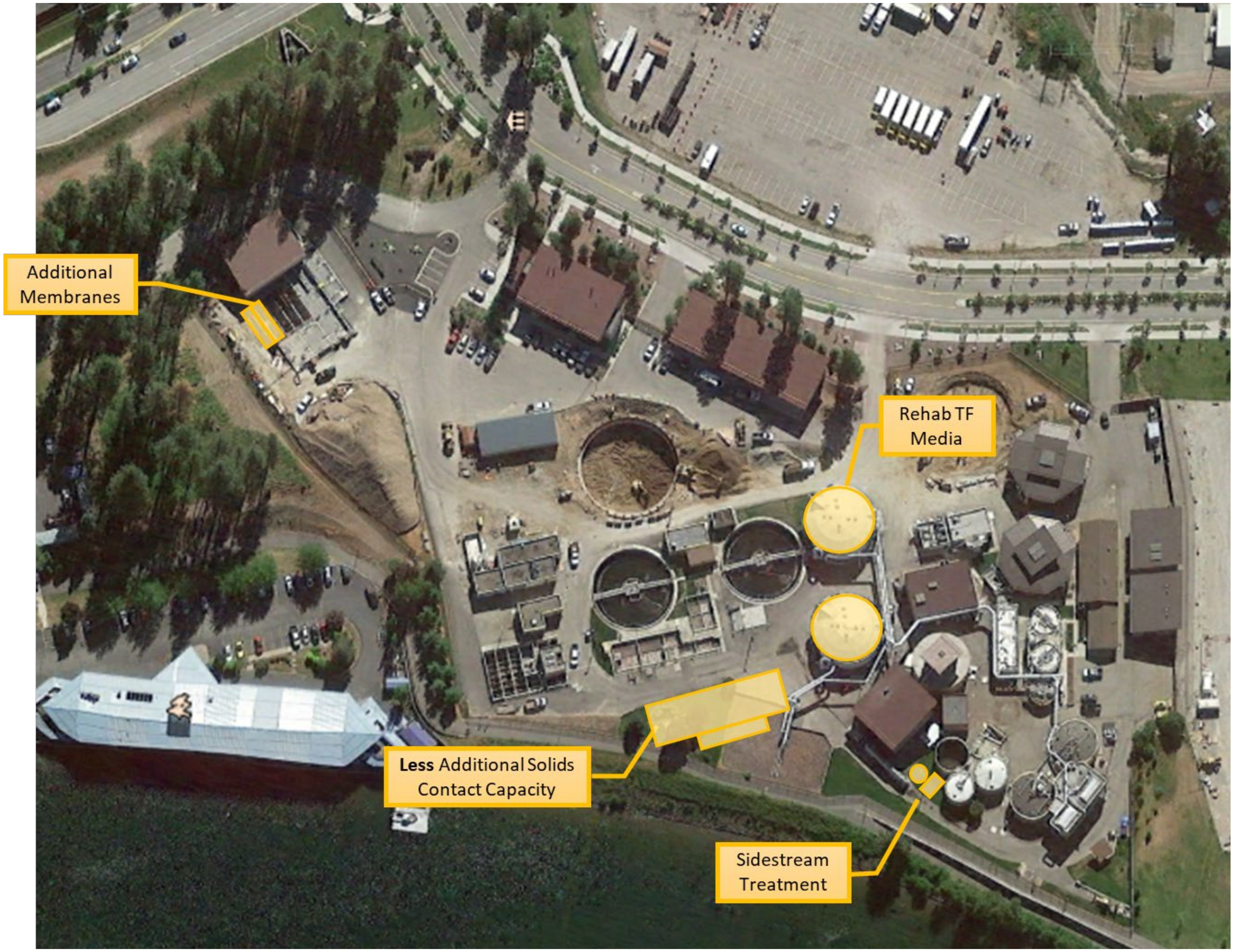

Figure A-4: Site Layout for Alternative 4 - Trickling Filter/Activated Sludge with Sidestream Treatment

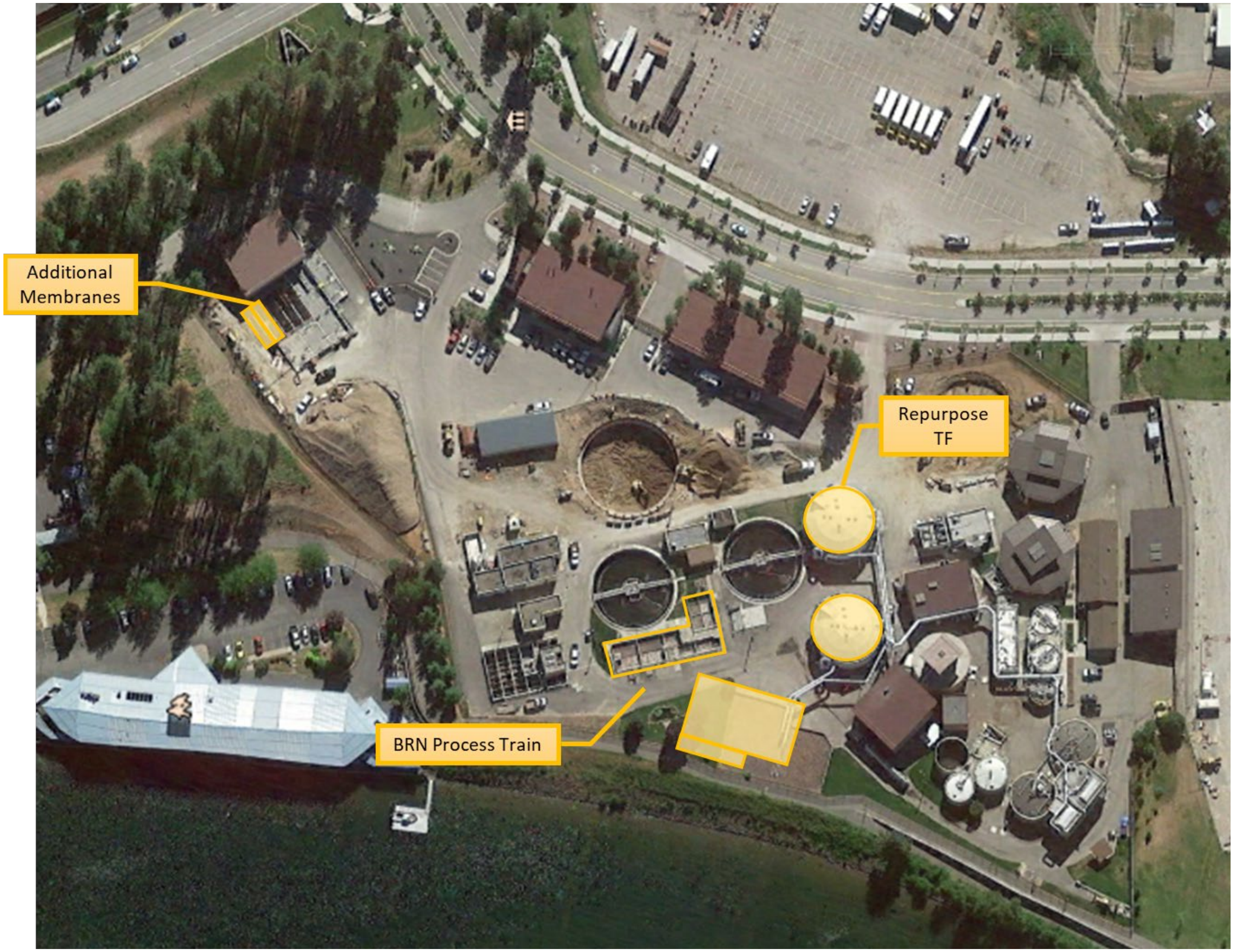

Figure A-5: Site Layout for Alternative 5 – Biological Nutrient Removal

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Appendix B. Alternatives Analysis Yardstick Performance Score Descriptions

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Alternative Evaluation Workshop

Coeur d'Alene 2019 Facility Plan

December 14, 2018

Participants: Mike Anderson, Jim Remitz, Casey Fisher, Dave Clark, Mario Benisch, Karen Bill, Matt Chapman

Impact Scoring Yardstick

Evaluation Drivers	None	Low	Moderate	Strong	Extreme
1. Address future capacity needs Anticipates future increases in flow and loading associated with population growth in the community.	Does not add any additional treatment capacity.	Adds some capacity to portions of the facility. However overall capacity is not improved.	Increase overall plant capacity but falls short of planning horizon forecasts	Meets expected planning horizon forecasts for flows and loading	Exceeds expected planning horizon forecasts for flows and loading
2. Receiving Water Regulatory Requirements Current and near-term NPDES permit requirements are met and future potential requirements are considered.	No change in ability to meet NPDES permit requirements	Small or inconsistent improvement in effluent quality	Occasional deviation from superior effluent quality	Satisfies effluent quality requirement for BOD Ammonia, P, and metals)	Enhance toxics removal (PCBs)
3. Green Initiatives Reclaimed Water Energy Optimization Biosolids Reuse Chemical Use	No Resource Recovery Biogas flared	Onsite reuse only Digester heating only with biogas	Moderate reclaimed water production Moderate biosolids reuse	Some reclaimed water use Some biosolids reuse Chemical Reduction	100% Reclaimed water reuse 100% Biosolids reuse Net Zero Energy
4. Natural Disaster Risk Spokane River Flood Control Levee Intense Storm risk (ice impacts, power failures) Climate Change Wild Fire Draught	Process offers no inherent buffering or resiliency, relying entirely on backup systems	Performance is highly reliant on consistent power supply, Extended time to recover from outages or failures	Standby power for critical infrastructure Inherently resilient to power failure	Additional Onsite power generation beyond just critical systems	100% On-site Power Generation
5. Good Neighbor Initiatives Odor Control Public Interpretation Aesthetics Landscaping Security	No Odor Control	Limited Odor Control	Select High Odor potential areas Inherently Neighbor friendly processes	Full Odor Scrubbing	Dual Containment and Full Odor Scrubbing
6. Maintain Facility Investment Avoid stranded assets Maintain performance Extend useful life Condition Assessment	Abandon existing facilities Construct all new	Utility relocation required Abandon lesser facilities	Avoid significant buried infrastructure impacts	Repurpose existing obsolete facilities Rehabilitate where life can be extended without increasing maintenance	Maximize use of existing facilities
7. Low Technology Risk Technology development Phased implementation Process risk	Embryonic Technologies Unproven	Demonstration Scale (e.g. Continuous Flow GrAS, MABR)	Limited Full-Scale (e.g. Annamox, Nereda GrAS)	Proven Full-Scale and offers new benefits (BNR, MBR)	Proven Technology Routinely applied.
8. Operability Simplicity Familiarity Automation Staffing	Full-Time, 24-7 Staffing Complex Controls	Manual Control 2-3 Shift Staffing	Two-Shift Fully staffed Limited automation	Reduced off-hour staffing Highly Automated	Single Shift Highly Automated Remote Control
9. Efficiency & Optimization Energy Use Chemical Consumption Preventative Maintenance	Offsite Maintenance Required Highest Energy Consumption Highest Chemical Consumption	High Maintenance Cost High Energy Consumption High Chemical Consumption	Moderate Maintenance Cost Moderate Energy Consumption Moderate Chemical Consumption	Low Maintenance Cost Low Energy Consumption Low Chemical Consumption	Net Zero Energy Very low maintenance Eliminates chemical

Chapter 6 - 2018 Facility Plan Update

Site Master Planning

Chapter 6 Wastewater Treatment Plant Site Analysis

6.1 Introduction

The purpose of this master planning effort is to summarize past planning efforts, the improvements they identified, along with their effectiveness, and to identify whether additional site refinements are necessary. This analysis evaluates "inside the fence line" issues which are primarily operational elements and "outside the fence line" issues which are primarily the impact of the facility on the neighborhood and community perceptions.

6.2 Site Master Planning Process

This master planning process focused on collecting Department staff, City leadership, and neighborhood representative's assessment of the facility. Naturally, Department staff have a deeper knowledge base to assess the entire range of elements for analysis, from operations to aesthetics, and this information was collected in a series of workshops.

However, staff admitted they can be "nose blind" to non-operational elements which motivated the outside the fence information gathering with neighborhood representatives to the north and south, University of Idaho and North Idaho College, respectively. Dr. Charles Buck, University of Idaho, and Chris Martin, Vice President for Finance and Business Affairs, and Bill McElver, Manager-Physical Plant - Facilities Operations, were interviewed to gather responses to the following questions:

1. What is their general impression of the facility and their specific impression of the facility odor?
2. What is your impression of the facility aesthetics?
3. Do you think the facility should be "hidden" from the neighborhood/community or be integrated/activated into the neighborhood/community?

Additionally, Mayor Widmyer and City Administrator Troy Tymesen were interviewed for their perceptions of the facility.

6.3 Historical Site Master Planning

The 2000 Facility Plan established the anticipated site needs and subsequent planning updates occurred in 2009 and 2012 and continued to address the evolving site planning needs to accommodate treatment process changes and neighborhood land use changes. These past master planning efforts kept the City ahead of nearby development and in a position to plan for necessary site improvements.

6.4 Advanced Wastewater Treatment Facility Site Analysis

For most of its life, the treatment facility was surrounded by the Stimson Mill and native forest land. Over the past 20 years, there have been four major land use changes in the surrounding neighborhood that have altered the local characteristics:

1. North: Construction of the Harbor Center Building, which was formerly a restaurant and office building and now currently houses the University of Idaho – Coeur d'Alene Campus.
2. South: Closure of the Stimson Lumber Mill and development of the "Educational Corridor" as an expansion of the North Idaho College Campus, including future parking and athletic facilities.
3. West and North: Construction of the Centennial Trail along the City's flood control levee.
4. East: City Acquisition of the former Burlington Northern Santa Fe Railroad right of way by easement from the Bureau of Land Management,

These four land use changes have effectively established/stabilized the land uses surrounding the facility site, which allows the Department to "plan with certainty" for the future

In the following sections, a discussion is presented of the existing characteristics of the surrounding neighborhood, anticipated future uses, and the perceptions of neighbors.

6.5 North and Northwest

The area north and northwest of the site consists of the University of Idaho Coeur d'Alene campus building (aka "Harbor Center"), the Centennial Trail, a mature pine forest, and overflow parking for

Figure 6-1: North and Northwest Area

the Harbor Center Building. The University of Idaho building and Centennial Trail are well established uses and unlikely to change. The City owned mature pine forest could evolve to a higher and better use, but no established plans are known at this time.

6.5.1 University of Idaho Coeur d'Alene Campus

Dr. Charles Buck, University of Idaho Associate Vice President and Coeur d'Alene Center Executive Officer was interviewed and provided the following observations about the treatment facility:

- Aesthetics
  - Architecture presented along Hubbard Avenue is beautiful.
  - North and west sides have a "prison" like feel because of all the chain link perimeter fencing.
- Odor
  - Significantly improved and rarely a disturbance.
- Treatment facility and community relationship
  - The treatment facility should be celebrated as a technological achievement and should be promoted to the community. It is a prime opportunity to educate citizens about all water resources, not just wastewater.
  - The University of Idaho has collaborated in the past with the Department and is prepared to continue that relationship.
  - Community education should be a Department priority. Public access to the Spokane River along the City's property would be a community amenity and opportunity to educate about the quality of treatment facility effluent. An overlook into the treatment facility with educational interaction with plant features would elevate community understanding and value of the facility.
  - The Department could be a key leader in explaining the value of water resources. Coeur d'Alene 2030 could assist the Department with community engagement.
  - Water reuse should be a Department priority.

6.6 East

The area east of the treatment facility includes Academic Way, the access road to the U of I Campus and the BLM Corridor property recently acquired by the City. The BLM Corridor property has been master planned with a substantial community input element and City Council adoption. The master plan anticipates land uses that will be transitory, e.g. bike riders passing through, commuter trailhead parking, and outdoor classroom (that has already been constructed). The area may also be used for a storm water treatment demonstration projects because a major stormwater discharge to the Spokane River crosses this area. The BLM Corridor master plan uses are focused on environmental and historical education and recreational uses.

Figure 6-2: BLM Corridor Master Plan Uses

6.7 South and Southeast

The areas to the south and southeast are currently graveled overflow parking lots for North Idaho College (NIC) students. A portion of the south graveled parking lot is planned for a future parking garage and an educational building near the river (See Figure 6-3). The parking lot to the east is planned for indoor and outdoor athletic facilities.

NIC representatives Chris Martin, Vice President for Finance and Business Affairs, and Bill McElver, Manager-Physical Plant - Facilities Operations, were interviewed and provided the following observations:

- Aesthetics
  - NIC staff is routinely asked by student and visitors "What are those buildings?" The NIC staff must tell them that "the buildings" are a wastewater treatment plant.
- Odor
  - It's resolved and not an issue for NIC. In an earlier college master plan, they placed a future parking garage at the college facility closest to the treatment facility to mitigate odor impacts.
- Treatment facility and community relationship
- The ability to peek into the facility and the couple of educational signs along the Centennial Trail are nice.
  - The pumpkin patch is really a popular student topic, but no one knows its story.
  - The facility should be integrated into the neighborhood by telling the treatment facility's story.

- Wastewater reuse should be a priority and NIC would use recycled water as soon as it is feasible.
- Creating a public park along the treatment facility riverfront property would be a great amenity.

Figure 6-3: South and Southeast Area

Figure 6-4: NIC 2018 Master Plan Excerpt

6.8 West

The Centennial Trail and Spokane River border the facility to the west. The trail is heavily used by walkers, runners, and bikers, especially during the summer months. Students often use the trail to walk between the U of I and NIC campus buildings.

Figure 6-5: West Area

6.8.1 Aesthetics

Given the proximity of the trail to the chain link fence and the elevation of the trail, users have an unobstructed view into the west side of the facility. The view from the west side remains the most industrial and aged as the recent improvements have been along the east, north, and south sides of the treatment facility. Views from the trail are shown on the following pages through a series of photographs taken in November 2018 and numbered 1 through 16 below.

