Preliminary Engineering Report

CITY OF SANDPOINT

Wastewater Treatment Plant Improvements
Volume 1

DECEMBER 2025 | Project No. 224073

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DALLIN P. STEPHENS

PREPARED BY

KELLER ASSOCIATES

601 Sherman Ave., Suite 1
Coeur D'Alene, ID 83814
(208) 758-8601

PREPARED FOR

SANDPOINT

1123 W. Lake Street
Sandpoint, ID 83864
(208) 946-2087

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ACRONYMS, ABBREVIATIONS, AND SELECTED DEFINITIONS

AAGR	Annual Average Growth Rate
ACI	American Concrete Institute
ADF	Average Day Flow
ADWR	Average Dry Weather Flow
AEIC	Association of Edison Illuminating Companies
AHF	Average High Flow
AISC	American Institute of Steel Construction
ALF	Average Low Flow
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
BOD_5	5-Day Biochemical Oxygen Demand
CatEx	Categorical Exclusion
CDBG	Community Development Block Grant
CMU	Concrete Masonry Unit
COMPASS	Community Planning Association of Southwest Idaho
CSE	Collection System Evaluation Facility Plan
DEQ	Idaho Department of Environmental Quality
DMR	Discharge Monitor Report
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FPS	Facility Planning Study
ft	Feet (or) Foot
gal	Gallons
gpm	Gallons per minute
HMI	Human Machine Interface
HP	Horsepower
HVAC	Heating, ventilation and air conditioning
IBC	International Building Code
ICEA	Insulated Cable Engineer’s Association
IDAPA	Idaho Administrative Procedure Act
IEEE	Institute of Electrical and Electronics Engineers
I/I	Infiltration and inflow

IES	Illuminating Engineering Society
IMC	International Mechanical Code
in	Inch(es)
IPDES	Idaho Pollutant Discharge Elimination System
ISA	International Society of Automation
ISPWC	Idaho Standards for Public Works Construction
lbs/day	Pounds per day
MBR	Membrane Bioreactor
MCC	Motor Control Center
MDF	Maximum Day Flow
MGD	Million Gallons per Day
mg/L	Milligrams per liter
mL	Milliliters
mm	Millimeter
MLSS	Mixed Liquor Suspended Solids
MMF	Maximum Month Flow
NEMA	National Electrical Manufacturer’s Association
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
OIT	Operator Interface Terminal
OH&P	Overhead and Profit
O&M	Operations and Maintenance
P&ID	Process and Instrumentation Diagram
PER	Preliminary Engineering Report
pH	Measure of the acidity or basicity
PHF	Peak Hour Flow
PLC	Programmable Logic Controller
ppd	Pounds per day
psi	Pounds per square inch
RAS	Return Activated Sludge
SCFM	Standard Cubic Feet per Minute
SCADA	Supervisory Control and Data Acquisition
SF	Square feet
SMACNA	Sheet Metal and Air Conditioning Contractor’s National Association
SRF	State Revolving Fund
SWD	Side Water Depth
TDH	Total Dynamic Head

TKN	Total Kjeldahl Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UL	Underwriter’s Laboratories
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USDA-RD	United States Department of Agriculture – Rural Development
UV	Ultraviolet Light
VFD	Variable Frequency Drive
WAS	Waste Activated Sludge
WWTP	Wastewater Treatment Plant
WWTPFP	Wastewater Treatment Plant Facility Plan

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EXECUTIVE SUMMARY

The City of Sandpoint (City) owns and operates a wastewater treatment plant (WWTP) that treats municipal and industrial-generated wastewater. The Sandpoint WWTP discharges treated effluent to the Pend Oreille River. The 2019 Wastewater Treatment Plant Facility Plan (WWTPFP) identified various issues with capacity limitations, aging infrastructure, and permit compliance while laying out the capital improvement plan to satisfy the needs for the future. The City contracted with Keller Associates (Keller) to advance the improvements through a Preliminary Engineering Report (PER). Developing a PER is an Idaho Administrative Procedures Act (IDAPA) requirement following the WWTPFP and is an important step that confirms the City's needs and priorities, helps the City plan for future costs and operations, and ultimately lays the foundation for successful funding applications, Idaho Department of Environmental Quality (DEQ) approval, and efficient final project design.

The PER serves as the roadmap for the future of the WWTP and met the City's objectives for the project which were as follows:

- Revisit and advance the recommendations of the WWTPFP and investigate new improvement alternatives.
- Assess existing site conditions.
- Identify funding opportunities and assist the City with applying for funding.
- Develop project and construction phasing plans.
- Prepare a cost estimate and preliminary drawings for the proposed project based on improvements selected by the City.
- Develop a PER that satisfies Idaho Administrative Procedures Act (IDAPA) requirements.

This PER established design criteria for the 2045 WWTP flows and loads and documented the conditions of existing infrastructure at the WWTP. Due to the complex projected flow variations, capacity limitations and suboptimal conditions identified, the WWTP will need significant improvements to continue to operate within its permit. The WWTP liquid treatment process components were evaluated both holistically and individually, and improvement alternatives were developed based on discussions with the City. Since funding has not been secured for the project and initial costs of improvements exceeded the City's capital budget, improvements and phasing must be flexible to adapt to the actual funding obtained and City capital which is unknown at this time. A phasing plan, cost estimate, and preliminary drawings were developed for the recommended improvements and will help the City complete the improvements in smaller sub-projects if needed. This PER additionally aims to memorialize the discussions and decisions between the City and Keller from the predesign process.

City staff were instrumental to this PER through their understanding of the system's current challenges and collaboration in the decision-making process. Keller gratefully recognizes the City staff's assistance in completing this PER. This PER is funded by the City of Sandpoint.

ES.1. DESIGN CRITERIA

City-defined goals, objectives, regulatory requirements, and engineering best practices formed the basis for the development of this PER. Chapter 1 provides an in-depth discussion of the design criteria. Permit requirements and other design elements as set by IDAPA are also discussed in Chapter 1.

Population

Population growth has been steady from 1998 to 2016. The WWTPFP planned for 1.5% growth while the recently completed 2023 Wastewater Collection System Evaluation (WWCFP) planned for 2.4%. The City selected an average annual growth rate of 2.5% for this PER to be consistent with the City's Comprehensive Plan.

Wastewater Flows

Table ES-1: Projected Wastewater Flows (MGD) presents a summary of the wastewater flow projections in millions of gallons per day (MGD) for the design year 2045 for the average day flow (ADF), maximum month flow (MMF), and maximum day flow (MDF). Chapter 1 provides a discussion of how the flow projections were developed as well as the WWTP's historical loadings (pounds per day of contaminants) and the 2045 projected loadings. These projections are in line with the WWTPFP and the WWCFP estimates.

TABLE ES-1: PROJECTED WASTEWATER FLOWS (MGD)

	2045
Growth Rate (%)	*2.5*
Population	*16,016*
Average Day Flow (MGD)	3.0
Average Dry Weather Flow (MGD)	2.4
Maximum Month Flow (MGD)	5.5
Maximum Day Flow (MGD)	12.4
Peak Hour Flow (MGD)	14.0

ES.2. SITE EVALUATION AND LAYOUT

Evaluation of site considerations in predesign helps the City plan appropriately for project duration and cost. Site considerations such as plant access, flood control provisions, procedures for initial start-up, and permitting requirements are discussed in Chapter 2.

The site evaluation includes detailed conditions assessments for the existing equipment and infrastructure at the WWTP. These assessments result from site visits by structural, electrical, and mechanical engineers from Keller. The goal of the site visits were to determine whether existing infrastructure could be reused or if replacement would be recommended. Many of the existing facilities were observed to be beyond their useful life and to have outdated electrical infrastructure and, in many areas, not meet classification code requirements. Based on the conditions observed, replacement of the existing facilities was recommended over rehabilitation; this conclusion served as the basis for the process unit alternative evaluations.

The site evaluation also included a Geotechnical Feasibility Study where subsurface exploration, laboratory testing, and high-level improvements were identified for the site that will assist with the subsequent design stages.

ES.3. PROCESS UNITS

Keller worked closely with the City to refine improvements to address the WWTP needs during the design period. Each alternative evaluation included design criteria, size and redundancy requirements, general discussion, 20-year life cycle cost, operational considerations, and construction sequencing parameters. A recommendation was provided for each alternative evaluated. Key issues with existing processes and proposed improvements are summarized below.

- Preliminary Treatment (Headworks):

  - The existing screens do not have sufficient hydraulic capacity for 2045. They will be replaced with two new, higher capacity coarse screens.
  - The existing grit chamber is past its useful life and is not anticipated to be providing an acceptable amount of removal. It will be replaced with a new vortex grit removal system and new grit dewatering equipment.
- Primary Treatment:
  - The existing primary clarifiers do not meet industry design standards and show significant signs of wear. They will be replaced with new primary treatment. The design currently anticipates this being primary filtration, subject to acceptable results from piloting. A new primary filter building containing these filters will also house the new wet well/dry pit influent pump station to lift flows to secondary treatment processes.
- Secondary Treatment:
  - The existing aeration basins do not have enough treatment capacity for 2045. Three new conventional activated sludge basins will be constructed to replace them and will include anoxic and aerobic zones, complete with mixing and diffused aeration.
  - The existing blowers are near the end of their useful life and will not have adequate capacity for the design conditions. A new blower building, constructed near the activated sludge basins, will contain new, energy efficient high speed magnetic bearing turbo blowers.
  - A new phosphorus chemical dosing system will be included to reduce effluent phosphorus concentrations as required to meet the phosphorus permit limit.
  - The existing secondary clarifiers do not have sufficient treatment capacity for 2045 and will be decommissioned. Two new secondary clarifiers will be constructed.
  - The existing RAS and WAS pumps do not have sufficient capacity and can be difficult to operate. New RAS pumps and WAS pumps will replace them. New scum collection and pumping systems will be constructed.
- Disinfection:
  - The existing gas chlorination and dechlorination system presents a safety hazard for operators and nearby residences and lacks capacity for projected peak flows. It will be decommissioned, and a new UV disinfection system will be installed in a new building.
- Auxiliary:
  - The current controls and communications system at the plant is outdated, unreliable, and has a high risk for failure, which can impact the City's ability to comply with permit limits. A new SCADA system is needed. Additionally, the electrical service, backup power, and utility water system do not have capacity for these improvements and will need to be upgraded.
- Administration Building:
  - The WWTP does not have a designated administration building; the laboratory and break area are in a shared space within the secondary control building with the intermediate pump station and WAS pump station. A new administration building will be constructed to house the WWTP's lab, offices, workshop, and laundry facilities.
- Solids Handling Processes

- ○ The WWTPFP identified in-kind replacement of various components of the solids handling treatment processes. However, at the onset of this PER, a high-level evaluation was performed to identify the actual capacity of the processes, especially the anaerobic digester. Through that evaluation, it was determined that these processes would likely not have adequate capacity for the projected flows and loads and complete replacement was anticipated. Furthermore, plant staff and Keller's condition assessment denoted significant concerns associated with infrastructure risk including buried piping failures and digester structural integrity. Additional analysis and design are required to take a more detailed look at the capacity and condition of existing solids handling equipment and to plan for the necessary improvements beyond the WWTPFP maintenance improvements; further evaluation in a separate PER is necessary.

Preliminary plans which show the proposed site plan, design criteria, hydraulic profile, mass balance, mechanical plans, and electrical Piping and Instrumentation Diagrams (P&IDs) are provided in Volume 2.

ES.4. CODE PROVISIONS

Operator safety and electrical reliability are key to the WWTP's successful operation, and the proposed improvements were designed with these in mind. Architectural, HVAC, electrical, and other relevant codes were referenced throughout the predesign process. Code compliance is discussed in Chapter 4.

ES.5. COST ESTIMATE

A cost estimate was developed for all improvements in this PER to help the City allocate funds and seek out funding opportunities. The cost estimate is shown in Table ES-2:WWTP Improvements Project Cost EstimateTable ES-2:WWTP Improvements Project Cost Estimate. Costs shown are preliminary estimates and can vary depending on market conditions.

TABLE ES-2:WWTP IMPROVEMENTS PROJECT COST ESTIMATE

Item	Estimated Cost	
Site Work	$	4,355,000
Yard Piping	$	1,981,000
Bypass Pumping/Power	$	600,000
Generator	$	1,200,000
Headworks	$	2,848,000
Odor Control	$	446,000
Primary Filters and Pump Station	$	11,572,000
Process Basins	$	10,823,000
Blower Building	$	2,034,000
Secondary Clarifiers	$	12,635,000
RAS and WAS Pumps	$	438,000
UV Disinfection	$	2,812,000
Administration Building	$	1,745,000
Non-Potable Water System	$	210,000
SCADA Integration	$	1,000,000
Solids Handling	$	6,250,000
Subtotal	**$**	**60,949,000**
General Conditions (10%)	$	6,095,000
Subtotal	**$**	**67,044,000**
Tariffs, BABA, etc. (8%)	$	5,364,000
Subtotal	**$**	**72,408,000**
Contingency (30%)	$	21,723,000
Subtotal	**$**	**94,131,000**
Contractor OH&P (15%)	$	14,120,000
Subtotal	**$**	**108,251,000**
Professional Services (20%)	$	21,700,000
Total Estimated Project Cost	**$**	**130,000,000**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Keller has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

ES.6. PROJECT IMPLEMENTATION

Financing for this project is a critical next step for the City. The City submitted a funding request to the DEQ State Revolving Fund (SRF) in January 2025 to begin the funding process. Other potential sources of funding include the United States Department of Agriculture – Rural Development, the Idaho Bond Bank Authority, private financing, the United States Army Corps of Engineers, the Community Development Block Grant, Water Infrastructure Finance and Innovation Act, and the Economic Development Administration.

The City has not yet secured the necessary funding to implement the proposed improvements, and the project costs significantly exceed the City's available budget. Due to recent drastic funding cuts at the state and federal levels for public infrastructure, securing the required funds all at once is challenging. Additionally, the City must obtain legal approval to procure debt, which has not been completed and is contingent upon community support, making it uncertain.

To offer the City maximum flexibility amidst the uncertainties mentioned, a range of phases, alternative delivery methods, and value engineering options have been developed in this PER. Consequently, the project implementation must remain adaptable in terms of phasing, schedule, delivery method, and overall budget due to the numerous variables involved. While many of these are daunting unknowns, Keller understands the importance of project momentum and progress. Regardless of the funding and debt procurement the City should continue to advance the development of these improvements even if it requires several development packages. The risk of not advancing improvements could include permit compliance and fines, operator safety and overall price increases over time. Chapter 6 outlines the project implementation.

Next Steps for Continued Advancement of the Improvements:

- Hire Bond Counsel, Schedule and Pass Revenue Bond for Fall of 2025.
- Apply for USDA-RD funding following pass of revenue bond.
- Advance the design of the Preliminary Engineering Report to 30% design plans.
- Complete Environmental/public outreach and submit for final approval of Wastewater Facility Plan.
- Complete amendment to PER associated with Anaerobic Digester and Solids Handling.
- Pilot test the Primary Filters and determine if design should be progressed with them.
- Select project delivery method.

ES.7. ENVIRONMENTAL REVIEW

Environmental impacts planned mitigation measures, and considerations for public inclusion are summarized in Chapter 7. As the WWTP improvements are located on the existing site, there should be minimal environmental impacts.

INTRODUCTION

PURPOSE AND SCOPE

The City of Sandpoint (City) owns and operates a wastewater treatment plant (WWTP) that receives and treats wastewater from throughout the City, and discharges to the Pend Oreille River. Improvements are needed to address the limited treatment capacity of the plant, aging infrastructure, and continue to meet the discharge permit requirements from the U.S. Environmental Protection Agency (EPA) and Idaho Department of Environmental Quality (DEQ). The WWTP does not have adequate capacity to treat the project design flows presented in Chapter 1. Additionally, several of the WWTP facilities were constructed in or before the 1980’s with some from the 1950’s and are nearing the end of their useful life. A Wastewater Treatment Plant Facility Plan (WWTPFP) was completed in 2019. The WWTPFP evaluated the condition and capacity of the WWTP and provided recommendations for WWTP improvements. In 2023, a Collection System Evaluation Facility Plan (CSE) for the City. The CSE provided updated sewage flow and population projections that were further refined in this report.

This Preliminary Engineering Report (PER) is structured according to the Wastewater Rules in the Idaho Administrative Code, IDAPA 58.01.16. This PER describes the proposed WWTP improvements and is based on the projections developed in the CSE. Drawings for this report are included in **Volume II**.

COORDINATION WITH FACILITY PLAN

The improvements noted herein coordinate with the recommendations from the WWTPFP; deviations from the facility plan are noted at the end of this section. The solids handling facilities were included in the conditions assessment, however, improvements related to solids handling or infiltration and inflow (I/I) in the collection system, are outside the scope of this PER.

Project Location

The WWTP is located in Sandpoint, Idaho, in Bonner County in northern Idaho. The City owns and operates the municipal wastewater collection and treatment facilities that serve the City of Sandpoint. The service area is being expanded to include parts of the surrounding area as part of the revised 2022 Area of City Impact boundary developed by Leland Consultant Group. The total future service area is over 5,000 acres. The WWTP is on the southern edge of the City, adjacent to the Bonner County Historical Society and the Pend Oreille River. The location of the WWTP is shown on the project drawings in **Volume II**.

Population Served

The City’s population remained relatively stable from 1998 to 2016 with populations ranging from 6,871 to 8,370. In the 2020 U.S. Census, the City’s population was 8,639. The 2019 WWTPFP used an annual growth rate of 1.5% from the 2011 Development Impact Fee to project the 2038 population as 11,078. The 2023 CSE used an annual growth rate of 2.4% to project the 2042 population as 14,000.

The City’s Comprehensive Plan used an average annual growth rate of 2.5%. As directed by the City, this updated growth rate was applied to the 2020 Census population of 8,639 to yield a projected 2045 population of 16,016. A projected 2045 population of 16,016 is used throughout this report.

Existing and Proposed Wastewater Flows

Historical flows from the City provided Discharge Monitoring Reports (DMRs) are shown in **Error! Reference source not found.**; due to technical issues with the flow monitoring system, peak hour flow data from recent years was not available. As noted in the WWTPFP and CSE, the WWTP has historically experienced high variation in influent flows due to high infiltration and inflow (I/I) in the collection system. The City has been working to reduce I/I in new developments. These efforts likely contributed to the observed reductions in maximum month and maximum day flows in 2023 compared to previous years, despite continued population growth.

TABLE 1-1: HISTORICAL WASTEWATER FLOWS (MGD)

	2020	2021	2022	2023
Population	*8,639*	*8,855*	*9,076*	*9,303*
Average Day Flow (ADF)	1.4	1.4	1.7	1.6
Maximum Month Flow (MMF)	2.6	2.8	3.3	2.5
Maximum Day Flow (MDF)	6.8	6.1	6.0	5.5

Table 1-2: Projected Wastewater Flows shows the projected flows for the design year 2045. Flow projections were based on the projections established in the CSE and the WWTPFP and were updated using a 2.5% population growth rate per the City's direction. More information on the development of the flow projections is found in Section 1.1.

TABLE 1-2: PROJECTED WASTEWATER FLOWS

	2045
Growth Rate (%)	*2.5*
Population	*16,016*
Average Day Flow (MGD)	3.0
Average Dry Weather Flow (MGD)	2.4
Maximum Month Flow (MGD)	5.5
Maximum Day Flow (MGD)	12.4
Peak Hour Flow (MGD)	14.0

Existing and Proposed Collection System

The collection system is not anticipated to be affected by this project.

Existing Treatment Works

The WWTP was constructed in the 1950s with major improvements being installed in 1973, 1974, 1982, 1983, and 2008-2010. A large number of the existing facilities were constructed in or prior to 1983. Liquid treatment at the WWTP currently consists of screening, grit removal, primary clarification and stormwater clarification, intermediate pumping, conventional activated sludge, secondary clarification, chlorination and dechlorination, and discharge to the Pend Oreille River. Solids handling processes include primary sludge and waste activated sludge (WAS) pumping, WAS thickening, anaerobic digestion, mechanical belt press dewatering, and disposal or land application of Class B biosolids. Other processes at the WWTP include a non-potable utility water system and a purification and cogeneration system for using the gas produced through anaerobic digestion.

The following deficiencies have been identified in either the 2019 WWTPFP or by Keller through the planning period.

- The existing screens do not have sufficient hydraulic capacity for 2045.

- The grit chamber performance is unreliable and is not anticipated to be providing an acceptable amount of removal.
- The primary clarifiers do not meet industry design standards and are past their useable life.
- The aeration basins do not have enough treatment capacity for 2045.
- The blowers are near the end of their useful life and will not have adequate capacity for the proposed design conditions.
- The secondary clarifiers do not have enough treatment capacity for 2045.
- The RAS pumps have insufficient capacity and share a common flow meter preventing adjustments to individual pumps.

To build on the WWTPFP findings, a conditions assessment was conducted as part of this PER; this assessment is summarized in Table 3 and is detailed in Chapter 2.

Proposed Treatment Works

The WWTPFP identified several capacity and operational concerns with the WWTP and outlined a series of proposed improvements to address these issues. The major recommendation in the WWTPFP was the implementation of ballasted sedimentation in secondary treatment, and several of the other recommended improvements revolve around this change. This PER includes additional evaluation building on the WWTPFP. The process improvements identified in the WWTPFP are shown below in Table 1 -3: Deviations From WWTPFP as well as any deviations from the WWTPFP proposed by Keller.

TABLE 1 -3: DEVIATIONS FROM WWTPFP

Process	Facility Plan Improvements	PER Recommendations
Liquid System		
Headworks Screening	Add second fine screen (approximate capacity of 3 to 4 MGD) for reliability / redundancy	The screen improvement was implemented in 2021 with the installation of the second mechanical screen. However, these two screens together do not appear to meet IDAPA requirements for redundancy (100% mechanical redundancy). To meet this requirement, **recommend two mechanical screens, each with a capacity of 14 MGD.**
Grit Removal	Construct new vortex grit chamber (or equal) to reduce grit load to downstream processes	**Recommend following Facility Plan**
Primary Clarifiers	Retrofit existing clarifier mechanisms due to age; Alternate: replace existing primary clarifiers and primary solids pumping	Other options evaluated as part of the Screenings Alterative Task. **Recommend designing for primary filters with option to adjust design for new primary clarifiers.**
Stormwater Clarifier	Phase out (and demolish) as biological capacity is added to the facility	**Recommend following Facility Plan**
Overflow Pumps	Demolish the existing wet well and pumps, and consolidate	**Recommend following Facility Plan**
Aeration Basins	Retrofit existing aeration basin and construct new aeration basin (associated with Ballasted Sedimentation process)	Other options were evaluated as part of the Screenings Alterative Task. **City has selected Conventional Activated Sludge.** This will necessitate the demolition of the existing aeration basins.

MLSS Feed Pump Station to Secondary Clarifiers	Add pumping from aeration basins to secondary clarifiers to improve flow split and deal with likely hydraulic limitations at higher flows	With new aeration basins and secondary clarifiers, the hydraulics can likely be controlled to allow gravity flow between the processes, thus eliminating this pump station. **Recommend decommissioning this process**
Secondary Clarifiers	Rehabilitate existing two secondary clarifiers as noted and construct new Secondary Clarifier No. 3	Other options evaluated as part of the Screenings Alternative Task. **City has selected Conventional Activated Sludge.** This will necessitate new secondary clarifiers.
RAS Pumping	Retrofit existing RAS room and expand basement for additional RAS capacity.	**Recommend following Facility Plan for new RAS pumps.** It is expected that the building will not need to be expanded to accommodate new pumps
WAS Pumping	New WAS pumping associated with ballasted sedimentation system.	**New WAS pumps are recommended, similar to Facility Plan**, but will not require as extensive improvements as required with the ballasted sedimentation process.
Ballasted Sedimentation System (New Process)	Add ballasted sedimentation components in a new building	**This system is deleted as it is not part of the City's selected alternative.**
Disinfection	UV disinfection is recommended in conjunction with ballasted sedimentation	**Recommend following Facility Plan.**
Flood Stage Pumps	Add flow meter(s) to existing pumps.	**Recommend decommissioning this equipment.** New treatment processes will allow flow to gravity flow to River without need for pumping
Non-Potable Water System	Extend piping network throughout facility to reduce potable water consumption.	**Recommend following Facility Plan**
Potable Water System	Replace piping network throughout facility due to leaks (reduce overall consumption).	**Recommend following Facility Plan**
Solids Stream		
Thickening	Address corrosion issues on electrical gear; add odor treatment (if primary solids thickening is implemented).	No redundancy is provided. **Improvements to this process are outside the scope of this PER.**
Anaerobic Digestion	New mixing for existing Primary Digester; new boilers in a new, centralized building; replace all gas piping; replace all hot water piping, replace all sludge piping	The single digester has no redundancy and is not able to meet Class B biosolids requirements from 40 CFR 503 at 20 year design conditions. **Digester improvements are outside the scope of this PER.**
Dewatering	Replace feed pumps, polymer system, belt filter presses, and solids conveyance to loading due to age, as well as improve performance.	**Improvements to this process are outside the scope of this PER.**
Additional Items		
Phosphorus Compliance	Add pump skid and chemical totes in an existing building or outdoor rated enclosure to maintain effluent phosphorus below monthly and weekly permit limits consistently.	**Recommend following Facility Plan**
Support Systems - Admin/Lab Building	Expansion of the ballasted sedimentation system will consume space currently occupied by the Admin/Lab Building.	The selected secondary treatment process will not occupy space where the Admin/Lab building is located. This facility could remain as is, or a new

	Therefore, a new building is recommended.	building could be constructed where budget permits. **Recommend including as optional deduct**.

The improvements planned to be implemented by the City through this project are summarized below. The alternatives evaluations used to arrive at the recommended projects are documented in Chapter 3.

- Preliminary Treatment (Headworks):
    - The existing coarse screens will be replaced with two new coarse screens. The existing screening channels will be widened to accommodate the larger screens. Ancillary improvements to the building, such as recoating surfaces, new HVAC and modifications to electrical components to meet classification requirements will be included.
    - The existing grit chamber will be replaced with a new vortex grit removal system in a new concrete structure. New grit dewatering equipment will be installed in the existing grit building. Ancillary improvements, such as structural and electrical updates, will be included.
    - The existing stormwater clarifier and associated infrastructure will be demolished.
- Primary Treatment:
    - The existing primary clarifiers and associated infrastructure will be demolished.
    - A new primary filter building will be constructed and will house two primary filters and a wet well/dry pit influent pump station. The building will also include an electrical room with primary service switchgear, motor control centers and other electrical panels. Utilization of primary filtration technology is contingent upon results of the primary filtration pilot test.
    - Note that improvements to the solids thickening process will likely be required as the primary filters are installed. These improvements will be covered in a separate PER.
- Secondary Treatment:
    - The existing aeration basins will be demolished. The existing secondary clarifiers will be decommissioned and, if their condition is determined to be adequate, will be available for repurposing in future projects.
    - Three new conventional activated sludge basins will be constructed in the area of the former primary clarifiers. These basins will include anoxic and aerobic zones. The anoxic zones will be equipped with compressed air mixing and the aerobic zones will be constructed with fine bubble diffusers for aeration.
    - The existing blowers will be removed from the existing Blower/RAS building. A new blower building, constructed near the activated sludge basins, will contain three new high speed turbo blowers.
    - A new phosphorus chemical dosing system matching the design outlined in the *WWTP Chemical Feed Pilot Project Preliminary Engineering Report* will be included. Storage of chemical will be adjacent to the existing Blower/RAS Building and the chemical pumping will be installed in the basement of the building. Dosing will be at the secondary clarifier influent splitter box.
    - Two new secondary clarifiers will be constructed. This will include an influent splitter box, the structures and mechanisms, a scum collection box and associated piping.

  - The existing RAS and WAS pumps will be replaced. New RAS pumps will be installed on the main level of the existing Blower/RAS Building, and new WAS pumps will be installed in the basement of the building.
- Disinfection:
  - The existing chlorination and dechlorination system will be decommissioned (including both the chlorination building and the chlorine contact chambers). A new UV system will be installed in a new building near the existing Dewatering Building.
- Auxiliary:
  - The SCADA, electrical service, backup power, and utility water will need to be upgraded to incorporate these improvements.
- Administration Building:
  - A new administration building may be constructed to house the WWTP's lab, offices, workshop, and laundry facilities.
- Solids Handling Processes
  - Existing solids handling processes, including solids thickening, anaerobic digestion and sludge dewatering, are not evaluated as part of this PER and improvements to these processes will be covered separately. Note that conceptual solids improvements are shown on the site to identify potential site impacts.

The improvements will be constructed at the existing WWTP on land already owned by the City. The WWTP phasing and buildout layouts will also be shown as a part of this PER.

DRINKING WATER SYSTEM IMPACTS

No adverse impacts to the municipal drinking water system are anticipated as part of the improvements. The WWTPFP recommended replacing the facility's potable water piping network due to leaks. This project aligns with that recommendation and includes piping replacement. Several structures at the WWTP utilize potable water, and the piping will be adjusted to supply these structures in their new locations.

HYDRAULIC ANALYSIS

This project will impact the hydraulics at the WWTP site. However, the two gravity collection pipelines that feed the existing headworks facility will not have a change in elevation and no hydraulic impacts to the collection system are anticipated. As such, no collection system hydraulic analysis is provided. An updated hydraulic profile at the WWTP site is provided on **Sheet No. G-010 in Volume 2**.

FINANCING METHODS

Funding is a critical part of the success of the City of Sandpoint's WWTP project and is instrumental to complete the bulk of the improvements needed. The most recent rate study planned for sewer rates assumes that an Idaho Department of Environmental Quality (DEQ) State Revolving Fund (SRF) loan of $61.5 million for the WWTP would be obtained. Based on this rate study, a loan much higher than this amount would result in high sewer rates that could receive significant pushback from the community.

In recent years, a large issuance of funding through ARPA funds has been fully obligated for these types of projects, leading to a significant funding deficit with state funds for wastewater improvements. In 2024, DEQ received wastewater improvement funding requests totaling approximately $880 million across 75 projects but was only able to fund 3 projects for approximately $29 million.

The City of Sandpoint and Keller have had several funding meetings with DEQ to develop a competitive application given the challenging availability of funds. In January 2025, the City submitted a funding request to DEQ SRF for approximately $130 million. Note that this cost is higher than the estimate in Chapter 6 as this funding request included contingency for solids handling improvements not evaluated as part of this PER. The draft DEQ funding list is expected to be issued in the spring of 2025. Additionally, the City and Keller have reviewed and discussed funding opportunities with the United States Department of Agriculture – Rural Development (USDA-RD) and are hopeful that this may be a viable funding option. The City currently meets the requirements for USDA-RD funding but is close to exceeding the maximum population requirement of 10,000 people, which could make it ineligible. Initial evaluations indicate that the City is likely to be classified as a disadvantaged community, which would increase the possibility of receiving significant grant dollars. It was recommended that the City apply for USDA-RD funding once a bond is passed.

Another consideration for funding is the Idaho Bond Bank Authority (Bond Bank), which would be readily available but is typically at a higher interest rate compared to DEQ SRF and USDA-RD. The Bond Bank is flexible on the duration, so if the City wanted to target an annual payment, they could adjust the duration accordingly. Once the community passes a bond, they can submit the application. The Idaho Bond Bank Authority meets quarterly, so a duration of 4-6 months until money is available is reasonable.

Other funding opportunities include USACE, CDBG, and EDA, but these are traditionally ancillary to DEQ, private funding, and USDA-RD. The City is currently planning to seek voter approval for a revenue bond for the project.