6.8.2 Odor

Great strides have been made in odor control, and as discussed earlier, the neighboring facilities no longer consider odor a major issue by neighbors. The Department has, however, continued to receive some comments from the public regarding odors along the trail, particularly near the south end of the facility. In this area, the open air sludge truck loading facility (see picture 14) and the biofilter (see pictures 11 and 12) are located adjacent to the trail, creating occasional odor issues. Since trail users are essentially experiencing “direct contact” with any odors produced by the facility, they remain the most susceptible to odor impacts.

6.8.3 Treatment Facility and the Community Relationship

The current interaction with the public is passive and unintentional. Views are not guided, or selected, but rather very open. A few educational signs exist along the trail that describe the facility and its purpose. Trail users also see the water feature and Koi Pond, although it is not immediately obvious that the feature is using reclaimed water from the treatment facility. The pumpkin patch is also a point of interest for the public.

Since the City owns the waterfront along the trail, there is an opportunity to enhance public use of the area fronting the facility by providing public access to the waterfront. This could take many forms and could be used as an educational opportunity. For example, a water feature or water slide discharging reclaimed water could be incorporated into the improvements. Such improvements would make the facility site an "action point" along the Centennial Trail and, done intentionally, would provide additional educational opportunities.

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6.9 Department Staff Observations

During the November 30, 2018 facility plan workshop, department staff members were polled on various topics. The outcome of and discussions surrounding that poll are summarized below.

6.9.1 Perimeter Interface

Staff were asked to rank varying levels of permiter interface around the treatment facility. All three staff members present ranked “enhance internal plant view with partial screening and selective viewpoints” as a top priority. Partial screening can be accomplished in a variety of ways and can be accomplished cost-effectively. For example, one idea discussed was to use ivy or a similar plant materias to fill in the fence where screening undesirable views is preferred. Establishing selected viewpoints would allow the Department to “show off” the facility’s highlights and provide targeted education so the public knows what they are looking at.

The options ranked next were “Enhance public interpretation/education with a Wastewater Focus” and “Active – screen internal views and add art, interactive displays, water features, etc.” Staff agreed that they want the public to be involved with the facility and they don’t want to hide. While an active interface with displays and art would be desireable, the concern was that it would also be more costly and may not be feasible.

6.9.2 Odor Control

While it was agreed that the level of odor control depends on what direction the City takes with respect to the perimeter interface, it was agreed that a hybrid of “expand containment areas for existing odor treatment system” and “expand containment and level of odor treatment” would be appropriate. As discussed earlier, the south end of the facility is where most of the offensive odors are currently generated and all were in agreement that mitigation is needed in this area. It was also noted that there little remaining space available for expansio of the odor control biofilters.

6.9.3 Neighborhood Engagement

Staff were asked what their preference was for working with their neighbors and all three members agreed that they would first prefer to “collaborate with others on opportunities” and second to “lead development of collaboration opportunities.” It was agreed that the Department should have more input on the surrounding areas and be involved in the planning process and implementation. It was speculated that the Wastewater Department would need to be the catalyst for collaboration on key elements, such as reclaimed water reuse opportunities. One of the goals of collaboration would be efficient use of funds.

6.9.4 General Discussion

The following are points that were made during the general discussion of the facility and its interaction with the surrounding neighborhood:

- The Department should look for opportunities to implement the most economical solution to potential future issues early.
- The City should be proud of the facility and should pass that pride on to its citizens.

- The use of reclaimed water for major irrigators would result in lower peak drinking water demands and may result in less capital improvements being required.
- Reclaimed water is a resource for which public education is perhaps lacking. Education opportunities should be considered.
- The facility produces “products” that can be utilized for public benefit such as biosolids compost (Coeur d’Green) and reclaimed water.
- The opportunity to cost effectively use reclaimed water should be studied.
- The public should be involved in the planning process of any public interface improvements.
- Involve a landscape architect in planning of improvements along the trail. The Department should define criteria for creative planning (i.e. we want the public to see the clarifier, but not the sludge loading facility). A design competition could also be held.

The following are “brainstorm ideas” for potential enhancements to the public interface that were mentioned during the workshop:

- Implementation of an educational orchard at the location of the current pine grove using Coeur d’Green compost and reclaimed water would provide a new public education opportunity.
- Potential to discharge reclaimed water to the river via a water feature or other enhancement.
- Provide public waterfront access via stairs or a dock. Potentially install a “sea-wall” and create a beach.
- Provide a nice sign along the trail with the facility name and potentially re-brand the Advanced Wastewater Treatment Facility (e.g. Water Resource Reclamation Facility or Water Recovery Facility).

6.10 City Leadership Observations

Mayor Widmyer and City Administrator Troy Tymesen provided general observations and future vision for the treatment facility.

City Administrator Tymesen, who previously held the position of City Treasurer, has a very extensive history and understanding of the treatment facility. He indicated that the facility is something the City should be very proud of showcasing because he knows that the long-term planning and regulatory negotiations that staff undertook have resulted in a very cost effective facility. He acknowledged the treatment facility construction costs are very big numbers, but they could have been bigger if it were not for the long term master planning and creative and aggressive efforts of Department Staff and their engineering team. Mr. Tymesen also supported the idea that the facility be an active educator promoting a range of topics from water conservation to water reuse.

6.11 Historical Wastewater Reuse Planning

In 2006, the City evaluated the potential for treating wastewater to a Class A reclaimed water standard at the treatment facility and satellite wastewater treatment plants, where there was a large sewer interceptor to provide wastewater near a location with a demand for reclaimed water use, such as an irrigation or industry. The City is one of the largest water users during the irrigation season and using Class A reclaimed water for irrigation would have the dual benefit of reducing wastewater discharge to the Spokane River and reducing groundwater withdrawals from the Spokane Valley-Rathdrum Prairie aquifer. Reclaimed water reuse would create both environmental and financial benefits. The City considered a satellite Class A reclamation facility demonstration project at McEuen Park, but it was not authorized.

In 2010 to 2011, the City pursued a demonstration project permit from the Idaho Department of Environmental Quality (IDEQ) to allow Class A reclaimed water to be land applied (irrigation) to City owned properties around the treatment facility. Since the City was pilot testing treatment technologies that could produce Class A reclaimed water, the City determined that this would be an efficient opportunity to also pilot test wastewater reuse for irrigation. In 2012, after a laborious application process, IDEQ issued a draft permit to the City with an extensive list of requirements that were generally viewed by the City as onerous and too expensive for such a small demonstration project. The City concluded that the draft reuse permit should be considered a starting point for future negotiations with IDEQ when the City decides to undertake a larger scale water reuse project.

6.12 New Water Reuse Opportunities

During the 2006 wastewater reuse study, the concept was to use the treatment facility as a central source for nearby lands and satellite treatment systems at major use/wastewater interceptor points further away from the central treatment facility. The satellite use points were not cost effectively “connectable” to the treatment facility because they would need to be made via City streets. Since 2006, the City has acquired several properties near the treatment facility that provide both land area and more cost-effective connections to other City properties. Additionally, two of these acquisitions will be future parks with irrigations systems that can be designed to accept reuse water, the primary distinction being the “purple pipe” identifier for reclaimed water. Currently, the treatment facility can produce 1 mgd of disinfected Class A reclaimed water for reuse.

6.13 Water Reuse Concept

For purposes of master plan concept development, the objective was to identify City owned properties (parks and cemeteries), North Idaho College properties, or Idaho Transportation Department (ITD) right of way that could be cost effectively connected to the treatment facility and accept up to 1 mgd of irrigation water during the growing season. Figure 6-6 provides an overview of these potential parcels and their approximate size. Table 6-1 provides a site description, acreage and potential irrigation demand, along with the irrigation system types and necessary modifications, if any.

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Figure 6-6: Potential Reclaimed Water Reuse Areas for Outdoor Irrigation

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In 2019, three new irrigation systems were to be constructed at Atlas and Memorial Parks and in the BLM corridor from River to Hubbard Avenues. These systems could be prepared to accept future reuse water. Additionally, NIC has expressed an interest in reuse water and a future purple pipe connection between the WWTF and Atlas Park would pass by Riverstone Park, which could be cost effectively connected. Just these areas would reduce the Spokane River discharge by 210,000 gpd and reduce the City water system demand by 210,000 gpd.

Table 6-1: Potential Reclaimed Water Reuse Parcels

Site Number	Existing Irrigation System	Purple Pipe System	Site	Approximate Size (acres)	Potential Irrigation Reuse (mgd)
1	Yes	Retrofit	Forest Cemetery	20	0.14
2	Yes	Retrofit	River View Cemetery	7	0.05
3	Yes	Retrofit	Memorial Park	4	0.03
4	2019 Construction	With Construction	River to Hubbard	2	0.01
5	No	With Construction	Lacrosse Park	3	0.02
6	2019 Construction	With Construction	2019 Atlas Waterfront	13	0.09
7	No	With Construction	Atlas Upland Park	13	0.09
8	Yes	Retrofit	Ramsey Park	9	0.06
9	Yes	Yes	City Park	25	0.17
10	Yes	Yes	McEuen Park	15	0.10
11	Yes	Retrofit	Winton Park	12	0.08
12	No	With Construction	Winton Forrest	2	0.01
13	Yes	Retrofit	US-95 @NW Blvd.	4	0.03
14	Yes	Retrofit	I-90 @NW Blvd.	3	0.02
15	Yes	Yes	Riverstone Park	7	0.05
16	Yes	Retrofit	North Idaho College	5	0.03
17	No	With Construction	Beebe to Ramsey Park (7,400 LF x 20' F)	3.5	0.02
			TOTALS	147.5	1.00

6.14 Water Reuse Concept to Implementation

While the water reuse concept clearly demonstrates the benefits of water reuse, there are several policy, funding, and regulatory elements that must be addressed prior to implementation.

6.14.1 Implementation Policy and Funding

The ability to land apply reuse water on City property will benefit:

1. The Wastewater Department (potentially less challenging to meet summer discharge permit requirements).
2. The Parks Department (potentially less costly irrigation water compared to potable water).
3. The Water Department (potentially smaller or fewer future capital needs because City property irrigation demand is lower).

If the City leadership determines that wastewater reuse should be implemented, several policy questions will need to be answered:

1. Which department(s) will pay the capital cost of construction since it can be argued all the departments benefit from wastewater reuse?
2. Which department(s) will manage the system construction?
3. Which department(s) will maintain the transmission system and the irrigation system?
4. Which department(s) will fund future system replacement?
5. Which department(s) will oversee regulatory compliance?

The City leadership, and the departments, will need substantially more information to objectively answer these questions. The most important questions will likely be:

1. What is the upfront capital cost?
2. What are the on-going operational costs?
3. What are the offset savings?
4. Does the net cost for reuse create a sufficient benefit to the citizens and the environment?

6.14.2 Regulatory

Since the 2012, when the City applied to IDEQ for and received a draft reuse permit, IDEQ's experience with issuing reuse permits has expanded and the regulatory requirements have become more cost effectively attainable. Nonetheless, this wastewater reuse concept presents several unique features including the following:

1. Disconnected remote reuse sites.
2. Potentially multiple responsible parties (e.g. the Wastewater Department for producing the reclaimed water and the Parks Department for properly applying the reclaimed water).
3. Multiple land owners (City, NIC, ITD).
4. A diversity of site types (adjacent to surface waters, upland, turf grass, native grass, forest land).

The regulatory approval process will be lengthy and the City will need a clear plan with well-established policies and funding to demonstrate to IDEQ that the City will satisfactorily comply with IDEQ regulations to protect human health.

6.14.3 Implementation

To objectively analyze wastewater reuse feasibility, a “Wastewater Reuse Facility Plan” would be necessary for both the City and IDEQ. The reuse facility plan would provide the information necessary for City Departments and City Leadership to make good decisions and it would provide IDEQ with the technical information necessary before undertaking a regulatory review of facility construction. As a companion effort, the City will also need to prepare an updated application for permit to land apply reclaimed water. Both of these efforts will take at least one year, or more, to complete depending on City and IDEQ reviews and revisions.

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HDR

Chapter 7 - 2018 Facility Plan Update

Recommended Plan

Chapter 7 Recommended Plan

This chapter presents the recommended plan for the City of Coeur d'Alene's (City) Advanced Wastewater Treatment Facility (AWTF) based on the details developed in Chapters 4, 5, and 6. The range of projects were identified as part of the condition assessment, the site master plan, and the alternatives analysis. The recommended plan provides a flexible, management strategy for the City, while identifying a phased implementation program to meet capacity and treatment requirements into the future. The plan encompasses the following components:

- Renewal and replacement of aging equipment and improvement of existing processes.
- Expansion of the secondary treatment process.
- Production of highly-treated effluent to meet permit requirements for discharge to the Spokane River.
- Preparation of a reclaimed water distribution program that identifies reuse customers, sites, water demands, and distribution system infrastructure required for potential implementation.
- Beneficial reuse of biosolids produced at the Coeur d'Alene Advanced Water Reclamation Facility.

7.1 Effluent Discharge Permitting

The City's current National Pollutant Discharge Elimination System (NPDES) permit was issued on December 1, 2014 and was scheduled to expire November 20, 2019. In June 2018, the EPA approved Idaho's application to administer and enforce the Idaho Pollutant Discharge Elimination System (IPDES) program. The City's renewed permit will be an IPDES permit. The current permit outlines multiple compliance milestones that continue past the expiration date. It is expected that these milestones will be incorporated in the renewed permit. The remaining milestones include the following:

- June 3, 2019 – Submit permit renewal application.
- November 30, 2019 – Provide EPA and IDEQ written notice that the design has been completed and bids have been awarded to begin construction to achieve final effluent limitations.
- November 20, 2020 - Provide EPA and IDEQ annual progress report outlining progress made toward achieving compliance with the total phosphorus and total ammonia as nitrogen effluent limitations.
- November 30, 2021 – Provide EPA and IDEQ annual progress report.
- November 30, 2022 – Provide EPA and IDEQ written notice that construction has been completed on the facilities to achieve final effluent limitations.
- November 30, 2023 – Provide EPA and IDEQ annual progress report.
- November 30, 2024 – Provide EPA and IDEQ written report providing details of a completed start up and optimization phase of the new treatment system and must achieve compliance with the final effluent limitations. The report shall include two years of effluent data demonstrating that the final effluent limits can be achieved.

The City's wastewater program is progressing according to plan in implementing tertiary treatment facilities to achieve compliance with the final effluent limits for phosphorus and ammonia. The first phase of tertiary treatment has been designed, constructed, and is in operation for full scale demonstration of performance of the nitrifying tertiary membrane filtration (NTF) system. The Phase 1 Tertiary Treatment project was a $13 million investment in advanced treatment. Effluent performance is excellent and complies with the interim limits in the NPDES permit.

The second phase of tertiary treatment design and construction began in February 2017. Substantial completion for the Phase 2 Tertiary Treatment facility was scheduled for March 2019. The Phase 2 Tertiary Treatment project represents an additional $16 million investment in advanced treatment. The discharge permit requires the City to complete construction by November 30, 2022 and gather two years of operating data prior to full compliance with the final effluent limits for ammonia and phosphorus by November 30, 2024.

7.2 Treatment

The recommended plan consists of renewal and improvement of the existing treatment facilities at the AWRF and the expansion of the liquid stream process to continue to achieve the effluent water quality limits under future influent flow and loading conditions.

7.2.1 2017 Wastewater Rate Study and 2018 Condition Assessment

A number of renewal and replacement projects were identified in the 2017 Wastewater Rate Study and the 2018 Condition Assessment, as part of this Facility Plan. Overlapping projects and funding between the two assessments were compiled into a list categorized by process area in Table 7-1. It is anticipated that these projects would be completed within the next 10 years as improvements to the plant. Funding for recommended improvements may be new capital projects, or alternatively from either the existing capital replacement fund or renewal and replacement fund.

Table 7-1: Condition Assessment Projects

Area	Projects Identified
Preliminary Treatment	• Screening Building Evaluation • Screening Building Improvements • Grit Classifier Equipment Replacement • IPS Pump Control Improvements • IPS Pump Replacement • IPS HVAC Improvements • Pre-aeration Basin Scum Removal Modifications
Primary Clarifiers	• Mechanism Renewal and Replacement • Electrical Improvements • Primary Sludge Pump Replacement
Trickling Filters	• Pump Station Control Improvements • Distribution Arm Evaluation • Distribution Arm Improvement • Exterior Painting • Fan Renewal and Replacement
Aeration Basin	• Diffuser Membrane Replacement • RSS Pump Renewal and Replacement • WSS Pump VFD Addition
TMF	• Membrane Replacement

Table 7-1: Condition Assessment Projects

Area	Projects Identified
Disinfection	• Evaluate UV Disinfection
Chemical Systems	• Add Chemical Flow Monitoring • Chlorine Feed Equipment Renewal and Replacement • Caustic Pump Standardization • Chemical Systems Center Roof Replacement
Effluent Pumping and Outfall	• Pump Station Control Improvements • Pump Station/Outfall Inspection and Capacity Evaluation • Outfall and Diffuser Repair/Improvement
Solids Handling	• Thickened Sludge Pump Hydraulic Improvement & Grinder Evaluation • Thickened Sludge Pump Improvement • Digester Feed Grinder Replacement • Sludge Storage Tank Building Electrical Improvements • Digester 5 Mixing and Level Indicator Evaluation • Cover Centrate Storage Tank • Centrate Storage Tank Flow Metering • Centrate Screening Evaluation • Solids Building Evaluation • Solids Building Improvements • Biogas to Flare Piping Improvement • Compost Filter Bed Media Replacement
Electrical Improvements	• Arc Flash and Electrical Hazard Analysis • Standby Power for Admin and Collection Facility • Standby Power for Solids Contact Facilities • SCADA Server Redundancy Upgrades – Admin or Ops Building
Other	• Emergency Facilities Resiliency Planning • Operations Control Building Architectural Programming • Asset Management Plan

7.2.1.1 Continued Asset Management Plan Development

In Chapter 4 Existing Resources, a facility assessment is presented based on a visual field inspection of the facility components and interviews with plant operations staff. The assessment focused on the review of process equipment and the general structural condition of the facilities. The condition of facilities was evaluated and a score was assigned to rate the condition associated with the expectation for remaining service life. Based on the findings of the facility assessment, recommendations were made for further evaluation, renewal or replacement, and/or additional improvements. The recommendations were prioritized according to criticality in maintaining current operations and addressing safety concerns.