CHAPTER 1 - DESIGN CRITERIA

1.1. WASTEWATER FLOW RATES

The 2023 influent flows averaged approximately 1.59 million gallons per day (MGD), with a maximum month flow of 2.53 MGD, and maximum day flow of 5.50 MGD. Due to technical issues with the flow monitoring system, detailed peak hour flow data was not available.

The CSE had previously established projections for average dry weather flow (ADWF) and maximum day flow (MDF) up to the year 2042. These projections had been calculated using a population growth rate of 2.4%. This PER extends the design period to 2045 for 20-year planning purposes. Per direction from City staff, the growth rate has been increased to 2.5%. Based on these changes, flow projections have been updated.

The 2045 population was calculated using a 2.5% average annual growth rate from a starting population of 8,639 (2020 U.S. Census). The 2042 ADWF and MDF were extrapolated to 2045 using a ratio of the 2045 population projection to the 2042 population projection. Peaking factors identified in the CSE were used to calculate average day flow (ADF) and maximum month flow (MMF) projections from the 2045 ADWF. The 2038 peak hour flow (PHF) provided in the WWTPFP was extrapolated to 2045 using a ratio of the 2038 PHF (13.0 MGD) to the 2038 MMF (5.1 MGD) and applying that ratio to the projected 2045 MMF. Refer to **Appendix C** for a detailed description of the flow projection calculations.

The 2042 flow projections from the CSE and the 2045 flow projections developed by Keller are presented in Table 1-4: Influent Flow Projections. Treatment plant upgrades will provide capacity for the 2045 flow projections.

TABLE 1-4: INFLUENT FLOW PROJECTIONS

	CSE Projections (2042)	PER Projections (2045)
Growth Rate (%)	*2.4*	*2.5*
Population	*14,000*	*16,016*
Average Day Flow (MGD)	-	3.0
Average Dry Weather Flow (MGD)	2.1	2.4
Maximum Month Flow (MGD)	-	5.5
Maximum Day Flow (MGD)	10.8	12.4
Peak Hour Flow (MGD)	-	14.0

1.2. WASTEWATER CHARACTERISTICS

The influent wastewater loading characteristics used to design the WWTP improvements are shown on **Sheet No. G-007 and G-008 Design Criteria** in **Volume 2**. Table 1-5: Influent Design Values shows a summary of the design influent loading parameters. The loading projections for Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) were calculated using the 2020-2023 monthly reports from the City. The monthly reports included the daily influent flow, BOD_5, and TSS data. The monthly average loadings for BOD_5 and TSS were calculated and the maximum month loadings for each year (2020 – 2023) was converted into a per capita loading rate using the population for the respective year. The highest per capita loading rate between 2020-2023 was then applied to the 2045 projected population to determine the 2045 maximum month loading projection for BOD_5 and TSS.

The monthly reports did not include influent phosphorus or Total Kjeldahl Nitrogen (TKN) data. Phosphorus and TKN loading projections for 2045 were updated using the same methodology from the WWTPFP – applying standard per capita loading rates from Metcalf and Eddy, 5th edition to the 2045 projected population. Projections were then multiplied by the peaking factor of 1.3 established in the WWTPFP to yield the maximum month loading projections. Refer to **Appendix C** for a detailed description of the influent loading projection calculations.

TABLE 1-5: INFLUENT DESIGN VALUES

Parameter	2045 Design (Max Month)
Maximum Month Flow	5.5 MGD
Biological Oxygen Demand (BOD_5)	7,600 ppd
Total Suspended Solids (TSS)	10,800 ppd
Total Kjeldahl Nitrogen (TKN)*	570 ppd
Total Phosphorus (TP)**	170 ppd

*Calculated using a standard loading rate of 0.027 pounds per capita per day (ppcd)
**Calculated using a standard loading rate of 0.008 ppcd

1.3. EFFLUENT REQUIREMENTS

Treated effluent from the WWTP is discharged into the Pend Oreille River under NPDES Permit No. ID0020842. The permit went into effect on December 1, 2017, and expired on November 30, 2022, but has been administratively extended. A copy of the permit is included in **Appendix A**. Table 1-6: NPDES Permit Limits shows the current NPDES permit limits.

TABLE 1-6: NPDES PERMIT LIMITS

Parameter	Average Monthly	Average Weekly	Maximum Daily
Biochemical Oxygen Demand (BOD_5)	30 mg/L 1,251 ppd ≥85% removal	45 mg/L 1,877 ppd --	--
Total Suspended Solids (TSS)	30 mg/L 1,251 ppd ≥85% removal	45 mg/L 1,877 ppd --	--
Total Mercury	0.56 µg/L 0.014 ppd	--	1.1 µg/L 0.028 ppd
Total Phosphorus (as P) June-September	61 ppd	79 ppd	--
Total Phosphorus (as P) October-May	96 ppd	125 ppd	--
Total Residual Chlorine	0.348 mg/L 14.5 ppd	--	0.912 mg/L 38.0 ppd
E. coli Bacteria	126/100 mL (geometric mean)	--	406/100 mL (instantaneous maximum)
pH	Not less than 6.5 or greater than 9.0 at all times		

The WWTPFP noted the effluent limits are anticipated to become more stringent when the permit is renewed. It is anticipated that ammonia limits will be included at an average monthly limit of 21.1 mg/L and a maximum daily limit of 40.5 mg/L. Additionally the total residual chlorine limit is anticipated to reduce to an average monthly limit of 0.1 mg/L and maximum daily limit of 0.2 mg/L. The upgrades described in this PER target the anticipated permit limits.

1.4. SOLIDS PRODUCTION AND DISPOSAL

Primary sludge from the primary clarifiers, WAS from the secondary clarifiers, and scum from both the primary and secondary clarifiers are currently treated in the anaerobic digester. There are two solids thickening systems at the WWTP: a gravity thickener (not operational) and a rotary screen thickener. The digested sludge is stored in the sludge holding tank until it is pumped by the transfer pumps to the belt filter press for dewatering. Dewatered sludge is used for land application through the City's contract with Selle Soil Solutions, LLC.

Detailed evaluation of and design of improvements for the solids handling processes at the WWTP are outside the scope of this PER.

1.5. PROCESS UNIT DESIGN CRITERIA

The project design criteria are provided on **Sheet No. G-007 and G-008 in Volume 2**.

1.6. PLANT SCHEMATIC

The plant schematic is provided on **Sheet No. G-009 in Volume 2**.

1.7. REDUNDANCY PROVISIONS

The specific redundancy provisions for each process included in this project are provided in Section 3. In general, each process provides the redundancy required by IDAPA.

1.8. MASS BALANCE CALCULATIONS FOR PROCESS UNITS

A mass balance for the design year 2045 is shown on **Sheet No. G-005 in Volume 2**. Because solids handling improvements are outside the scope of this PER, the mass balance assumes that even as future WAS loads increase, they will still be sent through the existing anaerobic digester. Based on the volume of the existing anaerobic digester and the retention time for the projected mass flow rate, a volatile solids removal rate of 35% was assumed.

1.9. MONITORING AND REPORTING REQUIREMENTS

The monitoring and reporting requirements are not expected to change with this project.

1.10. ELECTRICAL

Avista Utilities supplies power to the WWTP. A new electrical service will be needed to support the plant upgrades. In addition, a new standby diesel generator will supply backup power for the plant. The equipment will be fed from new and existing motor control centers (MCCs). Modifications will be made to the existing electrical equipment where required. The existing electrical service and generators will be decommissioned and removed or abandoned during construction when they are no longer needed for plant operation.

1.11. INSTRUMENTATION & CONTROLS

1.11.1. System Configuration

New equipment and instrumentation will be integrated into the SCADA system for monitoring, reporting, and control by the plant's SCADA system integrator. Communication between buildings will be provided, and the appropriate media will be utilized to ensure secure and reliable operations. New Programmable Logic Controllers (PLCs) will be provided with the new equipment, including switches, to allow communication with the SCADA system.

1.11.2. Operator Interface

The SCADA system equipment is located in the WWTP Secondary Controls Building. New operator interfaces will be provided via Human Machine Interface (HMI) screens at the new local control panels.

1.11.3. Process Control

The preliminary P&IDs are included in Volume 2. The letter designator is for the structure identification letter, as shown on Sheet No. G-002 Sheet Index in Volume 2.

CHAPTER 2 - SITE EVALUATION AND LAYOUT

The overall site plan and preliminary facility layouts are shown on **Sheet No. C-120 Overall Site Plan in Volume 2**. WWTP upgrades will be constructed on the existing WWTP site. Power and utility water are already provided to the site but may need to be updated to accommodate the other improvements.

2.1. PLANT ACCESS

The existing access to the WWTP will remain. Employee and visitor parking are located next to the Secondary Control Building. If additional parking is added, it will conform to the current International Building Code (IBC) requirements. Sidewalks will conform to Idaho Standards for Public Works Construction (ISPWC) standard drawing SD-709 and the concrete specifications.

2.2. PROCESS PIPING AND UTILITIES

Process piping and utilities are designed to meet building and plumbing codes. Process piping will be restrained and supported as necessary to prevent damage to the pipe.

2.3. FLOOD CONTROL PROVISIONS

The Contractor must comply with site discharge requirements during construction (specification Section 01 57 12 in the future bid documents). The WWTP is located adjacent to the Pend Oreille River. According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) the river is a Zone AE designation indicating the area is subject to inundation by the 1 percent annual chance flood, the 100-year flood. The base flood elevation in the area is 2,074 feet. The WWTP is outside of the regulatory floodway. Flood maps are included in the WWTPFP.

2.4. GEOTECHNICAL INVESTIGATION AND PROVISIONS

A geotechnical investigation was performed on September 4, 2024. The report is included in Appendix B. The resulting recommendations will be incorporated into the design.

2.5. BUFFER ZONES

The upgrade will occur within the existing WWTP. A buffer zone will be provided for work near the property line.

2.6. LANDSCAPING

Landscaping will be installed in disturbed areas around the WWTP. The landscaping will match the existing which includes grass and landscaping gravel. Geosynthetic weed barriers will be used to reduce unwanted plant growth.

2.7. SECURITY

The existing plant security, which consists of exterior fencing and entrance gates, will be retained. The Contractor will be required to provide security for their construction materials and equipment and to comply with the City's security requirements (specification Section 01 35 53 in the future bid documents).

2.8. LABORATORY

The existing laboratory is in a shared building with the WWTP shop area, intermediate pump station, auxiliary power room, office, lunchroom, restroom, and WAS pump station. A new administration building is proposed to house the laboratory, shop area, kitchen, bathrooms, conference room, laundry room, and offices. Construction of the new building will be completed before the existing laboratory space is repurposed. If the construction sequencing cannot accommodate continuous laboratory access, samples will be sent offsite for analysis.

2.9. OPERATION AND MAINTENANCE

The Contractor will be required to provide training and submit O&M manuals for all equipment installed as part of the project (specification Section 01 78 23 in the future bid documents). Keller and the City staff will review the O&M submittals for completeness and require the Contractor to update and amend them as necessary. An updated WWTP O&M manual will be prepared that describes operations and maintenance for the major equipment and processes. The individual equipment O&M manuals will be referenced in the WWTP O&M Manual.

2.10. TREATMENT DURING CONSTRUCTION

Construction will be phased to allow the WWTP to operate continuously during construction, except for short shutdowns on individual systems required by the Contractor to make connections for new work. For any process operations shutdown, the Contractor must submit an Outage Plan for review and acceptance by Keller and the City staff. The Contract Documents will indicate that the City is responsible for operating the plant equipment and systems. The Contractor is responsible for maintaining power and utilities for all plant equipment and systems during construction, except as noted in the accepted Outage Plans.

2.11. PROCEDURES FOR INITIAL START-UP

The initial start-up will include the coordination of new equipment and the evaluation of the equipment's performance. Start-up will require the combined effort of equipment vendors, installation contractors, subcontractors (if applicable), Keller, and the City.

2.12. ODOR MANAGEMENT

The WWTP does not currently have an odor control system. The WWTPFP recommended an odor treatment system be installed in the headworks building and the solids thickening building (if primary solids thickening is implemented). The proposed design is to install an odor control system for the headworks building. The odor control for the solid's thickening building is outside the scope of this PER.

2.13. PERMITTING REQUIREMENTS

As the project progresses into the design phase, plans and specifications must be coordinated with and approved by both the City and DEQ.

2.13.1. City of Sandpoint

Plans and specifications for the wastewater treatment plant will need to be submitted for review by the City, where they will be reviewed by staff. Building permit reviews are required for new building construction, additions and alterations, accessory buildings, mechanical and plumbing improvements, electrical improvements, fire improvements (sprinkler, alarm), and building signage.

2.13.2. DEQ

As a public wastewater system, as defined by IDAPA 58.01.16.010, plans and specifications must be designed to DEQ facility and design standards and approved by DEQ.

2.13.3. Other Permitting Agencies

Depending on the source of project funding, additional agency requirements may apply. No other agencies would need to be involved if project funding is secured through DEQ or local funding. If another funding agency is involved, they would likely require that plans and specifications be submitted to them for review and approval.

2.14. CIVIL DESIGN CONSIDERATIONS

2.14.1. Earthwork

A geotechnical investigation of the soils on-site was performed on September 4, 2024. The Geotechnical Report is provided in **Appendix B** and the findings will be incorporated into the design of the facility.

2.14.2. Plant Buildings

The following information briefly describes the various treatment processes and support facilities associated with this phase of the WWTP upgrades.

- Headworks Screening: Two new mechanical screens will be installed in the existing headworks structure. The screens will replace the existing equipment. The existing channels will be widened accommodate the larger screens. New screenings washer/compactors will also be installed (one dedicated to each screen).
- Grit Chamber: A new vortex grit chamber will replace the existing grit chamber. The existing grit bypass channel will be modified to direct flow to the new concrete structure and the effluent will be collected in the existing channel upstream of the Parshall flume. A new grit washer will be installed in the existing grit building.
- Primary Filter Building: A new primary filter building will be constructed to house two primary filters and a lift station. Influent flow will be monitored upstream of the filters with flow meters.
- Process Basins: Three process basins, each with an anoxic, and aerobic zone will be constructed. The basins will be sized so that two basins can hydraulically pass the projected 2045 peak hour flow with the third basin offline. All three basins are needed for treatment.
- Secondary Clarifiers: The existing secondary clarifiers will be decommissioned and repurposed in future projects if their condition is adequate. Two new secondary clarifiers will be constructed and sized for one clarifier to be able to process 75% of the 2045 peak hour flow.
- UV Building: A new UV building will be constructed to house two open channels, each with multiple banks of UV lamps. The level in the channels will be controlled with weirs downstream from the UV banks. After the UV channels flow will be combined into a single channel with a flow measurement weir to monitor the effluent flow of the WWTP.
- Chlorine Building: A non-potable water pump station will be installed in the Chlorine building to provide utility water for the WWTP.
- New Blower Building: A new blower building will be installed near the process basins with at least two blowers sized to meet the aeration demands of the process basins.
- RAS Pump Station and Blower Building: The existing RAS pumps in the basement of the blower building will be retrofitted to meet the demands of the expanded treatment processes. The WAS pumps will be removed from the administration building and new WAS pumps will be installed in the blower building.
- Administration Building: A new administration building will be constructed to house the laboratory, offices, shop area, and laundry facilities. The existing secondary control building will continue to house the auxiliary power room.

2.14.3. Pathway Feasibility

The City requested Keller to evaluate the feasibility of a 12-foot pathway between the WWTP and Lake Pend Oreille. This pathway would be for shared use by pedestrians and bicyclists and would be outside of the fenced area of the WWTP. To construct this pathway, a new embankment and retaining walls would be required and would likely encroach within the ordinary high-water mark of the lake. This encroachment would require coordination and permitting with regulatory agencies. Expected costs for the pathway range from $445,000 to $1,037,000. More detail on the feasibility analysis, along with a conceptual layout and cost estimate, is available in **Appendix D**.

2.15. HYDRAULIC PROFILE

Existing WWTP hydraulics will be affected, starting at the headworks building. The discharge location is unchanged by this project. Plant piping and pumping systems have been designed for the flows shown on **Sheet No. G-010 Hydraulic Profile in Volume 2**.

2.16. CONDITIONS ASSESSMENTS

In September 2024, members of Keller's team, including a structural engineer, an electrical engineer, and process/mechanical engineers, toured the site to review the existing conditions of the City's wastewater treatment plant (WWTP). These reviews were conducted at a high level and are based on the observed conditions during the tour. It should be noted that many of the facilities are beyond their useful life, and it is typical practice to consider complete replacement of these facilities. There is inherently more risk in extending the life of these facilities through rehabilitation in an effort to postpone replacement costs. Additional evaluation and testing may be necessary to fully understand the feasibility of extending the lift of these facilities.

Generally, all facilities are planned to receive comprehensive electrical, SCADA, and controls improvements with the planned future improvements. Most facilities have outdated electrical infrastructure that lack communication, operational control, and the ability to appropriately manage the infrastructure. As a result, the condition assessment of each facility with regards to electrical systems was minimal, with the planned improvements addressing these issues across the system.

2.16.1. Headworks

FIGURE 2-1: HEADWORKS BUILDING AND SCREEN

Originally Constructed: Prior to 1973.

Improvements made: 2008/2012 – new fine screen building, grit equipment upgrades

Structural: The headworks structure appears to be in adequate condition, consistent with its age. While the concrete channels below the grading were not observable, the exposed concrete appeared to be in adequate condition. The masonry walls, concrete floor, and steel joist decking exhibited minor signs of deterioration. The coatings on the steel and masonry showed localized failures and deterioration, with visible rust on exposed steel components. Notably, the roof hatch is rendered inoperable by significant corrosion. Some of the site concrete around the buildings and channels showed signs of cracking, spalling and settlement. The exterior channel walls and suspended concrete slab over headworks basin exhibited localized spalling and concrete failure around the guardrail posts, but otherwise concrete above water was in satisfactory condition.

Electrical: The headworks building is classified as Class 1 Division 1. The lighting and HVAC equipment that was upgraded in the 2012 project in the fine screen building is explosion proof rated, but the equipment is showing some age due to the corrosive nature of the environment. There may be some non-explosion proof rated equipment or unsealed conduits in the building that were not upgraded in the 2012 project and do not meet current NEC requirements.

Process/Mechanical: The existing screens are undersized for the projected peak hour flows. The combined capacity of the two screens is 13 MGD with both screens online, which does meet the redundancy requirements of IDAPA. The screens are showing wear and there is significant rust on the piping and the screens themselves. The serviceability of the screens is limited because there is no manual bypass available and physical spacing of the screen's limits access for maintenance. The foul air removal system is not operational.

2.16.2. Grit Classifier Building

FIGURE 2-2: GRIT CLASSIFIER AND BLOWERS

Originally Constructed: 1983.

Improvements made: 2008 – grit classifier replaced.

Structural: The grit classifier building is in adequate condition for the age of the structure. There is evidence of moisture in the ceiling panels, indicating leaking or drainage from roof. Roof will likely need repaired or replaced.

Electrical: The existing PLC was discontinued by Rockwell in April 2022. The PLC additionally has used all available IO card slots and will require a new PLC if IO card expansion is required. Planning for replacement is recommended if changes in IO are to be made within the foreseeable future.

Process/Mechanical: Equipment includes the grit classifier and the grit chamber blowers. The grit classifier was replaced in 2008 and remains operational and functional. As it approaches the end of its lifespan, planning for future replacement is recommended.

The aerated grit chamber blowers exhibit significant rusting along with associated piping. These components appear to be functional but are nearing the end of their useful life. Plant staff have also reported failures in portions of the piping between the grit chamber and the building.

2.16.3. Grit Chamber

FIGURE 2-3: GRIT CHAMBER

Originally Constructed: 1983.

Improvements made: None.

Structural: The grit chamber was in adequate condition. Some of the site concrete around the channels showed signs of cracking, spalling and settlement. The channel walls and suspended concrete slab exhibited localized spalling and concrete failure around the guardrail posts, but otherwise concrete above water was in satisfactory condition.

Electrical: The grit chamber structure is classified as Class 1 Division 2. The existing electrical equipment in the classified area is not explosion proof rated and is nearing end of life. Conduits are not properly sealed that feed from the grit classifier building posing an explosion risk.

Process/Mechanical: The grit chamber is aged and past its recommended lifespan. The performance of the grit chamber is currently unknown. Operators have observed minimal grit accumulation in the aeration basins; however, this may be attributed to effective settling in the primary clarifiers rather than efficient grit removal. Inefficient grit removal may be accumulating in the primary sludge and ultimately in the anaerobic digester.

2.16.4. Primary Clarifiers

FIGURE 2-4: PRIMARY CLARIFIER AND FLOWS SPLIT

Originally Constructed: Prior to 1973.

Improvements made: None.

Structural: Installed in the 1960s, the primary clarifier structures appears to exhibit an overall adequate condition, though visual inspection reveals signs of age. Exposed concrete walls were sound, exhibiting some differential settlement and cracking, indicating general wear. Below-grade and below-water surface concrete conditions were not observable. At the launder the concrete surface has deteriorated, exposing aggregate, which likely needs to be concrete capped or coated to extend the life of the structure and limit corrosion of reinforcing steel. The steel components of the elevated walkway showed signs of rusting and deterioration. The concrete on the walkway stairs and guardrails exhibited significant concrete cracking and spalling. The walkway and stairs are likely in need of replacement. Regular inspections, cleaning and maintenance are recommended to ensure continued structural integrity.

Electrical: The primary clarifier structures are classified as Class 1 division 2. The primary clarifier motors and are not explosion proof rated, nor are the conduits that enter the classified area sealed properly. This poses an explosion risk at the clarifiers and at the panels that feed equipment within the classified area. The electrical equipment shows signs of wear, consistent with its age. The panels that feed the primary clarifiers are nearing end of life.

Process/Mechanical: The mechanical equipment in the primary clarifiers is reported to be from the 1940’s, originally installed at another location and subsequently relocated to the facility when the concrete structures were constructed. The equipment is functional; however, due to its age, the equipment shows signs of significant wear and rust. Furthermore, the clarifiers are shallower than industry standards, which may be resulting in decreased performance and excessive solids overflowing the weirs. The clarifiers are also undersized (in terms of surface overflow rates) relative to the projected peak flows, which will result in additional performance issues.

2.16.5. Storm Clarifier

FIGURE 2-5: STORM CLARIFIER

Originally Constructed: 1983.

Improvements made: None.

Structural: The storm clarifier, currently empty, reveals severe deterioration of its interior slab, which has been subjected to numerous freeze-thaw cycles. Widespread cracking, spalling, and delamination are evident. Significant spalling and exposed aggregates are present at guardrail post locations. The elevated walkway displays rusting on its steel components, and the walkway stairs and guardrails exhibit extensive concrete cracking, spalling, and structural steel rust. To bring back online, additional inspection, and possibly significant repairs to the structure would likely be required.

Electrical: The storm clarifier is not in operation; motor driven equipment was unable to be assessed. The electrical equipment that feeds the storm clarifier structure is nearing end of life. The stormwater clarifier is a classified as a Class 1 division 2 space. Electrical equipment in the classified space is not explosion proof rated and conduits that enter the area are not properly sealed posing an explosion risk.

Process/Mechanical: As noted, the storm clarifier is no longer in operation. The mechanical equipment in the clarifier visually appears to be in good condition, however the functionality of motors, mechanisms, weirs and piping were not assessed.

2.16.6. Detention Tank and Overflow Pumps

FIGURE 2-6: OVERFLOW PUMP AND DETENTION TANK

Originally Constructed: Prior to 1973.

Improvements made: Overflow pumps installed in 1983.

The detention tank and overflow pumps are no longer in operation, their condition was not evaluated. Significant amounts of biological growth are evident in this structure due to the stagnant water.

2.16.7. Secondary Control Building and Pump Stations

FIGURE 2-7: SECONDARY CONTROL BUILDING AND INTERMEDIATE PUMPS

Originally Constructed: 1973.

Improvements made: 2008/2012 – Waste activated sludge pump station.

Structural: The structure appears to be in adequate condition, consistent with its age. Ongoing maintenance of the interior coatings is recommended to extend its lifespan. The exterior architectural roofing and flashing require replacement due to the end of their service life. Site concrete surrounding the building has settled and exhibits cracking throughout, with significant settlement in some locations posing a safety hazard. Regular inspections and maintenance are recommended to ensure continued structural integrity.

Electrical: The electrical systems at the secondary pump station are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The secondary pump station electrical equipment is nearing the end of its useful life. In 2012 WAS pumps were added to the building; this section of the building was incorrectly shown as unclassified in the 2012 drawing set. The WAS section of the building should have been classified as Class 1 division 2. The motors and other electrical equipment in the WAS section are not explosion proof rated and conduits that enter the area are not sealed properly. These conditions pose an explosion risk within the building.

The existing PLC has limited IO card expansion availability, and no room in the existing panel for IO card expansion. A new panel is recommended if additional IO cards are required.

Process/Mechanical: The intermediate pumps between the primary clarifiers and aeration basins are designed for clean water applications, not wastewater applications. The pumps appear to be operational. However, as they are not suitable for this application, clogging from debris can affect their efficiency and require significant operator attention. The intermediate pump wet well also utilizes two self-priming recirculation pumps that appear to be operating well and in adequate condition.

The laboratory is housed in a separate room within the secondary control building. The laboratory has functional equipment and sufficient space for the analysis being performed.

The WAS pumps were installed in the secondary control building in 2008. The pumps appear to be operating adequately at this time. Regular operation of valves and pumps is recommended to prevent seizing of moving parts.

2.16.8. Aeration Basins

FIGURE 2-8: AERATION BASIN

Originally Constructed: 1983.

Improvements made: 2008 - coarse bubble diffusers replaced with disk-type fine bubble membrane diffuser.

Structural: The aeration basin structure appears to be in adequate condition, consistent with its age. Exposed and visible concrete was sound. Evidence of healed cracks, or calcification around cracks in the walls were observed, but no moisture was present. Deterioration is occurring at the concrete stairs and walkway where posts are attached. Regular inspections and maintenance are recommended to ensure continued structural integrity.

Electrical: The electrical systems at the aerations basins are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment appears to be in adequate condition, consistent with its age. No code violations apparent with the system.

Process/Mechanical: The aeration basins are functioning and there are no observable diffuser failures, based on the surface turbulence. The process piping also appears to be in adequate condition. The basins lack anoxic zones, which while not required, does prevent the system from fully denitrifying. Operations staff have reported poor settleability in the clarifier, which is suspected to be associated with poor denitrification. No issues with the functionality of isolation gates was reported. Regular operation of valves and gates is recommended to prevent seizing of moving parts.

2.16.9. RAS Pump Station and Blower Building

FIGURE 2-9: BLOWER BUILDING AND BLOWERS

FIGURE 2-10: RAS PUMPS

Originally Constructed: 1983.

Improvements made: 2008 - Blowers 1 and 2 replaced with positive displacement blowers and variable frequency controllers.

Structural: The RAS pump station and blower building structure appear to be in reasonable condition, consistent with the age of the structure and the intended use. Minor cracking was observed, but overall concrete and masonry walls were in good condition. Roof /ceiling was in adequate condition. Regular maintenance, cleaning and coating can extend the life of the structure.

Electrical: The RAS pump station was incorrectly shown as unclassified in the 2012 drawing set. Under current ventilation conditions, the RAS pump station building is classified as Class 1 Division 2. The area can be unclassified if upgrades to the HVAC system are made to meet a minimum of 6 air changes per hour. Under current conditions the electrical equipment and motors are not explosion proof rated and pose an explosion risk inside the building. The MCC in the building was installed in 2012 and shows wear consistent with its age.

The existing PLC has availability for one more IO card; however, space is limited inside of the existing panel. Redesign/replacement is recommended if additional IO is expected in the near future.

Process/Mechanical: The Kaeser blowers, installed in 2008, remain operational but are approaching the end of their useful life. Maintenance and repairs have been reported to be challenging due to long lead times for replacement parts, with some components requiring several weeks for procurement.

The Return Activated Sludge (RAS) pumps are located in the basement of the building. In recent years, the basement flooded, causing damage to electrical components. It is understood that repairs were completed shortly after the flooding to return the equipment to service. No operational issues were observed or reported during the site visit. Accessibility for removal of pumps from the basement is limited to an access hatch near the staircase. Regular operation of valves and pumps is recommended to prevent seizing of moving parts.

2.16.10. Clarifier Splitter Box

FIGURE 2-11: CLARIFIER SPLITTER BOX

Structural: The clarifier splitter box structure appears to be in good condition with no visible signs of significant wear or damage.

Electrical: No electrical components to evaluate.

Process/Mechanical: No flow splitting devices were identified in this structure, which could lead to uneven flow splitting and variable performance between the clarifiers.

2.16.11. Secondary Clarifiers

FIGURE 2-12: SECONDARY CLARIFIERS

Originally Constructed: 1973.

Improvements made: None.

Structural: The secondary clarifier structures exhibit an overall adequate condition, though visual inspection reveals signs of age. Exposed concrete walls were sound, exhibiting some differential settlement and cracking, indicating general wear. Below-grade and below-water surface concrete conditions were not observable. The steel components of the elevated walkway showed signs of rusting and deterioration. The concrete on the walkway stairs and guardrails exhibited some concrete cracking and spalling. Regular inspections and maintenance, cleaning launder are recommended to ensure continued structural integrity.

Electrical: The electrical systems at the secondary clarifiers are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment is nearing end of life, but there are no apparent code violations with the structures.

Process/Mechanical: The secondary clarifiers appear to be functioning adequately. It is understood that the mechanisms have not been replaced since their installation in the 1970s. No major repairs or recoating of the mechanisms have been reported. Recent survey information indicates marginal variations (less than ½”) in the elevation of the effluent weir, which indicates reasonable flow distribution throughout the clarifier. Regular cleaning of the effluent launder is recommended to continue to produce high quality effluent and prevent biological growth in the effluent.

2.16.12. Chlorine Contact Basin

FIGURE 2-13: CHLORINE CONTACT BASIN AND EFFLUENT CHANNEL

Originally Constructed: 1973.

Improvements made: 2008/2012 – dechlorination injection added.

Structural: The chlorine contact basin structure appears to be in adequate condition, consistent with its age. Exposed and visible concrete was sound. Evidence of healed cracks, or calcification around cracks in the walls were observed, but no moisture was present. Deterioration is occurring at the concrete where posts are attached. Regular inspections and maintenance are recommended to ensure continued structural integrity.

Electrical: The electrical systems at the chlorine contact basin are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment is in adequate condition, consistent with its age. There are no apparent code violations with the structure.

Process/Mechanical: No issues with the operability of the isolation gates were reported from plant staff. No other mechanical equipment was identified in this structure. Regular operation of gates is recommended to prevent seizing of moving parts.

2.16.13. Chlorination Building

FIGURE 2-14: CHLORINE FEED SYSTEM AND STORAGE

Originally Constructed: 1983.

Improvements made: 2008 – dechlorination building added.

Structural: The chlorine building structure appears to be in good condition, consistent with the age of the structure and the intended use. Minor cracking was observed, but overall concrete and masonry walls were in good condition. Roof /ceiling was in adequate condition. Regular maintenance, cleaning and coatings can extend the life of the structure.

Electrical: The electrical systems at the chlorine building are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment is nearing end of life, but there are no apparent code violations with the building.

The existing PLC was discontinued by Rockwell in April 2022. The PLC additionally has used all available IO card slots and will require a new PLC if IO card expansion is required. Planning for replacement is recommended if changes in IO are to be made within the foreseeable future.

Process/Mechanical: No issues with chlorine gas storage, dosing systems or piping were identified or reported. Proper chlorine gas storage practices should continue to be followed to maintain a safe working environment.

2.16.14. Flood Stage Pumps

FIGURE 2-15: FLOOD STAGE PUMPS

Originally Constructed: 1983.

Improvements made: None.

Structural: The flood stage pumps structure appears to be in adequate condition, consistent with its age. Exposed and visible concrete was sound. Deterioration is occurring at the concrete where posts are attached. Regular inspections and maintenance are recommended to ensure continued structural integrity.

Electrical: The electrical systems at the flood stage pumps are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The electrical equipment seems to be in adequate condition, consistent with its age. MCC-8E, which feeds the pumps is nearing the end of its useful life and could pose reliability issues in the future. No apparent code violations are present.

Process/Mechanical: Observation of the operation of these pumps was not conducted during the site visit. Plant staff report operating these pumps infrequently, at times only associated with high flood levels in the River. There is no effluent flow monitoring when the flood pumps are in use because the pumps bypass the effluent Parshall flume.

2.16.15. Effluent Structure

FIGURE 2-16: EFFLUENT STRUCTURE

Originally Constructed: Prior to 1973.

Improvements made: None.

Structural: The effluent structure appears to be in adequate condition, consistent with its age. Exposed and visible concrete was sound. Cracks in the concrete were evident, but no significant spalling was observed. Deterioration is occurring at the concrete where posts and ladders are attached. Ladder steel, grading, are rusting. Regular inspections and maintenance are recommended to ensure continued structural integrity.

Electrical: No electrical components for assessment.

Process/Mechanical: No issues with operation of isolation gates were reported. No leaks or issues with connecting piping were identified. The effluent flume appears to be functional.

2.16.16. Sludge Storage Tank

FIGURE 2-17: SLUDGE STORAGE TANK

Originally Constructed: Prior to 1973.

Improvements made: None.

Structural: The sludge storage tank structure is below grade on the exterior side and partially full on the interior side, to truly assess the tank, the sludge should be removed and cleaned prior to observation. The above grade concrete exhibited some cracking, spalling, and delamination consistent with the age of the structure. Regular inspections and maintenance are recommended to ensure continued structural integrity. Repairs and coating are likely needed to extend the life of the structure.

Electrical: The sludge storage tank is classified as a Class 1 division 1 space. No instrumentation was observed in the tank, but if present, this equipment should be the respective classification requirements. Based on the age of the structure conduits that enter the classified area are probably not sealed properly and pose an explosion risk.

Process/Mechanical: No mechanical equipment was identified in the structure. No issues with interconnecting piping were identified.

2.16.17. Solids Transfer Building

FIGURE 2-18: DIGESTED SLUDGE TRANSFER PUMPS

Originally Constructed: Prior to 1973.

Improvements made: None.

Structural: The solids transfer building is in poor condition, the exterior concrete retaining walls are failing and pulling away from the building. The interior and exterior coatings are in need of repair and/or replacement. There are multiple cracks in the common walls between the digester and/or sludge holding tank that shown signs of leaking. The roof is in need of replacement as there are multiple daylight holes in the roof and show signs of leaking and is not weather resistant.

Electrical: The solids transfer building is classified as a Class 1 Division 2 area. Electrical equipment in the building is not explosion proof rated and conduits that exit building are not properly sealed. These conditions present an explosion risk in the building. MCC-5 in the building is nearing end of life and does not seem to meet current NEC working clearance requirements.

Process/Mechanical: The digested sludge transfer pumps appear to be operational and appear to have been replaced in 2022. Grinders are installed downstream of the pumps and appear to be operational. Piping in the building is heavily rusted.

2.16.18. Anaerobic Digester

FIGURE 2-19: ANAEROBIC DIGESTER EXTERIOR

Originally Constructed: 1983.

Improvements made: 2008 - Valving improvements, see generator building improvements.

Structural: The digester condition is unknown at this time, as the structure was not readily observable, the roof insulation is in need of replacement and/or repair which obscures the visibility and condition of the concrete roof structure. The interior of the digester was not observable, and a true condition assessment should be conducted when digester is offline and cleaned.

Electrical: Inside the anaerobic digestor is classified as a Class 2 division 1 space. We are unsure if electrical equipment inside the digestor is explosion proof rated or if conduits are properly sealed that enter the space. We cannot say with confidence the equipment from 1983 meets code requirements without an interior inspection.

Process/Mechanical: The anaerobic digester lacks redundancy in its treatment processes, limiting the ability to perform necessary service and maintenance on the equipment while continuing to treat solids. A full evaluation of the interior condition of the digester could not be conducted due to the lack of redundancy. No redundancy is the digester gas relief valve system is provided. The outlet box shows significant corrosion.

2.16.19. Generator Building

FIGURE 2-20: HEAT EXCHANGER AND SLUDGE MIXING LINES

Originally Constructed: 1983.

Improvements made: 2008 – digester mixing pump improvements including: manual isolation valves added on the sludge mixing lines, automated mixing valves installed, option to use either the upper or lower sludge suction line for the introduction of heated sludge into the mixing lines. Additionally, the heat exchanger was upsized.

Structural: The generator building was in adequate condition for the age of the structure.

Electrical: The electrical equipment in the building is nearing the end of its useful life. The generator, switchboard, and MCC show signs of wear, consistent with the equipment age. This building is unclassified, but conduits that feed equipment in classified areas outside of this building are not properly sealed which presents an explosion risk inside the building.

Process/Mechanical: This building contains the digester sludge and gas safety equipment. This includes sludge and hot water pumps, instrumentation, digester gas isolation and pressure valves and ancillary equipment and piping. No issues with the operation of this equipment was reported by plant staff and the digester performance was not reported to have been negatively impacted by the function of this equipment. Much of the equipment is aged and may be nearing the end of its useful life.

2.16.20. Dewatering and Solids Thickening Building

FIGURE 2-21: DEWATERING AND SOLIDS THICKENING BUILDING AND BELT PRESS

Originally Constructed: 1983.

Improvements made: 2008/2012 – polymer feed pump modifications.

Structural: The dewatering building structure appears to be in good condition, consistent with the age of the structure and the intended use. Minor cracking was observed, but overall concrete and masonry were in good condition. Steel platforms, stairs, roof /ceiling were in adequate condition. Regular maintenance, cleaning and coating can extend the life of the structure.

Electrical: The electrical systems at the dewatering and solids thickening building are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment is nearing its end of life. MCC-4 particularly is 40 years old and could pose reliability risks if it stays in operation. There are no apparent code violations with the structure.

The existing PLC was discontinued by Rockwell in April 2022. The PLC additionally has used all available IO card slots and will require a new PLC if IO card expansion is required. Planning for replacement is recommended if significant changes in IO are to be made within the foreseeable future.

Process/Mechanical: The belt presses are operational and appear to be meeting reasonable performance in terms of solids cake concentrations. The polymer storage, blending tanks and dosing pumps appear to be functioning adequately.

The rotary drum thickener was installed in 2008 to improve the sludge thickening process prior to digestion. The sludge mixing tank and rotary drum thickener appear to be functioning adequately. Minor rust and deterioration of structural components of the equipment are evident. Piping appears to be in acceptable conditions. No issues with equipment performance were reported by plant staff.

2.16.21. Non-potable Water Pump Station

FIGURE 2-22: NON-POTABLE WATER PUMP STATION BUILDING

Originally Constructed: 2008/2012.

Improvements made: None.

Structural: The non-potable water pump station structure appears to be in adequate condition, consistent with the age of the structure and the intended use. Minor cracking was observed, but overall concrete and masonry were in adequate condition. Metal railings and roof /ceiling were in adequate condition. Regular maintenance, cleaning and coating can extend the life of the structure.

Electrical: The electrical systems at the non-potable water pumping station are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment is in adequate condition, consistent with its age. There are no apparent code violations with the structure.

The existing PLC was discontinued by Rockwell in April 2022. The PLC additionally has used all available IO card slots and will require a new PLC if IO card expansion is required. Planning for replacement is recommended if changes in IO are to be made within the foreseeable future.

Process/Mechanical: The condition of equipment within the building was unable to be verified due to accessibility limitations. No issues with pumps or immediate piping connections were reported.

2.16.22. Combined Heat and Power Unit

FIGURE 2-23: COMBINED HEAT AND POWER CONTAINER AND ENGINE

Originally Constructed: 2012.

Improvements made: None.

Structural: The combined heat and power unit is located within a shipping container and was not structurally observed.

Electrical: The generator is not currently functioning. The associated electrical equipment seems to be in adequate condition, but since it has been inoperable for some time there could be other issues present with the generator functionality. There are no apparent code violations with the structure.

Process/Mechanical: Plant staff have reported that this system is not operating due to issues with gas quality and fouling of the components. No observations of the functionality of the system were conducted.

2.16.23. Bio-tower

FIGURE 2-24: BIO-TOWER EXTERIOR

The bio tower has been decommissioned for may years and no structural, electrical or mechanical condition assessments were provided. The City intends to demolish this structure in the near future.

2.16.24. Flare

FIGURE 2-25: FLARE

Originally Constructed: 1983.

Improvements made: None.

Structural: No structural components to evaluate.

Electrical: The electrical systems at the waste gas burner are functioning well, with no reported issues. Routine checks and timely replacements of any worn-out components will help maintain reliability. The associated electrical equipment is in adequate condition, consistent with its age. There are no apparent code violations with the structure.

Process/Mechanical: The flare appears to be operating adequately and no issues with piping or valving were noted.

CHAPTER 3 - PROCESS UNITS

This chapter outlines the process units to be improved or added through this project. Alternatives (such as locations, technologies, etc.) for each improvement are identified, discussed, and evaluated both qualitatively and in terms of life-cycle cost. Design criteria, size and redundancy requirements, operational considerations, and construction sequencing parameters are also discussed for each improvement.

This project will upgrade the WWTP to meet the permit requirements and provide treatment capacity for 2045 design flows. Solids handling improvements are outside the scope of this project; general design criteria and considerations, without specific proposals, are presented for solids handling processes. Design criteria for each process unit are shown on **Sheets No. G-007 and G-008 in Volume 2**. Process unit requirements are listed, and multiple process alternatives are discussed in this report as applicable. Cold weather operation and redundancy requirements are also discussed for each process. Capital costs were estimated using vendor quotes, installation costs, and contractor overhead and profit (OH&P). The operations and maintenance (O&M) costs were estimated based on energy consumption, maintenance, labor, repair and replacement, and parts. Based on the analyses and discussions with the City, design elements are recommended for each unit process component evaluated.

Keller and the City developed a scoring matrix (Table 3-1: Scoring Matrix) to rank alternatives for four key process units which the City had identified for preliminary screening. The matrix assigned weights to various parameters based on the City's goals and needs. As established with the City, the scoring matrix was used as a tool to generally compare advantages and disadvantages between alternatives; the highest scoring alternative was not dictated to be selected. Depending on which alternative was selected for each of the four process units that used the matrix, the scope or selection of other improvements at the WWTP could have changed; these four process units are thus evaluated first in this chapter. The four process units include the secondary treatment technology, odor control, peak flow treatment, and primary treatment technology. The type of secondary treatment selected determines the type of improvements in headworks and other processes, so secondary treatment is evaluated first. Based on the City's preference, the matrix was only used on the first four process units discussed and not the remaining process units which had smaller impacts from which alternative was selected.

TABLE 3-1: SCORING MATRIX

Parameter	Decision Weight
Capital Cost	60%
Operations & Maintenance Cost	10%
Repair & Replacement Cost	10%
Phasing Flexibility	10%
Miscellaneous*	10%
Overall Score	**100%**

*Defined where each matrix is used.

- Capital costs refer to construction costs, general conditions (assumed 10%), contingency (assumed 40%), contractor overhead and profit (assumed 15%), and professional services (assumed 20%).
- Operations and maintenance costs include utilities, parts, chemicals, and personnel required for continuous operation of each process. Labor rates for personnel were assumed to be $80 per hour, and electricity rates were assumed to be $0.09/kilowatt-hour.

- Repair and replacement costs assumed a 20-year equipment life, with life-cycle costs based on a 3% discount rate. Specifically for the first four processes discussed, these costs are shown separately from other annual costs on each cost estimate because they are a factor in the scoring matrix.
- Phasing flexibility refers to the ease with which an alternative could be installed in smaller sub-projects.
- The “Miscellaneous” parameter is defined in each process evaluation where the matrix was used.
- Scores for each alternative for a parameter were calculated relative to the other alternatives. For example, the alternative with the lowest capital cost would receive the full sixty points allotted by the parameter decision weight. A higher costing alternative would receive a proportion of points equivalent to the proportion between the two alternatives’ costs.

3.1. SECONDARY TREATMENT TECHNOLOGY

Through secondary treatment, the bulk of biological treatment and removal of nutrients and particulates is achieved. Bacteria are used in process basins to remove BOD, nitrogen, and phosphorus from wastewater. Bacteria and remaining suspended solids can then be removed via gravity settling or filtration.

3.1.1. Currently Proposed Facilities

Through this project, new process basins with mixing and aeration (and secondary clarifiers, a blower building, and auxiliary structures as needed) will be constructed in accordance with the selected secondary treatment technology. Existing RAS and WAS pumps and blowers will be replaced.

3.1.2. Size and Redundancy

Secondary treatment will be designed to remove BOD_5, TSS, total phosphorus, and ammonia. Structures and equipment will be sized to treat the 2045 PHF (14 MGD). To meet IDAPA 58.01.16.490 requirements, multiple process basins will be provided with the ability to hydraulically pass peak hour flows with one basin offline, will be included in design. Secondary clarifiers will be sized to hydraulically pass 75% of PHF through one clarifier. If MBR is selected, membrane units will be provided to hydraulically pass PHF with one redundant unit.

While denitrification is not required, it has been included in the design to enhance general microbial health and clarifier settleability (not relevant for MBR). Process basins were designed around an aerobic zone solids retention time (SRT) of 5 days for MBR, BAS, and conventional activated sludge; an SRT of 2.5 days was used for MOC. These SRTs are higher than what is required for nitrification based on permit limits but promote good biological growth and age.

The design conditions and criteria for secondary treatment are summarized on **Sheet No. G-008** in **Volume 2**.

3.1.3. Performance Requirements

The performance requirements for the secondary treatment process are as follows. Note that it was assumed that primary treatment with removal of 50% TSS and 30% BOD_5 would occur before secondary treatment.

- The system should require limited maintenance.
- The hydraulic and treatment capacity of the system should align with the design criteria.
- The system should achieve effluent BOD_5, TSS, total phosphorus, and ammonia permit compliance as shown in Table 1-6.

3.1.4. Alternatives Considered

The City requested four alternative technologies for evaluation in this PER: conventional activated sludge, mobile organic carriers, ballasted activated sludge, and membrane bio-reactors. These were the alternatives that the City selected for evaluation after considering multiple technologies and discussing with Keller. Primary treatment is needed for continued use of anaerobic digestion, so for all alternatives, it was assumed that primary clarifiers would be used. Descriptions of each technology and their associated improvements are summarized below.

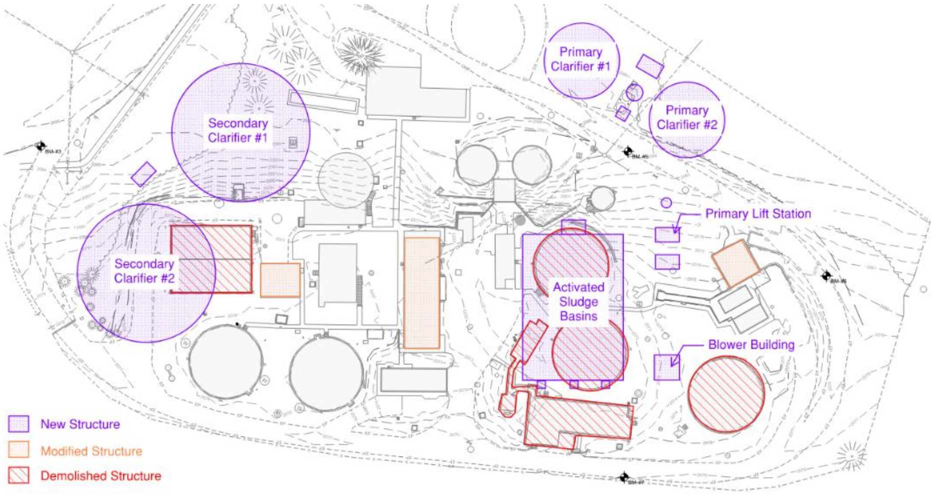
Conventional activated sludge (CAS): This alternative matches the same treatment technology that the WWTP currently utilizes and includes secondary treatment basins, including mixing and aeration, secondary clarifiers, return active sludge pumping, waste pumping and aeration blowers. This technology does not utilize any added media or proprietary equipment, and there are a high number of domestic installations.

Primary effluent enters process basin where it first flows through an anoxic zone and denitrification occurs. Wastewater then flows through an aerated zone where oxygen is introduced, allowing biological nutrient removal to take place. Suspended solids are settled out in the secondary clarifiers. RAS pumps return a portion of the secondary mixed liquor into the anoxic zone. Aged sludge is wasted from the system to the solids handling process to remove solids and maintain a suitable mixed liquor concentration. A typical process basin is shown in Figure 3-1: Conventional Activated Sludge.

FIGURE 3-1: CONVENTIONAL ACTIVATED SLUDGE

For this alternative, three new process basins would be built, with each basin 115’ long by 24’ wide, in the area currently occupied by the existing primary clarifiers. A new blower building will be built near the new basins. Two 110’-diameter secondary clarifiers would be constructed on the western side of the site; the existing aeration basins would be demolished. New RAS and WAS pumps would be installed in the basement of the existing blower building. A preliminary layout is shown in Figure 3-2: Preliminary Cas Layout. Note that primary clarifiers are also shown on this drawing; alternatives for this technology will be discussed later in this chapter.

FIGURE 3-2: PRELIMINARY CAS LAYOUT



Mobile organic carrier (MOC): MOC is a variation of CAS that uses process intensification to achieve with a higher microbial population, which in turn reduces the required process volume and cost of the associated infrastructure. Furthermore, this technology can improve solids settleability which can reduce the clarifier sizing. The technology is relatively new, with two main manufacturers and less than 25 domestic installations.

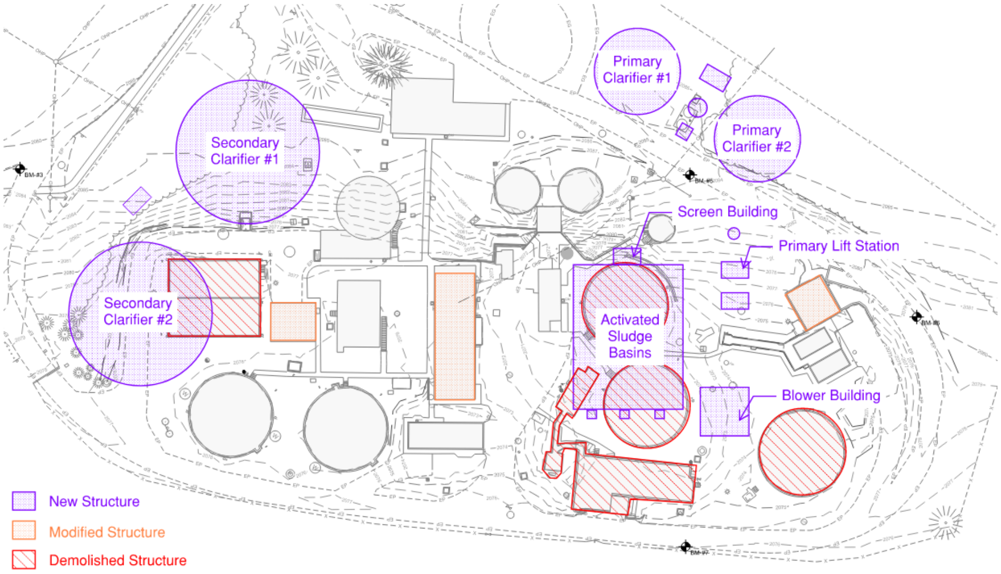
The higher density microbial population is achieved by utilizing plant-based pellets in the aeration basins. Where CAS relies on suspended growth of biology in the mixed liquor, these pellets allow for additional growth mediums in the form of attached growth. This allows for denser microbial populations. As more growth occurs on the pellets, their specific gravity increases which causes them to settle in the secondary clarifiers. Capacity can be added by adding more media. Figure 3-3: Mobile Organic Carriers shows the initial installation of the MOC into a process basin.

FIGURE 3-3: MOBILE ORGANIC CARRIERS

Pellets settle in and exit the secondary clarifiers through the RAS and WAS pumping systems. The pellets are removed from the WAS stream by a rotary drum screen and returned to the process basins. The rotary drum screen would require construction of a screening building atop the process basins. Media loss is low due to the inclusion of the screen, and the pellets do not break down under secondary treatment conditions; however, there would still be annual costs associated with media replacement.

With increased process basin and secondary clarifier capacity, the required size of each process unit is decreased. Three new process basins would be built, with each basin 92' long by 16' wide, where the existing primary clarifiers are located. A new blower building and a new screening building will be built near the new basins. Two 100'-diameter secondary clarifiers would be constructed on the west side of the site. New RAS and WAS pumps would be installed in the basement of the existing blower building. The existing aeration basins and primary clarifiers would be demolished. A preliminary layout is shown in Figure 3-4: Preliminary Moc Layout.

FIGURE 3-4: PRELIMINARY MOC LAYOUT

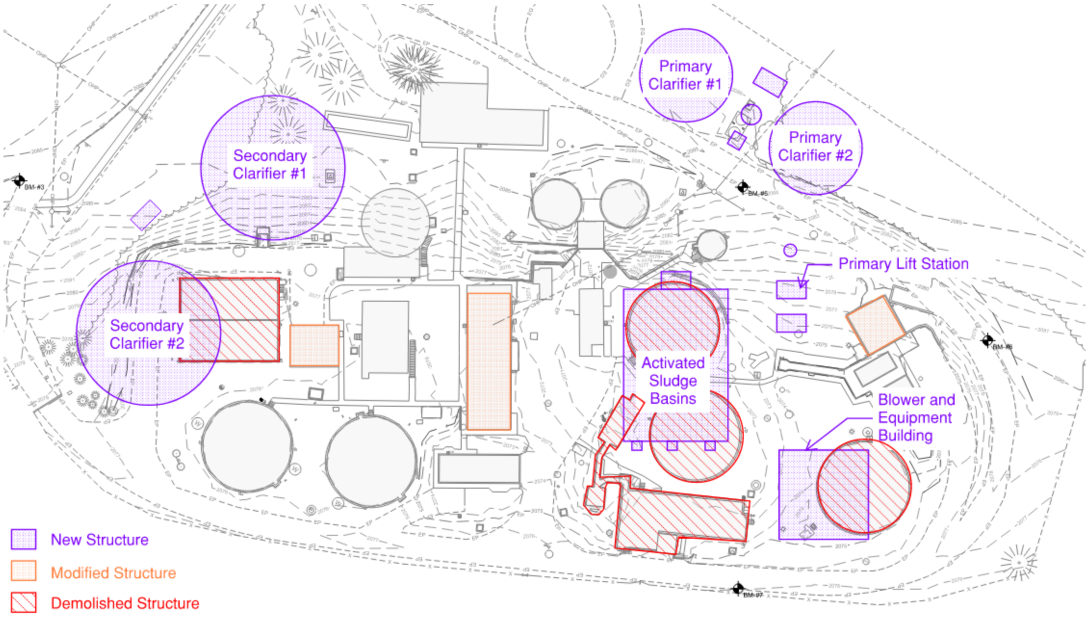


Ballasted Activated Sludge (BAS): BAS uses the same concept of intensification as MOC. However, instead of using a plant-based media, iron based, high-density particles are added to the activated sludge process. As with MOC, the media allows for attached growth and increased settling in the clarifiers. Note that this media is significantly more dense than both mixed liquor and MOC. Coagulation chemical is often dosed into the secondary clarifiers to enhance floc formation. Ballast particles are retained in the secondary process by being passed through a shear pump to break apart media from sludge and separating the media from WAS via a magnetic drum. The removed media is subsequently scraped from the drum and returned to the activated sludge basins. Other required infrastructure includes media return pumps, a storage silo (for replacing media lost to the solids handling process), and a delivery and mixing system for introducing new media into the process. The technology is proprietary to one manufacturer with less than 20 domestic installations and has high annual media replacement costs. A typical clarifier where BAS is used is shown in Figure 3-5: Ballasted Activated Sludge.

FIGURE 3-5: BALLASTED ACTIVATED SLUDGE

Three new process basins would be built, with each basin 90' long by 20' wide, where the existing primary clarifiers are located. A new blower building, a media silo, and a building for the media mixing system, shear pumps, and recovery drum will be built in the location of the existing stormwater clarifier. Two 90'-diameter secondary clarifiers would be constructed on the west side of the site. The existing aeration basins and primary and stormwater clarifiers would be demolished. A preliminary layout is shown in Figure 3-6: Preliminary Bas Layout.

FIGURE 3-6: PRELIMINARY BAS LAYOUT



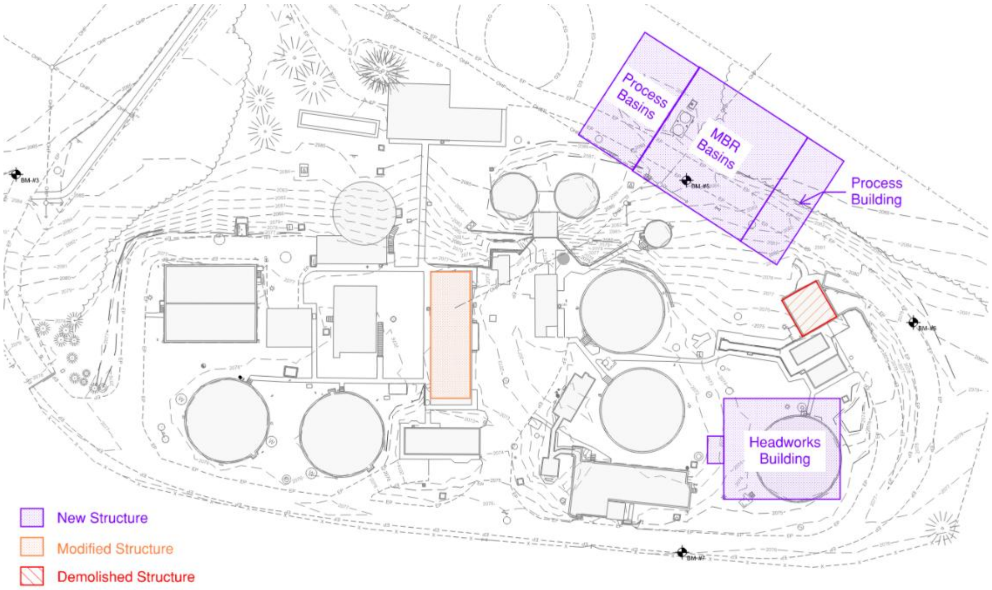
Membrane Bio-Reactors (MBR): The MBR technology uses the same activated sludge treatment process as CAS, with the major variance that instead of using secondary clarifiers to separate solids, a membrane filter with small openings is employed. Effluent from the aeration basins flows to MBR basins and pulled through membranes by permeate pumps; anything larger than the pores (0.2 micron in this design) is removed from the flow. This technology not only produces high quality effluent and eliminates the need for large clarifier infrastructure but also allows for a much higher density of mixed liquor when compared to CAS, or even MOC and BAS (two to three times as dense). This allows for much smaller aeration basins. Additionally, because effluent is of higher quality and has lower turbidity than is typical for CAS, UV disinfection equipment can be reduced in size, allowing for more cost savings, and the WWTP would best be able to meet any future, more stringent permit limits. This technology has a very compact footprint and could be constructed independently of existing facilities. However, while equipment installation could be phased, all components would need to be constructed together (phasing of earthwork, concrete, and building work is not recommended due to site constraints), and there would be higher utility costs for blower usage, permeate pumps, chemical cleaning, and membrane replacement.

The MBR system has several other components that are common to the other treatment options; anoxic and aerobic basins, mixing systems and diffusers, aeration blowers and RAS and WAS pumping. However, because the MBR system allows for smaller basins, the cost of this equipment can be reduced (with the exception of RAS pumping as a higher rate of recycle pumping is required relative to the other technologies). Additional infrastructure is required for MBRs when compared to other technologies to reduce fouling and clogging of the membranes and to extend the equipment life. This includes two stage influent screening (other secondary treatment processes only require ¼” screening, while membranes require 2-3 mm screening), scour blowers for dislodging of solids that accumulate on the membranes, chemical storage and dosing systems for cleaning the membranes, and permeate pumps for drawing clear water through the membranes. Note that because the permeate is pumped, closed vessel UV disinfection is often selected as part of the treatment process. A typical pre-aeration and MBR basin is shown in Figure 3-7: Membrane Bioreactor.

FIGURE 3-7: MEMBRANE BIOREACTOR

Four treatment trains (biological treatment and membrane cassettes) would be built in a structure 90’ long by 126’ wide, on the northeast side of the site. Four trains were designed because this optimized site and material costs associated with construction of more basins with cost savings from fewer membrane modules being required to meet secondary treatment redundancy requirements; with three trains, each train would need to be sized for 50% of the PHF in addition to plant recycle flow and RAS flow, while with four trains, each only needs to be sized for 33% of PHF, plant recycle flow, and RAS flow. The mixed liquor concentration in the MBR basins was designed for 10,000 mg/L, and the design flux rate of the MBR modules was 18 gallons per day per square foot for PHF. A process building will be constructed adjacent to the process basins and will hold blowers, pumps, electrical gear, and UV disinfection equipment. New fine screens would be installed in a new headworks building. A preliminary layout is shown in Figure 3-8: Preliminary MBR Layout.

FIGURE 3-8: PRELIMINARY MBR LAYOUT



3.1.5. Alternative Analysis

Advantages and disadvantages of the four secondary treatment alternatives are presented in Table 3-2: Secondary Treatment Advantages and Disadvantages.

TABLE 3-2: SECONDARY TREATMENT ADVANTAGES AND DISADVANTAGES

Advantages			
CAS	**MOC**	**BAS**	**MBR**
• Same as existing system – operators are familiar with process • No media replacement or proprietary equipment • High number of domestic installations	• Suspended and attached growth - higher microbial presence and allow for smaller basins, relative to CAS • Somewhat smaller secondary clarifiers needed due to improved settling • Low media loss rates Capacity can be added by adding more media	• Suspended and attached growth – smaller basins • Smaller secondary clarifiers needed due to very high settleability	• Very compact footprint • Can be constructed independently of existing facilities – high constructability • Highest quality effluent; best flexibility to meet future permit limits (reuse, ammonia limits, PFAS limits) • Smaller UV equipment needed
Disadvantages			
CAS	**MOC**	**BAS**	**MBR**
• Largest footprint • Larger secondary clarifiers needed due to unassisted sludge settling	• New technology with less than 25 domestic installations • Limited manufacturers • Annual costs associated with media replacement • Additional equipment needed (sludge screens, mixers, and pump station)	• Proprietary technology with one manufacturer • Less than 20 domestic installations • High annual media replacement costs • Additional equipment needed (magnetic screen, shear mill, storage silo, and mixing tank) • Potential need for coagulation chemical in secondary clarifiers	• Higher initial and annual costs due to more aeration and chemical cleaning • Membrane replacement costs • New headworks building needed to accommodate fine screens • More difficult to phase; all components need to be built/installed together

3.1.6. Cost Analysis

Costs for each secondary treatment alternative are shown in **Table 3-3**: Secondary Treatment Costs. For all alternatives, construction in areas where existing infrastructure will be demolished and continued use of primary clarifiers were assumed. Because implementing MBR would require additional headworks improvements but would have reduced costs in other areas (due to secondary clarifiers and a separate disinfection structure being unnecessary), the MBR cost estimate includes additional credits and line items. The credit for reduced UV equipment and building is due to MBR producing lower turbidity effluent (which reduces the required size of UV modules) and the UV modules being planned to be located in the MBR process building.