A summary of the asset assessment is presented in Chapter 4 Appendix A. Asset Inventory and Facility Assessment that provides the basis to initiate a more complete asset management planning effort and program for the City's wastewater facilities. Further investment will be necessary to develop and implement a complete asset management program to sustain the City's investments. That will require completion of the inventory and condition assessment efforts for assets that were not surveyed and reported on in Chapter 4. The assessment did not evaluate the new Administration/Laboratory, Collection Maintenance Facilities and Tertiary Treatment facilities that have been recently constructed and also excluded evaluation of the City's off-site biosolids Compost

Facility. Further, the scope of the assessment did not allow for detailed review of heating, ventilation, and air conditioning (HVAC) equipment, and electrical and instrumentation control systems.

Utility managers are responsible for maintaining facilities in good working order, regardless of the age. Asset management programs support that effort with good data, including asset attributes (e.g., age, condition, and criticality), life-cycle costing, proactive operations and maintenance, and capital replacement plans based on cost-benefit analyses. A complete asset management program includes detailed asset inventories, operation and maintenance tasks, and long-range financial planning. To continue to develop a complete wastewater asset management plan, the following recommendations are made:

- Develop an implementation plan, or Asset Management Program Road Map, to guide development that is organized around the following activities:
    1. Asset inventory refinement and management
    2. Condition assessment and renewal and replacement budgeting
    3. Program implementation planning
- Refine and complete the asset inventory initiated in Chapter 4 by completing the inventory and assessment of all wastewater assets. This will involve an inventory of the equipment systems not covered in Chapter 4 (HVAC, Electrical, I&C), the newest facilities at the AWTF, and the biosolids Compost Facility.
- Use the results of the inventory and condition assessment to refine the Equipment Replacement Plan. Evaluate budgeting of the Capital Replacement Fund at $1M per year to validate the adequacy of funding and how best to prioritize spending. It is suggested that the replacement plan be extended over a 20 year period, with the initial 5 years detailed on an annual basis, and the remaining years in 5-year buckets of anticipated renewal and replacement. Evaluate staffing needs to provide an adequate level to support the planned renewal and replacement projects.
- Incorporate the asset inventory and renewal and replacement plans now in spreadsheet format into a database or Computerized Maintenance Management System (CMMS) with maintenance work orders to form a comprehensive asset management system for the Wastewater Utility.

7.2.2 Process Improvements

The recommended plan for implementation of the liquid treatment and solids stream process improvements are described in the following sections.

7.2.2.1 Secondary Process Expansion

Alternatives for secondary treatment expansion were developed in Chapter 5 to meet the future flow and loadings projections. Alternative 1 including the expansion of the TMF mixing/aeration tank scored the highest on the noneconomic analysis scale and had the lowest net present value. This alternative also includes the replacement of the trickling filter media and maintaining the process into the future. However, a phased implementation for the additional secondary capacity allows for delayed selection in technology or process improvement to meet the effluent quality requirements. The life expectancy of the trickling filter media is difficult to determine and should be monitored on an annual basis to track when rehabilitation or another process improvements should be considered. A discussion on the secondary treatment nitrification capacity expansion triggers is included in Section 7.3.2.

In the near term, the following recommendations are made for continuing operation of the existing trickling filters:

- Monitor the condition of the trickling filter media, including periodic inspections (e.g. quarterly) of the media for indications of material degradation, ponding, sagging, etc. Establish benchmarks in the interior of the structural walls of the trickling filters and periodically survey the height of the media in comparison to these reference points.
- Evaluate the trickling filter pumping controls and prepare enhancements to upgrade the controls to newer technology.
- Evaluate whether to retrofit the rotary distributors with motorized drive units to reduce the amount of recycle pumping required and provide additional controllable options for trickling filter feed. Evaluate weather trickling filter pumping controls improvements would alleviate the need for a relatively expensive retrofit of the rotary distributors.
- Evaluate alternatives to using dewatering recycle ammonia for snail control.

7.2.2.2 Disinfection Upgrades

Replacement of the existing chlorine gas disinfection system is preferred by City staff due the extensive maintenance requirements and drivers related to health and safety. A new system should be evaluated to reduce safety risks, reduce potential for disinfection by-products, and enhance the ability to deactivate viruses/bacteriophages. There is some flexibility in scheduling implementation of an upgrade project for the disinfection process, since the current system can meet future capacity needs and continue to be operated as long as the City desires.

In the near term, the City continues operate the existing gaseous chlorine system and transfer ton chlorine cylinders to the treatment facility through a congested and developed commercial and residential area. While the existing chlorine feed system remains in relatively good condition and changes have been made to update the chlorine feed controls, development of alternatives disinfection systems is recommended.

To mitigate safety concerns and fully develop alternatives to the use of gaseous chlorine, the City should conduct a more detailed engineering evaluation of the disinfection facility. This should include continued use of gaseous chlorine and chemical de-chlorination, replacement of gaseous chlorine with sodium hypochlorite and chemical de-chlorination, and installation of UV disinfection equipment. In order to make an informed selection of the most appropriate technology, the following steps are recommended for the development of a Disinfection System Preliminary Design:

- Complete longer-term transmissivity testing of the City’s effluent to determine the compatibility with UV light disinfection technologies.
- Complete collimated beam testing of the City’s effluent to determine whether there are any limitations on the City’s ability to employ UV light disinfection.

- Conduct a disinfection system workshop to discuss disinfection system options available to the City, merits and drawbacks to each technology, and selection of technologies for further evaluation.
- Implement a UV disinfection system pilot testing program, and/or utilize the existing 1 mgd in-vessel UV disinfection unit, to provide the City with operating experience with the selected technologies and performance data on effectiveness, power consumption, operating ease and mechanical and operation and maintenance drawbacks.
- Evaluate multi-barrier disinfection options that combine UV, chlorine, and other disinfectants to address future disinfection requirements (e.g. coliphage criteria), as well as providing options to support recycled water reuse (i.e. residual chlorine requirements).
- Prepare a disinfection system preliminary design that investigates both economic and non-economic criteria for the disinfection technologies and completion of a sustainable return on investment analysis to determine the best long-term technology for use to as the long-term disinfection process.
- The preliminary design will provide the physical layout information necessary for plant site planning and coordination of future improvements within the existing chlorine contact channels or an alternative disinfection facility location. Facility layouts will be completed for the technologies for incorporation into projected capital costs for each technology.

7.2.2.3 Effluent Pumping and Outfall Improvements

A number of recommendations apply to the effluent pumping station and outfall to the Spokane River to rehabilitate the facility and enhance hydraulic performance. The capacity of the existing effluent pumping facilities are not readily known, due to the controls limitation at the pumping station and unknown condition of the outfall diffusers in Spokane River bed. A plan to conduct pump testing is recommended, along with a physical inspection of the outfall, prior to proposing pumping and outfall improvements.

The purpose of the outfall inspection is to check to the structural integrity of the outfall and assess current conditions in comparison with the original design and the requirements of the NPDES discharge permit. Field inspection is conducted to determine the following:

- Assess the physical condition of the outfall pipe, diffuser ports, and associated hardware.
- Determine the extent of sediment accumulation in the vicinity of the outfall and diffuser ports.
- Check that the outflow is free of obstructions and allows proper flow.
- Confirm the physical location (latitude/longitude) and depth of the outfall.
- Assess the physical condition of exposed sections of the outfall pipeline.
- Assess physical condition of hardware used to secure the outfall pipeline.

Condition assessment of the effluent outfall includes the following:

- Assess the pipe material, age, degradation, risks to integrity, and any other issues.
- Assess the structural condition and mechanical properties of the system.
- Determine potential schedule for maintenance and/or replacement along with capital cost estimates.

The outfall inspection checks the proper operation and structural integrity of the system and includes general observations and photographic records of the outfall where possible, as well as that of the river bottom in the area around the outfall. Maintenance and repair performed on the system and the replacement of equipment with similar items, or new items of the same size and type, are not considered a material modification. Modifications beyond maintenance and repair may require more elaborate regulatory approval and permitting.

The following steps are recommended to develop a long-term strategy for enhanced effluent pumping and outfall hydraulic capacity:

- Complete a revised outfall evaluation and inspection as a supplement to the inspection conducted by the City in 2008. The inspection will include a Joint Application for Permits through the US Army Corps of Engineers, Idaho Department of Water Resources, and Idaho Department of Lands. Complete the inspection using divers under conditions that prevent sediment disturbance during the initial evaluation.
- Following determination of the existing outfall condition, complete an updated Joint Application for Permits to complete a revised preliminary design evaluation of the outfall to repair problems and/or any damage to the existing outfall and diffusers identified during the initial inspection. The updated Joint Application should also include replacement of all of the existing diffuser nozzles with increased port size from 6-inch to 10iinch in diameter. It is assumed that the revised port size nozzles (fabricated from elastomeric materials) are ready for replacement at this time.
- Complete of a 30-foot wide topographic survey of the existing stream bed and diffuser installation.
- Prepare an outfall rehabilitation preliminary design that evaluates both economic and non-economic criteria for the outfall improvements and determine the best long-term strategy for improvement to the existing outfall.
- Develop a rehabilitation design, including preparation and application of necessary permits, to enable maintenance and refurbishment of the outfall.
- Complete a detailed evaluation of effluent pumping controls, and provide recommendations for improvements to the existing controls to provide for better low flow and high flow conditions and to stabilize erratic operation occurring in the existing system.
- Following completion of the recommended outfall rehabilitation items and completion of the recommended effluent pumping controls improvements, conduct a pumping system evaluation to test the pumping system output with the rehabilitated outfall diffusers.
- Following completion of the pumping system performance testing, complete a revised hydraulic profile for the outfall system as a supplement to the evaluation completed in Section 3 of the AWRF Phase 5C Preliminary Engineering Report.

7.2.2.4 Biosolids Dewatering Equipment Upgrades

The City relies heavily on the existing dewatering centrifuge, which is aging, and the backup belt filter press that is nearing the end of its useful life. An evaluation to determine the optimal technology for dewatering is recommended as the initial step in upgrading the dewatering facility. It is recommended that the City proceed with the selection of the preferred equipment replacement for the belt filter press that will provide redundancy, minimize plant operational efforts, and provides a balance between cake dryness with other dewatering performance parameters linked to the City's biosolids composting program and ultimate disposition of the biosolids.

In order to make an informed decision on the selection of the appropriate dewatering technology, the following steps are recommended for development of a Dewatering Facility Preliminary Design:

- Complete a comprehensive solids balance and projection of solids loadings for a selected planning period.
- Conduct an evaluation of the cake dryness requirements and implementation with the compositing facility.
- Conduct dewatering testing of the City's biosolids, including mechanical solids testing, to determine polymer and dewatering performance capabilities.
- Conduct a dewatering workshop to discuss mechanical dewatering options available to the City, merits and drawbacks to each technology, and selection of candidate technologies for further evaluation.
- Implement a mechanical dewatering pilot testing program to provide the City with operating experience with the candidate technologies and performance data on polymer consumption, cake dryness, operational ease and mechanical and operating drawbacks.
- Prepare a dewatering system preliminary design that evaluates both economic and non-economic criteria for the dewatering technologies and completion of a sustainable return on investment analysis to determine the best long-term technology for use to replace the City's existing belt filter press.
- The preliminary design will provide the needed dimensional and layout information for coordinating of improvements to the Solids Building.

7.2.2.5 Solids Building Improvements

Solids Building improvements are required to house the new dewatering equipment as well as to address fugitive odor emissions in the truck loading area, and provide space for centrate screening equipment. In conjunction with the dewatering system preliminary design, preparation of a comprehensive Solids Building preliminary design is recommended to incorporate the selected dewatering equipment, expansion of the solids loadout area, provision of space for polymer storage, inclusion of centrate screening equipment, and provision for odor control enhancements.

The following steps are recommended for development of the Solids Building Preliminary Design:

- Complete a detailed evaluation of the options available for centrate screening.
- Conduct a Solids Building workshop to discuss mechanical dewatering, cake storage, centrate screening, and biosolids truck loadout improvements including odor control

enhancements and odor control options available to the City. Develop a facility layout and evaluate the merits and limitations of the potential improvement options.

- Implement a centrate screening equipment pilot testing program to provide the City with operating experience with the candidate technologies, performance data, and operations and maintenance requirements.
- Prepare a Solids Building preliminary design that evaluates both economic and non-economic criteria for the physical layouts including dewatering equipment, centrate screening equipment, odor control, and dewatered biosolids loadout. Conduct an alternatives evaluation to determine the best long-term facility layout.
- The preliminary design will provide the needed dimensional and layout information for coordinating future improvements to the Solids Building.

7.2.2.6 TMF Membrane Expansion

Additional membrane filtration capacity is required to meet the future flow projections and satisfy effluent phosphorus limitations. The TMF flow capacity expansion trigger is discussed in Section 7.3.3.

7.2.2.7 Grit Removal Expansion

Expansion of the grit removal process with a parallel 3 mgd forced vortex process is proposed for planning purposes. Since the current pre-aeration grit removal basin is in reliable condition and has sufficient current capacity, this expansion project is proposed to occur later in the implementation schedule, approximately fiscal year 2030.

The following steps are recommended for development of the Grit Removal Preliminary Design:

- Conduct field grit sampling to characterize the loadings and grit characteristics. Grit particles are made up of different sizes, shapes, and densities whose settling rates are affected by organic accumulation on the particles and variations in buoyancy. Conduct a grit size analysis using sand equivalent size (SES). Conduct upflow column reactor testing to characterize the grit according to actual settling velocity to account for the particular density, shape and condition (organic content) of Coeur d'Alene grit particles.
- Evaluate the potential to optimize performance of the existing aerated grit removal tank in light of the grit size analysis, as well as parallel operation with a new forced vortex grit removal process.
- Conduct a Grit Removal workshop to discuss grit size analysis, process configuration, and equipment options.
- Prepare a Grit Removal preliminary design that evaluates both economic and non-economic criteria for the grit removal equipment options available and provides a recommended plant site layout.

7.3 Implementation Triggers

Condition and capacity of the existing treatment facility are implementation triggers for the scheduling of the some of the recommended capital improvement projects. Drivers for improvements to the existing outfall, nitrification, and membrane filtration capacities are discussed in the sections below.

7.3.1 Outfall Capacity

The current condition and hydraulics of the outfall limit the capacity in both gravity and pumped operational scenarios. Based on the hydraulic analysis conducted as part of the Phase 5C Preliminary Engineering Report, the capacity of the outfall is 11.9 mgd by gravity and 15.75 mgd when pumped from the effluent pump station. The capacity is based on the current outfall length with 6 inch diameter diffuser ports. The current peak hour flow is 12.0 mgd as discussed in Chapter 2 Basis of Planning. If a high river level condition that requires the use of effluent pumping occurs at the same time as the peak hour wastewater flow, the outfall could be capacity limited. It is recommended that an inspection and evaluation of the outfall and effluent pump station be conducted to determine the best improvement option to increase the hydraulic capacity.

7.3.2 Nitrification Capacity

The implementation timing for future nitrification capacity upgrades is dependent on two factors: (1) the rate of population growth within the service area; and (2) the capacity if the existing system, specifically the TMF. While there are many years of historical data on the nitrification capacity of the upstream TF/SC facility, only a few months of operational data of the completed TMF are available so far. The initial operating data does suggest that the existing TMF can remove approximately 21 mg/L of ammonia at an average of 3.9 mgd (Figure 7-1), or a volumetric loading rate of 17 mg NH_4-N/L/hr. This translates into an allowable secondary effluent (TF/SC effluent) concentration of 19 mg/L ammonia at current maximum month flows of 4.4 mgd. This information was used as the basis for establishing the nitrification capacity of the existing TMF system.

To estimate the approximate year at which additional nitrification capacity is needed at the plant, the secondary effluent ammonia was converted to a nitrogen removal rate (mg/L/hr) shown in Figure 7-2. Following the historical trend where the removal rate crosses the estimated 17 mg NH_4-N/L/hr capacity corresponds to the projected year at which it will occur. Two conditions are projected to formulate a potential range for needed improvements based on meeting full nitrification and a 4 mg/L ammonia effluent target based on the NPDES discharge permit. Figure 7-2 shows that additional nitrification capacity is needed by 2024 accounting for an allowance of 4 mg/L of effluent ammonia. However, it is recommended that planning be based on full nitrification with added capacity on-line by 2022 and that the 4 mg/L effluent ammonia “allowance” in the NPDES permit be retained as a factor of safety.

Additional operational experience in the upcoming year will improve confidence in the estimated 17 mg NH_4-N/L/hr nitrification rate in the TMF. Monitoring trends in influent wastewater ammonia growth and tracking the nitrification capacity of the TMF is recommended to refine the implementation schedule for process improvements as experience is gained over time. Additional diffusers can also be added to TMF mixing tank to increase the nitrification capacity within the existing basin as an interim improvement. This would increase the number of diffusers by 50 percent, from the current 16 to 25 percent floor coverage. The additional diffusers could add enough capacity to extend the expansion of additional reactor volume by an estimated two to five years at the current rate of increasing ammonia loadings.

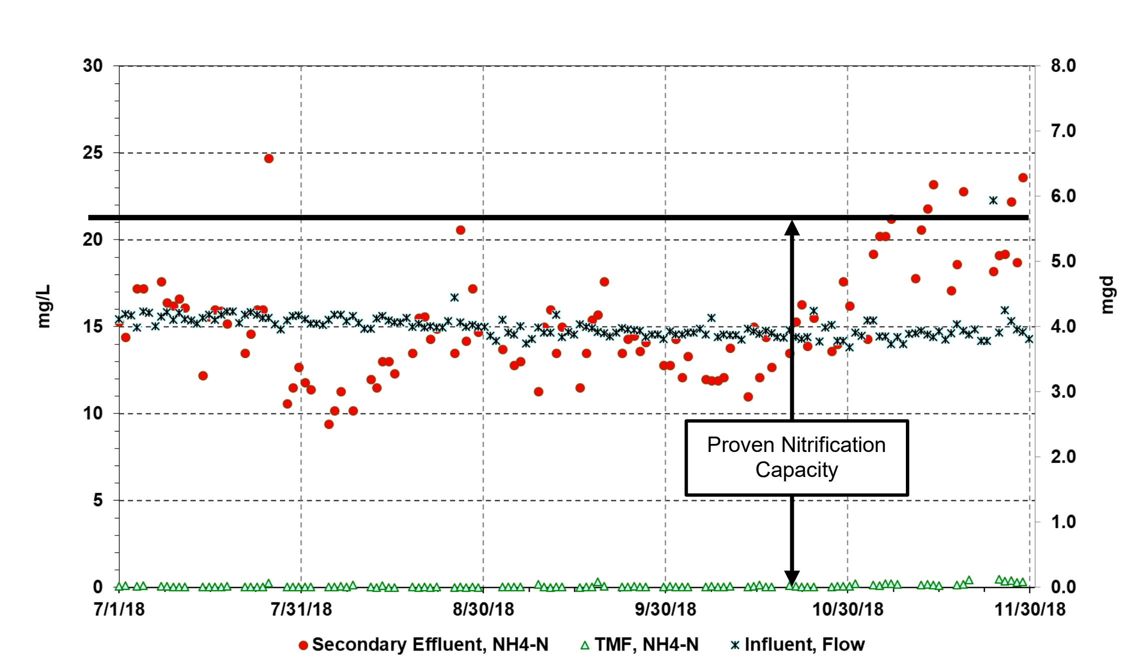

Figure 7-1: TMF Nitrification Capacity

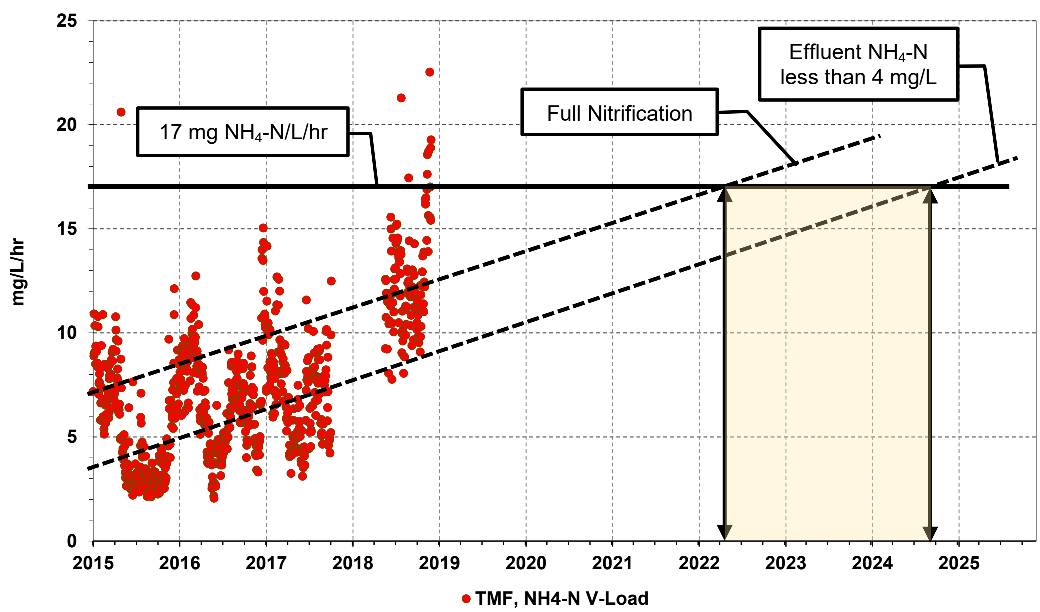

Figure 7-2: TMF Loading Rate Trend

7.3.3 Tertiary Membrane Filtration Flow Capacity

The completion of the Phase 2 Tertiary Treatment project increases the capacity of the TMF to 5 mgd based on annual average annual flow. The flow projections discussed in Chapter 2 Basis of Design recommend the use of 2 percent growth over the planning horizon. Figure 7-3 shows the anticipated timing for additional membrane capacity by 2027. One membrane train tank is available for expansion and requires only the addition of membranes themselves for an additional approximately 1 mgd of capacity based on the current membrane flux rate. Expansion planning currently includes the addition of another membrane train for future capacity. Other options for consideration include evaluation of newer types of membranes which provide greater filtration capacity within the existing tankage.

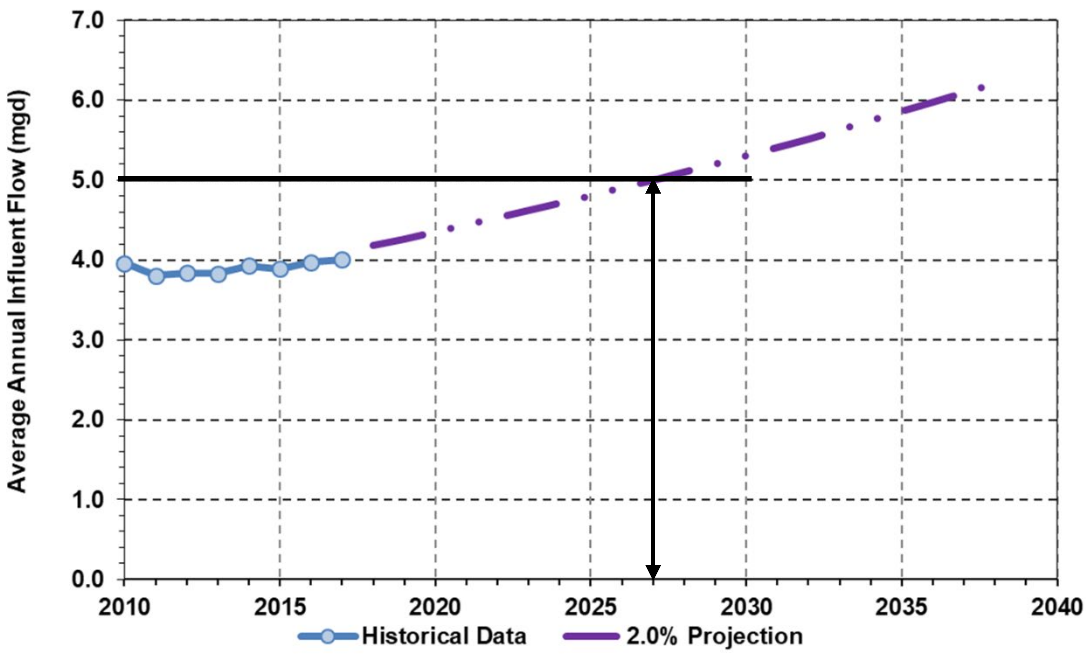

Figure 7-3: TMF Flow Capacity

7.4 Biosolids Management

All biosolids produced at the City's AWRF will continue to be stabilized through anaerobic digestion, dewatered and composted to produce a Class A biosolids product. The material is sold to landscape nurseries and may also be applied to agricultural land, or to reclaimed mining sites. This beneficially recycles nutrients and organic material to the land. The City's continuation of the Class A biosolids composting program may be driven by changing regulatory requirements, need for greater diversity in reuse options, and a public desire for a compost product. Composting would likely be continued at the existing composting facility near Julia Street.

Biosolids include very low concentrations of myriad synthetic chemicals, including Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS). These fluorinated organic chemicals are part of a larger group referred to as perfluoroalkyl substances (PFASs) that have been used in industry and consumer products since the 1950s. They are persistent and do not break down in the environment.

Some PFASs are no longer used, but products may still contain PFAS, including food packaging, nonstick cookware, stain resistant carpet treatments, water resistant clothing, paints, firefighting foams, and some cosmetics.

Reports of drinking water contamination and heightened public awareness have led to calls for regulation of PFAS. Bills have been introduced in Congress that might designate PFAS compounds as hazardous substances under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) that would trigger Superfund liability for releases of these chemicals. On February 14, 2019, EPA announced a PFAS Action Plan. EPA's Action Plan will move forward with the Maximum Contaminant Level (MCL) process outlined in the Safe Drinking Water Act (SDWA) for PFOA and PFOS. The Action Plan states that EPA is in the early scoping stages of risk assessment for PFOA and PFOS in biosolids to better understand the implications of PFOA and PFOS in biosolids to determine if there are any potential risks. It is anticipated that EPA will complete this assessment in 2020.

7.5 Site Master Plan

The AWTF produces reclaimed water which meets the IDEQ Class A reclaimed water quality standards and is suitable for outdoor irrigation of public spaces and other uses. The City plans to consider expansion of the reclaimed water system at the AWTF to provide irrigation water to nearby parks, right-of-way, and other green spaces. In Chapter 6 Site Master Planning, a number of reclaimed water reuse opportunities were identified, as well has other steps to enhance the interface with the surrounding neighborhood, including the following:

- Reclaimed Water Distribution Expansion Study and Permitting
- Reclaimed Water Distribution Expansion Implementation
- Perimeter Landscaping Enhancements
- Centennial Trail Public Education and Interpretation

7.6 Financing Plan

The City updated the Wastewater Rate Study in 2017 and identified funding mechanisms and anticipated rate impacts for the wastewater management program. An equipment replacement fund and a capital replacement fund were included in the budget as annual funding sources to cover the repair and replacement of aging or failing equipment and address other facility needs. The renewal and replacement funds are intended to cover a number of the repairs identified in the condition assessment for existing equipment systems. Capital replacement funds may be used to address equipment renewal and replacement, as well as smaller capital improvement projects. Larger capital improvements, such as future process improvements and capacity expansion projects will require new funding beyond the budget included in the 2017 Wastewater Rate Study.

7.6.1 Funding Sources

A variety of funding sources may be used to pay for the projected capital costs in the recommended plan. Pay-as-you go options are available with funding from existing user charges, however funding capacity may be limited to the revenue requirements included in the 2017 Wastewater Rate Study, absent additional user charge increases. Alternatively, funds can be borrowed to spread costs over a longer period to reduce near term user charge increases and the debt retired over a long term period (e.g. 20 to 30 years). The City may explore an agreement for funding the new capital requirements in the recommended program through a loan from the State Revolving Fund (SRF) Loan Program administered through the Idaho Department of Environmental Quality (IDEQ), as has been done in the past. Under this program, IDEQ provides up to 20-year loans to municipal agencies for water quality projects at interest rates that are generally lower than prevailing market interest rates for municipal bonds, with the added advantage of more modest issuance costs compared to bonds. The City could meet the needs beyond the SRF loan with general obligation bonds, or revenue bonds, and other sources including:

- General Facility Charges
- Capital Facilities Rates
- Advanced Water Reclamation Facility Charges
- Aquifer Protection Area Fees
- Monthly Sewer Service Charges
- Other sources of potential funding, such as Community Development Block grants (low income) or developer contributions.

7.6.2 Idaho State Revolving Loan Fund

The Water Pollution Control State Revolving Loan Fund (SRF) provides below-market-rate interest loans to help build new or repair existing wastewater treatment facilities. Potential candidates must submit a Letter of Interest (LOI) to IDEQ requesting funding and identifying the improvements or expansion needed. Utilities that submit LOIs are eligible for placement on the state's priority list, which is developed through a rating and ranking process based upon public health and water quality concerns, long-term viability of the system (i.e., sustainability), and the status of the system's compliance with state and federal regulations.

The list below outlines the steps in the process required to receive a SRF loan:

1. Submit letter of interest to get on fundable list
2. Receive confirmation that your entity is on fundable list
3. Pre-application meeting
4. Application received
5. Environmental review process initiated
6. Environmental determination issued and published
7. Engineering contract approved
8. Viability certified through technical, financial, and managerial capacity assessment
9. Operator licensure verified
10. Final environmental determination is approved
11. Facility plan approved
12. Offer made

13. Offer accepted
14. Plans and specifications approved
15. Sewer user ordinance approved
16. Pre-bid conference
17. Bid review checklist completed
18. Authorization to award bid
19. Pre-construction conference
20. Notice to proceed
21. Plan of operation approved
22. Design and construction
23. Operations and maintenance manual approved
24. Final inspection
25. Closeout package
26. Final project review
27. Repayment of loan

The letter of interest is typically due annually in early January. The letter of interest is actually a DEQ form. While not specifically called out on the procedural list, IDEQ actually recommends a preliminary call and meeting to discuss the issues at the facility and potential uses of SRF as an initial step in the process. IDEQ also recommends the assistance of facility planners and designers. The letter of interest form includes the following sections:

1. System Identification (background information)
2. Project Problems (narrative about proposed project)
3. Readiness
4. Integrated Priority Rating System (emergency/hazards, compliance, watershed, sustainability, and affordability

The systems on the priority list are further refined based upon the entity's readiness to proceed. The refined listing makes up the final *fundable list*. Projects are rated using the following criteria:

1. Public health emergency certified by the IDEQ Board or a Health District Board up to 150 Points
2. Regulatory Compliance Status up to 100 Points
3. Watershed Restoration up to 100 Points
4. Watershed Protection up to 100 Points
5. Preventing Impacts to Uses up to 100 Points
6. Sustainability up to 50 Points
7. Affordability up to 10 Points

Selected and pending projects are then listed in IDEQ's annual Intended Use Plan (IUP) document for SRF.

7.7 Program Costs and Implementation Schedule

The City's wastewater program is progressing according to plan in implementing tertiary treatment facilities to achieve compliance with the final effluent limits for phosphorus and ammonia. The projects identified in this recommended plan allow the AWTF to maintain the current facilities and to meet the projected increases in flow and loadings as the City grows. A program costs schedule matrix for the condition assessment improvement recommendations, process improvements, and the site master plan was developed as an overall recommended program. The detailed schedule is provided in 7.7Appendix A. Figure 7-4 presents a simplified, overall schedule for near term discharge permit compliance requirements and sequencing of the implementation of process improvements to provide capacity for growth. The recent Phase 1 and Phase 2 Tertiary Treatment improvement projects address the current NPDES Permit Requirements and implementation of the advanced treatment processes to meet the effluent ammonia and phosphorus limits, as shown in Figure 7-4. The existing NPDES permit is scheduled for renewal in 2019, as shown in Figure 7-4, with an application package due in June 2019. The new process improvement projects included in the recommended plan include upgrades to disinfection and dewatering, and capacity expansion for the secondary process, TMF, and grit removal. The overall sequence of planning, design, and construction is illustrated in Figure 7-4.

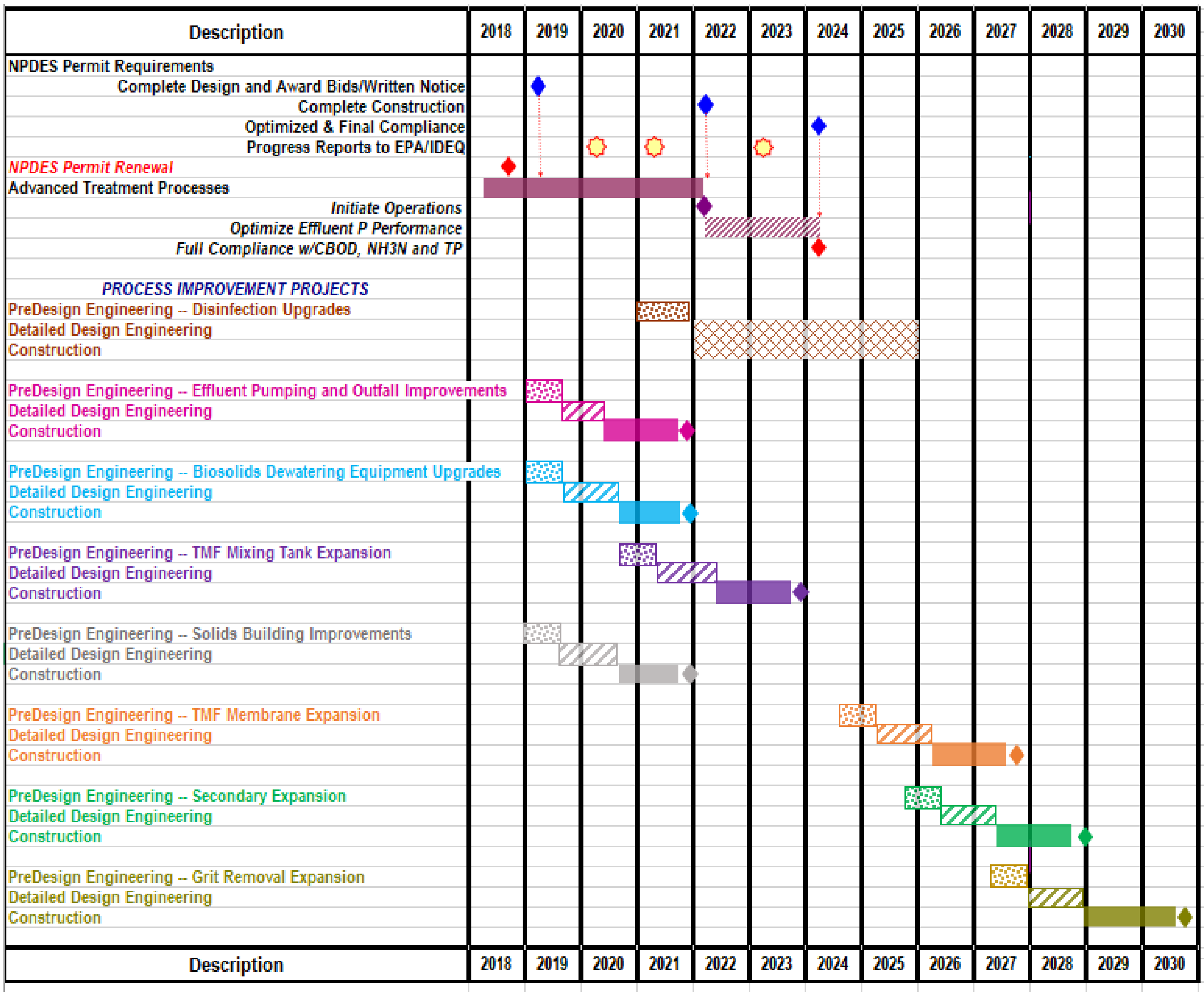

Figure 7-4: Simplified Program Schedule

Appendix A. Recommended Plan Schedule

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2/5/2020

2018 Wastewater Facility Plan Update
Fiscal Year is October 1 to September 20

- 2017 rate study item general/annual funding
- 2017 rate study item that corresponds to a 2018 FP identified item
- deferred in 2017 rate study that corresponds to a 2018 FP identified item
- 2017 rate study item not identified in 2018 FP