TABLE 3-3: SECONDARY TREATMENT COSTS

Item	CAS	MOC	BAS	MBR
Process Basins	$ 13,575,000	$ 13,769,000	$ 14,584,000	$ 26,464,000
Secondary Clarifiers	$ 12,419,000	$ 11,372,000	$ 10,075,000	-
Credit for Reduced Site Work, Bypass Pumping, Demolition and Yard Piping	-	-	-	$ (2,250,000)
Net Cost Increase for New Headworks	-	-	-	$ 5,430,000
Credit for Reduced UV Equipment and Building	-	-	-	$ (1,000,000)
Subtotal	**$ 25,994,000**	**$ 25,141,000**	**$ 24,659,000**	**$ 28,644,000**
General Conditions (10%)	$ 2,600,000	$ 2,515,000	$ 2,466,000	$ 2,865,000
Subtotal	**$ 28,594,000**	**$ 27,656,000**	**$ 27,125,000**	**$ 31,509,000**
Contingency (40%)	$ 11,438,000	$ 11,063,000	$ 10,850,000	$ 12,604,000
Subtotal	**$ 40,032,000**	**$ 38,719,000**	**$ 37,975,000**	**$ 44,113,000**
Contractor OH&P (15%)	$ 6,005,000	$ 5,808,000	$ 5,697,000	$ 6,617,000
Subtotal	**$ 46,037,000**	**$ 44,527,000**	**$ 43,672,000**	**$ 50,730,000**
Professional Services (20%)	$ 9,208,000	$ 8,906,000	$ 8,735,000	$ 10,146,000
Total Estimated Project Cost	**$ 55,245,000**	**$ 53,433,000**	**$ 52,407,000**	**$ 60,876,000**
Utilities	$ 78,000	$ 93,000	$ 115,000	$ 95,300
Parts	$ 5,000	$ 15,000	$ 25,000	$ 25,000
Chemical	$ -	$ -	$ 2,000	$ 44,000
Personnel	$ 146,000	$ 182,000	$ 219,000	$ 219,000
Annual Expenses	***$ 229,000***	***$ 290,000***	***$ 361,000***	***$ 383,300***
Repair and Replacement Costs	***$ 58,000***	***$ 86,000***	***$ 139,500***	***$ 109,000***
20-Year Life Cycle Cost	**$ 59,520,000**	**$ 59,030,000**	**$ 59,860,000**	**$ 68,210,000**

Recommendation

The alternatives were scored according to the City's pre-selected scoring matrix. The scores are shown in Table 3-4: Secondary Treatment Scoring Matrix. Miscellaneous factors for secondary treatment include flexibility for the technology to meet future permit requirements, how much room for future expansion would be left, and ease of constructability.

TABLE 3-4: SECONDARY TREATMENT SCORING MATRIX

Criterion	CAS	MOC	BAS	MBR
Capital Cost (60%)	57	59	60	53
O&M Cost (10%)	10	8	6	6
R&R Cost (10%)	10	7	4	5
Phasing Flexibility (10%)	10	7	7	3
Miscellaneous (10%)	2	2	2	10
Total	**89**	**82**	**79**	**77**

In the alternative screening meeting with the City, CAS was selected due to its operational flexibility, high number of installations, and capability for phased implementation. Additional benefits include lower chemical usage, lower electrical costs, and consistency with the decisions of previous elected officials.

3.1.7. Operations and Maintenance Assessment

The new treatment system will function similarly to the existing system, allowing for ease of continued operation. With larger process basins and secondary clarifiers, the WWTP will be less reactive to changes in flow, sludge age, or MLSS concentrations, allowing for smoother operation. All equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms.

3.1.8. Cold Weather Operation

Flow within the basins will maintain a velocity sufficient to prevent freezing or icing over. Any unsubmerged liquid piping will be heat traced and insulated.

3.1.9. Construction Sequencing

Because the new process basins and secondary clarifiers would be constructed where there are existing structures, demolition and construction will need to be carefully phased. A construction sequencing plan is presented in Chapter 6.

3.2. ODOR CONTROL

Preliminary treatment processes can be large contributors of odor at a WWTP, and these odors can be corrosive and damaging to WWTP facilities. While some facilities (such as the headworks area) have foul air ventilation equipment installed, there is no foul air treatment installed, and several of the foul air ventilation systems are non-functional.

3.2.1. Currently Proposed Facilities

The WWTPFP recommended for odor treatment to be installed in the headworks building. Outside of the scope of this PER, odor treatment systems for the solids handling processes could be considered. Consistent with these recommendations, the odor control system will be installed near the headworks building to treat foul air from the headworks processes. Influent screening channels, grit removal structures, and equipment will be covered to allow for the removal of foul air.

3.2.2. Size and Redundancy

The City is planning to conduct odor sampling in the headworks building, anaerobic digester, solids holding tank, and solids thickening building. Based on the strength of these samples, the size and the extent of the odor control system will be determined, and redundancy will be provided.

Preliminary assumptions have been made for the sizing of the odor control system based on dimensions of the existing treatment components and anticipated odorous compound concentrations present in the airstream. Influent is a mixture of residential and light industrial wastewater which mainly consists of hydrogen sulfide (H_2S) and potential for other reduced sulfur compounds (RSCs: methyl mercaptan, dimethyl sulfide, dimethyl disulfide). It is not expected that there will be significant amounts of ammonia, and other volatile organic compounds (VOCs). The system will be designed to remove hydrogen sulfide (H_2S), which is commonly the primary odorant of concern. The design conditions and criteria for the odor control system are summarized on **Sheet No. G-008** in **Volume 2**.

3.2.3. Performance Requirements and Design Criteria

The performance requirements and design criteria for the new odor control system are as follows:

- Average H_2S concentration - 30 ppm.
- Peak H_2S concentration - 60 ppm.
- 1,000 CFM airflow rate.
- Empty Bed Residence Time (EBRT).
    - Biofilter - 30-second minimum EBRT r.
    - Biotrickling filter – 10 second minimum EBRT.
- Hydrogen sulfide removal efficiency greater than or equal to 99 percent removal rate for concentrations above 10 ppm by volume.

3.2.4. Alternatives Considered

Three alternative technologies were chosen for evaluation in a discussion with the City based on Keller's experience with past projects and the City's goals for odor control. These include biotrickling filter (BTF), biofilter, and photoionization. Each odor control alternative differs in functionality and provides various levels of treatment for unique air streams. The most common technologies used for a WWTP headworks application are biological oxidation (BTF and biofilter). Photoionization is more commonly used in treating complex air streams with a large industrial or manufacturing influence.

Biofilter: These systems use filter media (ex. wood chips, lava rock, engineered media, etc.) on which microorganisms can grow to oxidize odorous compounds. Some medias are installed with biology impregnated in the media to improve startup and stability. For this evaluation, biofilters are assumed to use engineered media. Foul air is treated by being directed through the media from bottom to top.

In a biofilter, the microorganisms grow on the media and directly interact with pollutants in the foul air stream that provide the necessary nutrients. There is a response time for the microorganisms to adapt to significant changes in concentrations. Specific humidity and moisture conditions are required to promote growth and efficiently treat the air stream. During periods of low concentrations and colder temperatures during the winter months, the microbial activity decreases and some of the microorganisms die off or go dormant.

Biofilters can be constructed in a variety of configurations including open or closed bed concrete or fiberglass reinforced plastic (FRP) vessel. The major ancillary equipment for a biofilter system generally includes fan(s), humidification system, electrical control panel, and a water control panel. The media is intermittently irrigated through a sprinkler system controlled by a timer. The water used for irrigation is collected by a drain at the bottom of the vessel. Biofilters require a larger EBRT to treat the odorous compounds resulting in a larger footprint, as media height is generally limited to minimize pressure drop.

Biotrickling filter (BTF): These filters use a nutrient rich scrubbing solution over synthetic (plastic or foam) or inorganic media (rock or recycled glass) on which microorganisms can grow to oxidize odorous compounds. Foul air is treated by being directed through the media from bottom to top.

In a biotrickling filter, the microorganisms attach to the media and the liquid film absorbs the pollutants from the foul air stream and transports the nutrients to the microorganisms. Biotrickling filters can be slow to adapt to changes in concentrations. Specific moisture conditions are required to promote growth and efficiently treat the air stream. During periods of low concentrations and colder temperatures during the winter months, the microbial activity decreases and some of the microorganisms die off or go dormant.

The configuration of a biotrickling filter is within a closed, circular vessel. The major ancillary equipment for a biotrickling filter system generally includes fan(s), nutrient dosing system, electrical control panel, and a water control panel. The media is irrigated by a nutrient rich solution through a sprinkler system controlled by a timer. The water used for irrigation is collected by a drain at the bottom of the vessel. The biotrickling filter can contain different stages of media within the vessel to treat more complex air streams that contain other RSCs and VOCs. The synthetic media can be packed within a smaller area because it is light weight and has a minimal pressure drop. This allows the biotrickling filter to be significantly taller, resulting in a smaller footprint.

Photoionization: Each unit uses ultraviolet (UV) light and a catalyst to oxidize odorous compounds. The photoionization unit essentially consist of a dust filter, UV compartment, and catalyst housed in an enclosed stainless-steel vessel. The catalyst is chosen based on the odorous compounds present within the air stream. There are no chemical or water requirements. The major ancillary equipment generally includes fan(s), and an electrical control panel. The units are able to handle swings in concentration without altering treatment capabilities.

FIGURE 3-9: ODOR CONTROL ALTERNATIVES

Biofilter

Biotrickling Filter

Photoionization

3.2.5. Alternative Analysis

Advantages and disadvantages of the three odor control alternatives are presented in Table 3-5: Odor Control Advantages and Disadvantages.

TABLE 3-5: ODOR CONTROL ADVANTAGES AND DISADVANTAGES

Advantages		
Biofilter	**Biotrickling Filter**	**Photoionization**
• Moderate capital costs • No handling or storage of chemicals • History of successful installations • Longer lifespan of engineered media	• Moderate capital costs • Small footprint (vertical arrangement) • Can be combined with other technologies to target complex air streams • Little handling or storage of chemicals Requires a short residence time	• Smallest footprint • No handling or storage of chemicals • Capable of handling complex odor streams
Disadvantages		
Biofilter	**Biotrickling Filter**	**Photoionization**
• Large footprint • Requires a long residence time • Fluctuations in concentrations can impact the biological activity • Sensitive to pH and humidity • Drainage can be acidic	• Requires an acclimation period for the bacteria • Fluctuations in concentrations can impact biological activity • Can be slow to react to loading variations	• Higher capital costs • Newer technology • Can be slow to react to loading variations

3.2.6. Cost Analysis

Costs for each odor control alternative are shown in **Table 3-6**: Odor Control Costs. Costs are for the equipment and installation for the odor control technology only and do not include costs associated with the interconnecting ducting or site work.

TABLE 3-6: ODOR CONTROL COSTS

Item	Biofilter	BTF	Photoionization
Equipment and Installation	$ 282,000	$ 310,000	$ 317,000
Subtotal	**$ 282,000**	**$ 310,000**	**$ 317,000**
General Conditions (10%)	$ 29,000	$ 31,000	$ 32,000
Subtotal	**$ 311,000**	**$ 341,000**	**$ 349,000**
Contingency (40%)	$ 125,000	$ 137,000	$ 140,000
Subtotal	**$ 436,000**	**$ 478,000**	**$ 489,000**
Contractor OH&P (15%)	$ 66,000	$ 72,000	$ 74,000
Subtotal	**$ 502,000**	**$ 550,000**	**$ 563,000**
Professional Services (20%)	$ 200,000	$ 200,000	$ 200,000
Total Estimated Project Cost	**$ 702,000**	**$ 750,000**	**$ 763,000**
Utilities	$ 4,000	$ 3,500	$ 2,000
Parts	$ -	$ -	$ -
Chemical	$ 1,000	$ 1,500	$ -
Personnel	$ 4,000	$ 4,000	$ 2,000
Annual Expenses	***$ 9,000***	***$ 9,000***	***$ 4,000***
Repair and Replacement Costs	***$ 3,000***	***$ 2,000***	***$ 8,000***
20-Year Life Cycle Cost	**$ 890,000**	**$ 920,000**	**$ 950,000**

Recommendation

The alternatives were scored according to the City's pre-selected scoring matrix. The scores are shown in Table 3-7: Odor Control Scoring Matrix. Miscellaneous factors for the odor control alternatives included ability to treat miscellaneous compounds beyond H_2S and equipment footprint.

TABLE 3-7: ODOR CONTROL SCORING MATRIX

Criterion	Biofilter	Biotrickling Filter	Photoionization
Capital Cost (60%)	60	55	54
O&M Cost (10%)	5	4	10
R&R Cost (10%)	10	10	3
Phasing Flexibility (10%)	10	10	10
Miscellaneous (10%)	10	9	9
Total	**95**	**89**	**85**

Even though photoionization was the most expensive technology evaluated, the actual differences in costs between alternatives were relatively small. The difference in cost was not seen as a disadvantage by the City. The City selected photoionization due to the plug-and-play nature of the technology and overall ease of use for operators.

3.2.7. Operations and Maintenance Assessment

The odor control system will reduce corrosion and associated maintenance in the headworks building. Because photoionization does not utilize biological treatment, operator intervention is not expected to be frequent. The equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms.

3.2.8. Cold Weather Operation

The control panel for the system will be located inside a nearby unclassified building or the electrical room. The system does not use water, so heat tracing is not necessary.

3.2.9. Construction Sequencing

Because the odor control system is not critical to the WWTP operation, it can be installed at any time during the project. A construction sequencing plan is presented in Chapter 6.

3.3. PEAK FLOW TREATMENT

High variations in influent wastewater flowrates can cause operational problems as activated sludge microorganisms need a fairly consistent nutrient loading and many process equipment items may not be able to turn down to run at low capacities. Flow equalization diverts some flow into storage where it is held until peak flows have subsided; stored flow is then added back into the treatment process. Equalization of peak flows allows for the size and cost of most downstream equipment to be reduced.

3.3.1. Currently Proposed Facilities

No peak flow equalization is planned.

3.3.2. Size and Redundancy

While a wide variety of basin volumes could be considered, the equalization basin and associated equipment would be sized to hold 3.5 MG. This is based on available site footprint. Redundancy of the equalization basin is not required; because the peak flows are expected to occur during the wet season, the basin can be scheduled to be taken offline during the dry months for regular maintenance. Associated redundancy requirements for all other processes at the WWTP would still be met.

3.3.3. Performance Requirements

The performance requirements and design criteria for the equalization basin are as follows:

- The basin should be provided with mixing and odor control.
- The basin should have sufficient volume to noticeably reduce peak events.

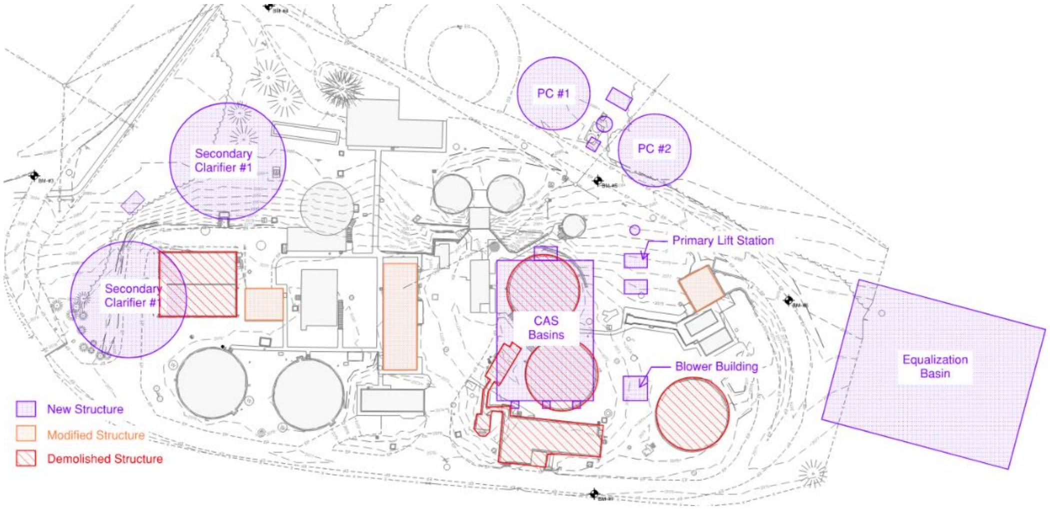
3.3.4. Alternatives Considered

Two alternatives were evaluated for peak flow treatment:

Equalization basin: A 120' wide by 150' long by 22' deep concrete equalization basin would be constructed, allowing for the secondary clarifiers and UV equipment to be sized for lower flows. Process basins would not change in size as their design is controlled by solids loading and not flow rate; the biological communities within the process basins would be more stable as they would not be subject to as varied flow rates. Construction of the equalization basin would require a large footprint on the site and a large investment for a structure that would be used relatively infrequently.

The equalization basin would be constructed below-ground next to the existing pickleball courts. The basin would be installed downstream of headworks and the primary clarifiers to prevent issues with solids deposition. An additional pumping station would be needed to transfer water from the underground basin to the process basins. Mixing and odor control would also be installed in the basin, which would require a large increase in odor control system capacity. A preliminary layout showing the equalization basin is shown in Figure 3-10: Preliminary Equalization Basin Layout.

FIGURE 3-10: PRELIMINARY EQUALIZATION BASIN LAYOUT



No equalization basin: The secondary clarifiers and UV disinfection equipment would not be reduced in size and would be designed to (respectively) hydraulically pass or treat the full 2045 PHF of 14 MGD. Peak flows would be included in the main treatment process rather than be removed and added back in at lower flows.

FIGURE 3-11: EQUALIZATION BASIN

3.3.5. Alternative Analysis

Advantages and disadvantages of construction of an equalization basin are presented in Table 3-8: Equalization Basin Advantages and Disadvantages. The advantages and disadvantages of not including an equalization basin are the opposite of what are shown below.

TABLE 3-8: EQUALIZATION BASIN ADVANTAGES AND DISADVANTAGES

Advantages
Equalization Basin
• Reduction of secondary clarifier size • Reduction of UV equipment size • Buffering of peak load events – more stabilized biology
Disadvantages
Equalization Basin
• Large footprint • Large investment for a structure that will be used infrequently • May require installation of additional lift station • Will require large increase in odor control system capacity • May not affect downstream sizing significantly as process basin size is controlled by solids loading

3.3.6. Cost Analysis

Costs for installing an equalization basin, with savings from downsized secondary clarifiers and UV equipment accounted for, are shown in Table 3-9: Equalization Basin Costs. The cost savings shown are in comparison to conventional activated sludge for secondary treatment.

TABLE 3-9: EQUALIZATION BASIN COSTS

Item	Equalization Basin
Equalization Basin	$ 9,146,000
Net Secondary Clarifier Savings	$ (1,772,000)
Net UV Equipment Savings	$ (302,000)
Subtotal	**$ 7,072,000**
General Conditions (10%)	$ 708,000
Subtotal	**$ 7,780,000**
Contingency (40%)	$ 3,112,000
Subtotal	**$ 10,892,000**
Contractor OH&P (15%)	$ 1,634,000
Subtotal	**$ 12,526,000**
Professional Services (20%)	$ 2,506,000
Total Estimated Project Cost	**$ 15,032,000**

Recommendation

A scoring matrix was not used for evaluation of the peak flow treatment alternatives as the driving factor for the City’s decision was the difference in capital cost. The City elected to forego an equalization basin because the net savings from downsized equipment did not outweigh the cost of construction.

3.4. PRIMARY TREATMENT TECHNOLOGY

Primary treatment reduces the biological demand to the secondary treatment process and thus reduces the required infrastructure and aeration requirements in secondary treatment. Primary treatment also produces primary solids which have a high organic content, which are easier to digest in the anaerobic digester and allow the anaerobic digester to function normally and produce Class B biosolids. For the WWTP to continue producing Class B biosolids with their current mode of solids handling operations at the expected increased flows and loads, primary treatment improvements are necessary.

3.4.1. Currently Proposed Facilities

The new primary treatment system will replace the existing primary clarifiers, allowing for the existing primary clarifiers to be demolished. The new system will be located near the headworks or new process basins.

3.4.2. Size and Redundancy

The system will consist of multiple units that when combined in capacity will cover the 2045 PHF. A minimum of two units (clarifiers or filters) will be installed, with flow splitting and means of isolation provided so that each unit is able to run independently. The initial comparison was based on N+1 redundancy (one fully redundant unit) for the primary filters, but this could be reduced to N capacity (each filter designed for 50% of PHF), in accordance with IDAPA 58.01.16.470. The design conditions and criteria for the primary treatment system are summarized on **Sheet No. G-007** in **Volume 2**.

3.4.3. Performance Requirements

The performance requirements for the primary treatment system are as follows:

- The system should require limited maintenance.
- The treatment capacity of the system should be 14 MGD.
- The system should achieve a minimum of 30% BOD_5 removal and 50% TSS removal. (This is a minimum requirement; systems that exceed this performance will reduce the required aeration and process basin volume and will be a net benefit).

3.4.4. Alternatives Considered

Two alternative technologies were chosen for evaluation with the City. Descriptions of each technology and associated improvements for each alternative are summarized below.

Primary clarifiers: New circular, center-feed clarifiers would be constructed; the existing primary clarifiers are not large or deep enough to meet IDAPA requirements or design standards and would be retired. With center-feed clarifiers, screened wastewater enters the clarifier through a central column. Suspended solids settle to the bottom, where a rotating scraper pushes the accumulated solids into a discharge pit. A skimmer arm slowly rotates over the wastewater surface and pushes clarified wastewater over a weir into an effluent launder. The wastewater then flows to downstream processes.

Clarifiers offer high reliability due to the high number of installations. It is also a familiar technology for the WWTP operators. However, the required footprint is large, and odors may be produced due to the clarifiers not being covered.

Two new 60'-diameter primary clarifiers would be constructed, each with a wall height of 12.5'. An influent splitter box would also be constructed, and sludge and scum pumping would be installed.

Primary filters: Filters do not rely on gravity settling for removal of solids. Instead filters use a barrier, such as pile cloth or fine wire mesh wrapped around a circular frame, to separate solids and reduce the BOD and TSS passing through to downstream processes. Filters are placed in tanks and submerged in wastewater; the wastewater flows through and into the filter, collects in the filter's interior, and flows to downstream processes. As solids accumulate on the filter surface, head loss increases and the water level within the tank rises. When the wastewater backs up to a set elevation, the filters are backwashed. Some manufacturers have reported higher performance of BOD_5 and TSS removal than is typical for primary clarifiers. Additionally, the filters have a small footprint and less potential for odor production due to being installed indoors.

Primary filtration is a growing technology and has fewer domestic installations than primary clarifiers do. Other disadvantages include higher maintenance time and costs for washing the filters, high backwash volume which creates a need for more solids thickening, and low effluent BOD_5 concentrations which could limit the available carbon necessary for nutrient removal in the aeration basins. Pilot testing would be necessary to verify the treatment and operational performance of this technology. Utility costs would also be higher due to the need to heat the building housing the primary filters.

For this evaluation, it was assumed that three primary filters would be installed in a building 40 feet long by 40 feet wide. Sludge pumping to solids thickening would be installed as well. The primary filter structure could house other process equipment such as the influent pump station; for the sake of comparison with the primary clarifiers, these items were excluded from the alternative cost comparison.

FIGURE 3-12: PRIMARY TREATMENT ALTERNATIVES

Primary Clarifier

Primary Filter (Cloth)

Primary Filter (Wire Mesh)

3.4.5. Alternative Analysis

Advantages and disadvantages of the two primary treatment alternatives are presented in Table 3-10: Primary Treatment Advantages and Disadvantages.

TABLE 3-10: PRIMARY TREATMENT ADVANTAGES AND DISADVANTAGES

Advantages	
Primary Clarifiers	**Primary Filters**
• Consistent with existing primary treatment – familiar technology for operators • High number of installations – high reliability	• Smaller footprint • Potential increase in BOD and TSS removal – reduction in process basin volume • Less potential for odor production (filters installed inside)
Disadvantages	
Primary Clarifiers	**Primary Filters**
• Larger footprint • May produce more odors due to clarifiers not being covered	• Limited installations • Produces thinner primary sludge – sludge thickening would be required • New building to house filters would be required • Pilot test needed to verify equipment • More maintenance associated with washing filters

3.4.6. Cost Analysis

Costs for mechanical equipment for each alternative are shown in Table 3-11: Primary Treatment Costs.

TABLE 3-11: PRIMARY TREATMENT COSTS

Item	Primary Clarifiers	Primary Filters
Primary Treatment Equipment & Installation	$ 5,572,000	$ 5,066,000
Subtotal	**$ 5,572,000**	**$ 5,066,000**
General Conditions (10%)	$ 558,000	$ 507,000
Subtotal	**$ 6,130,000**	**$ 5,573,000**
Contingency (40%)	$ 2,452,000	$ 2,230,000
Subtotal	**$ 8,582,000**	**$ 7,803,000**
Contractor OH&P (15%)	$ 1,288,000	$ 1,171,000
Subtotal	**$ 9,870,000**	**$ 8,974,000**
Professional Services (20%)	$ 1,974,000	$ 1,795,000
Total Estimated Project Cost	**$ 11,844,000**	**$ 10,769,000**
Utilities	$ 2,000	$ 18,000
Parts	$ 2,000	$ 5,000
Chemicals	$ 5,000	$ 8,000
Personnel	$ 18,000	$ 35,000
Annual Expenses	***$ 27,000***	***$ 66,000***
Repair and Replacement	***$ 13,000***	***$ 16,000***
20-Year Life Cycle Cost	**$ 12,250,000**	**$ 11,760,000**

Recommendation

The alternatives were scored according to the City's pre-selected scoring matrix. Miscellaneous factors included how established each technology is in the wastewater treatment industry and structural footprint. The scores are shown in Table 3-12: Primary Treatment Scoring Matrix.

TABLE 3-12: PRIMARY TREATMENT SCORING MATRIX

Criterion	Primary Clarifiers	Primary Filters
Capital Cost (60%)	55	60
O&M Cost (10%)	10	4
R&R Cost (10%)	10	8
Phasing Flexibility (10%)	3	10
Miscellaneous (10%)	10	5
Total	**88**	**87**

In the alternative screening meeting with the City, primary filters were tentatively selected due to their smaller footprint and lower capital cost relative to clarifiers, despite clarifiers scoring slightly higher. The small footprint of the filters is a key advantage as the existing site has limited space available and would allow for easier phasing of the overall project. Design criteria for the primary filters were further refined after the technology was selected, and subsequent design was done for two primary filter units. While filters have been initially selected, the City may elect to base final design around either filters or clarifiers, depending on pilot test results as well as potential impacts to solids handling treatment processes.

Pilot testing of the primary filters is planned to occur in the next phase of the project. Testing is needed to confirm the BOD_5 and TSS removal efficiencies of the units and to confirm that primary filtration is compatible with the design and operation of the WWTP. During testing, operators will need to allot time for conducting routine maintenance checks of the equipment, collecting samples of filter effluent and primary solids, and monitoring volume and frequency of filter backwash. The pilot test may be found to be unsuccessful if the BOD_5 and TSS removal rates are found to be lower than the minimum requirement; if filter backwash cycles are too lengthy or too frequent, leading to high volumes of wash water being sent to solids handling; if the filters are found to require too much maintenance; or if, for any other reason, the filters are found to not be acceptable by the City or by the WWTP operators. An unsuccessful pilot test would necessitate a re-evaluation of primary treatment options and design criteria and redesign of interconnections between primary treatment equipment and other process equipment, which could delay project design; therefore, pilot testing of primary filtration equipment is recommended to occur as soon as possible.

3.4.7. Operations and Maintenance Assessment

Operators will need to monitor the filters' performance as part of their routine checks; this is expected to take a similar amount of time as is spent monitoring the existing primary clarifiers. The installed equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms.

3.4.8. Cold Weather Operation

The primary filters will be located indoors and will not be subject to freezing.

3.4.9. Construction Sequencing

Primary filters will need to be installed and operational before the existing primary clarifiers are taken offline. Phasing will need to account for re-routing wastewater influent from the existing primary clarifiers to the new primary filters and effluent from the existing process basins to the new process basins. A construction sequencing plan is presented in Chapter 6.

3.5. HEADWORKS SCREENING

Screens are necessary to remove debris and coarse materials from the influent flow. If these coarse materials are not removed, they could damage downstream process equipment and reduce overall treatment process effectiveness. Screenings are typically washed and dewatered to reduce odors and reduce the volume of solids that must be disposed of.

3.5.1. Currently Proposed Facilities

To fully meet the design PHF established in this PER (14 MGD), two new 6-mm mechanical screens are planned to be installed in the existing headworks structure and will replace the existing mechanical screens.

3.5.2. Size and Redundancy

The mechanical screens will each be sized to treat 14 MGD to meet IDAPA requirements for 100% mechanical redundancy. Screenings will be conveyed to a washer/compactor where they will be dewatered and discharged to a dumpster. Both the screens and the washer/compactors must fit in and around the existing screening channels in the headworks building without extensive structural modifications. The design conditions and criteria for the screens and washer/compactor are summarized on **Sheet No. G-007** in **Volume 2**.

3.5.3. Performance Requirements

The performance requirements for the screening equipment are as follows:

- Automatic mechanical screening.

- Automatic washing, compacting, and transport.
- Dewatered screenings should pass the EPA paint filter test.
- Equipment should require limited maintenance.
- Where possible, equipment should fit in the existing headworks building without significant structural modifications.
- Design of the equipment and the channel should maintain sufficiently high channel velocities to minimize solids deposition during low flow conditions.

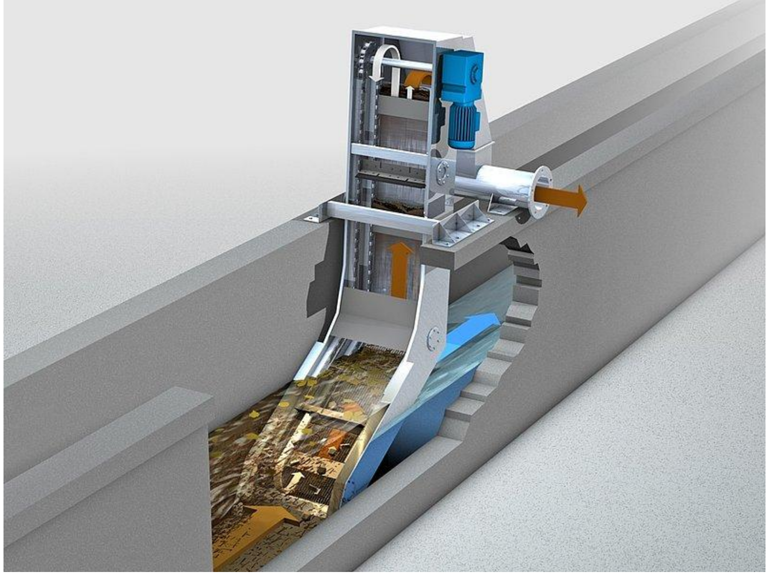
3.5.4. Alternatives Considered

At the City's request, only through-flow mechanical bar screens were considered. Other types of screens, such as center-flow bar screens, drum screens, or perforated plate screens, have a larger footprint and would be difficult, if not impossible, to fit within the existing building. While step screens have a similar footprint to bar screens, the City elected to not evaluate these further because of the poor capture rate and the potentially higher maintenance requirements associated with this equipment.

Mechanical bar screens have vertical metal bars that can be oriented with flow. Debris and particles larger than the bar spacing accumulate on the front of the bars and are carried up and off the screen by mechanical rakes. The screenings are then washed and compacted and then discharged through a chute into a dumpster.

In order to accommodate screens with sufficient capacity for design flows, the existing headworks structure will need to be modified. These modifications include widening the existing east screening channel, filling in the existing middle channel, adding new wall penetrations for the screen discharge chutes to reach the outside dumpster, and making necessary HVAC improvements. Phased construction will be required, with each channel modification occurring separately so that treatment can continue throughout construction.

FIGURE 3-13: MECHANICAL BAR SCREEN



3.5.5. Cost Analysis

The cost for the screening improvements is shown in Table 3-13: Headworks Screening Costs.

TABLE 3-13: HEADWORKS SCREENING COSTS

Item	Estimated Cost
Screening Equipment & Installation	$ 1,537,000
Screening Building Modifications	$ 154,000
Subtotal	**$ 1,691,000**
General Conditions (10%)	$ 170,000
Subtotal	**$ 1,861,000**
Contingency (40%)	$ 745,000
Subtotal	**$ 2,606,000**
Contractor OH&P (15%)	$ 391,000
Subtotal	**$ 2,997,000**
Professional Services (20%)	$ 600,000
Total Estimated Project Cost	**$ 3,597,000**
Annual Power Cost	$ 8,000
Labor	$ 5,000
Maintenance	$ 3,000
Annual Expenses	*$ 16,000*
20-Year Life Cycle Cost	**$ 3,836,000**

3.5.6. Operations and Maintenance Assessment

The new screens and washer/compactors will provide City staff with a fully redundant system capable of treating the design flows. It will enable staff to remove equipment from service for maintenance without adversely affecting the plant treatment ability. Additionally, it will include safe measures for workplace conditions. The equipment will be tied into the wastewater plant's SCADA system.

3.5.7. Cold Weather Operation

All screens and washer/compactor equipment will be installed inside the existing, temperature-controlled headworks structure and will be protected from freezing conditions. Electrical panels and controls will be indoors.

3.5.8. Construction Sequencing

Removal of the existing screens, widening of the headworks channels, and installation of the new screening equipment will need to be carefully phased. The screening process cannot be bypassed. A construction sequencing plan is presented in Chapter 6.

3.6. HEADWORKS GRIT REMOVAL

Grit removal is needed to remove grit, sand, and other heavy materials that are small enough to pass through the upstream screens. This material is often abrasive and can damage downstream process equipment; if not removed, it can also accumulate in the process basins and reduce the usable volume for biological treatment.

3.6.1. Currently Proposed Facilities

Through this project, it is planned to install new grit removal equipment outside adjacent to the existing grit basin. A new grit washer/compactor will also be installed in the existing grit washer room. Existing grit removal equipment will be retired.

3.6.2. Size and Redundancy

IDAPA does not require a redundant grit removal system. A bypass channel will be used when the design flow is exceeded or when the grit chamber must be taken offline; the downstream primary filter has sufficient capacity to remove grit from bypassed flows but will need to be backwashed more frequently when this occurs. Full design conditions and criteria for the grit removal system are summarized on **Sheet No. G-007** in **Volume 2**.

3.6.3. Performance Requirements

The performance requirements for the grit chamber and washer/compactor are as follows. Design criteria can be further refined during the design phase.

- The system should offer automatic grit removal, washing, compacting, and transport.
- The system should remove 95% of grit particles 140 micron and larger. This removal criterion is based on industry best practices and could be refined during design.
- If grit washing is included in design, the dewatered grit should have less than 10% moisture and less than 5% organic material.
- The system (grit chamber in combination with bypass channel) should have capacity for the 2045 PHF.
- The system should have no more than 9” of headloss.

3.6.4. Alternatives Considered

The City requested for two alternative technologies to be considered for grit removal. As the technologies have different headloss values, the hydraulic profile was checked with each technology to verify the feasibility of each technology. Descriptions of each technology are summarized below.

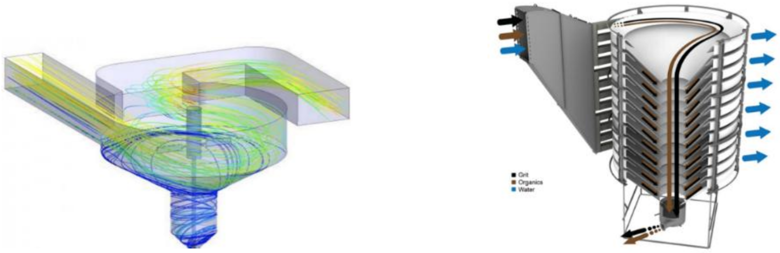
Vortex: Hydraulically induced vortex centrifugal separators rely on accelerated gravity to remove grit from influent. The system utilizes a slow speed paddle near the lower chamber to keep organic material suspended and relies on the hydraulic properties of the flow to settle out grit. This technology works best for removing coarser grit. There are numerous manufacturers for this technology, and water requirements are low. However, some utility water is still required to pump grit slurry, and construction can be complex.

One concrete vortex grit trap would be installed with an upper diameter of 12’, a lower diameter of 6’, and a depth of 7’. For simplicity of construction, the grit trap would be installed adjacent to the existing grit system. A top-mounted grit pump and a grit washer/compactor would be installed. The grit classification or washing system would be housed in the existing grit removal building located adjacent to the existing aerated grit basin and would utilize the existing grit bypass channel.

Stacked trays: Multiple trays are arranged in a rectangular tank, creating a series of circular, vortex flows. The flow enters the tank and moves through each tray, with grit settling as it progresses through the system. The multi-tray design increases the surface area for grit settlement with short settling distances, improving the overall efficiency of grit removal. These systems can be expanded in capacity by adding additional trays and have low maintenance requirements due to the lack of internal moving parts. However, there are limited manufacturers for this technology, and if upstream screening is unreliable, the trays can become clogged.

Two grit tank units, each with 9' diameter and with five stacked trays, would be installed outdoors next to the existing grit basin. A grit pump for each trap and grit washer or classifier would also be installed in the existing grit building. The existing grit bypass channel will remain in use; isolation gates will be installed on both the bypass channel and the inlet channel.

FIGURE 3-14: GRIT REMOVAL ALTERNATIVES



Vortex

Stacked Trays

3.6.5. Alternative Analysis

Advantages and disadvantages of the two grit removal alternatives are presented in Table 3-14: Grit Removal Advantages and Disadvantages.

TABLE 3-14: GRIT REMOVAL ADVANTAGES AND DISADVANTAGES

Advantages	
Vortex	**Stacked Trays**
• Lower water requirements • Numerous manufacturers	• Simple construction • Expandable with additional trays • No moving parts in trap
Disadvantages	
Vortex	**Stacked Trays**
• More complex construction • Less suited for finer grit • Requires fluidizing water when pumping grit slurry	• Limited manufacturers

3.6.6. Cost Analysis

The cost for the screening improvements is shown in Table 3-15: Headworks Grit Removal Costs.

TABLE 3-15: HEADWORKS GRIT REMOVAL COSTS

Item	Vortex		Stacked Trays	
Grit Removal Equipment & Installation	$	953,000	$	1,932,000
Grit Removal Building Modifications	$	204,000	$	298,000
Subtotal	**$**	**1,157,000**	**$**	**2,230,000**
General Conditions (10%)	$	116,000	$	223,000
Subtotal	**$**	**1,273,000**	**$**	**2,453,000**
Contingency (40%)	$	510,000	$	982,000
Subtotal	**$**	**1,783,000**	**$**	**3,435,000**
Contractor OH&P (15%)	$	268,000	$	516,000
Subtotal	**$**	**2,051,000**	**$**	**3,951,000**
Professional Services (20%)	$	400,000	$	800,000
Total Estimated Project Cost	**$**	**2,451,000**	**$**	**4,751,000**
Annual Power Cost	$	3,000	$	8,000
Labor	$	3,000	$	2,000
Maintenance	$	4,000	$	4,000
Annual Expenses	***$***	***10,000***	***$***	***14,000***
20-Year Life Cycle Cost	**$**	**2,600,000**	**$**	**4,960,000**

Recommendation

The City selected vortex grit removal technology due to its lower project cost.

3.6.7. Operations and Maintenance Assessment

New equipment that offers more reliable grit removal will reduce the maintenance requirements associated with cleaning out grit in downstream processes. The equipment will be tied into the WWTP's SCADA system.

3.6.8. Cold Weather Operation

The grit trap and pump will be installed outdoors; the pump will be provided with heat tracing and a heat box. The grit washer/compactor equipment will be installed inside the existing, temperature-controlled headworks structure and will be protected from freezing conditions. Electrical panels and controls will be indoors.

3.6.9. Construction Sequencing

As the new grit removal system will be installed in a different area than the existing grit chamber, there should be minimal disruption to operation of the existing grit removal system. Coordination will be required to replace the existing grit washer with the new washer/compactor. Start-up will require the combined effort of the equipment vendors, installation contractors, subcontractors (if applicable), Keller, and the City. A construction sequencing plan is presented in Chapter 6.

3.7. INFLUENT PUMP STATION

Pump stations are necessary when there is not enough head to transfer flow from a lower elevation to a higher elevation. For this site, a pump station will be required to lift primary effluent to the aeration basins, which will be constructed above grade to simplify excavation and dewatering efforts. Where primary filters are selected, it can also be advantageous to construct the filter building as part of the pump station. The pump station discussed in this section is termed an influent pump station rather than an intermediate pump station to remain consistent with the WWTPFP.

3.7.1. Currently Proposed Facilities

Due to the elevations at the existing headworks and the hydraulics of the treatment process, it is not possible to flow by gravity through the plant. A new influent pump station is planned to be installed in the primary filter building and will transfer effluent from the primary filters to the process basins.

3.7.2. Size and Redundancy

The new influent pump station will be sized to pass the current ADF (1.59 MGD) and 2045 PHF (14.0 MGD) with the largest pump out of service. Pumps will be designed to handle the wide variation in expected flows with minimal loss of efficiency. Design criteria for the new pump station are summarized on **Sheet No. G-007** in **Volume 2.**

3.7.3. Performance Requirements

The performance requirements for the intermediate pump station are as follows:

- The pumps should be able to pump screened and filtered wastewater.
- The pumps should be able to pass flows ranging from 1.6 MGD to 14.0 MGD.
- The pumps should require limited maintenance and have minimal clogging.

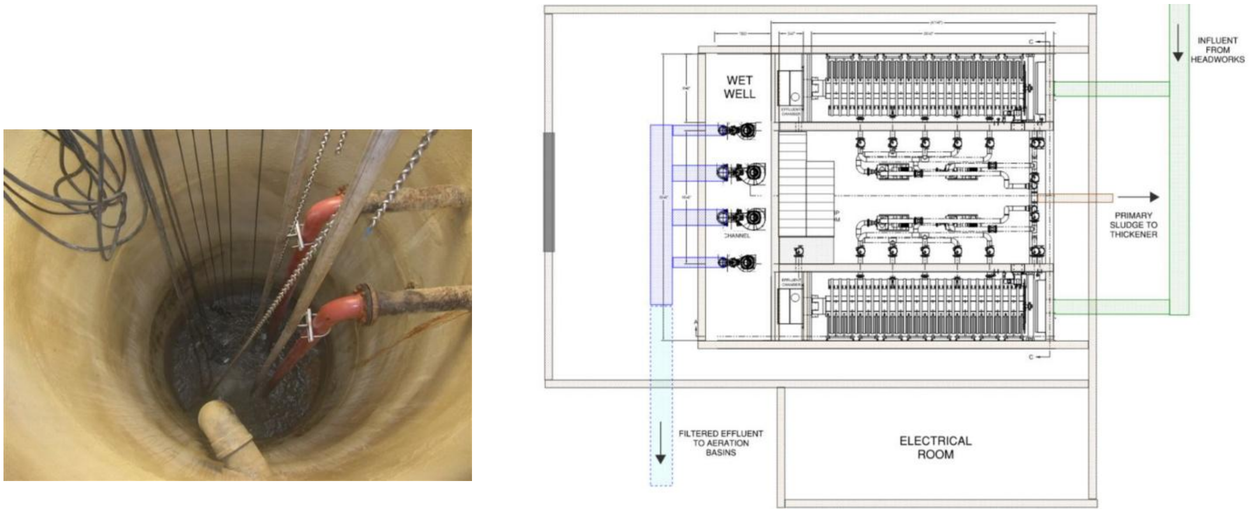
3.7.4. Alternative Configurations Considered

Two alternative pump station configurations were evaluated. For either configuration, an overhead bridge crane and pump set-down area are included for easy pump removal and servicing.

Wet well: Submersible pumps are installed directly in a wet well and are submerged in wastewater. Liquid is drawn into the impeller of the pump and discharged out of the top of the pump into a header. Pumps are removed from the wet well using guide rails and chains without the need for operators to enter the wet well. Wet wells typically have smaller footprints, less excavation, and lower capital costs because the pumps and liquid are contained in the same structure. Maintenance can be more challenging as the pumps are submerged; they must be removed from the wet well and are exposed to more wear and tear.

The wet well would be 8’ wide by 36’ long and would be installed as part of the primary filter structure, immediately following the filter effluent chambers (Figure 3-15: Wet Well Configuration).

FIGURE 3-15: WET WELL CONFIGURATION



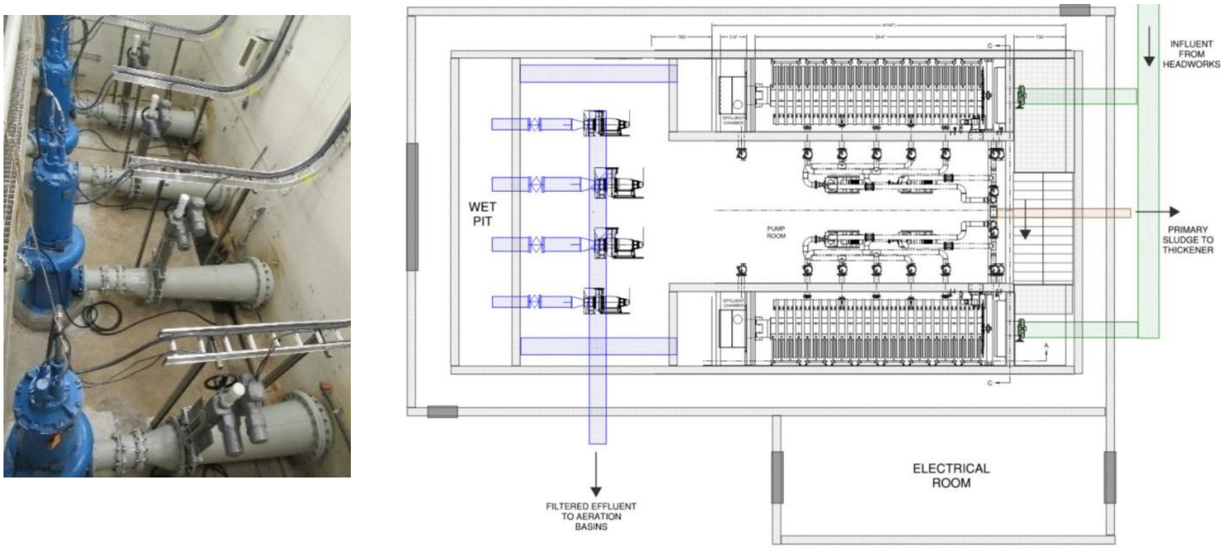
Typical Installation

Planned Layout

Wet well/dry pit: Wastewater is held in a wet well, and pumps are installed in a separate, dry environment (dry pit), with suction piping connecting the wet well contents to the pumps. Because the pumps are not submerged, they can be easily accessed for maintenance and have longer lifespans. The separate wet and dry structures do however increase the footprint of the pump station. Typically, the dry pit is a below-grade vault to ensure the pumps have flooded suction. To allow for flooded suction, the dry pit must be fairly deep, which increases concrete and excavation costs.

The pumps would be installed in the basement of the primary filter structure. Because the basement of the structure is already deeper than the planned wet well, no additional excavation would be needed. Pipes connecting the filter effluent chambers would be directed to a 6' wide by 36' long wet well which the pumps access via suction pipes (Figure 3-16: Wet Well/Dry Pit Configuration).

FIGURE 3-16: WET WELL/DRY PIT CONFIGURATION



Typical Installation

Planned Layout

3.7.5. Alternative Analysis – Configuration

Advantages and disadvantages of the influent pump station configurations are presented in Table 3-16: Influent Pump Station Configuration Advantages and Disadvantages

TABLE 3-16: INFLUENT PUMP STATION CONFIGURATION ADVANTAGES AND DISADVANTAGES

Advantages	
Wet Well	**Wet Well/Dry Pit**
• Lower capital cost • Smaller footprint • Less concrete and excavation	• Easier maintenance in sheltered environment Pumps are in clean environment, longer equipment life
Disadvantages	
Wet Well	**Wet Well/Dry Pit**
• Pump maintenance requires removal • Equipment is submerged, more wear and tear	• Higher capital costs • Larger footprint • More concrete and excavation

3.7.6. Cost Analysis – Configuration

Costs for each configuration are shown in Table 3-17: Influent Pump Station Configuration Costs. Because the influent pump station will be installed in the primary filter building and will share material, sitework, and construction costs with the primary filters, the costs for the pump station configurations in Table 3-17: Influent Pump Station Configuration Costs include the capital costs associated with the primary filters.

TABLE 3-17: INFLUENT PUMP STATION CONFIGURATION COSTS

Item	Wet Well		Wet Well/Dry Pit	
Pump Station Equipment & Installation	$	600,000	$	556,000
Primary Filter Structure & Modifications	$	8,725,000	$	11,016,000
Subtotal	**$**	**9,325,000**	**$**	**11,572,000**
General Conditions (10%)	$	933,000	$	1,158,000
Subtotal	**$**	**10,258,000**	**$**	**12,730,000**
Contingency (40%)	$	4,104,000	$	5,092,000
Subtotal	**$**	**14,362,000**	**$**	**17,822,000**
Contractor OH&P (15%)	$	2,155,000	$	2,674,000
Subtotal	**$**	**16,517,000**	**$**	**20,496,000**
Professional Services (20%)	$	3,300,000	$	4,100,000
Total Estimated Project Cost	**$**	**19,817,000**	**$**	**24,596,000**
Electricity	$	18,000	$	18,000
Parts	$	15,000	$	12,000
Personnel	$	22,000	$	15,000
Annual Expenses	***$***	***55,000***	***$***	***45,000***
20-Year Life Cycle Cost	**$**	**20,636,000**	**$**	**25,266,000**

Recommendation

The City selected a wet well/dry pit configuration due to the lower annual O&M costs and ease of access to pumps for maintenance.

3.7.7. Alternative Technologies Considered

Two pump technologies were evaluated for influent pumping. Descriptions of each technology are summarized below. Whichever pumps are installed within the headworks lift station; it is anticipated that multiple pumps will operate in parallel in a rotating lead/lag manner. In this operation style, the capacity of the lift station can modulate based on influent flow or level within the station wet well as multiple pumps turn on and off. The order of operation in which pumps initialize will be pre-programmed to sequence each week so that pumps wear more evenly. Pre-programmed wet well draw-down sequences will also be used to provide periodic cleaning of the wet well.

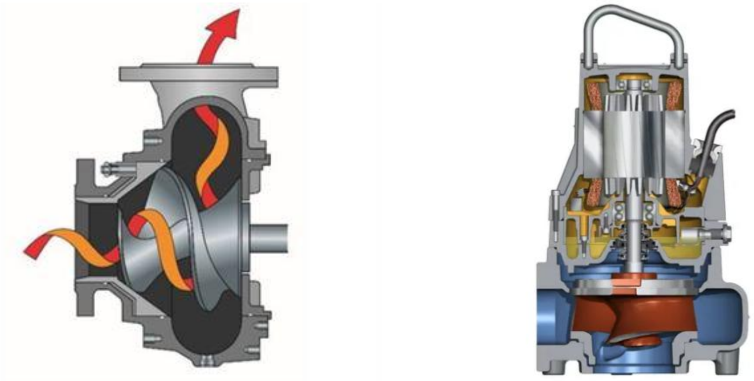
Screw centrifugal pumps: Pumps contain single, spiral vane impellers with cutting edges. These pumps are designed to pass large solids and stringy material with little maintenance. The screw impeller performs similar to an Archimedes screw, which burrows like a corkscrew to start and keep the large solids pumping. The nature of the screw impeller is less likely to rag compared to those that contain vanes, which are more prone to getting fibrous materials hung up on their impeller vane edges, and it is better able to pump fragile floc. These pumps have high efficiency, but there are few manufacturers which leads to longer wait time for getting spare parts.

Four horizontally mounted screw centrifugal pumps with check and isolation valves would be installed in the dry pit area of the basement of the primary filter structure.

Non-clog centrifugal pumps: Non-clog pumps are also designed to handle solids, including stringy fibrous material and trash. However, their casings are not designed to pass large solids and can become clogged; thus, they are commonly placed after a screen. In addition, a larger non-clog pump will typically have more vanes, which decreases the size of the flow passage and prohibits larger solids from passing through. Similar to a screw centrifugal, a non-clog pump is capable of maintaining a high level of efficiency. Impellers are either recessed or open, a configuration which allows solids to pass. The rotor agitates influent fluids to help viscous fluids flow through more smoothly. Non-clog pumps have slightly lower efficiency and could clog at lower pump speeds; they are best suited for high flow applications. Additionally, there are several manufacturers of these pumps.

Four horizontally mounted non-clog pumps with check and isolation valves would be installed in the basement of the primary filter structure.

FIGURE 3-17: INFLUENT PUMP TECHNOLOGY ALTERNATIVES



Screw Centrifugal

Non-Clog Centrifugal

3.7.8. Alternative Analysis – Technology

Advantages and disadvantages of the two pump technologies are presented in Table 3-18: Influent Pump Technology Advantages and Disadvantages.

TABLE 3-18: INFLUENT PUMP TECHNOLOGY ADVANTAGES AND DISADVANTAGES

Advantages	
Screw Centrifugal	**Non-Clog Centrifugal**
• Less likely to clog • High efficiency (up to 80%)	• Several manufacturers
Disadvantages	
Screw Centrifugal	**Non-Clog Centrifugal**
• One manufacturer • Longer lead time • Spare parts are not readily available and expensive	• Lower efficiency • Not ideal for low flow applications • Some potential for clogging at lower pump speeds

3.7.9. Cost Analysis – Technology

Costs for each influent pump alternative are shown in Table 3-19: Influent Pump Station Costs.

TABLE 3-19: INFLUENT PUMP STATION COSTS

Item	Screw Centrifugal	Non-Clog Centrifugal
Pumps & Installation	$ 556,000	$ 605,000
Subtotal	**$ 556,000**	**$ 605,000**
General Conditions (10%)	$ 56,000	$ 61,000
Subtotal	**$ 612,000**	**$ 666,000**
Contingency (40%)	$ 245,000	$ 267,000
Subtotal	**$ 857,000**	**$ 933,000**
Contractor OH&P (15%)	$ 129,000	$ 140,000
Subtotal	**$ 986,000**	**$ 1,073,000**
Professional Services (20%)	$ 200,000	$ 200,000
Total Estimated Project Cost	**$ 1,186,000**	**$ 1,273,000**
Utilities	$ 51,000	$ 49,000
Parts	$ 18,000	$ 12,000
Personnel	$ 15,000	$ 15,000
Annual Expenses	***$ 84,000***	***$ 76,000***
20-Year Life Cycle Cost	**$ 2,436,000**	**$ 2,404,000**

Recommendation

Because the influent pump technology does not significantly change the configuration of or cost of the influent pump station, Keller recommends that the pump technology be selected in final design based on received bids.

3.7.10. Operations and Maintenance Assessment

The equipment will be tied into the WWTP's SCADA system. Having new pumps that are designed for wastewater applications will likely reduce required maintenance as compared to the existing pumps.

3.7.11. Cold Weather Operation

The pumps will be installed indoors and will be protected from freezing conditions. Buried pipes to and from the pump station will be buried below the frost line.

3.7.12. Construction Sequencing

The construction of the new pump station will be phased to maintain full plant operation. Bypass pumping and piping will likely be needed. A construction sequencing plan is presented in Chapter 6.

3.8. PROCESS BASIN MIXING

Mixing in the process basins, particularly in the anoxic zones, is necessary to prevent foam layer production, to ensure even blending of secondary influent with return activated sludge (RAS) and basin contents, and to keep sludge in suspension.

3.8.1. Currently Proposed Facilities

In this project, it is planned to install a mixing system in the anoxic zone of each new process basin.

3.8.2. Size and Redundancy

The system will be designed to provide adequate mixing at the 2045 PHF. Redundancy will be provided in each basin. The design conditions and criteria for the mixing system are summarized on **Sheet No. G-007** in **Volume 2**.

3.8.3. Performance Requirements

The performance requirements for the mixing system are as follows:

- The system should require limited maintenance.
- At least one mixer or mixing system should be installed in each anoxic zone, with the ability to isolate each system.
- The system should not introduce significant amounts of dissolved oxygen into the wastewater that would inhibit the denitrification process.

3.8.4. Alternatives Considered

The City considered two alternative technologies: propeller mixers and compressed air mixers. Descriptions of each technology and associated improvements for each alternative are summarized below.

Propeller mixers: Motorized propellers are submerged along the basin walls, where they introduce turbulence and forward velocity directly into the wastewater. Several manufacturers produce this technology. While these mixers can easily be removed via guiderails for maintenance, servicing is typically more frequent due to the submerged motor and the potential for clogging of the propeller.

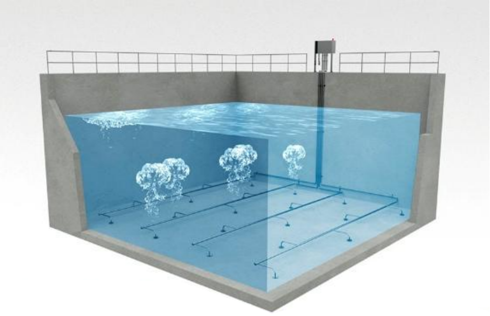
Two mixers would be installed along the influent wall of each anoxic zone, for a total of six mixers.

Compressed air mixers: An air compressor provides air to networks of stainless-steel air piping attached to the floor of each anoxic zone. The compressed air system is controlled by solenoid valves on timers, so air is released intermittently through each basin. Large bubbles are released from the air piping nozzles, and their ascent provides vertical mixing. Redundancy is provided by the air compressor having multiple heads. This system does not utilize any submerged moving parts and is not prone to clogging in the nozzles due to the intermittent release of air. However, there are limited manufacturers and fewer installations, and more space is needed to accommodate the air compressor and piping to and from basins.

An air piping grid would be installed on the floor of each anoxic zone, for a total of three grids. Two air compressors would be installed indoors in the process basin structure. Control panels for each grid would be placed along the platforms surrounding each anoxic zone.

TABLE 3-20: PROCESS BASIN MIXING ALTERNATIVES

Propeller Mixer



Compressed Air Mixer

3.8.5. Alternative Analysis

Advantages and disadvantages of the two mixing alternatives are presented in Table 3-21: Process Basin Mixing Advantages and Disadvantages.

TABLE 3-21: PROCESS BASIN MIXING ADVANTAGES AND DISADVANTAGES

Advantages	
Propeller Mixer	**Compressed Air Mixer**
• Several manufacturers • Easily removable via rails for service •	• No moving or serviced parts located below the water surface • Clogging of mixing piping is unlikely
Disadvantages	
Propeller Mixer	**Compressed Air Mixer**
• Motor is submerged, leading to more frequent servicing • Clogging and ragging of propeller is possible	• Limited manufacturers • Fewer installations • Larger footprint to accommodate piping to and from basins and air compressor

3.8.6. Cost Analysis

Costs for each alternative are shown in : Process Basin Mixing Costs.

TABLE 3-22: PROCESS BASIN MIXING COSTS

Item	Propeller Mixer	Compressed Air Mixer
Mixing System Equipment & Installation	$ 310,000	$ 382,000
Subtotal	**$ 310,000**	**$ 382,000**
General Conditions (10%)	$ 31,000	$ 39,000
Subtotal	**$ 341,000**	**$ 421,000**
Contingency (40%)	$ 137,000	$ 169,000
Subtotal	**$ 478,000**	**$ 590,000**
Contractor OH&P (15%)	$ 72,000	$ 89,000
Subtotal	**$ 550,000**	**$ 679,000**
Professional Services (20%)	$ 100,000	$ 100,000
Total Estimated Project Cost	**$ 650,000**	**$ 779,000**
Annual Power Cost	$ 8,000	$ 4,000
Labor	$ 8,000	$ 4,000
Maintenance	$ 20,000	$ 10,000
Annual Expenses	***$ 36,000***	***$ 18,000***
20-Year Life Cycle Cost	**$ 1,186,000**	**$ 1,047,000**

Recommendation

The City selected compressed air mixing due to the lower expected maintenance costs and the lack of need to service parts inside the basins.

3.8.7. Operations and Maintenance Assessment

The addition of mixing to the process basins will lead to fewer issues with foam formation or sludge settling, which will reduce time spent on maintenance or clearing out sludge. The equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms.

3.8.8. Cold Weather Operation

The air compressors will be installed indoors in a temperature-controlled room. Control panels and other electrical equipment such as electrically actuated valves will be installed in weatherproof enclosures or otherwise protected from the elements.

3.8.9. Construction Sequencing

The anoxic mixing system should be installed after construction of the new process basins and before the basins are brought online. A construction sequencing plan is presented in Chapter 6.

3.9. AERATION BASIN DIFFUSERS

Aeration systems are added to aeration basins to satisfy the oxygen demand of decomposing waste, support respiration of aerobic microorganisms, and generally maintain a minimum dissolved oxygen concentration. Other benefits of aeration include mixing and, where needed, additional air to meet nitrification demands.

3.9.1. Currently Proposed Facilities

Complete replacement of the existing diffused aeration system is proposed. Submerged air diffusers will be provided at the bottom of each new aeration basin, and necessary process air piping will be installed from the blowers to the diffused air feeder pipes.

3.9.2. Size and Redundancy

The diffusers will be designed to provide sufficient oxygen for treatment for the 2045 maximum month loading. The design conditions and criteria for the diffusers are summarized on **Sheet No. G-007** in **Volume 2**.

3.9.3. Performance Requirements

The performance requirements for the diffusers are as follows:

- The system should require limited maintenance.
- Diffusers should be capable of maintaining a minimum of 2.0 mg/L of dissolved oxygen in the mixed liquor at all times.
- Diffusers should have a high oxygen transfer efficiency.

3.9.4. Alternatives Considered

Three alternative technologies were selected for evaluation with the City. Descriptions of each technology are summarized below. Regardless of diffuser type, air piping would be installed to supply air to the diffusers. This would include process air mains leading from the blowers to the aeration basins, drop pipes descending into the basins, and piping grids mounted on the basin floor.

Disc diffusers: Flat discs are mounted on top of feeder piping grids along the basin floor. Discs are made with ceramic or membrane faces. Perforations in the diffuser face release fine air bubbles vertically. Airflow ranges from 0.5 to 3.2 standard cubic feet per minute (scfm) per diffuser. Disc diffusers are widely used and have had a successful use historically at the WWTP, with individual diffusers found to have long lifespans. Cleaning of diffusers is recommended to occur more frequently by manufacturers of disc diffusers than of plate or tube diffusers; this would require more frequent draining of the aeration basins to access diffusers and longer maintenance times due to the high number of diffusers needing to be serviced.