		2018 FY	2019 FY	2020 FY	2021 FY	2022 FY	2023 FY	2024 FY	2025 FY	2026 FY	2027 FY	2028 FY	2029 FY	2030 FY
1	**2017 Rate Study**	$1,930,000	$2,345,000	$2,540,000	$3,512,000	$1,595,000	$520,000	$0	$0	$0	$0	$0	$0	$0
2	EQUIPMENT REPLACEMENT	$360,000	$400,000	$440,000	$480,000	$520,000	$520,000							
3	Capital Replacement Fund	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000								
4	Outfall Modification/Expansion	$0	$0	$0	$500,000	$0								
5	Annual SCADA Updates	$50,000	$50,000	$50,000	$50,000	$50,000								
6	Chemical feed enhancements (Mg Oxide)	$50,000	$0	$0	$0	$0								
7	Additional solids dewatering equipment - Evaluation	$15,000	$0	$0	$0	$0								
8	New Dewatering Equipment	$0	$800,000	$0	$0	$0								
9	Centrate Screening	$300,000	$0	$0	$0	$0								
10	Grit Removal Evaluation	$0	$15,000	$0	$0	$0								
11	New Grit Removal Equipment	$0	$0	$0	$0	$0								
12	Underground waste gas supply pipe	$30,000	$0	$0	$0	$0								
13	Membrane Replacment (only 5C1 within planning period)	$0	$0	$0	$432,000	$0								
14	Trickling Filter Media Replacement	$0	$0	$0	$0	$0								
15	Trickling Filter controls upgrade/drives	$100,000	$0	$0	$0	$0								
16	Foul Odor Bed Media Replacement	$25,000	$0	$0	$0	$25,000								
17	Evaluate Disinfection Technology	$0	$20,000	$0	$0	$0								
18	Disinfection Retrofit - replaced by Row 74 - Disinfection Upgrades below	$0	$0	$0	$0	$0								
19	Operations Control Building	$0	$0	$1,050,000	$1,050,000	$0								
20	Dewatering Sidestream Treatment (Chem, Anammox, etc)	$0	$0	$0	$0	$0								
21	Biogas Recovery & Utilization	$0	$0	$0	$0	$0								
22	Chemical Systems Center Roof Replacement	$0	$60,000	$0	$0	$0								
23	**2018 Condition Assessment**	$355,000	$1,850,000	$975,000	$130,000	$650,000	$0	$20,000	$1,000,000	$0	$0	$1,025,000	$20,000	$500,000
24	Screenings Building Evaluation		$20,000											
25	Screenings Building Improvements			$300,000										
26	Grit Classifier Equipment Replacement			$200,000										
27	IPS Pump Control Improvements			$75,000										
28	IPS Pump Replacement								$1,000,000					
29	IPS HVAC Improvements		$0											
30	Pre-aeration Basin Scum Removal Modifications			$100,000										
31	Primary Clarifier Mechanism Renewal and Replacement													$500,000
32	Primary Clarifier Electrical Improvements	$150,000		$150,000										
33	Primary Sludge Pump Replacement						$0							
34	Trickling Filter Pump Station Control Improvements													
35	Trickling Filter Distribution Arm Evaluation	$10,000												
36	Trickling Filter Distribution Arm Improvement											$1,000,000		
37	Trickling Filter Exterior Painting				$50,000									
38	Trickling Filter Fan Renewal and Replacement			$0										
39	Aeration Basin Diffuser Membrane Replacement					$300,000								
40	RSS Pump Renewal and Replacement		$0											

		2018 FY	2019 FY	2020 FY	2021 FY	2022 FY	2023 FY	2024 FY	2025 FY	2026 FY	2027 FY	2028 FY	2029 FY	2030 FY
41	WSS Pump VFD Addition		$100,000											
42	Chlorine Feed Equipment Renewal and Replacement													
43	Caustic Pump Standardization and Chemical Dosing Flow Meters		$0											
44	Effluent Pump Station Control Improvements		$100,000											
45	Effluent Pump Station/Outfall Inspection and Capacity Evaluation	$50,000												
46	Outfall and Diffuser Repair/Improvement		$1,000,000											
47	Thickened Sludge Pump Hydraulic Improvement & Grinder Evaluation	$25,000												
48	Thickened Sludge Pump Improvement	$0												
49	Digester Feed Grinder Replacement	$0												
50	Digester 2/Sludge Storage Tank Building Electrical Improvements		$100,000											
51	Digester 5 Mixing and Level Indicator Evaluation	$10,000												
52	Cover Centrate Storage Tank			$100,000										
53	Centrate Storage Tank Flow Metering			$50,000										
54	Centrate Screening Evaluation	$10,000												
55	Solids Building Evaluation	$30,000												
56	Solids Building Improvements		$500,000											
57	Biogas to Flare Piping Improvement	$70,000												
58	Compost Filter Bed Media Replacement											$25,000		
59	Arc Flash and Electrical Hazard Analysis		$30,000					$20,000					$20,000	
60	Standby Power for Admin and Collection Facility					$100,000								
61	Standby Power for Solids Contact Facilities					$250,000								
62	Emergency Facilities Resiliency Planning				$30,000									
63	SCADA Server Redundancy Upgrades - Admin or Ops Building				$50,000									
64	**2018 Site Master Plan**	$0	$25,000	$1,200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
65	Reclaimed Water Distribution Expansion Study and Permitting		$25,000											
66	Reclaimed Water Distribution Expansion Implementation			$1,000,000										
67	Perimeter Landscaping Enhancements			$100,000										
68	Centennial Trail Public Education/Interpretations			$100,000										
69	**2018 Process Improvements**	$0	$0	$0	$1,298,000	$3,395,000	$3,395,000	$0	$0	$2,616,500	$2,616,500	$6,736,000	$0	$2,587,000
70	Grit Removal Expansion													$2,587,000
71	Trickling Filter Rehab											$6,736,000		
72	TMF Mixing Tank Expansion					$3,395,000	$3,395,000							
73	TMF Membrane Expansion									$2,616,500	$2,616,500			
74	Disinfection Upgrades						$500,000 to $4,200,000							
75	Dewatering Equipment Upgrades				$1,298,000									
76	**2018 Other Items**	$45,000	$50,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
77	Operations Control Building Architectural Programming	$30,000												
78	Condition Assessment of Electrical and I/C	$15,000												
79	Asset Management Plan		$50,000											

Chapter 8 - 2018 Facility Plan Update

Environmental Information Document

Chapter 8 Environmental Information Document

The purpose of this chapter is to provide an Environmental Information Document (EID) to accompany the Facility Plan Update should the City choose to pursue state and federal funding assistance. While the primary objective of the Facility Plan Update is to address the capacity and condition of the various plant processes and components, the City may consider funding assistance for all, or parts of the recommended plan. The Idaho Department of Environmental Quality (DEQ) offers loans to qualified municipalities for wastewater facilities with funding provided by the United States Environmental Protection Agency (EPA) through the Clean Water State Revolving Fund (CWSRF).

An environmental review process is required for each potential state revolving fund (SRF) loan project to determine whether the project may have a significant impact on the environment, requiring implementation of mitigation measures and possible preparation of an Environmental Impact Statement (EIS). Idaho DEQ administers a review and approval process for planning documents and environmental assessments when administering the State Environmental Review Process (SERP).

Projects with minimal impacts may be categorically excluded from further environmental review. An Environmental Information Documentation (EID) may be necessary to support a Finding of No Significant Impact (FONSI) to document why an action not otherwise categorically excluded will not have a significant effect on the environment and not require a more extensive environmental impact statement (EIS). An EID must be of sufficient scope to enable the responsible official to assess the environmental impacts of the proposed project and ultimately determine if an environmental impact statement (EIS) is warranted.

For the facilities improvements included in the Recommended Plan presented in Chapter 7, it is anticipated that many with minimal environmental impacts will be considered categorically excluded from further environmental review. For larger scale improvements, such as the addition of new treatment reactors, or potentially modifications to the solids building and/or construction near the Spokane River flood control levee, or extension of the outfall diffuser, an EID may be needed to support a FONSI. Further, expansion of the City’s effluent reclamation and recycling program outside of the existing plant site and along the Centennial Trail, may introduce other considerations that require an environmental assessment to support the review process at such time as when the City develops a reuse plan and permit.

8.1 Environmental Review Process

An EID is a document that describes the environmental impacts of a proposed construction project.

The EID is to identify the major human-made and natural features of the environment that will be affected by the proposed project as well as the direct, indirect, short-term, long-term, and cumulative effects. The EID is to demonstrate that the project is environmentally sound and verify that any adverse environmental impacts have been avoided, minimized, or mitigated.

Idaho DEQ reviews the EID and determines whether the EID meets state environmental review process requirements. If so, IDEQ may issue one of the following environmental determinations on a project:

- Categorical Exclusion (Cat Ex)
  - DEQ issues a categorical exclusion when it determines that the actions proposed do not individually or cumulatively have a significant effect on the human environment.
- Finding of No Significant Impact (FONSI)
  - DEQ issues a FONSI when: (1) the actions not otherwise categorically excluded will not have a significant effect on the human environment; and (2) an environmental impact statement does not need to be prepared
- Environmental Impact Statement (EIS)
- An EIS is required if the proposed project will significantly affect the quality of the human environment

8.2 Facility Plan Update

The objective of this Facility Plan Update is to prepare a wastewater plan that meets the requirements of Idaho Department of Environmental Quality (IDEQ) regulations (Idaho Administrative Code IDAPA 58.01.16) and addresses the capacity and condition of the various plant processes and components, as well as key operational, maintenance, and infrastructure issues identified by the City. The Facility Plan Update builds upon the 2012 Update to the 2009 Wastewater Facilities Plan Amendment and includes much of the earlier environmental assessment. The focus of the 2012 Update to the 2009 Wastewater Facilities Plan Amendment was to address the Spokane River and Lake Spokane regulatory requirements driven by the Washington Department of Ecology’s Dissolved Oxygen Total Maximum Daily Load (TMDL). The TMDL led to very restrictive effluent limits for Carbonaceous Biochemical Oxygen Demand (CBOD), ammonia nitrogen, and phosphorus which were incorporated into the City's 2014 NPDES discharge permit. The 2018 Facility Plan Update provides the City with a long-term master plan for ultimate expansion of the facilities, while identifying a program for near term improvements for permit compliance and capacity requirements.

8.3 Environmental Assessment

Since nearly all of the components of the Recommended Plan are for facilities improvements within the existing treatment plant site boundary, this environmental assessment is based upon the assessments conducted earlier in the 2012 Update to the 2009 Wastewater Facilities Plan Amendment, the 2009 Wastewater Facility Plan Amendment, and the 2000 Wastewater Facility Plan. The environmental assessment information from earlier plans remains valid for the recommended treatment process improvements and retrofits. Updated consideration is given to those elements that may have changed in some way from the earlier planning efforts. The most significant difference in the 2018 Facility Plan Update is in the configuration of the liquid stream secondary and tertiary processes. Design criteria for sizing and plant site layouts have been updated to reflect operational experience with the Phase 1 and Phase 2 Tertiary Treatment improvement projects that have been constructed to meet the restrictive effluent discharge permit limits for CBOD, ammonia nitrogen, and phosphorus.

8.4 Recommended Plan

Chapter 7 presents the recommended plan for the City's Advanced Wastewater Treatment Facility (AWTF) based on the details developed in Chapters 4, 5, and 6 of the 2018 Facility Plan Update. The plan encompasses the following components:

- Renewal and replacement of aging equipment and improvement of existing processes
- Expansion of the secondary treatment process
- Production of highly-treated effluent to meet permit requirements for discharge to the Spokane River
- Preparation of a reclaimed water distribution program that identifies reuse customers, sites, water demands, and distribution system infrastructure required for potential implementation
- Beneficial reuse of biosolids produced at the Coeur d'Alene Advanced Water Reclamation Facility

The recommended plan consists of renewal and improvement of the existing treatment facilities at the AWTF and the expansion of the liquid stream process to continue to achieve the effluent water quality limits under future influent flow and loading conditions. The following sections describe the recommended improvements in the following categories:

- Renewal and Replacement Projects
- Secondary Treatment Process Expansion and Solids Improvements
- Site Master Plan Improvements

Figure 8-1 illustrates the plant site location of some of the key recommendations that are most significant in terms of extent of the improvements and costs.

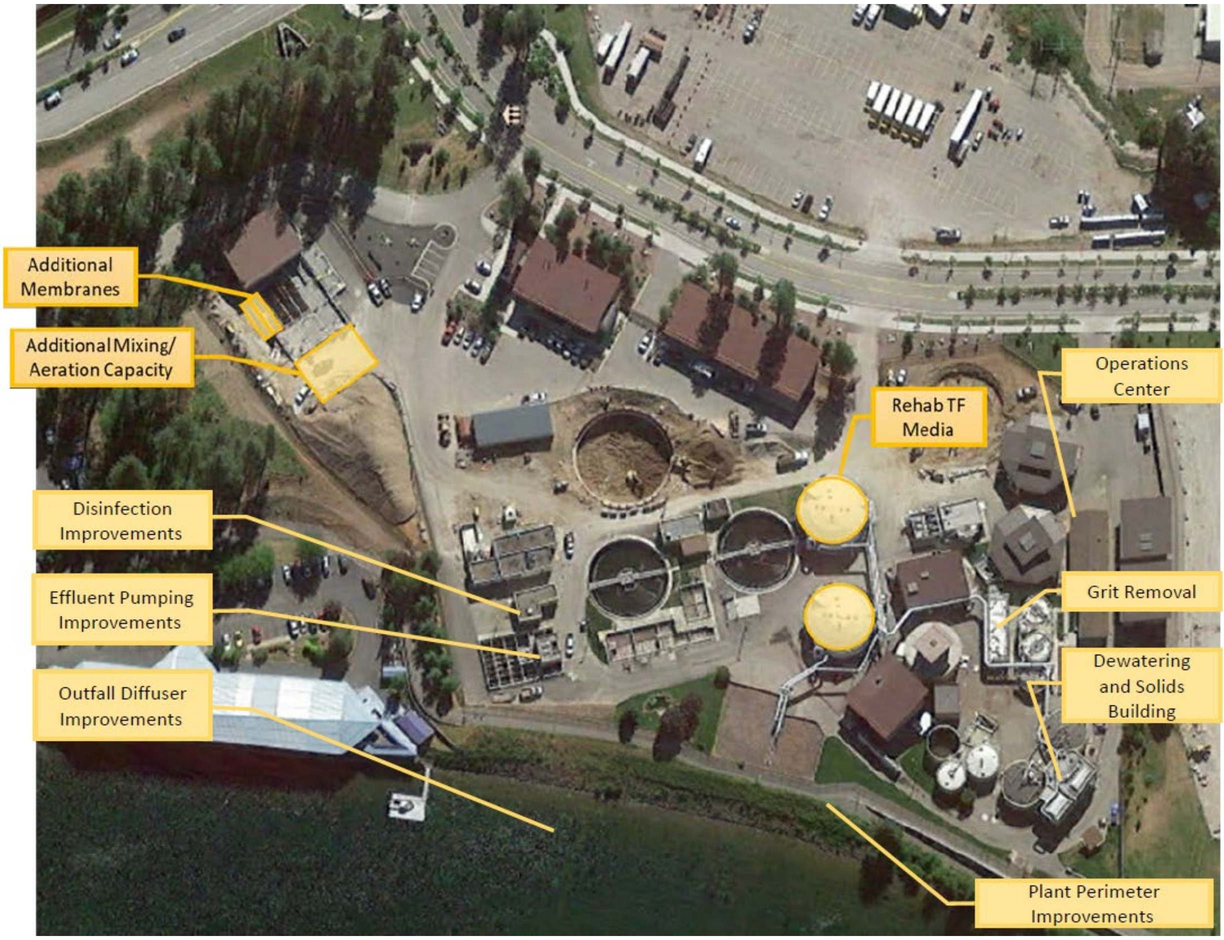

Figure 8-1: Recommended Plan Highlights with Alternative 1 Baseline TF/SC with Expanded TMF Treatment Process

8.4.1 Renewal and Replacement Projects

A number of renewal and replacement projects were identified in the 2017 Comprehensive Rate and Capitalization Fee Studies (Coeur d'Alene 2017) and the 2018 Condition Assessment conducted as part of the 2018 Facility Plan Update (Chapter 4). These projects are retrofits to existing facilities to be constructed within the existing buildings and process tankage inside the existing treatment plant site boundary. The exception being the Outfall and Diffuser Repair/Improvement project, which will be further defined in detail based upon a field inspection of the condition of the existing diffuser section. The repair or retrofit project could entail replacement of the existing diffuser ports with larger openings, and/or an extension of the diffuser to provide additional hydraulic capacity.