Plate diffusers: Diffusers are long, flat, and rectangular. Plates are connected to and below air pipes mounted on the basin floor. Air bubbles are released vertically from each plate. Airflow ranges from 0.3 to 7 scfm per square foot per diffuser. Plate diffusers have been found to have higher oxygen transfer rates than other diffuser types; with oxygen being transferred to the wastewater more efficiently, blowers do not need to provide as much air and can be reduced in size. Maintenance requirements are also lower than other diffuser types as the large surface area of each diffuser is easier to work with and membranes can be routinely depressurized and deflated (known as “relaxing”) to remove fouling and delay servicing. However, the large size of each diffuser leads to lower ease of operation due to difficulties getting consistent air flow through the span of the diffuser.

Tube diffusers: Diffusers can be rigid ceramic or plastic tubes or flexible tube-shaped membranes. Tubes are connected directly to air piping along the basin floor. Perforations are typically on the sides of each tube. Airflow ranges from 2.1 to 10.6 scfm per diffuser. Tube diffusers are less likely to clog if diffusers are not used for a period of time, such as when a basin is taken offline. However, the tubes typically have a shorter lifespan and higher potential for failure than other diffuser types due to improperly sealed connections between the diffusers and the air piping.

FIGURE 3-18: AERATION BASIN DIFFUSER ALTERNATIVES

Disc Diffuser

Plate Diffuser

Tube Diffuser

Disc Installation

Plate Installation

Tube Installation

3.9.5. Alternative Analysis

Advantages and disadvantages of the three diffuser types are presented in Table 3-23: Aeration Basin Diffuser Advantages and Disadvantages.

TABLE 3-23: AERATION BASIN DIFFUSER ADVANTAGES AND DISADVANTAGES

Advantages		
Disc Diffuser	**Plate Diffuser**	**Tube Diffuser**
• Widely used and reliable • Successful installation history at the WWTP • Long lifespan for diffusers	• Higher oxygen transfer rate • More access for maintenance • Can delay servicing by “relaxing” membranes	• Typically lower capital cost • Less likely to clog if diffusers are not used for a period of time
Disadvantages		
Disc Diffuser	**Plate Diffuser**	**Tube Diffuser**
• Draining basin for cleaning of diffusers is recommended more frequently than for other diffuser types • Higher replacement and maintenance costs due to high number of diffusers	• Lower ease of operation • Highest cost	• Shorter lifespan • Somewhat higher potential for membrane failure due to connection types

3.9.6. Cost Analysis

Costs for each alternative are shown in Table 3-24: Aeration Basin Diffuser Costs.

TABLE 3-24: AERATION BASIN DIFFUSER COSTS

Item	Disc Diffusers		Plate Diffusers		Tube Diffusers	
Diffusers & Installation	$	435,000	$	616,000	$	150,000
Air Piping	$	283,000	$	283,000	$	283,000
Subtotal	**$**	**718,000**	**$**	**899,000**	**$**	**433,000**
General Conditions (10%)	$	72,000	$	90,000	$	44,000
Subtotal	**$**	**790,000**	**$**	**989,000**	**$**	**477,000**
Contingency (40%)	$	316,000	$	396,000	$	191,000
Subtotal	**$**	**1,106,000**	**$**	**1,385,000**	**$**	**668,000**
Contractor OH&P (15%)	$	166,000	$	208,000	$	101,000
Subtotal	**$**	**1,272,000**	**$**	**1,593,000**	**$**	**769,000**
Professional Services (20%)	$	300,000	$	300,000	$	200,000
Total Estimated Project Cost	**$**	**1,572,000**	**$**	**1,893,000**	**$**	**969,000**
Annual Power Cost	$	-	$	-	$	-
Labor	$	24,000	$	5,000	$	32,000
Maintenance	$	24,000	$	46,000	$	31,000
Annual Expenses	*$*	*48,000*	*$*	*51,000*	*$*	*63,000*
20-Year Life Cycle Cost	**$**	**2,287,000**	**$**	**2,652,000**	**$**	**1,907,000**

Recommendation

The City selected membrane disc diffusers due to the positive experience the operators have had with the currently installed disc diffusers and due to the technology having the lowest life cycle cost.

3.9.7. Operations and Maintenance Assessment

As the diffuser type selected is consistent with what is already installed at the WWTP, there should be no impact to operations. The equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms. During times when the WWTP operates with two aeration basins and has the third basin offline, the operators will need to keep enough liquid in the offline basin to submerge the diffusers and prevent them from drying out.

3.9.8. Cold Weather Operation

Diffusers will be located underwater and will not be subject to freezing.

3.9.9. Construction Sequencing

Diffusers will need to be installed in the new aeration basins before the basins are brought online. A construction sequencing plan is presented in Chapter 6.

3.10. AERATION BASIN BLOWERS

Blowers provide air to the aeration diffusers in the process basins. As mentioned in Section 3.9, this air is needed to meet oxygen demands of decomposing waste and aerobic microorganisms, provide mixing, and maintain a minimum concentration of dissolved oxygen.

3.10.1. Currently Proposed Facilities

Existing blowers will be replaced with new, higher capacity blowers. A minimum of two blowers will be installed, one being standby. A new blower building will be constructed west of the new process basins.

3.10.2. Size and Redundancy

At least two blowers will be installed so that maximum air demand can be met with the single largest unit out of service. VFDs shall be provided so airflow can be adjusted proportionally to the load demand of the plant. Blowers will be sized to provide a total capacity ranging from 920 to 2,750 scfm at 10.5 psi. The design criteria and conditions for the blowers are summarized on **Sheet No. G-008** in **Volume 2**.

3.10.3. Performance Requirements

The performance requirements for the blowers are as follows:

- Blowers should be energy efficient.
- The system should be reliable and easy to maintain.
- The system should include one redundant blower.
- Blowers should be capable of turndown to meet the expected variation in flows and loads; this may require multiple duty blowers.

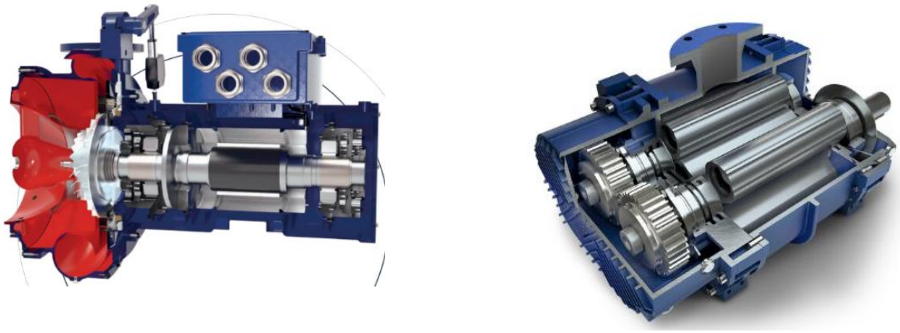
3.10.4. Alternatives Considered

Two alternative blower technologies were presented to the City for consideration: magnetic bearing turbo blowers and hybrid PD blowers. Descriptions of each technology are summarized below. For either technology, a new blower building will be constructed to house the blowers and control panels.

Magnetic bearing turbo: Turbo blowers include an in-unit turbine that compresses air by rotating at very high speeds. Magnetic bearing turbo blowers are a specific type of turbo blower in which the rotor within the blower levitates between magnetic bearings, eliminating lubrication requirements, minimizing friction losses, and maximizing efficiency. Because the turbine must be running at high speeds regardless of the air demand, turbo blowers have limited turndown capability and do best in situations where air demand is relatively constant and where blowers are not frequently cycling between on- and off-duty. Replacing parts within the blower can be more complex and expensive due to the specialized technology.

Hybrid positive displacement (PD): Hybrid PD blowers are a subtype of positive displacement blowers and combine PD blower and screw compressor technologies. Two rotors rotate in opposite directions and are shaped like screws. Gas is trapped in the interlocking space between the rotors and is pushed to the blower outlet. With PD blowers, the volume of air produced is directly proportional to the blower speed which allows for better turndowns. While this blower technology is commonly used, it experiences friction losses from the rotor contact and requires more labor for routine lubrication.

FIGURE 3-19: BLOWER ALTERNATIVES



Magnetic Bearing Turbo   Hybrid PD

3.10.5. Alternative Analysis

Advantages and disadvantages of the two blower technologies are presented in Table 3-25: Blower Advantages and Disadvantages.

TABLE 3-25: BLOWER ADVANTAGES AND DISADVANTAGES

Advantages	
Magnetic Bearing Turbo	**Hybrid PD**
• High efficiency • No lubrication needed in rotor or motor	• Commonly used • Larger range of turndown capabilities
Disadvantages	
Magnetic Bearing Turbo	**Hybrid PD**
• More complex and expensive maintenance for replacing parts • On/off cycling can be less favorable • Smaller range of turndown	• Can be less efficient • Lubrication is required; higher labor requirement

3.10.6. Cost Analysis

The costs for the blower alternatives are shown in Table 3-26: Blower Costs.

TABLE 3-26: BLOWER COSTS

Item	Magnetic Bearing Turbo Blower	Hybrid PD Blower
Blower Equipment & Installation	$ 1,509,000	$ 1,042,000
Blower Building	$ 525,000	$ 525,000
Subtotal	**$ 2,034,000**	**$ 1,567,000**
General Conditions (10%)	$ 204,000	$ 157,000
Subtotal	**$ 2,238,000**	**$ 1,724,000**
Contingency (40%)	$ 896,000	$ 690,000
Subtotal	**$ 3,134,000**	**$ 2,414,000**
Contractor OH&P (15%)	$ 471,000	$ 363,000
Subtotal	**$ 3,605,000**	**$ 2,777,000**
Professional Services (20%)	$ 700,000	$ 600,000
Total Estimated Project Cost	**$ 4,305,000**	**$ 3,377,000**
Annual Power Cost	$ 42,000	$ 53,000
Labor	$ 8,000	$ 12,000
Maintenance	$ 51,000	$ 44,000
Annual Expenses	*$ 101,000*	*$ 109,000*
20-Year Life Cycle Cost	**$ 5,808,000**	**$ 4,999,000**

Recommendation

The City selected magnetic bearing turbo blowers due to the lower anticipated maintenance efforts.

3.10.7. Operations and Maintenance Assessment

The blowers and associated equipment will be tied into the WWTP’s SCADA system. Because lubrication is not required for magnetic bearing turbo blowers, maintenance requirements will be reduced.

3.10.8. Cold Weather Operation

The blowers will be installed inside a temperature-controlled building and will not be subject to freezing. Panels are to either be installed in a temperature-controlled room or be rated for outdoor exposure.

3.10.9. Construction Sequencing

Construction of the new blower building cannot occur until the existing overflow pump station is relocated and the structure demolished. The blowers will need to be installed and operational before the new process basins are brought online. A construction sequencing plan is provided in Chapter 6.

3.11. SECONDARY CLARIFIER MATERIAL

Effluent from process basins is typically sent to secondary clarifiers to separate solids via gravity settling. Scum is removed from the top of the clarifier by a rotating skimmer arm. Solids consolidate at the bottom of the clarifier and are either recycled to the start of the process basins by the RAS pumps or wasted to solids handling by the WAS pumps. Clarified effluent overflows into a launder at the top of the clarifier and flows to downstream processes. Only circular clarifiers were considered due to the Operator’s familiarity with their operation and because of operational challenges associated with rectangular clarifiers .

3.11.1. Currently Proposed Facilities

Through this project, it is planned to abandon the existing secondary clarifiers and to construct two new secondary clarifiers on the western side of the site. Clarifiers will be equipped with spiral blades.

3.11.2. Size and Redundancy

To meet IDAPA requirements, two new secondary clarifiers capable of independent operation and of handling the 2045 design flows and solids loading will be provided. For redundancy, each clarifier will be sized for 75% treatment capacity with one clarifier offline. Each clarifier will have a diameter of 110 feet with a side water depth of 15 feet; clarifier mechanisms will be designed to operate within these dimensions. The design conditions and criteria for the secondary clarifiers are summarized on **Sheet No. G-008** in **Volume 2**.

3.11.3. Performance Requirements

The performance requirements for the secondary clarifiers are as follows:

- Clarifiers should have a circular configuration with center-pier design, center feed, and perimeter overflow.
- Clarifiers should have a flocculating feed well with an energy dissipation inlet to receive influent flow and distribute the flow equally in all directions.
- Clarifiers should have a sludge collection mechanism to collect sludge on the bottom and move it to the center of the clarifier for removal.
- Density current baffles should be included to prevent solids from rising up the wall and over the weir.
- Drive should be oil-lubricated cast iron with strip liner bearing.
- Scum trough should be full radius with two skimmer arms for improved scum removal.
- Clarifiers and mechanisms should require limited maintenance.
- Clarifiers should be capable of passing the 2045 PHF.
- Clarifier effluent should have a 30-day average TSS concentration of 30 mg/L and allow for a UV transmittance of 65%.

3.11.4. Alternatives Considered

The City requested two materials be evaluated for use in the secondary clarifier mechanisms: 304 stainless steel (304 SS) and painted carbon steel. Descriptions of each material are summarized below.

304 SS: 304 SS consists of iron, carbon, and chromium and has high strength and durability. Due to the additional chromium content, it is highly resistant to corrosion and staining.

Painted carbon steel: Carbon steel consists of iron and carbon. This material has a higher carbon content, giving it higher strength and hardness than other steel materials. Painting is applied to reduce corrosion, and regular repainting is required.

3.11.5. Alternative Analysis

Advantages and disadvantages of the two materials are presented in Table 3-27: Secondary Clarifier Material Advantages and Disadvantages.

TABLE 3-27: SECONDARY CLARIFIER MATERIAL ADVANTAGES AND DISADVANTAGES

Advantages	
304 SS	**Painted Carbon Steel**
• Highly corrosion resistant • Less frequent maintenance	• Lower capital cost
Disadvantages	
304 SS	**Painted Carbon Steel**
• Higher capital cost	• Coating must be reapplied on a regular basis

3.11.6. Cost Analysis

Costs for each alternative are shown in Table 3-28: Secondary Clarifier Material Costs. These costs do not include all costs associated with construction and operation of the secondary clarifiers and are instead specific to the clarifier mechanisms.

TABLE 3-28: SECONDARY CLARIFIER MATERIAL COSTS

Item	304 SS	Painted Carbon Steel
Clarifier Mechanisms & Installation	$ 3,713,000	$ 2,187,000
Subtotal	**$ 3,713,000**	**$ 2,187,000**
General Conditions (10%)	$ 372,000	$ 219,000
Subtotal	**$ 4,085,000**	**$ 2,406,000**
Contingency (40%)	$ 1,634,000	$ 963,000
Subtotal	**$ 5,719,000**	**$ 3,369,000**
Contractor OH&P (15%)	$ 858,000	$ 506,000
Subtotal	**$ 6,577,000**	**$ 3,875,000**
Professional Services (20%)	$ 1,300,000	$ 800,000
Total Estimated Project Cost	**$ 7,877,000**	**$ 4,675,000**
Maintenance	$ -	$ 40,000
Annual Expenses	*$ -*	***$ 40,000***
20-Year Life Cycle Cost	**$ 7,877,000**	**$ 5,271,000**

<u>Recommendation</u>

The City selected 304 SS to minimize future maintenance requirements. 304 SS mechanisms are expected to remain in service longer than 20 years which will further decrease the life cycle cost for the higher cost equipment.

3.11.7. Operations and Maintenance Assessment

304 SS is highly corrosion resistant, so maintenance requirements will be minimal. Clarifier equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms.

3.11.8. Cold Weather Operation

The secondary clarifiers are not expected to freeze due to the levels of recirculation and the hydraulic retention time being less than 4 hours at the 2045 PHF. Waterlines with spray nozzles to direct scum to the scum trough, as well as all other above-ground and unsubmerged liquid piping, will be heat-traced and insulated for freeze protection.

3.11.9. Construction Sequencing

The existing aeration basins will need to be abandoned and demolished before both secondary clarifiers can be constructed. One phasing option involves constructing only one new secondary clarifier while continuing to use the two existing secondary clarifiers. A construction sequencing plan is detailed in Chapter 6.

3.12. RAS PUMPS

A portion of the solids removed from the secondary clarifiers is returned to the process basins in activated sludge systems and is known as return activated sludge. This return flow helps maintain a sufficient concentration of activated sludge in the process basins so that treatment time is short.

3.12.1. Currently Proposed Facilities

The existing RAS pumps will be retired, and three new, higher capacity pumps will be retrofitted in the basement of the existing blower building. New piping will be installed to accommodate the higher expected RAS flows, and each pump will have a separate flow meter.

3.12.2. Size and Redundancy

Three RAS pumps will be installed; one pump will be dedicated to each secondary clarifier, and the third will be a standby unit in accordance with IDAPA redundancy requirements. Discharge piping will be sized to maintain a velocity of at least two feet per second. The new pumps must fit within the basement of the existing blower building without significant structural modifications. Full design conditions and criteria for the RAS pumping system are summarized on **Sheet No. G-008** in **Volume 2**.

3.12.3. Performance Requirements

The performance requirements for the RAS pumps are as follows:

- The pumps should require minimal maintenance.
- The pumps should be energy efficient.
- The pumps should have a small footprint.
- The pumps should be capable of conveying up to 150% of the design influent flow (typically 0.3 – 1% solids) with one pump out of service.

3.12.4. Alternatives Considered

Two pump technologies were evaluated: screw centrifugal and non-clog centrifugal. Descriptions of each technology can be found in Section 3.7.7.

3.12.5. Alternative Analysis

Advantages and disadvantages of the two pump technologies are presented in Section 3.7.8.

3.12.6. Cost Analysis

Costs for each RAS pump alternative are shown in Table 3-29: RAS Pump Costs.

TABLE 3-29: RAS PUMP COSTS

Item	Screw Centrifugal	Non-Clog Centrifugal
RAS Pumps & Installation	$ 303,000	$ 288,000
Subtotal	**$ 303,000**	**$ 288,000**
General Conditions (10%)	$ 31,000	$ 29,000
Subtotal	**$ 334,000**	**$ 317,000**
Contingency (40%)	$ 134,000	$ 127,000
Subtotal	**$ 468,000**	**$ 444,000**
Contractor OH&P (15%)	$ 71,000	$ 67,000
Subtotal	**$ 539,000**	**$ 511,000**
Professional Services (20%)	$ 108,000	$ 102,000
Total Estimated Project Cost	**$ 647,000**	**$ 613,000**
Annual Power Cost	$ 71,000	$ 49,000
Labor	$ 17,000	$ 17,000
Maintenance	$ 8,000	$ 10,000
Annual Expenses	*$ 96,000*	***$ 76,000***
20-Year Life Cycle Cost	**$ 2,076,000**	**$ 1,744,000**

Recommendation

Keller recommends screw centrifugal pumps for RAS pumping due to their higher efficiency.

3.12.7. Operations and Maintenance Assessment

The equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms. Operators will be able to remove a pump from service for maintenance without adversely affecting the plant's treatment ability.

3.12.8. Cold Weather Operation

The pumps will be located indoors and will not be subject to freezing temperatures. Any outdoor above-ground piping will be heat-traced.

3.12.9. Construction Sequencing

Replacement of the existing RAS pumps and tie-ins of the RAS piping from the new and existing secondary clarifiers and to the new and existing process basins will need to be phased. A construction sequencing plan is presented in Chapter 6.

3.13. WAS PUMPS

Excess activated sludge must be wasted regularly to maintain the WWTP's solids retention time (SRT). It is important for the SRT to be controlled and maintained as it is a critical parameter for sizing the aeration basins, the aeration system, and solids handling processes. This wasted sludge is known as waste activated sludge and is typically a portion of the consolidated solids removed from the secondary clarifiers.

3.13.1. Currently Proposed Facilities

The planned improvements for this project include relocating the WAS pump station to be in the basement of the existing blower building with a dry-pit configuration and replacing the existing pumps. Two new pumps with associated valves and piping will be installed, one for each clarifier, with a third as a scum pump which also acts as a swing/standby WAS pump.

3.13.2. Size and Redundancy

Each pump will be sized to meet 2045 design WAS flows from one secondary clarifier. Per IDAPA design requirements, a flow meter and sampling access will be provided to allow for observing, measuring, sampling, and controlling WAS flow. The design conditions and criteria for the WAS pumps are summarized on **Sheet No. G-008** in **Volume 2**.

3.13.3. Performance Requirements

The performance requirements for the WAS pumps are as follows:

- The pumps should be capable of handling sludge from the secondary clarifiers (typically 0.3 – 1% solids).
- The pumps should have a small footprint to fit inside the existing blower building basement.
- The pumps should require limited maintenance and have minimal clogging.

3.13.4. Alternatives Considered

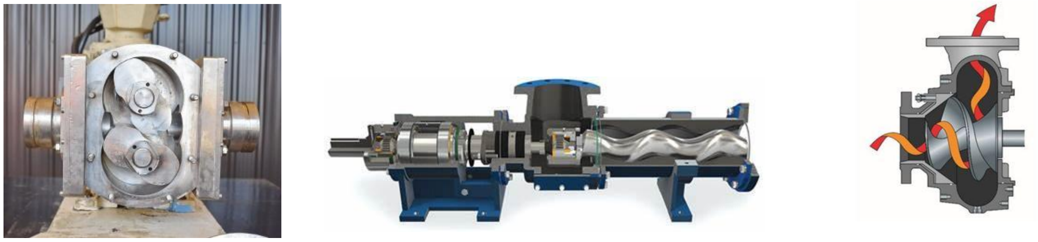
Three alternative technologies were evaluated with the City. Descriptions of each technology are summarized below.

Rotary lobe pumps: Two lobes rotate in opposite directions, trapping a fixed volume of media in the free spaces between the lobes and pushing it to the outlet in a pulsing manner. Rotary lobe pumps are a type of positive displacement pump which means they provide a constant flow regardless of pressure, which helps when dosing polymer. They have a small footprint, are self-priming, and are easy to take apart for maintenance; additionally, the existing WAS pumps are rotary lobe pumps, so the operators are familiar with their operation.

Progressive cavity pumps: A screw-shaped rotor rotates and pushes a fixed volume of media along the vanes through a wide channel. The inlet must be primed. Progressive cavity pumps are also a type of positive displacement pump and provide constant flow even with changing pressure. Even though check valves are not required in discharge piping for these pumps, their footprint is still fairly large due to the length of the rotor. Replacing the rotor or stator can be a challenge as the casing around the rotor must be removed.

Centrifugal pumps: A spinning impeller pressurizes the media and transfers velocity from the pump motor to the media. The flow rate varies nonlinearly with pump speed and with pressure, which can make polymer dosing more complex; variations in the operating point can cause efficiency loss and damage. Centrifugal pumps have few moving parts inside and have a small footprint.

FIGURE 3-20: WAS PUMP ALTERNATIVES



Rotary Lobe

Progressive Cavity

Centrifugal

3.13.5. Alternative Analysis

Advantages and disadvantages of the three WAS pump technologies are presented in Table 3-30: WAS Pump Advantages and Disadvantages.

TABLE 3-30: WAS PUMP ADVANTAGES AND DISADVANTAGES

Advantages		
Rotary Lobe	**Progressive Cavity**	**Centrifugal**
• Small footprint • Easy to take apart for maintenance • Consistent with existing WAS pumps • Constant flow with pressure; simple polymer dosing	• Constant flow with pressure; simple polymer dosing	• Few moving parts inside • Small footprint • Lower cost
Disadvantages		
Rotary Lobe	**Progressive Cavity**	**Centrifugal**
• Some pulsing of flow	• Replacement of rotor or stator can be more difficult • Larger footprint • Inlet must be primed	• Variations in operating point can cause damage and efficiency loss • Flow rate varies with pressure; more complex polymer dosing

3.13.6. Cost Analysis

Costs for each alternative are shown in Table 3-31: WAS Pump Costs.

TABLE 3-31: WAS PUMP COSTS

Item	Rotary Lobe	Progressive Cavity	Centrifugal
WAS Pumps & Installation	$ 79,000	$ 84,000	$ 135,000
Subtotal	**$ 79,000**	**$ 84,000**	**$ 135,000**
General Conditions (10%)	$ 8,000	$ 9,000	$ 14,000
Subtotal	**$ 87,000**	**$ 93,000**	**$ 149,000**
Contingency (40%)	$ 35,000	$ 38,000	$ 60,000
Subtotal	**$ 122,000**	**$ 131,000**	**$ 209,000**
Contractor OH&P (15%)	$ 19,000	$ 20,000	$ 32,000
Subtotal	**$ 141,000**	**$ 151,000**	**$ 241,000**
Professional Services (20%)	$ 28,000	$ 30,000	$ 48,000
Total Estimated Project Cost	**$ 169,000**	**$ 181,000**	**$ 289,000**
Annual Power Cost	$ 6,000	$ 14,000	$ 9,000
Labor	$ 17,000	$ 17,000	$ 17,000
Maintenance	$ 4,000	$ 5,000	$ 7,000
Annual Expenses	*$ 27,000*	*$ 36,000*	*$ 33,000*
20-Year Life Cycle Cost	**$ 571,000**	**$ 717,000**	**$ 780,000**

Recommendation

Keller recommends that the WAS pump technology be selected in final design after the solids handling improvements have been planned. Depending on where WAS is pumped to, different technologies may be preferred. As the most conservative option, horizontal centrifugal WAS pumps are shown in Volume 2.

3.13.7. Operations and Maintenance Assessment

The equipment will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms. The new WAS pumping configuration will allow the operators to more easily take samples.

3.13.8. Cold Weather Operation

The WAS pumps will be inside the basement of the existing blower building and will not be subject to freezing. Any outdoor above-ground piping will be heat-insulated.

3.13.9. Construction Sequencing

The new WAS pump station will need to be online before the existing administration building is demolished. Piping from the existing and new secondary clarifiers and to the solids handling processes must be operational before the existing WAS pumps can be retired. A construction sequencing plan is presented in Chapter 6.

3.14. UV DISINFECTION

Ultraviolet (UV) radiation is effective at deactivating bacteria, microorganisms, and viruses with the proper dosage. UV lamps contain mercury vapor which, when electrified, emit UV light. Lamps are contained in quartz sleeves to protect them from direct water contact and to manage the lamp temperature. Dosage is determined by the UV intensity and the exposure time of the treated liquid and varies depending on the disinfection requirements and the constituents within the treated liquid. The City chose to only consider UV disinfection due to safety concerns over continuing to use the existing gas disinfection system and the WWFP recommending UV disinfection.

3.14.1. Currently Proposed Facilities

Through this project, the chlorination and dechlorination processes will be discontinued, and UV equipment will be installed for disinfection. The system will have two open channels with three banks of UV lamps per channel. UV lamps will be low-pressure high intensity. Finger weirs will be installed downstream to split flow between the UV channels and control the water level in each channel. Slide gates will be installed upstream of each channel for channel isolation. The UV system will be installed in a new building. This building is planned to be located near the solids handling processes to allow for an at-grade building, but where conflicts with solids improvements are presented, an alternate location will be identified.

3.14.2. Design Data

UVT data was not collected because the proposed project improvements will significantly alter the existing treatment process. UVT data for the existing treatment stream is not expected to be representative of effluent after the other project improvements have been implemented. A UVT of 60% was used in design and was selected based on Keller's experience on similar projects. Keller recommends sampling for UVT during final design to confirm the design.

Collimated beam data is used for bio dosimetry, the experimental method for exposing a test microorganism to varying UV doses and validating a UV reactor. The UV reactors for this project are planned to be pre-validated by the manufacturer, and collimated beam data for the designed UV system are expected to be provided by the manufacturer at bidding.

3.14.3. Size and Redundancy

The UV system will be sized to treat the 2045 PHF with one channel and bank out of service in accordance with IDAPA redundancy requirements. The system will be designed in accordance with the recommendations outlined in the "Design Manual: Municipal Wastewater Disinfection" published by the EPA in 1986. The design conditions and criteria for the UV system are summarized on **Sheet No. G-008** in **Volume 2**.

3.14.4. Performance Requirements

The performance requirements for the UV system are as follows:

- The system should consist of two channels with a redundant bank in each channel.
- The system should require limited maintenance and be easy to access.
- The system should achieve effluent E. coli bacteria permit compliance as shown in Table 1-6.
- The system should be capable of dimming the lamps for dose pacing based on influent flow to save energy.
- UV reactors should be pre-validated for site conditions.
- Units should have an automatic wiping system to reduce the frequency of chemical cleaning.
- Equipment should be validated for performance as per National Water Research Institute (NWRI) guidelines; calculations shall not be permitted to verify delivered dose.
- The system should be installed with a UV transmittance monitor as part of the control package to monitor water quality and provide alarms if the system is operating out of compliance.
- The system should be low pressure high intensity with output based on the anticipated power consumption of other options.

3.14.5. Alternative Technologies Considered

The City selected two UV technologies for evaluation: horizontal and inclined. Closed-chamber units do not perform well at higher TSS concentrations; they were not evaluated due to the expected secondary effluent TSS concentrations and the potential for solids fouling the bulbs. Descriptions of each evaluated technology are summarized below.

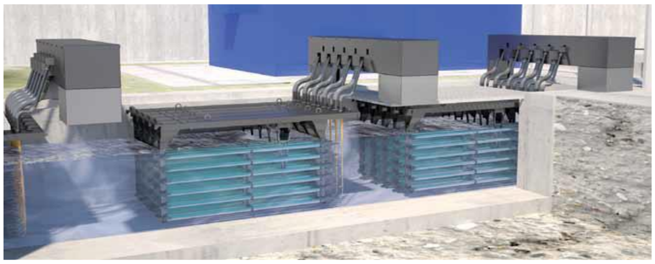
Horizontal: Racks of bulbs are inserted parallel to the water flow. Bulbs are low watt, so many lamps are required with this installation type. Typically, a crane is required to lift racks out of the channel, and if lamps need to be replaced, the whole bank will need to be removed from the channel. There are several manufacturers of this technology.

Each of the two channels would hold three UV banks (two duty, one redundant at peak flow). Each bank would have nine modules, and each module would have eight lamps. Channels would be equipped with isolation gates on the influent end and weir gates on the effluent end for controlling water level within the channels.

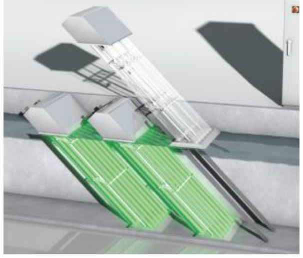
Inclined: Racks of bulbs are submerged in a channel at an angle. Bulbs are high watt, so fewer lamps are required with this technology than with horizontal units. There are also fewer manufacturers of this technology. Inclined units typically use hydraulically or electrically operated motors to be lifted out of the channel, and lamps can be replaced with the banks still in the channel.

Two channels would be provided, with three banks (two duty, one redundant at peak flow) per channel. Each bank would have twelve lamps. Each channel would have an isolation gate at the influent end and a fixed weir at the effluent end for controlling water level within the channel.

FIGURE 3-21: UV TECHNOLOGY ALTERNATIVES



Horizontal



Inclined

3.14.6. Alternative Analysis – Technology

Advantages and disadvantages of the two UV technologies are presented in Table 3-32: UV Technology Advantages and Disadvantages.

TABLE 3-32: UV TECHNOLOGY ADVANTAGES AND DISADVANTAGES

Advantages	
Horizontal	**Inclined**
• More manufacturers	• Higher watt lamps, requires fewer lamps • Lifts out of channel for maintenance • Lamps can be replaced with the bank in the channel
Disadvantages	
Horizontal	**Inclined**
• Crane is required to lift racks out of channel • Lower watt lamps, requires more lamps • Bank must be removed from channel to replace lamps	• Fewer manufacturers

3.14.7. Cost Analysis – Technology

Costs for each alternative are shown in Table 3-33: UV Technology Costs. Costs are for equipment and installation alone.

TABLE 3-33: UV TECHNOLOGY COSTS

Item	Horizontal	Inclined
UV Modules & Installation	$ 952,000	$ 785,000
Subtotal	**$ 952,000**	**$ 785,000**
General Conditions (10%)	$ 96,000	$ 79,000
Subtotal	**$ 1,048,000**	**$ 864,000**
Contingency (40%)	$ 420,000	$ 346,000
Subtotal	**$ 1,468,000**	**$ 1,210,000**
Contractor OH&P (15%)	$ 221,000	$ 182,000
Subtotal	**$ 1,689,000**	**$ 1,392,000**
Professional Services (20%)	$ 300,000	$ 300,000
Total Estimated Project Cost	**$ 1,989,000**	**$ 1,692,000**
Utilities	$ 41,000	$ 43,000
Maintenance	$ 18,000	$ 10,000
Personnel	$ 9,000	$ 9,000
Annual Expenses	***$ 68,000***	***$ 62,000***
20-Year Life Cycle Cost	**$ 3,001,000**	**$ 2,615,000**

Recommendation

The City selected inclined UV units due to the easier removal for maintenance.

3.14.8. Operations and Maintenance Assessment

The UV system will be tied into the wastewater plant's SCADA system to allow for monitoring and alarms. A control package will be installed to monitor, at minimum, lamp function, water quality, water level, and power status, and to provide alarms if the system is operating out of compliance. Instrumentation in each channel will include, at minimum, a water level sensor, flow meter, and UVT sensor.

Each channel will be equipped with a slide gate upstream of the UV modules to isolate flow from the channel. When a channel must be taken offline for maintenance or cleaning, the lamps within the channel will be turned off, and the slide gate will be lowered, blocking additional flow from entering the channel. Liquid within the channel will flow out through a channel drain located between the influent slide gate and the UV banks. UV banks will be equipped with automatic lifting devices for removal of the banks from the channel. The dewatered channel can then be cleaned or inspected. The channel should be dewatered and cleaned annually. The quartz sleeves holding the UV lamps will be cleaned automatically with a self-cleaning wiper system. A maintenance schedule will be provided by the selected manufacturer during bidding.

3.14.9. HVAC System Requirements

HVAC will be provided to ensure adequate UV module performance at varying temperatures.

3.14.10. Cold Weather Operation

The UV system will be installed indoors and will not be subject to freezing.

3.14.11. Construction Sequencing

Relocation of underlying pipes and demolition of any overlapping structures must occur before the new UV building can be constructed. A full construction sequencing plan is presented in Chapter 6.

3.15. SOLIDS HANDLING

The WWTPFP identified in-kind replacements and rehabilitation to the solids handling processes including corrosion protection, ventilation, replacement of mixing equipment and piping and dewatering equipment. As part of the PER, additional high-level investigations were conducted. These investigations identified capacity limitations in the anaerobic digester and capacity limitations in the thickening and dewatering processes, dependent on the amount of primary sludge produced in the primary treatment process and the solids destruction in the digester. The need for new infrastructure is likely well beyond the equipment and maintenance improvements previously identified and outlined in the scope of this report. While detailed evaluations and design for these improvements were not included as part of the scope of this report, it is anticipated that additional thickening equipment, digester volume and dewatering capacity will be required in order to maintain Class B biosolids production. Some liquid stream alternatives which were selected may have an impact on the solids handling improvements needed and vice versa; these impacts should be taken into account when the solids handling processes are evaluated in greater detail. The proposed solids handling improvements in the WWTPFP will not be sufficient for future operations and reliability of the existing solids handling portions of the plant. The City has elected to perform additional investigations and design of these facilities at a later date as these efforts are outside the scope of this report.

It should be noted in the IDEQ LOI funding request that cost estimates included allocations for reasonable expected improvements needed in the solid handling processes in order to meet capacity and treatment of future solids streams. The basis for this estimate is new anaerobic digestion, including all necessary ancillary equipment and adequate redundancy to produce Class B biosolids. Additionally, the City should be active in collecting solids handling data to aid in the final selection, design and updated cost estimates for the solids handling improvements.

3.16. PHOSPHORUS REMOVAL CHEMICAL FEED SYSTEM

Along with nitrogen, phosphorus is a limiting element in algae and plant growth. Treatment plants that discharge into surface waters need to limit the amount of phosphorus in their effluent (and are typically required to in their discharge permits) to avoid contributing to the occurrence of noxious algal blooms. Phosphorus can be removed from wastewater with biological or chemical treatment. With chemical treatment, coagulants or polymers are added to form phosphorus precipitates that settle out. With biological treatment, anaerobic zones are included in the process basins before the aerobic zones; phosphorus-accumulating organisms thrive in anaerobic conditions and remove phosphorus at higher rates than aerobic activated sludge.

3.16.1. Currently Proposed Facilities

The plant is currently meeting phosphorus limits. Design of a chemical phosphorus removal system will be included in this project. Chemical treatment was selected because the WWTP completed a pilot study on a chemical feed process for phosphorus removal in 2019 and is more familiar with the chemical treatment process. Note however, that the design of the secondary treatment processes can include provisions for biological phosphorus removal, which can reduce the need for chemical dosing for phosphorus removal.

3.16.2. Size and Redundancy

The system will be designed to meet the permit limits for effluent phosphorus concentrations and loads. The design conditions are summarized on **Sheet No. G-008** in **Volume 2**.

3.16.3. Performance Requirements

The performance requirements for the system are briefly summarized below:

- The system should require limited maintenance.
- The system should produce effluent with total phosphorus concentrations and loads that meet current permit limits.
- The system should produce effluent with a pH of 6.6.

3.16.4. Cost Analysis

Costs for the phosphorus removal system are shown in Table 3-34: Phosphorus Removal System Costs.

TABLE 3-34: PHOSPHORUS REMOVAL SYSTEM COSTS

Item	Phosphorus Removal
Chemical Feed System & Installation	$ 90,000
Subtotal	**$ 90,000**
General Conditions (10%)	$ 9,000
Subtotal	**$ 99,000**
Contingency (40%)	$ 40,000
Subtotal	**$ 139,000**
Contractor OH&P (15%)	$ 21,000
Subtotal	**$ 160,000**
Professional Services (20%)	$ 32,000
Total Estimated Project Cost	**$ 192,000**
Utilities	$ 3,000
Chemicals	$ 317,000
Labor	$ 6,000
Maintenance	$ 2,000
Annual Expenses	***$ 328,000***
20-Year Life Cycle Cost	**$ 5,072,000**

3.16.5. Operations and Maintenance Assessment

O&M requirements will increase as the system consists of new equipment that the operators will need to regularly monitor. Equipment will be tied into SCADA.

3.16.6. Cold Weather Operation

The phosphorus removal system will be kept on the first floor of the existing blower building, above the RAS and WAS pumps and in a temperature-regulated environment. Chemical dosing piping to the clarifiers will be heat-traced as needed.

3.16.7. Construction Sequencing

The existing blowers will need to be relocated before the phosphorus removal system can be installed. A construction sequencing plan is presented in Chapter 6.

3.17. ANCILLARY COMPONENTS

3.17.1. Administration Building

A new administration building will be built on the northwest corner of the site. The new building will house the shop area, lab, kitchen, bathrooms, conference room, laundry room, and offices, as requested by operators.

3.17.2. Electrical Service

The existing transformer and standby generators do not have sufficient capacity for the planned improvements. A new 3-phase 480Vac electric service will be needed for the planned improvements. The new service will be in the 2000 to 2500A range and will be provided by Avista Utilities. Coordination on the new service will begin during the detailed design phase of the project when preliminary loads can be solidified. Per IDAPA requirements, the WWTP will be provided with an alternate source of electric power to allow continuity of operation during power failures. Standby generators will be sized to power UV disinfection. A new automatic transfer switch will be utilized to switch automatically between grid and standby power.

The electrical system will be designed for full load operation and to minimize voltage drop in distribution throughout the site. The standby generator will also be sized for full load operation of the plant.

3.17.3. Potable and Non-Potable Water Systems

Through this project, the existing non-potable water piping network will be expanded. A new non-potable water pump station will be installed in the new UV disinfection building. The station will include a pump skid. The existing non-potable pump stations will be retired.

The non-potable water system will be sized to provide utility water to all planned equipment requiring wash or spray water simultaneously with sufficient storage. Non-potable water will not be used off site. Non-potable and potable water distribution lines will be sized to meet expected flow and pressure requirements and will follow all separation requirements. The design conditions and criteria for the non-potable water system are summarized on **Sheet No. G-008** in **Volume 2**.

Parts of the potable water system pipe network which have been identified to be leaking will be replaced through this project.

3.17.4. HVAC

Existing buildings are equipped with HVAC systems as needed. All new buildings proposed in this project will be designed with HVAC systems in accordance with regulatory code as described in Chapter 4.

3.17.5. SCADA

The existing aeration system, RAS/WAS system, solids thickening, dechlorination, and grit removal system can be monitored and controlled via a SCADA computer onsite. The operators have previously requested a SCADA system where remote checks and changes could be made. All equipment which will be installed through this project will be connected to SCADA for remote monitoring and control.

3.17.6. Site Security

The WWTP currently has a fence that surrounds the site. Additional site security will be provided with the planned installation of security cameras around the plant. The location of the new administration building at the entrance to the WWTP will also allow monitoring of incoming and outgoing visitors.

3.17.7. Cost Estimate

Electrical and HVAC costs were included in the cost estimates for the previously discussed processes. Costs for the administration building, NPW and potable water systems, and SCADA integration are presented in Table 3-35: Ancillary Improvements Cost Estimate.

TABLE 3-35: ANCILLARY IMPROVEMENTS COST ESTIMATE

Item	Administration Building	
Site Work - Administration Building	$	50,000
CMU Building and HVAC - Administration Building	$	1,545,000
Lab Equipment - Administration Building	$	150,000
NPW System & Installation	$	210,000
Potable Water System Improvements	$	100,000
SCADA Integration	$	1,000,000
Subtotal	**$**	**3,055,000**
General Conditions (10%)	$	306,000
Subtotal	**$**	**3,361,000**
Contingency (40%)	$	1,345,000
Subtotal	**$**	**4,706,000**
Contractor OH&P (15%)	$	706,000
Subtotal	**$**	**5,412,000**
Professional Services (20%)	$	1,100,000
Total Estimated Project Cost	**$**	**6,512,000**
Utilities	$	15,000
Lab Supplies (Chemicals, Parts)	$	19,000
Maintenance	$	2,000
Labor	$	192,000
Annual Expenses	***$***	***228,000***
20-Year Life Cycle Cost	**$**	**9,905,000**

3.17.8. Operations and Maintenance Assessment

The electrical system will be monitored through SCADA. With new electrical distribution equipment throughout the site reliability and maintenance costs related to the electrical system should decrease significantly.

The NPW equipment will be tied into the WWTP's SCADA system to allow for monitoring and alarms. Overall potable water usage and associated costs at the WWTP should decrease due to the expansion of the non-potable water network and removal of leaky pipes.

Having a centralized SCADA system where equipment can be controlled and monitored will make operation of the WWTP more streamlined.

3.17.9. Cold Weather Operation

The utility power and standby power sources will operate under cold weather conditions. Exposed pipes will be heat traced as needed to prevent freezing.

The non-potable water pump stations and holding tank will be installed indoors and will not be subject to freezing. All non-potable and potable water lines will be buried below the frost depth or heat-insulated where above-ground.

3.17.10. Construction Sequencing

The administration building is planned to be constructed in an area where there are no existing structures. Abandonment and demolition of the existing administration building will need to be phased to maintain operation of secondary treatment.

The new electrical service will be installed in the first phase of the project. Power will be distributed to new facilities through the new electrical service as they are built. Temporary service to the existing 480Vac switchboard may be needed during the phases of construction from the new service. A main switchboard will distribute power to motor control centers in electrical rooms throughout the site. The existing service will be demolished when it is no longer needed for operation.

The new non-potable water pump station will need to be installed before the chlorine contact chamber is taken offline. Installation of new water lines should be timed in parallel with other process pipe installation at the WWTP so that trenching and earthwork is minimized.

A construction sequencing plan is presented in Chapter 6.

CHAPTER 4 - CODE PROVISIONS

4.1. ARCHITECTURAL

Sheet No. S-001 General Structural Notes in **Volume 2** contains structural design standards applicable to the construction of new structures. The new buildings will be constructed to match the architecture of the existing buildings, giving the WWTP an overall uniform aesthetic. They will be designed according to the 2024 IBC. The design will incorporate materials and construction with high thermal resistance. Lighting will be LED with automatic controls. Building entrances will be easily identifiable with adequate lighting. Applicable building occupancy and use requirements are shown in Table 4- 1: Building Code Requirements. The project will be designed according to the codes in Section 4.4.

TABLE 4- 1: BUILDING CODE REQUIREMENTS

Building	Occupancy	Construction Type	Allowable Stories	Allowable Area	Classification
New Primary Filter Building	F-1	VB	1	8,500 sf	Unclassified
New Process Basin Building	F-1	VB	1	8,500 sf	Unclassified
New Secondary Clarifiers	F-1	VB	1	8,500 sf	Unclassified
New UV Building	F-1	VB	1	8,500 sf	Unclassified
New Blower Building	F-1	VB	1	8,500 sf	Unclassified
New Administration Building	F-1	VB	2*	25,500 sf	Unclassified

*Building must be sprinklered.

4.2. HVAC

The HVAC system for all new occupied spaces and equipment spaces will be designed to provide:

- Ventilation to meet National Fire Protection Association (NFPA) code requirements.
- Heating to keep enclosed areas from freezing (40 to 50°F).
- Heating of occasional occupancy areas to human comfort levels (60 to 70°F).
- Cooling of equipment rooms with electronic control equipment to maintain a temperature below 85°F.

NFPA 820 establishes minimum standards for ventilation of WWTP buildings to protect against fire and explosion hazards. Hazardous classifications used in NFPA 820 are defined in the National Electrical Code. WWTPs have Class I hazards, which are flammable gases. Areas in the plant where flammable gases exist under regular operation are classified as Class I Division I. Areas where liquid or gas is confined in closed tanks or piping and can only escape during an abnormal event are classified as Class I Division II. All other areas are unclassified. Ventilation (6 or 12 air changes per hour, as specified in NFPA) may be used to lower the hazardous classification of an area.

HVAC improvements will include the installation of louvers, relief dampers, exhaust fans, supply fans, ductless air conditioners, unit heaters, supply fans, temperature sensors, thermostats, and direct digital controllers.

4.3. ELECTRICAL

Power will be supplied by Avista Utilities. The equipment power supply will be designed for 480-volt, 3-phase power. The electrical system for all new occupied spaces will be designed to meet code requirements. Electrical classification and ventilation requirements for buildings at WWTPs are determined by the NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities. A separate electrical room would be required for all electrical panels and components not rated for a given classified environment. Table 4- 2: WWTP Electrical Requirement Summarysummarizes the electrical requirements for each improvement. Solids handling equipment improvements are not included in Table 4- 2: WWTP Electrical Requirement Summaryas the design of these improvements is outside the scope of this project, but future design will need to take into account those loads.

TABLE 4- 2: WWTP ELECTRICAL REQUIREMENT SUMMARY

Building/Area	Equipment	Existing/New	Power Requirements per Unit (HP)	Number of Units
Headworks	Bar Screen	New	1.5	2
Headworks	Screenings Washer Compactor	New	5	2
Headworks	Grit Chamber	New	1.5	1
Headworks	Grit Removal Pump	New	10	1
Headworks	Grit Washer	New	1	1
Primary Filters/Lift Station	Primary Filter Drives	New	5	2
Primary Filters/Lift Station	Backwash Pumps	New	20	2
Primary Filters/Lift Station	Solids Pumps	New	20	2
Primary Filters/Lift Station	Primary Effluent Pumps	New	60	2
Primary Filters/Lift Station	Primary Effluent Pumps	New	35	2
Process Basins	Air Compressors	New	7.5	2
Secondary Clarifiers	Clarifiers Mechanisms	New	1.5	4
Secondary Clarifiers	Scum Pumps	New	5	1
Phosphorus Removal System	Alum Feed Pumps	New	0.25	2
UV Building	UV Equipment	New	16	6
UV Building	Utility Water Pumps	New	15	2
UV Building	Utility Water Pumps	New	8	1
Blower Building	Blowers	New	100	3
RAS/WAS Building	RAS Pumps	New	35	3
RAS/WAS Building	WAS Pumps	New	5	2
RAS/WAS Building	Scum Pump	New	5	1
Odor Control	Fan Motor	New	6.5	1

4.4. CODES AND STANDARDS

The following codes and standards shall be used as applicable for the design of WWTP improvements:

- International Building Code (IBC).
- Uniform Plumbing Code.
- ASTM Material Standards.
- International Mechanical Code (IMC).
- Standard for Protection in Wastewater Treatment and Collection Facilities (NFPA 820).

- National Electric Code (NFPA 70).
- AISC Manual of Steel Construction.
- ACI 318 Building Code Requirements for Reinforced Concrete.
- IDAPA 58.01.16 Wastewater Rules.
- Hydraulic Institute Standards.
- American Water Works Association (AWWA).
- Institute of Electrical and Electronics Engineers (IEEE).
- National Electrical Manufacturer's Association (NEMA).
- Underwriter's Laboratories (UL).
- Association of Edison Illuminating Companies (AEIC).
- Insulated Cable Engineer's Association (ICEA).
- Illuminating Engineering Society (IES).
- National Fire Protection Association (NFPA).
- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- American Society of Mechanical Engineers (ASME).
- Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).

CHAPTER 5 - PROJECT IMPACT

5.1. COST ESTIMATE

The engineer's opinion of construction cost (OPCC) for all planned improvements through this project is presented in Table 5- 1: WWTP Improvements Project Cost Estimate. For additional detail on what was taken into account in the OPCC, refer to the project drawings in **Volume II**. The OPCC includes a 40% contingency. Keller uses the Association for the Advancement of Cost Engineering (AACE) recommendations for estimate accuracy when developing OPCCs. AACE generally aligns estimate accuracy with the degree of project definition, technical complexity, and availability of appropriate cost reference information. AACE estimate classes range from Class 1 (e.g., bid documents with design deliverables definition between 65 to 100%) to Class 5 (e.g., planning level between 0 and 2% level of completion). Class 1 estimates have an expected accuracy between -5% to +10 and Class 5 estimates have expected accuracy ranges between -50% on the low end and +50% on the high end. In other words, the lower maturity level of project definition (i.e., percent of design completion plus the items discussed previously), the lower the range of estimate accuracy and the higher variation between low and high estimates.

Keller's OPCC is an AAEC Class 4 estimate because of the level of design completion and the potential variability in costs due to supply chain issues, bidding climate, and worker availability. In general, Keller typically recommends that owners plan and budget projects using OPCCs presented in the moderate to high end because it can provide for more realistic outcomes when communicating costs to stakeholders and when piecing funding packages together for design and construction.

The City may implement a phased approach to the planned improvements to reduce initial capital costs. A phasing plan is presented in Chapter 6, and the cost estimates associated with each phase are included in **Appendix C**. If the project is broken out into phases (each with different designs and construction contracts), costs will likely be higher; the most economical way is to perform the work as one project, and the cost estimates in this PER assume all proposed improvements will be conducted in one project.

TABLE 5- 1: WWTP IMPROVEMENTS PROJECT COST ESTIMATE

Item	Estimated Cost	
Site Work	$	4,355,000
Yard Piping	$	1,981,000
Bypass Pumping/Power	$	600,000
Generator	$	1,200,000
Headworks	$	2,848,000
Odor Control	$	446,000
Primary Filters and Pump Station	$	11,572,000
Process Basins	$	10,823,000
Blower Building	$	2,034,000
Secondary Clarifiers	$	12,635,000
RAS and WAS Pumps	$	438,000
UV Disinfection	$	2,812,000
Administration Building	$	1,745,000
Non-Potable Water System	$	210,000
SCADA Integration	$	1,000,000
Solids Handling	$	6,250,000
Subtotal	**$**	**60,949,000**
General Conditions (10%)	$	6,095,000
Subtotal	**$**	**67,044,000**
Tariffs, BABA, etc. (8%)	$	5,364,000
Subtotal	**$**	**72,408,000**
Contingency (30%)	$	21,723,000
Subtotal	**$**	**94,131,000**
Contractor OH&P (15%)	$	14,120,000
Subtotal	**$**	**108,251,000**
Professional Services (20%)	$	21,700,000
Total Estimated Project Cost	**$**	**130,000,000**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Keller has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

5.2. OPERATOR CLASSIFICATION

The existing WWTP is considered a Class IV plant, which is the highest DEQ classification. The proposed improvements will increase the plant score, rather than reduce it. Therefore, there will be no impact to the plant classification, and the WWTP will maintain its Class IV status.

5.3. SAMPLING AND MONITORING REQUIREMENTS

The WWTPFP summarized the sampling and monitoring requirements from the WWTP's 2018 NPDES permit. The permit is included in **Appendix A**. No additional sampling or monitoring is expected to be required as a result of these improvements.

5.4. OPERATIONS AND MAINTENANCE

The projected O&M costs for the WWTP improvements are shown in Table 5-2: Annual O&M Costs. O&M costs are shown for all proposed alternatives and do not include the solids handling processes.

TABLE 5-2: ANNUAL O&M COSTS

Materials & Services	Annual Cost
Proposed Alternatives	
Utilities	$ 368,000
Parts	$ 260,000
Chemicals	$ 325,000
Personnel	$ 492,000
Total	**$ 1,445,000**

CHAPTER 6 - PROJECT IMPLEMENTATION

6.1. CONSTRUCTION SCHEDULE

The implementation of the Sandpoint Wastewater Treatment Plant (WWTP) improvements involves a multitude of activities, each critical to the project's success. The construction schedule is influenced by several significant factors, including available project funding and the chosen delivery method. These factors introduce uncertainties that can drastically impact the timeline for the proposed improvements.

A simplified schedule can be seen below in Table 6- 1: WWTP Improvements Project Schedule with the detailed schedule in the Appendix **F**; they have been developed based on the assumption of a traditional design-build delivery method, with all improvements occurring as a single project. This approach provides a comprehensive overview of the project from start to finish. However, alternative delivery methods may offer opportunities to streamline the schedule and potentially reduce the overall project duration.

To reduce schedule for all delivery methods, pre-procurement of equipment with long lead times is essential. Long lead items, such as generators, control panels, specialized wastewater treatment equipment, often require months to years from order to delivery. Early identification and strategic procurement of these items can significantly reduce the risk of schedule disruptions. By ordering long lead equipment well in advance, the project can ensure timely arrival and installation, thereby maintaining the overall project timeline.

Funding and project budget constraints are pivotal in determining the construction schedule. If funding is limited or the project budget is reduced, it may necessitate phasing the improvements over several years, which could extend the timeline significantly. This phased approach would require careful planning and coordination to ensure each phase aligns with the overall project goals and objectives. Once the funding and delivery methods are finalized, an updated construction schedule should be provided to reflect these decisions.

TABLE 6- 1: WWTP IMPROVEMENTS PROJECT SCHEDULE

Description	2024	2025	2026	2027	2028	2029	2030	2031
PER	🟩	🟩						
Bonding/Funding		🟩	🟩					
30% Design Package		🟩	🟩					
Final Design			🟩	🟩				
Bidding and Award				🟩				
Construction				🟩	🟩	🟩	🟩	
Contractor Warranty Period							🟩	🟩

6.2. PROJECT DELIVERY METHODS

The Sandpoint WWTP Alternative Delivery presentation, held on March 4, 2025, aimed to review various project delivery alternatives and identify the best fit for the City and the project. The meeting emphasized the importance of cost management to reduce the risk of exceeding the project budget, timely completion of design and construction, and minimizing the impact on current WWTP operations. It also highlighted the need for direct City input during the design phase and the different approaches to risk allocation associated with each delivery method. Other factors such as agency experience, contractor tolerance, and the level of Owner involvement were also considered crucial in selecting the appropriate delivery method.

The presentation outlined several unique project challenges, including unknown funding types and amounts, project sequencing and phasing, existing facilities conditions and risks, and the City's available funds to begin some of the work. These challenges significantly influence the project's schedule and overall execution.

Five delivery methods were reviewed: Design-Bid-Build (DBB), Construction Manager/General Contractor (CM/GC), Progressive Design Build (PDB), Fixed Price Design Build, and Design-Build-Operate (DBO). Each method was analyzed for its pros and cons. DBB is familiar to the contracting community and regulatory agencies, offers Owner control of design, and has the lowest initial cost but lacks contractor input during design and has the longest delivery schedule. CM/GC allows for increased collaboration during design, cost estimating, and phasing input but involves a preconstruction fee and a more complex selection process. PDB offers a single contract for the City to manage, increased collaboration, and cost estimating during design but includes additional costs for an Owner advisor and a preconstruction fee. Fixed Price Design Build emphasizes speed of delivery with known project cost and schedule early in the process but has limited scope flexibility and potentially higher change orders. DBO extends services beyond construction, leading to operational efficiency but involves higher initial costs and long-term dependency on the contractor.

The next steps involve the City selecting the delivery method and developing a plan to implement the chosen method. This decision will be crucial in ensuring the project's success and addressing the unique challenges identified during the meeting. It’s anticipated the delivery method may be dependent on funding type and overall budget, which in result could change project scope and phasing.

6.3. CONSTRUCTION PHASING PLAN

An overall site plan with proposed improvements is included on Sheet No. C-120 in Volume 2. From this site layout, a phasing and construction sequencing plan has been developed. Breaking the proposed improvements into smaller subprojects may help reduce the capital cost barrier and improve the construction feasibility. Figures showing the phased improvements are included in **Appendix C**, and phases are summarized below.

6.3.1. Phase 1 – Demolition of Storm Clarifier

This phase includes the demolition of the existing storm clarifier and associated inlet and outlet piping. Flows will continue to be treated through the existing processes, including headworks and primary clarifiers. No bypass pumping or shutdowns are required during this phase.

6.3.2. Phase 2 – Construction of Primary Filters and Influent Pump Station

This phase includes the construction of the new Primary Filter/Influent Pump Station Building (Structure B) and associated piping. Primary effluent piping will be routed near the location of where the new Aeration Basins (Structure C) will be constructed (Phase 4). Temporary primary effluent piping will be connected to the existing primary clarifier effluent piping, upstream of the wet well in the existing Secondary Control Building.

A new sludge blending tank will be constructed to blend secondary WAS with new primary sludge. Discharge from the existing secondary WAS pumps will be rerouted to this tank and the existing primary sludge pumps will be repurposed to pump the blended sludge from this tank to the rotary drum thickener. Short duration shutdowns will be required to make the respective pipe connections.

Structure B houses the new primary service feed and switchgear. This phase will require several short duration electrical shutdowns to tie over existing feeds from the existing primary service point to this building. These shutdowns will be conducted during low flow events and will be staggered to ensure adequate treatment is maintained.

6.3.3. Phase 3 – Demolition of Existing Primary Clarifiers

This phase covers the demolition of the primary clarifiers and associated structures in preparation for the construction of the new Aeration Basins. This phase only begins once successful operation of Structure B is verified.

Structures to be removed include both primary clarifiers, the detention tank and overflow pumps, the distribution box, gravity thickener and influent Parshall flume. The Primary Solids Pump Station will need to remain in service to continue to deliver primary sludge to the thickener. Additionally, this building houses the digester boiler, which must remain in service until new digester improvements are completed.

Short duration shutdowns or bypasses are anticipated to disconnect primary clarifier piping from active service pipelines.

6.3.4. Phase 4 – Construction of New Aeration Basins

This phase covers the construction of the new Aeration Basins (Structure C), the new blower building (Structure G) and the new Secondary Clarifier Splitter Box (Structure D), as well as all associated interconnecting piping and electrical services. New return activated sludge piping will be constructed from the existing Blower Room (which houses the existing RAS pumps) to connect to Structure C and allow RAS from the existing secondary clarifiers to be returned to the new Aeration Basins once completed. Piping stub outs from Structure D will also be provided to allow for simple connections to the new secondary clarifiers.

Power for new equipment and buildings will be fed from Structure B and will not require electrical shutdowns. All structures can be constructed without disturbances to remaining structures or without impacting treatment capabilities. New influent piping to Structure C can be connected from Structure B without shutdowns.

New effluent piping from Structure C will be constructed up to Structure D and will have a portion of temporary piping connecting to the effluent pipe from the existing aeration basins. This will require a shutdown to connect the temporary piping. This temporary pipe will be put into service once the existing aeration basin is taken offline.

6.3.5. Phase 5 – Demolition of Existing Aeration Basins

This phase will cover the demolition of the existing aeration basins, blowers and RAS pumps. This phase also includes the conversion of the wet well in the Secondary Control Building to a sludge blending tank. The existing secondary clarifiers will continue to operate during this phase. The existing trailer-based administration building will be relocated during this phase. The existing flare will also need to be relocated during this phase.

Short duration shutdowns or bypasses are anticipated to disconnect aeration basin piping from active service pipelines. Short duration electrical shutdowns may be required to disconnect existing motor loads.

6.3.6. Phase 6 – Construction of New Secondary Clarifiers

This phase will include the construction of the new secondary clarifiers, new RAS, WAS and scum pumps, new chemical storage and dosing systems, and associated piping. Once this new infrastructure is operational, the existing secondary clarifiers can be decommissioned.

The new secondary clarifiers can be constructed without disturbance to the existing remaining infrastructure or treatment processes. The new effluent piping from these clarifiers will be connected to the manhole upstream of the chlorine contact basins. This will require a short duration shutdown to make the connection. A stub out from the new effluent piping will also be provided near the location of the new UV building (Phase 7).

The new RAS pumps will be installed where the former aeration blowers were located. The existing RAS pumps will need to be removed prior to the installation of new WAS pumps and chemical dosing systems. This will be done after the new RAS pumps are operating. Short duration shutdowns or bypasses are anticipated to connect new piping to active service pipelines. Short duration electrical shutdowns may be required to connect new services.

6.3.7. Phase 7 – Construction of New UV Building

This phase includes the demolition of one of the existing secondary clarifiers, the construction of a new UV building (Structure F) in its place, and the decommissioning and/or demolition of the existing chlorine building and chlorine contact basins and associated structures.

Once Structure F is operational, effluent piping from the new secondary clarifiers will be connected to the building, and effluent piping from Structure F will be connected back into the effluent piping. This will require a short duration shutdown to accommodate this connection. New utility water pumps and utility water piping would also be constructed during this phase. Short duration shutdowns of the utility water system would be required for these connections. No electrical shutdowns are anticipated for this phase.

6.3.8. Phase 8 – Construction of Headworks Improvements

This phase includes the modifications of the existing screenings building to accommodate new screens, the construction of the new grit trap and modifications to the existing Grit Classifier Building to accommodate the new grit washer. This phase can be completed at any point after the completion of Phase 2, as the new headworks equipment will be powered out of Building B.

The screening area would need structural modifications to the channels to accommodate the larger screens. This work would be accomplished one channel at a time, to allow continuous screening treatment. Other improvements to this building could be accomplished without disrupting treatment.

The new grit removal system would be constructed adjacent to the existing grit system and will be completed without disrupting grit removal treatment. A short duration shutdown would be required to modify the existing bypass channel to direct flow through the new grit trap.

The grit classifier building structural modifications will be completed without disrupting grit classification treatment. The installation of the new grit washer will require a pause in grit treatment until the installation is complete. This is anticipated to be less than one month. The downstream primary filter process will continue to function adequately during this period.