Table 8-8-1: Condition Assessment Projects

Area	Projects Identified
Preliminary Treatment	• Screening Building Evaluation • Screening Building Improvements • Grit Classifier Equipment Replacement • IPS Pump Control Improvements • IPS Pump Replacement • IPS HVAC Improvements • Pre-aeration Basin Scum Removal Modifications
Primary Clarifiers	• Mechanism Renewal and Replacement • Electrical Improvements • Primary Sludge Pump Replacement
Trickling Filters	• Pump Station Control Improvements • Distribution Arm Evaluation • Distribution Arm Improvement • Exterior Painting • Fan Renewal and Replacement
Aeration Basin	• Diffuser Membrane Replacement • RSS Pump Renewal and Replacement • WSS Pump VFD Addition
TMF	• Membrane Replacement
Disinfection	• Evaluate UV Disinfection
Chemical Systems	• Add Chemical Flow Monitoring • Chlorine Feed Equipment Renewal and Replacement • Caustic Pump Standardization • Chemical Systems Center Roof Replacement
Effluent Pumping and Outfall	• Pump Station Control Improvements • Pump Station/Outfall Inspection and Capacity Evaluation • Outfall and Diffuser Repair/Improvement
Solids Handling	• Thickened Sludge Pump Hydraulic Improvement & Grinder Evaluation • Thickened Sludge Pump Improvement • Digester Feed Grinder Replacement • Sludge Storage Tank Building Electrical Improvements • Digester 5 Mixing and Level Indicator Evaluation • Cover Centrate Storage Tank • Centrate Storage Tank Flow Metering • Centrate Screening Evaluation • Solids Building Evaluation • Solids Building Improvements • Biogas to Flare Piping Improvement • Compost Filter Bed Media Replacement
Electrical Improvements	• Arc Flash and Electrical Hazard Analysis • Standby Power for Admin and Collection Facility • Standby Power for Solids Contact Facilities • SCADA Server Redundancy Upgrades – Admin or Ops Building
Other	• Emergency Facilities Resiliency Planning • Operations Control Building Architectural Programming • Asset Management Plan

8.4.2 Secondary Treatment Process Expansion and Solids Improvements Process Improvements

The recommended plan for implementation of the liquid treatment and solids stream process improvements are summarized in the following sections.

8.4.2.1 Secondary Treatment Process Expansion

Alternatives for secondary treatment expansion were developed in Chapter 5 to meet the future flow and loadings projections. Alternative 1 based on expansion of the Tertiary Membrane Filter (TMF) mixing/aeration tank scored the highest on the noneconomic analysis scale and had the lowest net present value. This alternative also includes the replacement of the trickling filter media and maintaining the TF/SC process into the future. Phased implementation for the additional secondary capacity will allow the City more time for technology selection of process improvement to meet the effluent quality requirements. A more detailed discussion of secondary treatment nitrification capacity expansion triggers is included in Chapter 7 Section 7.3.2. Additional membrane filtration capacity is required to meet the future flow projections and satisfy effluent phosphorus limitations. The TMF flow capacity expansion trigger is discussed in Chapter 7 Section 7.3.3.

8.4.2.2 Disinfection Upgrades

Replacement of the existing chlorine gas disinfection system is preferred by City staff due to the extensive maintenance requirements and drivers related to health and safety. A new system will be evaluated to select the preferred process to reduce safety risks, reduce potential for disinfection by-products, and enhance the ability to deactivate viruses/bacteriophages. The recommended plan is to conduct a more detailed engineering evaluation of the disinfection facility in order to make an informed selection of the most appropriate technology. This should include continued use of gaseous chlorine and chemical de-chlorination, replacement of gaseous chlorine with sodium hypochlorite and chemical de-chlorination, and installation of UV disinfection equipment.

There is some flexibility in scheduling for implementation of an upgrade project for the disinfection process, since the current system can meet future capacity needs and continue to be operated as long as the City desires. In the near term, the City continues operate the existing gaseous chlorine disinfection system.

8.4.2.3 Effluent Pumping and Outfall Improvements

A number of recommendations apply to the effluent pumping station and outfall to the Spokane River to rehabilitate the facility and enhance hydraulic performance. A plan to conduct effluent pump testing is recommended, along with a physical inspection of the outfall, prior to proposing pumping and outfall improvements. The purpose of the outfall inspection is to check the structural integrity of the outfall and assess current conditions in comparison with the original design and the requirements of the NPDES discharge permit. Maintenance and repair performed on the system and the replacement of equipment with similar items, or new items of the same size and type, are not considered a material modification. Modifications beyond maintenance and repair may require more elaborate regulatory approval and permitting.

8.4.2.4 Biosolids Dewatering Equipment Upgrades

The recommended plan calls for the evaluation and selection of additional dewatering equipment to replace the aging backup belt filter press that is nearing the end of its useful life. An evaluation to determine the optimal technology for dewatering is recommended as the initial step in upgrading the dewatering facility. It is recommended that the City proceed with the selection of the preferred equipment replacement for the belt filter press that will provide redundancy, minimize plant operational efforts, and provides a balance between cake dryness and other dewatering performance parameters linked to the City's biosolids composting program and the ultimate disposition of the biosolids.

8.4.2.5 Solids Building Improvements

Solids Building improvements are required to house the new dewatering equipment, as well as to address fugitive odor emissions in the truck loading area, and provide space for centrate screening equipment. In conjunction with the dewatering system preliminary design, preparation of a comprehensive Solids Building preliminary design is recommended to incorporate the selected dewatering equipment, expansion of the solids loadout area, provision of space for polymer storage, inclusion of centrate screening equipment, and provision for odor control enhancements.

8.4.2.6 Grit Removal Expansion

The recommended plan includes expansion of the grit removal process with a parallel 3 mgd forced vortex process. Since the current pre-aeration grit removal basin is in reliable condition and has sufficient current capacity, this expansion project is proposed to occur later in the implementation schedule in approximately fiscal year 2030.

8.4.3 Site Master Plan Improvements

In Chapter 6 Site Master Planning, a number plant site perimeter enhancements were identified to better integrate with the surrounding community, including the following:

- Reclaimed Water Distribution Expansion Study and Permitting
- Reclaimed Water Distribution Expansion Implementation
- Perimeter Landscaping Enhancements
- Centennial Trail Public Education and Interpretation

The AWTF produces reclaimed water which meets the IDEQ Class A reclaimed water quality standards and is suitable for outdoor irrigation of public spaces and other uses. The City plans to consider expansion of the reclaimed water system at the AWTF to provide irrigation water to nearby parks, right-of-way, and other green spaces where a number of reclaimed water reuse opportunities were identified.

8.5 Implementation Schedule and Program Costs and

Figure 7-4 presents a simplified, overall schedule for near-term discharge permit compliance requirements and sequencing of the implementation of process improvements to provide capacity for growth. The new process improvement projects included in the recommended plan include upgrades to grit removal, disinfection, solids dewatering, and capacity expansion for the secondary process and Tertiary Membrane Filtration (TMF). The overall sequence of planning, design, and construction is illustrated in Figure 8-2.

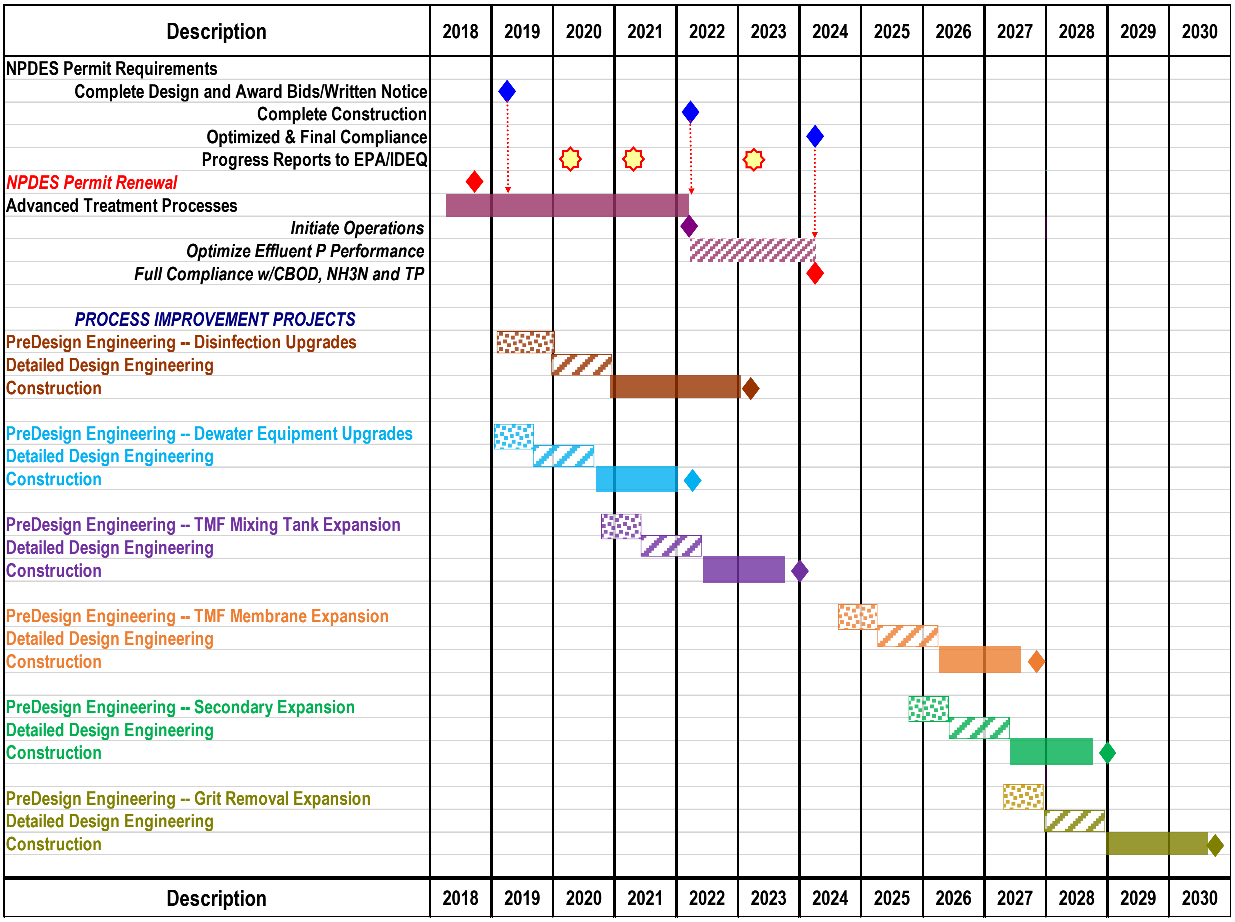

Figure 8-2: Simplified Program Schedule

The City's wastewater program is progressing according to plan in implementing tertiary treatment facilities to achieve compliance with the final effluent limits for phosphorus and ammonia. The projects identified in this recommended plan allow the AWTF to maintain the current facilities and to meet the projected increases in flow and loadings as the City grows.

A program cost and schedule matrix for the condition assessment improvement recommendations, process improvements, and the site master plan improvements was developed for the overall recommended program and is presented in Appendix A of Chapter 7.

8.6 Alternatives Including the Proposed Action

For the purposes of this environmental information document, the alternatives considered focused on liquid stream options for the secondary and tertiary treatment processes that are, by and large, refinements of preferred alternative selected in the past facilities planning. The previous facilities plans and environmental assessments considered broader programmatic alternatives, such as a no action alternative, and an alternative combining secondary treatment at a new facility location combined with effluent land application.

8.6.1 No Action

No action is not a viable alternative. Failure to implement the recommended improvements in a timely manner would have significant adverse impacts on the City of Coeur d’Alene, including:

- Non-compliance with discharge permit requirements
- Water quality impairment of the Spokane River
- Inability to handle wastewater generated by the community

These consequences would likely lead to regulatory enforcement actions and fines as the City continues to grow, and may result in a moratorium on construction within the City’s service area. The improvements in and of themselves will not stimulate growth, but are ordinary and necessary to meet the needs of a growing community.

8.6.2 Land Application Alternative

Alternatives to retrofitting the existing Coeur d’Alene wastewater facility and using secondary treatment with effluent land application have been investigated and found to be more expensive and present complications in terms of effluent discharge or reuse, and site availability. Wastewater treated at a remote location would require new plant siting and land acquisition. Effluent would need to be returned to the Spokane River for discharge and/or land applied seasonally. This alternative was not selected previously because it is substantially more expensive than upgrading the existing wastewater treatment plant for continued discharge to the Spokane River. Further, the land requirements necessary to site a new wastewater treatment facility, land apply the effluent, and potentially store the effluent through the non-irrigation season, are so large for the Coeur d’Alene capacity requirements that this alternative is not feasible considering the cost and availability of lands within a reasonable proximity to the existing sewer service area.

8.6.3 Recommended Preferred Action

The preferred alternative continues the recommendations of the 2000 Wastewater Facility Plan and associated IDEQ December 2001 Finding of No Significant Impact (FONSI) for expansion of the wastewater treatment plant with tertiary treatment. The 2009 Facility Plan Amendment also resulted in an IDEQ FONSI. The recommended preferred action consists of continued treatment using the existing treatment facilities at the City’s Advanced Wastewater Treatment Facility with tertiary treatment to achieve effluent water quality limits. The preferred alternative continues to be upgrading the existing facility and employing tertiary treatment to meet Spokane River discharge requirements.

8.7 Affected Environment

The area of potential effect is focused on the Advanced Wastewater Treatment Facility (AWTF) site and the immediate surrounding area. The planning period addresses future facility flows and loads projected to grow in five year increments for the 20 year planning horizon based on analysis of the past five years (2013 to 2017) of monitoring and operating data.

The surrounding neighborhood has changed significantly over the past 40 years as land use in the surrounding neighborhood has transitioned from industrial with saw mills, to campuses in the Education Corridor. The Centennial Trail has also brought the general public into close proximity with the treatment facility. Expectations for the visual appearance of the treatment facility and level of odor control have increased as land use in the surrounding neighborhood has changed. Historically, Spokane River water quality requirements have driven the need for many improvements to the wastewater treatment process. Effluent limits for ammonia nitrogen have long been a challenge, as has compliance for cadmium, lead, and zinc. Most recently, dissolved oxygen impacts downstream in Washington have driven very restrictive control over phosphorus, ammonia, and carbonaceous biochemical oxygen demand (CBOD) discharges. Polychlorinated Biphenyl (PCB) contamination of the river and recent Idaho rulemaking on human health water quality standards for toxics may create new compliance challenges for the river discharge. The location of the treatment facility along a flood control dike on the Spokane River waterfront is an illustration of one risk factor to be considered in resiliency planning.

While the City's wastewater utility includes the sewer service area, wastewater treatment plant site, the effluent discharge to the Spokane River, and a biosolids recycling program, this environmental assessment addresses the advanced treatment facility. The wastewater collection system delivers influent sewage to the treatment facility, however planning for the sewer system is addressed in a separate comprehensive sewer plan. The City's biosolids composting facility is located remotely from the treatment facility and planning for the biosolids management program is addressed separately.

8.8 Historical Environmental Assessment

The environmental assessment for the 2018 Facility Plan Update is based upon previous assessments linked to earlier plans, including the 1997 Kootenai Regional Long-Range Wastewater Facilities Plan (Regional Plan), the 2000 Wastewater Facility Plan, the 2009 Wastewater Facility Plan Amendment, and the 2012 Update to the 2009 Wastewater Facilities Plan Amendment. A brief summary of earlier environmental assessments provides a foundation and much of the detail supporting the current assessment.

The City of Coeur d'Alene's long-term wastewater management program was presented in the Kootenai Regional Long-Range Wastewater Facilities Plan (Regional Plan) prepared in 1997. An Environmental Impact Statement (EIS) was prepared in 1997 to identify and evaluate potential impacts to the natural and built environment from implementation of the Regional Plan. The Idaho Department of Environmental Quality (IDEQ) approved both the Regional Plan and EIS, with a Record of Decision issued on February 10, 1998.

Following the 1997 Regional Plan, a site specific facilities plan was prepared for the City's treatment facility. This includes the 2000 Wastewater Facility Plan, the 2009 Wastewater Facility Plan Amendment, and the 2012 Update to the 2009 Wastewater Facilities Plan Amendment. These plans are consistent with the recommendations of the Regional Plan and represent a refinement of the technical and financial requirements for implementation. Circumstances and conditions related to environmental effects of the planned improvements to the Coeur d'Alene wastewater facilities remained similar to those previously evaluated. No substantive changes had arisen that would alter the findings of the EIS or the Record of Decision. The Idaho Department of Environmental Quality issued a Finding of No Significant Impact (FONSI) on December 18, 2001 based on review of the Final 2000 Wastewater Facility Plan Volume 1: Facility Plan Report, September 2001.

The 2009 Wastewater Facility Plan Amendment addressed three liquid stream alternatives for the Phase 5C Liquid Stream Improvements and future growth. The 2009 Amendment recommended the City conduct pilot-scale demonstration testing to investigate three advanced treatment technologies included in the three liquid stream alternatives. On January 8, 2010, Idaho DEQ issued a final Finding of No Significant Impact (FONSI) for the City of Coeur d'Alene Wastewater System Improvement Project - Phase 5B (Solid Handling Improvements) and Phase 5C Liquid Stream Improvements (Tertiary Treatment Phases 1 and 2).

The 2012 Update to the 2009 Wastewater Facilities Plan Amendment included consideration of the operation and performance data from the pilot testing facility and updates to the planning-level cost opinion for Phase 5C improvements to recommended phased implementation of Phase 5C Liquid Stream Improvements with an enhanced process configuration (Tertiary Treatment Phases 1 and 2).

In a November 2, 2012 letter to DEQ, the City requested confirmation that the Environmental Information Document (EID) that the Idaho Department of Environmental Quality (DEQ) approved on January 8, 2010 remained valid for the planned improvements and that the FONSI issued by DEQ in 2010 remained applicable. DEQ concurred. The Tertiary Phase 1 improvements to meet the final effluent limits for phosphorus and ammonia included in the City's 2014 NPDES permit were completed in 2015 for full scale demonstration of performance of the nitrifying tertiary membrane filtration system. The Phase 1 Tertiary Treatment project was a $13 million investment in advanced treatment. The second phase of tertiary treatment was completed in 2019. The Phase 2 Tertiary Treatment project represents an additional $16 million investment in advanced treatment to expand membrane filtration capacity to 5 mgd.

The initial implementation step in the Phase 5C liquid stream improvements is a tertiary membrane filtration system following the existing trickling filter/solids contact (TF/SC) process. This enhanced process configuration is designed to demonstrate at a larger scale, the positive performance observed with the tertiary membrane system in pilot testing. The post-pilot testing configuration of enhanced Phase 5C facilities continue to be located within the site footprint as originally shown in the 2009 Amendment and thus the affected environment remains unchanged.

The 2018 Facility Plan Update recommends improvements that remain consistent with the Environmental Information Documents prepared for the previous 2000 Wastewater Facility Plan, the 2009 Wastewater Facility Plan Amendment, and the 2012 Update to the 2009 Wastewater Facility Plan Amendment. It is anticipated that many of the individual renewal and replacement projects, along with other improvements to the existing facilities, will have minimal environmental impacts and will be considered categorically excluded from further environmental review. For larger scale improvements, such as the addition of new treatment reactors, or potentially modifications to the solids building and/or construction near the Spokane River flood control levee, or extension of the outfall diffuser, an EID may be needed to support a FONSI. Further, expansion of the City's effluent reclamation and recycling program outside of the existing plant site and along the Centennial Trail, may introduce other considerations that require an environmental assessment in the future.

8.9 Review of the Affected Environment

This section presents a brief overview of the affected environment based on the Environmental Impact Statement (EIS) prepared for the Kootenai Regional Long-Range Wastewater Facilities Plan with relevant updates. The Regional Plan and EIS was prepared by a consortium of utilities and agencies including the Cities of Post Falls, Coeur d'Alene and Rathdrum, the Hayden Area Regional

Sewer Board, Idaho DEQ, the Panhandle Health District and Kootenai County. That planning process considered a wide range of wastewater management strategies including effluent management alternatives (year-round reuse, seasonal reuse, river discharge), biosolids management alternatives (composting, land application, export from the County) and institutional arrangements (regionalization, resource sharing, and stand-alone utilities).

8.9.1 Physical Resources

There are no known physical conditions in the planning area that would be adversely affected by, or would adversely affect construction of the proposed project. Nor are the any known physical conditions that would make the planning area unsuitable for development. No unusual or unique geologic features would be affected by the proposed project. According to geologic map of Kootenai County by the Idaho Geological Survey (2002), a concealed normal fault runs near the project site in a north-south direction.

8.9.2 Climate

There are no known unusual or special meteorological constraints in the planning area that would affect the feasibility of the proposed project. Air quality impacts are discussed further below.

8.9.3 Population

The US Census Bureau 2016 population for Coeur d'Alene was 50,285. The total Coeur d'Alene residential service area population is approximately 35,580 and contributes approximately 2.3 mgd of wastewater (Coeur d'Alene 2017). Commercial flows amount to approximately 1.8 mgd and represent approximately 27,200 population equivalents. The total calculated population equivalents served by the Coeur d'Alene wastewater system is approximately 62,800 (Coeur d'Alene 2017).

Chapter 2 Basis of Planning describes the flows and wasteloads entering the Coeur d'Alene facility based on data analysis from the past five years (2013 to 2017). Baseline wastewater flows during this period were approximately 4.1 mgd as an annual average. Maximum month flows were 4.5 mgd and peak hour was approximately 12 mgd.

Future plant flows and loads projections were developed in five year increments for the 20 year planning horizon. Wastewater flows have been increasing at an annual rate of about 1.1 percent based on analysis of the 2013 to 2017 monitoring data. Ammonia nitrogen and phosphorus loadings have been escalating at a higher rates of 3.9 percent and 2 percent, respectively. The projected year 2037 wastewater flows are estimated to be between 5 and 6.1 mgd.

8.9.4 Economics and Social

A comprehensive review of the City's wastewater rates was undertaken in 2017. Based on the revenue requirements and the cost of service analysis, user rates were developed for the next 5 years. The single family monthly wastewater rate in FY2017 was $35.65. Rate increases are projected to escalate at 6.5% annually up to a $48.82 per month in FY2022 (Coeur d'Alene 2017).

The total capital projects included in the 2017 Comprehensive Rate and Capitalization Fee Studies (Coeur d'Alene 2017) for the period of 2017 through 2026 are significant and total $52.8 million including inflationary impacts. This includes most, but not all of the recommended plan resulting from the 2018 Facility Plan Update. The 2017 rate analysis includes equipment replacement projects totaling $24.6 million and other renewal and replacement projects for $9.7 million. Facility improvement projects total $67.4 million. Of that amount, there are $14.6 million of the improvement and replacement projects required to meet mandatory discharge permit requirements.

EPA provides guidance on affordability in a Workbook titled Interim Economic Guidance for Water Quality Standards (USEPA 1995) which provides for tests of substantial and widespread economic impact. EPA generally defines these impacts in terms of a “municipal preliminary screener” at 1 to 2 percent of median household income.

Kootenai County median household income was $54,457 in 2018 dollars (2014 - 2018). For Kootenai County, the 1 to 2 percent of median household income affordability test would range from $45.38 to $90.76 per month. Current single family wastewater rates for Coeur d’Alene at $35.65 are less than the 1 percent EPA affordability threshold. The projected increase in single family monthly rates to $48.82 in 2022 are slightly above the 1 percent affordability threshold (approximately 1.1 percent).

As discussed in Chapter 6 Site Master Plan, the current development surrounding the wastewater treatment plant is mixed and includes commercial office and institutional uses. Recreational use also exists west of the site along the Spokane River and on Blackwell Island and on the Centennial Trail. The City has committed to presenting a visual buffer between the facility structures and the surrounding neighborhood. It is not anticipated that the proposed project will impact nearby land values.

The proposed project would not displace any residents or business owners. Based on the lack of displacement or impact to land values, it is not anticipated that the proposed project would adversely affect any poor or disadvantaged groups. It is not anticipated that any landowners would benefit substantially from the development of land due to the proposed project.

8.9.5 Land Use

Also as discussed in Chapter 6 Site Master Plan, existing land uses around the treatment facility have transitioned from historical industrial uses to commercial office and institutional uses with the Education Corridor. The waterfront bordering the Spokane River is a prime recreational asset with the Centennial Trail. The area surrounding the facility will likely undergo further transition to a mix of higher density development and/or expansion of educational use. This trend is occurring independent of the proposed project, and it is not anticipated to be triggered by construction of the proposed improvements.

As mentioned previously, the proposed project would not displace any residents, nor is it expected to impact land values or nearby properties. Therefore, inhabited areas are not expected to be adversely impacted by the proposed project.

The proposed project is being planned to meet the needs of a growing community. It is not expected to induce development, but rather to respond to an increased need caused by development that is already anticipated and accepted by community planning documentation. The proposed project would not have an adverse effect on older, existing land uses.

8.9.6 Flood Control Dike

The Federal Emergency Management Agency (FEMA) shows that the planning area is protected from the 100-year flood by a levee (Community Panel Numbers 1600760170D, 1984 and 1600780005C, 1995). The flood control dike extends along the Spokane River shoreline adjacent to the treatment plant and then turns east between the existing plant and Harbor Center. This dike and the plug for the gap in the dike at the previous alignment of the Union Pacific railroad, which has now been abandoned, must be maintained to protect the City from flooding. The top of the flood control dike is approximately elevation 2140. The 100-year recurrence flood elevation in the river is 2137. The facility is protected by this levee, and is therefore expected to be able to fully function and operate during the 100-year flood event.

The Harbor Center Building has a flood control wall along the Spokane River waterfront. It is not clear how the design of this wall is linked with flood elevations on the river or the flood control dike. Flooding in the spring of 1997 resulted in river water surface elevations of 2132.5 as measured at the Harbor Center Building. The peak flow for the Spokane River during the event in 1997 was 42,200 cfs. By contrast, the peak flow during a high runoff event in the spring of 2008 was 40,600 cfs and the record peak flow is 47,100 cfs in 1933.

The advanced treatment facility and planned improvements are located immediately adjacent to an existing Spokane River levee owned and maintained by the City of Coeur d’Alene that provides flood risk reduction for areas of the City including the project site. Assuming that the levee is intended to provide a minimum of 100-year level of protection sufficient for participation in the National Flood Insurance Program, then FEMA is requiring all levee owners to evaluate the condition of their levees with respect to stability, seepage control, erosion protection and freeboard in order to obtain certification that the levee will meet the requirements of 44 CFR Part 65.10. The results of the analysis, the need for continued participation in the National Flood Insurance Program and/or to provide the desired level of protection may result in modifications of the levee that could result in additional levee height, levee width, foundation improvements, seepage mitigation requirements, pipe penetration modifications for seepage control, interior drainage systems and other modifications that could impact the levee footprint and associated levee features. Design of planned improvements will need to be coordinated with those efforts to provide adequate space for these features and their associated maintenance access requirements. The design of the wastewater reclamation facility must also consider any impacts of its proposed grading, drainage and structural improvements on the stability of the levee and the function and access to all levee related improvements.

The Idaho Department of Water Resources has noted that the state has no statutory authority to regulate flood control levees but has offered advisory comments that critical facilities, such as a wastewater treatment plant, be located behind levels built to a level of protection higher than the 1 percent annual chance of flood. The City Engineer, who is also the Dike Manager designated by the Corp of Engineers, has evaluated the dike and found that it is currently certified to comply with all regulations. The City does not plan to construct improvements to protect for a greater flood event, and in case of need will provide temporary protection measures to protect the critical wastewater facilities.

8.9.7 Effluent Outfall

The need to modify the diffuser ports on the existing outfall have been identified to provide adequate capacity for peak discharges. Modifications to enlarge the effluent diffuser ports to provide additional hydraulic capacity are planned. Additional engineering analysis will be required to define the required modifications and the extent of construction necessary to accomplish the retrofit. It is anticipated that the existing effluent outfall pipeline will remain unchanged, but that the diffuser ports will be retrofit for a larger size and this will require construction work in the Spokane River.

The City has an existing permit with the Department of Lands for the effluent discharge outfall to the Spokane River. Modifications to enlarge the effluent diffuser ports will require work below the ordinary high water mark (OHWM) of the Spokane River. Idaho Code requires an Encroachment Permit from the Idaho Department of Lands (Department) for construction, enlargement of an existing permitted encroachment, and replacement of an existing encroachment below the OHWM of the river.

Work in the Spokane River will require permit review by Department of the Army Corps of Engineers (Corps), the Idaho Department of Water Resources (Stream Channel Alteration permit), and a permit from the Idaho Department of Lands (Encroachment permit). The Corps of Engineers publishes a Joint Application for Permits form for work in waters and wetlands in Idaho that may be used to apply for the three separate permits. Corps permits are required under Section 404 of the Clean Water Act for discharges of dredged or fill material into waters of the United States, including wetlands. This includes excavation activities which result in the discharge of dredged material and destroy or degrade waters of the United States. Corps permits are also required, under Section 10 of the Rivers and Harbors Act of 1899, for work or structures waterward of the ordinary high water mark of, or affecting, navigable waters of the United States. Individual Corps permit applications may take 2 or 3 months to process, with larger more complex projects requiring longer periods. Nationwide Permits (NWPs) require less time to process than individual permits. Typically, nationwide permits can be finalized in an average of 60 days or less.

8.9.8 Wetlands

On June 10, 2009, Mr. Houston Hannafious of the U.S. Army Corps of Engineers surveyed plant expansion Zones 4 and 6 in Figure 8-2 looking for the presence of wetlands on the subject property (Zone references to Figure 8-2 are for convenience only in identifying locations on the plant site and the wetlands inspection does not relate to the cultural survey). The determination was that wetlands are not present on this portion of the plant expansion area, and consequently, the Corps of Engineers has no regulatory authority on this property. Mr. Hannafious did not specifically address Zone 3, however since this is the historical railroad alignment that has been disturbed in the past by construction of the railroad bed and an influent sewer to the wastewater treatment plant, wetland plants are not likely to be present.

8.9.9 Wild and Scenic Rivers

According to the National Wild and Scenic Rivers website (www.rivers.gov), the Spokane River is not designated as a wild or scenic river in Idaho or Washington, nor is it being studied for potential designation.

8.9.10 Cultural Resources

In his review of the 1997 EIS, Robert M. Yohe II of the Idaho State Historical Society made the following comments regarding the Coeur d’Alene treatment plant site.

> "From investigations in Coeur d'Alene, we know that the treatment plant is located in an area highly sensitive for archaeological resources. New ground disturbance within the Coeur d'Alene facility, then has the potential to adversely affect archaeological deposits. In fact a 1980 archaeological report strongly cautioned the City against further development at this location, and recommends extensive archaeological testing if development was planned. The Coeur d'Alene Tribe should also be consulted regarding new construction at this facility."

In response to those comments, the 1997 EIS was revised to recommend consulting past archaeological examinations and conducting further study as necessary for new construction at existing sites. It also suggests contacting the Coeur d'Alene Tribe before new construction at the Coeur d'Alene facility.

In earlier facilities planning for the 2009 Wastewater Facility Plan Amendment, a review was conducted of past archaeological investigations at the Coeur d'Alene facility site. The most pertinent findings are summarized in EPA's 1982 Final Environmental Impact Statement for Wastewater Treatment Facilities for the City of Coeur d'Alene, Idaho. This document provided the following statement regarding expansion of the Coeur d'Alene facility at its current site.

> "The land adjacent to the Spokane River in the vicinity of the proposed treatment plant expansion was once the site of a major Coeur d'Alene Indian village. While the exact boundaries of the settlement are not known, the general area has been designated Site 10-KA-48 in state archaeological site survey records. An analysis of the Alternative B1 expansion site conducted by the University of Idaho Laboratory of Anthropology, however, concluded that no significant cultural materials would be affected by plant construction."

According to the correspondence presented in the appendix to the EIS, the University of Idaho survey covered all of the treatment plant property that was owned by the City in 1981. The survey concluded that the site was a fill area, containing no significant cultural remains. Based on these findings, Thomas J. Green, the State Archaeologist, wrote a letter concurring that that the proposed treatment plant expansion would have no effect on significant archaeological or historic properties.

The 1981 archaeological survey addressed the property within Zone 1 on Figure 8-2. The 2018 Facility Plan Update includes recommended improvements in Zones 1, 2, 3, 4, and 6. The following discussion provides a brief description of the other site zones.

- **Zone 2 – Southern Boundary**. This strip of land lies parallel to the southern boundary of the City's plant. The property is formerly part of the Stimson DeArmond Mill to the south of the facility that has closed and has been disturbed by construction of roadways and structures for both the mill site and the treatment plant, including the Headworks and Influent Pumping station.
- **Zone 3 – Former Railroad Right-of-Way**. The historical railroad right-of-way has been heavily disturbed by the construction of tracks and other utilities, such as the Riverside Interceptor and more recently, Secondary Clarifier No. 3. The railroad right-of-way within the plant boundaries has been abandoned.
- **Zone 4 – City-Owned Eastern Triangle**. This property has been used as a construction staging area for several expansions of the treatment facility. To prepare the site for this purpose, several large trees were removed, the site was leveled and a crushed-rock working surface was placed. This area now includes the access roads to the treatment facility, as well

as the Wastewater Administration Building and the Collection Systems Maintenance Building.

- **Zone 5 – Hubbard Street and Former Log Yard**. In the 2000 Wastewater Facility Plan, Layout Concept C involved construction of facilities in this zone. However, the 2006 University of Idaho education corridor master planning process calls for North Idaho College facilities to be located in this area (see Chapter 6, Figure 6-6). This area has been cleared of vegetation and the historical log yard replaced by a crushed rock surface now used for parking and as a construction materials lay-down area.
- **Zone 6 – Previously Wooded Area**. This zone was historically covered with a mature Ponderosa Pine forest, part of which has been removed to allow for construction of treatment facilities. The Tertiary Membrane Filtration (TMF) system building and process tankage are now located in this area.

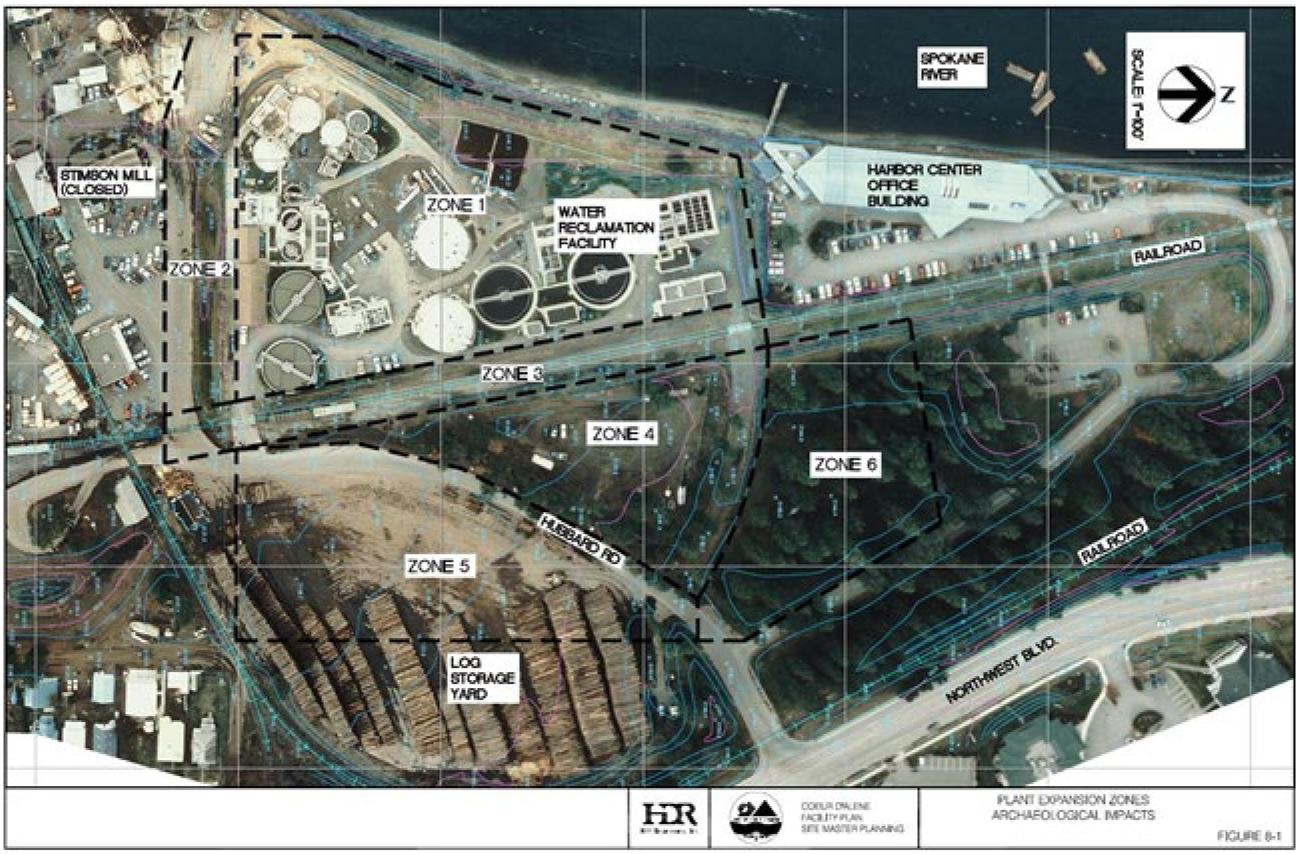

Figure 8-3: Cultural Resources Survey and Plant Expansion Zones

During the summer of 2000, the City contacted the Coeur d'Alene Tribe regarding the proposed expansion of the treatment plant and the potential impact on cultural resources. The City also provided the State Historical Society with copies of all documentation of past investigations. On August 29, 2000 and December 12, 2000 members of the Tribe toured the site with City representatives. During these meetings, the participants: (1) reviewed the history of the area; (2) discussed the potential for discovering tribal artifacts and remains within the areas where construction may occur; and (3) identified measures to protect and preserve artifacts. A letter summarizing the meeting may be found in the Appendix C of the 2000 Wastewater Facility Plan that included key points of discussion that are summarized below:

- Recollection of Richard Mullan and Nellie Michael of their understanding of the history in the area
- Realization that most of the area in the vicinity of the planned improvements has been disturbed by previous construction, and there seems to be little chance that remains will be found
- The wooded area in Zone 6 is thought to be the only possible area where remains may be discovered
- The Tribe's interest in preserving and transferring any artifacts/remains with least disruption, publicity, and delay
- Cooperation with the City's project to involve the Tribe in any discoveries as soon as possible to minimize any delays and preserve the dignity of the tribal heritage
- Invite the Tribe to project preconstruction meetings where they may describe their interests and expectations to the contractors, engineers, inspectors, and City representatives. At the meeting(s), the Tribe would be informed of the likely dates for excavation to begin, so that a representative from the Tribe could be onsite when excavation begins.
- The Tribe committed to be responsive to any issue that arises in an effort to minimize any delays to the project.

Using this past work as a starting point, the City undertook an updated cultural survey in August of 2009. Rain Shadow Research Inc. conducted a 100 percent surface survey of 2.3 acres located northeast of the existing treatment facilities in Zones 4 & 6 (Figure 8-2) and as further described on page 16 in the Rain Shadow Research report included in Appendix J of the 2009 Wastewater Facility Plan Amendment. The cultural survey included 33 shovel tests for cultural resources and recovered 116 pieces of historic trash from 17 shovel tests. Most of the historic artifacts recovered appear to be associated with late nineteenth century occupation of nearby Fort Sherman or early twentieth century occupation of Coeur d'Alene. Fifteen of the 17 positive tests contained fragments of bottle glass. The investigation also found two machine cut square nails and a complete bone toothbrush. The survey found no indication of a dense deposit of artifacts in the project area.

Rain Shadow Research Inc. recommended that archeological monitoring take place during construction and that in the unlikely event that cultural materials are exposed, that all activities in the area of discovery be halted. In the unlikely event that human remains or other cultural items are discovered, work is to halt and contacts are to be made with the Idaho State Historic Preservation Office and the Coeur d'Alene Tribe Historic Preservation Office.

8.9.11 Biological Resources

The federal list of endangered and threatened species is maintained by the U.S. Fish and Wildlife Service (USFWS). Species on this list receive protection under the Endangered Species Act. An 'endangered' species is one that is in danger of extinction throughout all or a significant portion of its range. A 'threatened' species is one that is likely to become endangered in the foreseeable future. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list. Federally listed endangered threatened proposed, and candidate species for Kootenai County are summarized in Table 8-2.

Table 8-2. ESA Listed Species and Critical Habitat in Kootenai County as of July 23, 2009

Listed Species/Critical Habitat	Scientific Name	Federal Status
Canada Lynx	Lynx canadenis	Listed Threatened
Bull Trout	Salvelinus confluentus	Listed Threatened
Water Howellia	Howellia aquatilis	Listed Threatened
Spalding’s Catchfly	Silene spaldingii	Listed Threatened
Bull Trout Critical Habitat	Salvelinus confluentus	Designated Critical Habitat

Canada Lynx. Canada lynx west of the Continental Divide generally occur in subalpine forests between 4,000 and 7,050 feet in elevation in stands composed of pure lodgepole pine but also mixed stands of subalpine fire, lodgepole pine, Douglas fir, grand fir, western larch and hardwoods. They typically avoid large openings but often hunt along edges in areas of dense cover. While Zone 6 of the facility expansion area is comprised of a small grove of Ponderosa pine forest, the surrounding area is entirely developed and the tertiary membrane filtration building and process tankage is now located in this area. It is not likely that lynx habitat occurs within the project area.

Bull Trout. The bull trout has been documented as present in Coeur d’Alene Lake and upstream tributaries, but not downstream of the lake. Critical habitat that has been designated for bull trout in Kootenai County does not include the Spokane River. As there are no other water bodies in the project area, bull trout habitat would not be impacted by construction of the proposed project.

Bull trout is identified as “threatened species” as of July 2009. In comments to the EPA regarding renewal of the City of Coeur d’Alene NPDES discharge permit, the U.S Fish and Wildlife Service have indicated that bull trout cannot pass Post Falls dam and those present in the Spokane River may be transient from Lake Coeur d’Alene. A potential future issue with regard to effluent discharge is increased scrutiny of water quality criteria for temperature in consideration of Endangered Species Act (ESA) listings.

Water Howellia. Water howellia occurrences are limited to six geographic in California, Washington, Idaho and Montana. The entire species occupies a total area of less than 200 acres. Water howellia is an aquatic plant restricted to small, vernal, freshwater wetlands that have an annual cycle of filling up with water over the fall winter, and early spring, followed by drying during the summer months. Ponds are almost always surrounded by broadleaf deciduous trees. It is not anticipated that the proposed project would impact potential habitat for the water howellia.

Spalding’s Catchfly. Spalding’s catchfly is endemic to mesic grasslands of the Palouse Prairie region in eastern Washington and adjacent portions of northeastern Oregon and north-central Idaho. Throughout its range, much of the Palouse Prairie grassland habitat of Silene spaldingii has been converted to crop agriculture or pastureland. In Idaho, it is associated with relatively undisturbed slopes or flats in swales and drainages, upper canyon slopes, and in small strips of native vegetation surrounded by cultivated fields. Sites often occur near lower treeline or scattered Ponderosa trees. There are only 10 known occurrences in Idaho, none of which are located in the area of the proposed project or in Kootenai County according to the U.S. Fish and Wildlife Service Spalding’s Catchfly Recovery Plan.

The Fish and Wildlife Service requires that a Biological Assessment (BA) be conducted for actions with a federal nexus only if listed species are located in the study area. None of the ESA listed species in Table 8-2 have been identified on the project site.

8.9.12 Recreation and Open Space

The Spokane River and Blackwell Island west of the treatment plant site are used for recreation. The Centennial Trail is frequently used for recreation and is routed along the northern and western boundary of the treatment facility. The proposed project would not eliminate or modify recreational open space, parks, or areas of recognized scenic or recreational value.

8.9.13 Agricultural Lands

The planning area does not contain any environmentally significant agricultural lands as defined in the EPA Policy to Protect Environmentally Significant Agricultural Lands, dated September 8, 1978.

8.9.14 Air Quality

The proposed project is not located in an Idaho Air Planning Area per DEQ (map dated January 3, 2007). The proposed project will adhere to the State Implementation Plan for statewide air quality rules and programs.

According to DEQ, potential air quality impacts from the project may be associated with the construction phase of installing infrastructure improvements (DEQ 2009). The project plans will incorporate reasonable controls on fugitive dust sources during the demolition, clearing, and construction of new facilities. According to IDEQ, reasonable control of fugitive dust is described as follows:

> "All reasonable precautions shall be taken to prevent particulate matter (dust) from becoming airborne, as required in IDAPA 58.01.01.651. In determining what is reasonable, consideration will be given to factors such as the proximity of dust-emitting operations to human habitations and/or activities and atmospheric conditions, which might affect the movement of particulate matter. Some of the reasonable precautions include, but are not limited to, the following:
>
> - Use, where practical of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of lands;
> - Application, where practical, of asphalt, oil, water or suitable chemicals to, or covering of, direct roads, materials stockpiles, and other surfaces which can create dust;
> - Installation and use, where practical, of hoods, fans fabric filters, or equivalent systems to enclose and vent the handling of dusty materials. Adequate containment methods should be employed during sandblasting or other operations;
> - Covering, where practical, of open-bodied trucks transporting materials likely to give rise to airborne dusts;
> - Paving of roadways and their maintenance in a clean conditions, where practical; or
> - Prompt removal of earth or other stored materials from streets, where practical."

It is unlikely that the Coeur d'Alene treatment facilities will meet either the criteria pollutant emission threshold of 100 tons per year, or the hazardous air pollutant criteria of 10 tons per year for a single hazardous air pollutant, or 25 tons per year for aggregate. There are currently no municipal facilities in Idaho that are regulated for the emission of air pollutants. In addition, hydrogen sulfide (H2S) has recently been removed from the list of hazardous air pollutants in the Clean Air Act. It is still considered a hazardous pollutant by the State.

Odor control is a concern at any wastewater treatment facility and maintenance of a good neighbor policy is given a high priority in operation of the Coeur d'Alene wastewater facility. New odor containment and treatment facilities were commissioned at the Coeur d'Alene plant in 1999 targeting emissions from high odor potential areas. Foul air from the plant headworks, preliminary treatment, sludge thickening, anaerobic digestion, solids dewatering, and the trickling filters is routed to a compost biofilter for odor scrubbing. The recommended plant includes Solids Building improvements to enhance the control of foul air emissions.

While odorous compounds at the facility do not have strong health effects at low concentrations, they can have physical and psychological effects. Regardless of the loadings to the facilities and local rules, the communities and neighbors are sensitive to odors and noise from wastewater treatment facilities. The control of nuisance odors and noise is an important element in the City's capital and operating plan.

8.9.15 Energy

Biogas produced in the digesters is captured and used as a supplemental energy source at the wastewater treatment facility. Energy generated from combustion of biogas in treatment facility boilers is used for space heating in several of the plant buildings and for digester heating. By using biogas in facility boilers, wasted and flared biogas is reduced, thus reduced carbon emissions.

8.10 Direct, Indirect, and Cumulative Impacts

The City's wastewater program provides direct benefits to both surface water and ground water quality. The Coeur d'Alene advanced wastewater treatment facility was constructed and expanded to provide the capacity needed to allow extension of sewers to eliminate thousands of septic systems located directly over the Rathdrum Prairie aquifer. Further, the high level of tertiary wastewater treatment provided by the facility protects water quality in the Spokane River. The planned improvements will sustain facility operation to meet some of the most restrictive effluent discharge limits anywhere in the nation with very low concentrations of phosphorus, CBOD, and ammonia nitrogen. This will also improve aquifer water quality because of the large interchange between the aquifer and river in the Spokane Valley.

Short-term direct impacts of planned improvements will be focused on the existing wastewater treatment plant site during construction of the recommended improvements. Construction impacts will be temporary and will be mitigated by adhering to appropriate industry practices and by compliance with permitting requirements. Planned mitigation actions include aesthetic improvements with enhanced odor control, architectural treatment of building structures for visual enhancement, and perimeter landscaping.

It is unlikely that significant cultural resources will be found on the project site and it is unlikely that the planned improvements will have a significant effect on the endangered species in the area.

Indirect impacts of the recommended program include additional electrical energy use, chemical use, and production of larger quantities of biosolids. All have secondary environmental impacts resulting from the generation of electricity, production of chemicals, and transportation and processing of biosolids. Increased use of electrical power and chemicals are necessitated by the water quality requirements of the Spokane River, in particular the extremely low effluent phosphorus limits. Generation of additional biosolids is a result of increasing wastewater flows and loadings to the facility and a consequence of greater chemical use to achieve low levels of effluent phosphorus.

The cumulative impact of water quality requirements dictating advanced levels of treatment for low phosphorus will be increased costs for construction of facilities and operation and maintenance of the treatment processes. This will result in increases in wastewater utility user charges for both monthly rates and connection fees for new service. The result will be higher effluent quality for discharge to the Spokane River and potentially for reclaimed water recycling.

8.11 Conclusions and Mitigation

The 2018 Facility Plan Update recommended improvements are consistent with the recommendations of the Regional Plan and the findings of the approved EIS for the Regional Plan. Further, they remain consistent with the Environmental Information Documents prepared for the previous 2000 Wastewater Facility Plan and the 2009 Wastewater Facility Plan Amendment.

The City will work with the Idaho State Historical Society and the State Historical Preservation Officer (SHPO) to implement SHPO's recommendations for mitigation during construction of facility improvements. SHPO and the City will also work with the Coeur d'Alene tribe and the Coeur d'Alene Tribal Historical Preservation Officer during construction since the facility is located in an area of historical and religious significance to the Coeur d'Alene tribe. The October 23, 2009 letter from the SHPO outlined the following mitigation conditions that must be met during construction:

1. *"Ground disturbing activities, throughout the entire project area, will be monitored by a qualified archaeologist. We will depend upon the professional judgment of the archaeologist to determine when monitoring is no longer warranted.*
2. *Further consultation with the Coeur d'Alene tribe, so that, if the tribe so desires, a tribal representative can be present during the construction and monitoring.*
3. *Your consultant will hold a preconstruction meeting with the construction crew to inform them of the sensitivity of the project area, provide guidance on the type of archaeological remains that may be uncovered, and outline a protocol to follow when archaeological remains are uncovered during excavation and construction activities.*
4. *If archaeological remains are discovered during excavation and construction activities, at any time while your consultant or a tribal representative is not present, all work must halt in the area of discover and your consultant, the Coeur d'Alene Tribe and our office notified immediately.*
5. *All construction activities and machinery will be confined to the previously surveyed areas.*
6. *In any ground disturbing activities are proposed or planned for any unsurveyed or unevaluated areas, those new project plans will be sent to our office for review.*
7. *Following the completion of the monitoring, a report will be sent to our office."*

The flood control dike presents a site constraint and design of the recommended improvements will need to be coordinated with City efforts to provide adequate space and maintenance access for protection of the City from flooding and the City's effort to comply with FEMA requirements of all levee owners to evaluate the condition of their levees, as well as the recommendations of the Idaho Department of Water Resources.

Effluent discharge outfall retrofit work in the Spokane River will require permit review by Department of the Army Corps of Engineers (Corps), the Idaho Department of Water Resources (Stream Channel Alteration permit), and a Lake Encroachment permit from the Idaho Department of Lands (Encroachment permit). The Corps of Engineers publishes a Joint Application for Permits form for work in waters and wetlands in Idaho that may be used to apply for the three separate permits.

In the past, the Department of Environmental Quality has contacted the U.S. Fish and Wildlife Service to consult about the threatened and endangered species and critical habitat found in the vicinity of the proposed project area. Following discussion, the U.S. Fish and Wildlife Service and IDEQ has determined that no further informal or formal consultation is necessary according to Section 7 of the Endangered Species Act for Phase 5 of the Coeur d'Alene Wastewater Treatment Plant Improvement Project.

The project will adhere to the State Implementation Plan for air quality. If the Coeur d'Alene plant were regulated as a major source, some method of emission reduction would need to be employed. The control of nuisance odors is an important element in the system's capital and operating budgets.

8.12 Reclaimed Water Reuse

A number of reclaimed water reuse opportunities were identified in Chapter 6 Site Master Planning. If the City leadership determines that wastewater reuse should be implemented, several policy questions will need to be addressed and preparation of a reclaimed water plan will be needed to identify reuse customers, sites, water demands, and the distribution system infrastructure required for potential implementation.

Since the 2012 Update to the 2009 Wastewater Facilities Plan Amendment, when the City applied to IDEQ for, and received a draft reuse permit, IDEQ's experience with issuing reuse permits has expanded and the regulatory requirements have become more cost effectively attainable. The regulatory approval process may be lengthy and the City will need a clear plan with well-established policies and funding to demonstrate to IDEQ that the City will satisfactorily comply with IDEQ regulations to protect human health.

Plans for reclaimed water reuse will be prepared in accordance with IDEQ guidance for Reclamation and Reuse of Municipal and Industrial Wastewater (IDEQ 2007) and Idaho regulations (IDAPA 58.01.17). Any necessary environmental assessment will be undertaken in conjunction with the preparation of the reuse plan and permit application process.

8.13 References

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