6.4. PROJECT PHASING CONSIDERATIONS

Where funding for the full project described above is not available, this section discusses phasing the project over longer periods of time, as additional funding becomes available. This considers each phase of the project as a separate construction project, with all necessary construction activities, such as construction management, mobilization, and so forth. Predecessor activities, or separate projects, which are necessary for each “sub-project”, are provided to give clarity as to which projects can be implemented with initial funding sources, and which projects rely on the completion of other sub-projects prior to completion. Potential future impacts should each phased project be implemented are also discussed. Estimated costs for each phase are also provided.

Note that for each separate phase of the project that is broken out, additional costs and schedule impacts could occur. Some of these impacts include: remobilization efforts, increased costs due to inflation, redesign efforts if original designs lay latent for long periods of time, rebidding efforts, risk of fewer years of service as current designs are based on the 20-year planning period, risk of changes to permit. The City should consider these potential risks as it considers how to phase the project based on available funding.

6.4.1. Headworks Improvements

Description: This phase of the project could consist of the headworks screening and building improvements, as well as the grit removal system and associated piping and building modifications. This project could be further phased out where screening and grit are separate phases; however, as the cost of this particular project is relatively small, there is not much value in separating these out.

While the existing primary electrical service can likely support this phase of the project, refeeding of power from new primary power source will be required once this service is in place. Additional bypass pumping or temporary shutdowns will be required after this project once the primary treatment phase of the project is implemented.

Other consideration for this phase of the project is that delaying this project could result in more frequent maintenance or replacement costs of downstream equipment, such as primary filters, aeration basins and solids handling processes.

Predecessor Activities: None. This project could be completed independently of other projects.

Phase Project Costs: The following table illustrates estimated costs for this phase of the project.

TABLE 6-2: HEADWORKS PHASE COSTS

Item	Estimated Cost	
Site Work	$	99,000
Bypass Pumping/Power	$	50,000
Headworks	$	2,848,000
Odor Control	$	446,000
SCADA Integration	$	75,000
Subtotal	**$**	**3,518,000**
General Conditions (10%)	$	352,000
Subtotal	**$**	**3,870,000**
Tariffs, BABA, etc. (8%)	$	310,000
Subtotal	**$**	**4,180,000**
Contingency (30%)	$	1,254,000
Subtotal	**$**	**5,434,000**
Contractor OH&P (15%)	$	816,000
Subtotal	**$**	**6,250,000**
Professional Services (20%)	$	1,300,000
Total Estimated Project Cost	**$**	**7,550,000**

6.4.2. Primary Treatment and Influent Pumping

Description: This phase of the project would include new primary treatment and influent pumping, based on the recommendations provided in Chapter 3. Where new aeration basins are not completed as part of this phase of the project, these new influent lift station could require long-term (likely buried) temporary piping to the existing intermediate lift station, or directly to the existing aeration basins. In the case of the prior, additional annual costs would likely be incurred due to pumping twice to the aeration basins. When the new aeration basins are constructed, new piping and temporary shutdowns could be required.

Predecessor Activities: Pilot testing and final selection of primary treatment technology is necessary before implementing this phase of the project. New primary electrical service will also likely be required as part of this project. Demolition of the existing storm clarifier and associated infrastructure would be required prior to this project being constructed. Where the City has selected a dry pit influent lift station as part of the same building as the filters, this would also need to be completed.

Phase Project Costs: The following table illustrates estimated costs for this phase of the project.

TABLE 6-3: PRIMARY TREATMENT PHASE COSTS

Item	Estimated Cost	
Site Work	$	1,215,000
Yard Piping	$	691,000
Bypass Pumping/Power	$	200,000
Generator	$	750,000
Primary Filters and Pump Station	$	11,572,000
SCADA Integration	$	200,000
Subtotal	**$**	**14,628,000**
General Conditions (10%)	$	1,463,000
Subtotal	**$**	**16,091,000**
Tariffs, BABA, etc. (8%)	$	1,288,000
Subtotal	**$**	**17,379,000**
Contingency (30%)	$	5,214,000
Subtotal	**$**	**22,593,000**
Contractor OH&P (15%)	$	3,389,000
Subtotal	**$**	**25,982,000**
Professional Services (20%)	$	5,200,000
Total Estimated Project Cost	**$**	**31,182,000**

6.4.3. Aeration Basins

Description: This phase of the project would need to include the new aeration basins, along with all internal appurtenances, the blower building, and associated yard piping. The new secondary clarifiers are not required to be constructed with this phase; where this is the case, long term temporary piping from the new aeration basins to the existing secondary clarifiers would need to be installed. Depending on the capacity of the existing RAS pumps, the new RAS pumps may need to be constructed with this project. The existing WAS pumps could remain in place.

Predecessor Activities: As the new aeration basins will be located where the existing primary clarifiers are currently located, the primary treatment and influent pumping phase of the project must be completed prior to this phase of the project. The new primary electrical service would also likely be required as part of this project. A future shutdown or bypass pumping operation would likely be required when the new secondary clarifiers are constructed.

Phase Project Costs: The following table illustrates estimated costs for this phase of the project.

TABLE 6-4: AERATION BASIN PHASE COSTS

Item	Estimated Cost	
Site Work	$	1,300,000
Yard Piping	$	765,000
Bypass Pumping/Power	$	200,000
Process Basins	$	12,857,000
SCADA Integration	$	200,000
Subtotal	**$**	**15,322,000**
General Conditions (10%)	$	1,533,000
Subtotal	**$**	**16,855,000**
Tariffs, BABA, etc. (8%)	$	1,349,000
Subtotal	**$**	**18,204,000**
Contingency (30%)	$	5,462,000
Subtotal	**$**	**23,666,000**
Contractor OH&P (15%)	$	3,550,000
Subtotal	**$**	**27,216,000**
Professional Services (20%)	$	5,400,000
Total Estimated Project Cost	**$**	**32,616,000**

6.4.4. Secondary Clarifiers

Description: This phase of the project would include new secondary clarifiers, new scum removal, new RAS pumps (where not previously installed), new WAS and scum pumps. Where new UV disinfection equipment is not installed, long term temporary piping would need to be installed from the new secondary clarifiers to the chlorine contact basins (the flood stage pumps would also need to remain in service for high flood events).

Predecessor Activities: As the new secondary clarifiers will be located where the existing aeration basins are currently located, the new aeration basin phase of the project must be completed prior to this phase of the project. A future shutdown or bypass pumping operation would likely be required when the new UV disinfection process is constructed.

Phase Project Costs: The following table illustrates estimated costs for this phase of the project.

TABLE 6-5: SECONDARY CLARIFIER PHASE COSTS

Item	Estimated Cost	
Site Work	$	1,090,000
Yard Piping	$	340,000
Bypass Pumping/Power	$	200,000
Secondary Clarifiers	$	13,073,000
SCADA Integration	$	200,000
Subtotal	**$**	**14,903,000**
General Conditions (10%)	$	1,491,000
Subtotal	**$**	**16,394,000**
Tariffs, BABA, etc. (8%)	$	1,312,000
Subtotal	**$**	**17,706,000**
Contingency (30%)	$	5,312,000
Subtotal	**$**	**23,018,000**
Contractor OH&P (15%)	$	3,453,000
Subtotal	**$**	**26,471,000**
Professional Services (20%)	$	5,300,000
Total Estimated Project Cost	**$**	**31,771,000**

6.4.5. UV Disinfection and Utility Water

Description: This phase of the project would include the new UV disinfection equipment and building. Because the chlorine contact basins would be decommissioned as part of this phase, new utility water pumps and piping would also need to be constructed.

Predecessor Activities: Because the new UV building will be located at a higher hydraulic elevation than the current disinfection process, the new influent pump station, aeration basins and secondary clarifiers must be constructed first. Furthermore, where the City elects to construct the new UV building near the existing solids handling building, improvements to these processes may be required as the new UV building is located where the existing solids holding tank and dewatered feed pumping building is located.

Phase Project Costs: The following table illustrates estimated costs for this phase of the project.

TABLE 6-6: UV DISINFECTION PHASE COSTS

Item	Estimated Cost	
Site Work	$	545,000
Yard Piping	$	300,000
Bypass Pumping/Power	$	100,000
UV Disinfection	$	3,022,000
SCADA Integration	$	150,000
Subtotal	**$**	**4,117,000**
General Conditions (10%)	$	412,000
Subtotal	**$**	**4,529,000**
Tariffs, BABA, etc. (8%)	$	363,000
Subtotal	**$**	**4,892,000**
Contingency (30%)	$	1,468,000
Subtotal	**$**	**6,360,000**
Contractor OH&P (15%)	$	954,000
Subtotal	**$**	**7,314,000**
Professional Services (20%)	$	1,500,000
Total Estimated Project Cost	**$**	**8,814,000**

6.4.6. New Administration Building

Description: This phase of the project would include the new administration building. No other portions of the project are required to be constructed with this.

Predecessor Activities: There are no predecessor activities associated with the construction of a new administration building.

Phase Project Costs: The following table illustrates estimated costs for this phase of the project.

TABLE 6-7: ADMINISTRATION BUILDING PHASE COSTS

Item	Estimated Cost	
Site Work	$	255,000
Yard Piping	$	80,000
Administration Building	$	1,745,000
SCADA Integration	$	100,000
Subtotal	**$**	**2,180,000**
General Conditions (10%)	$	218,000
Subtotal	**$**	**2,398,000**
Tariffs, BABA, etc. (8%)	$	192,000
Subtotal	**$**	**2,590,000**
Contingency (30%)	$	777,000
Subtotal	**$**	**3,367,000**
Contractor OH&P (15%)	$	506,000
Subtotal	**$**	**3,873,000**
Professional Services (20%)	$	800,000
Total Estimated Project Cost	**$**	**4,673,000**

6.5. VALUE ENGINEERING OPPORTUNITIES

In addition to phasing the project into multiple projects, another funding strategy is to implement value engineering options. While these options come with some inherent downsides, such as more frequent maintenance or operator attention, the options presented here generally would meet the design requirements for treatment capacity and applicable regulatory requirements. The following opportunities are presented qualitatively and can be further investigated to identify more specific cost savings.

6.5.1. Wet Pit Pump Station

This option would eliminate the dry pit pump station design and base the influent pump station around a wet well with submersible pumps. This can potentially have significant cost savings for excavation, dewatering, soil stabilization and concrete costs. Furthermore, the primary treatment building and process could be located elsewhere on the site (with the assumption that the pump station would lift to the primary treatment after which wastewater would gravity flow to the aeration basins). This has additional savings for excavation costs for the building. Finally, the storm clarifier could be modified to serve as the wet pit, eliminating the need for additional concrete work.

6.5.2. Reduced Aeration Basin Sizing

As noted in Chapter 3 of this report, aeration basins are typically sized based on maintaining a certain sludge age (SRT) to promote biological health and improve nutrient removal. The target SRT of the design was 5 days. As noted, this SRT is not required to meet permit limits, but to encourage a stable biological system. The reduction of the SRT would proportionally reduce the required volume of the aeration basins and the associated costs for concrete, excavation, mechanical and electrical components. However, this value engineering option would expose the City to more risk of biological upsets as the system would have a more limited sludge age.

6.5.3. Partial Aeration Basin Construction

Another value engineering option associated with the aeration basins is to only construct two of the three treatment trains in this project. The existing aeration basin could either be retained or decommissioned. Whether the existing aeration basin is retained or not, this option would not have adequate capacity for the 20-year planning flows and loads and would only provide the City with a capacity for a limited amount of future growth. Note that the retention of the existing aeration basins would prevent the construction of at least one of the new secondary clarifiers.

It should be noted that this option, if teamed with retaining the existing aeration basins, would add some significant temporary piping and complex operations for the plant staff. These complex operations would include pumping to two different hydraulic elevations, maintaining biology in two separate basins, properly balancing RAS flow to each basin and multiple blower operations (new blowers would be needed for the new aeration basins).

6.5.4. Single New Secondary Clarifier Construction

This option would consider the construction of only one of the new secondary clarifiers. With this option, the two existing clarifiers would remain in operation. As noted above, if the existing aeration basins were retained, only the northernmost clarifier could be constructed.

As with partial aeration basin construction, this adds significant pumping and operational complexity to the plant staff, with new and existing RAS and WAS pumping, needs to maintain adequate sludge blankets in all clarifiers, properly controlling flow splitting and controlling downstream hydraulic flows to the chlorine contact basins.

CHAPTER 7 - ENVIRONMENTAL REVIEW

The environmental conditions at WWTP are discussed in the WWTPFP. The potential environmental impacts of the improvements are discussed below.

7.1. LAND USE / PRIME FARMLAND / FORMALLY CLASSIFIED LANDS

With the current project, there are no anticipated changes to the land use, as the improvements would be at WWTP on previously disturbed land.

7.2. FLOODPLAINS / WETLANDS

WWTP is located adjacent to the Pend Oreille River, a Zone AE area subject to inundation by the 1 percent annual chance flood, the 100-year flood according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). The base flood elevation in the area is 2,074 feet and the WWTP is outside of the regulatory floodway. The improvements are not anticipated to obstruct the flood plain or be in wetland areas.

7.3. CULTURAL, BIOLOGICAL, AND WATER RESOURCES

The improvements are on previously disturbed lands, and it is not anticipated that the improvements will interfere with cultural, biological, or water resources.

7.4. POTENTIAL CONSTRUCTION CONSIDERATIONS

The depth of the water table may affect the construction. Construction techniques to effectively manage excavation, dewatering, and sloughing issues would be required in construction plans. Construction plans should also include provisions to mitigate dust and site runoff. The contractor will be required to provide standard erosion mitigation measures during construction.

APPENDIX A

Permit

Revised Fact Sheet

The U.S. Environmental Protection Agency (EPA)
Proposes to Reissue a National Pollutant Discharge Elimination System (NPDES) Permit to Discharge Pollutants Pursuant to the Provisions of the Clean Water Act (CWA) to:

City of Sandpoint
Wastewater Treatment Plant

Public Comment Start Date: April 19, 2016
Public Comment Expiration Date: May 19, 2016

Technical Contact: Brian Nickel
206-553-6251
800-424-4372, ext. 3-6251 (within Alaska, Idaho, Oregon and Washington)
Nickel.Brian@epa.gov

The EPA Proposes To Reissue an NPDES Permit

The EPA proposes to reissue the NPDES permit for the facility referenced above. The draft permit places conditions on the discharge of pollutants from the wastewater treatment plant to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility.

This Fact Sheet includes:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions for the facility
- a map and description of the discharge location
- technical material supporting the conditions in the permit

State Certification

The EPA is requesting that the Idaho Department of Environmental Quality (IDEQ) certify the NPDES permit for this facility, under Section 401 of the Clean Water Act. Comments regarding the certification should be directed to:

Idaho Department of Environmental Quality
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue Suite 900
Seattle, Washington 98101-3140

Authorization to Discharge Under the National Pollutant Discharge Elimination System

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 *et seq.*, as amended by the Water Quality Act of 1987, P.L. 100-4, the "Act",

City of Sandpoint
Wastewater Treatment Plant
723 South Ella Ave
Sandpoint, ID 83864

is authorized to discharge from the wastewater treatment plant located in Sandpoint, Idaho, at the following location(s):

Outfall	Receiving Water	Latitude	Longitude
001	Pend Oreille River	48° 15' 40.5"	116° 33' 31"

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective December 1, 2017

This permit and the authorization to discharge shall expire at midnight, November 30, 2022.

The permittee shall reapply for a permit reissuance on or before June 3, 2022 if the permittee intends to continue operations and discharges at the facility beyond the term of this permit.

Signed this 5th day of September 2017.

/s/
Michael J. Lidgard, Acting Director
Office of Water and Watersheds

Effluent limitations for total phosphorus were withdrawn on January 9, 2018. Effluent limitations for total phosphorus shall become effective August 1, 2018.

Signed this 8th day of June 2018.

Daniel D. Opalski, Director
Office of Water and Watersheds

Schedule of Submissions

The following is a summary of some of the items the permittee must complete and/or submit to EPA during the term of this permit:

Item	Due Date
1. Discharge Monitoring Reports (DMR)	DMRs are due monthly and must be submitted on or before the 20th day of the month following the monitoring month (see III.B).
2. Quality Assurance Plan (QAP)	The permittee must provide EPA and IDEQ with written notification that the Plan has been developed and implemented by May 31, 2018 (see II.C). The Plan must be kept on site and made available to EPA and IDEQ upon request.
3. Operation and Maintenance (O&M) Plan	The permittee must provide EPA and IDEQ with written notification that the Plan has been developed and implemented by May 31, 2018 (see II.B). The Plan must be kept on site and made available to EPA and IDEQ upon request.
4. NPDES Application Renewal	The application must be submitted by June 3, 2022 (see V.B).
5. Surface Water Monitoring Report	The permittee must submit all surface water monitoring results for the previous calendar year for all parameters in an annual report to EPA and IDEQ by January 31st of the following year (see I.D).
6. Twenty-Four Hour Notice of Noncompliance Reporting	The permittee must report certain occurrences of noncompliance by telephone within 24 hours from the time the permittee becomes aware of the circumstances. (See III.G. and I.B.2.)
7. Local Limits Evaluation	By November 30, 2018, the permittee must submit to EPA a complete local limits evaluation pursuant to 40 CFR 403.5(c)(1). (See II.A.5.)
8. Annual Pretreatment Report	The Report must be submitted to the pretreatment coordinator no later than October 1st of each calendar year. (See II.A.9.)
9. Emergency Response and Public Notification Plan	The permittee must develop and implement an overflow emergency response and public notification plan. The permittee must submit written notice to EPA and IDEQ that the plan has been developed and implemented by May 31, 2018 (see II.E).
10. Mercury Minimization Plan	Written notice must be submitted to the EPA and the IDEQ that the plan has been developed and implemented by May 31, 2018 (see I.E.1).
11. Methylmercury Fish Tissue Monitoring Plan	The permittee must develop and submit a Methylmercury Fish Tissue Monitoring Plan to the Director of the Office of Water and Watersheds and the IDEQ for review and approval by November 30, 2018. (See I.E.2).

Table of Contents

I. Limitations and Monitoring Requirements

A. Discharge Authorization

During the effective period of this permit, the permittee is authorized to discharge pollutants from the outfalls specified herein to the Pend Oreille River, within the limits and subject to the conditions set forth herein. This permit authorizes the discharge of only those pollutants resulting from facility processes, waste streams, and operations that have been clearly identified in the permit application process.

B. Effluent Limitations and Monitoring

1. The permittee must limit and monitor discharges from outfall 001 as specified in Table 1, below. All figures represent maximum effluent limits unless otherwise indicated. The permittee must comply with the effluent limits in the tables at all times unless otherwise indicated, regardless of the frequency of monitoring or reporting required by other provisions of this permit.

Table 1: Effluent Limitations and Monitoring Requirements

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Sample Location	Sample Frequency	Sample Type
Flow	mgd	Report	—	Report	Effluent	continuous	recording
Temperature	°C	See Notes 10 and 11.			Effluent	continuous	recording
Biochemical Oxygen Demand (BOD$_5$)	mg/L	30	45	—	Influent and Effluent	3/week	24-hr. comp.
	lb/day	1251	1877	—			calculation
	% removal	85% (minimum)	—	—	% removal	1/month	calculation
Total Suspended Solids (TSS)	mg/L	30	45	—	Influent and Effluent	3/week	24-hr. comp.
	lb/day	1251	1877	—			calculation
	% removal	85% (minimum)	—	—	% removal	1/month	calculation
pH	s.u.	6.5 – 9.0 at all times			Effluent	daily	grab
E. Coli Bacteria[1,2]	#/100 ml	126 (geometric mean)	—	406 (instantaneous max.)	Effluent	10/month	grab
Total Residual Chlorine[2]	mg/L	0.348	—	0.912	Effluent	daily	grab
	lb/day	14.5	—	38.0			calculation
Mercury, Total[2,4]	µg/L	0.56	—	1.1	Effluent	1/month	24-hr. comp.
	lb/day	0.014	—	0.028			calculation
	µg/L	Report	—	Report	Influent	2/year[3]	24-hr. comp.
Phosphorus, Total as P June – September (Interim)	µg/L	Report	Report	—	Effluent	2/week	24-hr. comp.
	lb/day	96	125	—			calculation
Phosphorus, Total as P June – September[9] (Final)	µg/L	Report	Report	—	Effluent	2/week	24-hr. comp.
	lb/day	61	79	—			calculation
Phosphorus, Total as P October – May	µg/L	Report	Report	—	Effluent	2/week	24-hr. comp.
	lb/day	96	125	—			calculation
Ammonia, Total as N	mg/L	Report	—	Report	Effluent	1/month	24-hr. comp.
Nitrate + Nitrite	mg/L	Report	—	Report	Effluent	1/quarter[5]	24-hr. comp.
Total Kjeldahl Nitrogen	mg/L	Report	—	Report	Effluent	1/quarter[5]	24-hr. comp.
Soluble Reactive Phosphorus as P	mg/L	Report	—	Report	Effluent	1/month	24-hr. comp.

Effluent limitations for total phosphorus shall become effective August 1, 2018.

Table 1: Effluent Limitations and Monitoring Requirements

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Sample Location	Sample Frequency	Sample Type
Arsenic	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Cadmium, Total Recoverable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Chromium, Total	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Chromium VI, Dissolved	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Conductivity	µmhos/cm	Report	—	Report	Effluent	1/month[8]	24-hr. comp.
Copper, Total Recoverable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Cyanide, weak acid dissociable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	See I.B.10.
Dissolved organic carbon	mg/L	Report	—	Report	Effluent	1/month[8]	24-hr. comp.
Hardness, total	mg/L as $CaCO_3$	Report	—	Report	Effluent	1/month[8]	24-hr. comp.
Lead, Total Recoverable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Nickel, Total Recoverable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Silver, Total Recoverable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Zinc, Total Recoverable	µg/L	Report	—	Report	Influent & effluent	2/year[3]	24-hr. comp.
Polychlorinated Biphenyl (PCB) Congeners[6]	pg/L	Report	—	Report	Influent & effluent	2/year	24-hr. comp.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)[7]	pg/L	Report	—	Report	Influent & effluent	2/year	24-hr. comp.
Whole Effluent Toxicity, Chronic	TU_c	See I.C.			Effluent	See I.C.	24-hr. comp.
NPDES Application Form 2A Expanded Effluent Testing	—	See I.B.9.			Effluent	3x/5 years	—

Effluent limitations for total phosphorus shall become effective August 1, 2018.

Table 1: Effluent Limitations and Monitoring Requirements

Parameter	Units	Effluent Limitations			Monitoring Requirements		
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Sample Location	Sample Frequency	Sample Type

1. The average monthly E. Coli bacteria counts must not exceed a geometric mean of 126/100 ml based on samples taken every 3-7 days within a calendar month. See Part VI for a definition of geometric mean.
2. Reporting is required within 24 hours of a maximum daily limit or instantaneous maximum limit violation. See Parts I.B.2. and III.G.
3. See I.B.11.
4. The permittee must use an analytical method that can achieve a maximum ML less than or equal to that specified in Appendix A: Minimum Levels.
5. Quarters are defined as January – March, April – June, July – September, and October – December.
6. See I.B.12.
7. See I.B.13.
8. Samples for dissolved organic carbon, pH, hardness, and conductivity must be collected on the same day.
9. These effluent limits are subject to a compliance schedule. See II.F.
10. Temperature data must be recorded using micro-recording temperature devices known as thermistors. Set the recording device to record at one-hour intervals. Report the following temperature monitoring data on the DMR: monthly instantaneous maximum, maximum daily average, seven-day running average of the daily instantaneous maximum.
11. Use the temperature device manufacturer's software to generate (export) an Excel text or electronic ASCII text file. The file must be submitted annually to IDEQ by January 31 for the previous monitoring year along with the placement log. The placement logs should include the following information for both thermistor deployment and retrieval: date, time, temperature device manufacturer ID, location, depth, whether it measured air or water temperature, and any other details that may explain data anomalies.

2. The permittee must report within 24 hours any violation of the maximum daily limits or instantaneous maximum limits for the following pollutants: E. coli, total residual chlorine, and mercury. Violations of all other effluent limits are to be reported at the time that discharge monitoring reports are submitted (See III.B. and III.H.).

3. The permittee must not discharge floating, suspended, or submerged matter of any kind in amounts causing nuisance or objectionable conditions or that may impair designated beneficial uses of the receiving water.

4. Removal Requirements for BOD_5 and TSS: The monthly average effluent concentration must not exceed 15 percent of the monthly average influent concentration. Percent removal of BOD_5 and TSS must be reported on the Discharge Monitoring Reports (DMRs). For each parameter, the monthly average percent removal must be calculated from the arithmetic mean of the influent values and the arithmetic mean of the effluent values for that month. Influent and effluent samples must be taken over approximately the same time period.

5. The permittee must collect effluent samples from the effluent stream after the last treatment unit prior to discharge into the receiving waters.

6. For all effluent monitoring, the permittee must use sufficiently sensitive analytical methods which meet the following:

   a) Parameters with an effluent limit. The method must achieve a minimum level (ML) less than the effluent limitation unless otherwise specified in *Table 1 Effluent Limitations and Monitoring Requirements*.

   b) Parameters that do not have effluent limitations.

Effluent limitations for total phosphorus shall become effective August 1, 2018.

(i) The permittee must use a method that detects and quantifies the level of the pollutant, or

(ii) The permittee must use a method that can achieve a maximum ML less than or equal to those specified in *Appendix A. Minimum Levels.*

c) For parameters that do not have an effluent limit, the permittee may request different MLs. The request must be in writing and must be approved by EPA.

d) See also Part III.D *Monitoring Procedures.*

7. For purposes of reporting on the DMR for a single sample, if a value is less than the MDL, the permittee must report "less than {numeric value of the MDL}" and if a value is less than the ML, the permittee must report "less than {numeric value of the ML}."

8. For purposes of calculating monthly and weekly averages, except for E. coli, zero may be assigned for values less than the MDL, and the {numeric value of the MDL} may be assigned for values between the MDL and the ML. If the average value is less than the MDL, the permittee must report "less than {numeric value of the MDL}" and if the average value is less than the ML, the permittee must report "less than {numeric value of the ML}." If a value is equal to or greater than the ML, the permittee must report and use the actual value.

9. The permittee must perform the effluent testing required by Part D of NPDES application Form 2A (EPA Form 3510-2A, revised 1-99). The permittee must submit the results of this testing with its application for renewal of this NPDES permit. To the extent that effluent monitoring required by other conditions of this permit satisfies this requirement, these samples may be used to satisfy the requirements of this paragraph.

10. Influent and effluent sampling for cyanide must be conducted as follows. Eight discrete grab samples must be collected over a 24-hour period. Each grab sample must be at least 100 ml. Prior to compositing, any interferences must be removed or suppressed and the individual grab samples must be preserved as specified in Table II of 40 CFR 136.3. The grab samples can then be composited into a larger container to allow for one analysis for the day. The composited sample must also be preserved as specified in Table II of 40 CFR 136.3.

11. Sampling frequency for metals, selenium and cyanide:

a) For arsenic, cadmium, chromium, copper, cyanide, lead, nickel, selenium, silver and zinc, influent and effluent sampling must be conducted twice per year, once during the month of May and once during the month of November. For mercury, influent sampling must be conducted twice per year, once during the month of May and once during the month of November, and effluent sampling must be conducted as specified in Table 1. For each twice-per-year sampling event, the permittee must collect three 24-hour composite samples within a calendar week. The permittee must report the results of sampling for these parameters on the DMRs for the months when sampling is performed and in the pretreatment annual report required by Part II.A.9 of this permit.

b) Sludge: Sludge sampling must be conducted as described in Table 4 in Part II.A of this permit.

12. The permittee must use EPA Method 1668 Revision C (1668C) for analysis of PCB congeners. The permittee must target MDLs no greater than the MDLs listed in Table 2 of EPA Method 1668C (EPA-820-R-10-005) and must analyze for each of the 209 individual congeners. The permittee must report the results on the DMR for the last month of the monitoring period as total PCBs. The total PCB concentration must be calculated as the sum of the concentrations of all PCB congeners measured at concentrations greater than three times the concentration in the associated blank. The permittee must analyze a split of each influent and effluent PCB sample for total suspended solids (TSS). When the timing of sample collection coincides with that of the TSS sampling required in Table 1, analysis of the split sample will fulfill the TSS monitoring requirements of Table 1 as well. The permittee must submit the laboratory results of the PCB congener and TSS analyses as attachments to the DMRs.

13. The permittee must analyze influent and effluent samples for 2,3,7,8 TCDD and report the results as specified below.

    a) For analysis of influent and effluent samples for 2,3,7,8 TCDD, the permittee must use EPA Method 1613B and must target an ML no greater than 10 picograms per liter.

    b) The permittee must analyze a split of each influent and effluent 2,3,7,8 TCDD sample for TSS. When the timing of sample collection coincides with that of the TSS sampling required in Table 1, analysis of the split sample will fulfill the requirements of Table 1 as well.

    c) The permittee may discontinue influent and effluent sampling for 2,3,7,8 TCDD after the first three samples if no quantifiable 2,3,7,8 TCDD is measured in the influent or effluent in the first three samples. 2,3,7,8 TCDD is considered less than quantifiable if the concentration is less than the minimum level.

C. Whole Effluent Toxicity Testing Requirements

The permittee must conduct chronic toxicity tests on effluent samples from outfall 001. Testing must be conducted in accordance with subsections 1 through 7, below.

1. Toxicity testing must be conducted on 24-hour composite samples of effluent. In addition, a split of each sample collected must be analyzed for the chemical and physical parameters required in Part I.B, above, with a required sampling frequency of once per quarter or more frequently, using the sample type required in Part I.B. For parameters for which grab samples are required in Part I.B, grab samples must be taken during the same 24-hour period as the 24-hour composite sample used for the toxicity tests. When the timing of sample collection coincides with that of the sampling required in Part I.B, analysis of the split sample will fulfill the requirements of Part I.B as well.

2. Chronic Test Species and Methods

a) For Outfall 001, chronic WET testing must be conducted annually while the permit remains in effect. WET testing must begin during the 1st quarter of the first full calendar year (January 1 – December 31) after the effective date of the permit. To account for any seasonal variability in effluent quality, annual testing shall be conducted on a rotating quarterly schedule, so that each annual test is conducted during a different quarter than the previous year's test. After four years of testing (one test per year, each during a different quarter), the cycle is repeated. For the purposes of WET testing, the annual testing schedule is defined as follows:

(i) First full calendar year: 1st Quarter (January 1—March 31);

(ii) Second calendar year: 2nd Quarter (April 1—June 30);

(iii) Third calendar year: 3rd Quarter (July 1—September 30);

(iv) Fourth calendar year: 4th Quarter (October 1—December 31)

(v) Fifth calendar year, and thereafter: repeat rotating quarterly schedule, starting with monitoring during 1st Quarter.

b) The permittee must conduct the following two chronic toxicity tests on each sample, using the species and protocols in Table 2:

Table 2: Toxicity Test Species and Protocols

Freshwater Acute Toxicity Tests	**Species**	**Method**
Fathead minnow larval survival and growth test (method 1000.0)	*Pimephales promelas*	EPA-821-R-02-013
Daphnid survival and reproduction test (method 1002.0)	*Ceriodaphnia dubia*	EPA-821-R-02-013

c) The presence of chronic toxicity must be determined as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002.

d) Results must be reported in TU_c (chronic toxic units), which is defined as follows:

(i) For survival endpoints, $TU_c = 100/NOEC$.

(ii) For all other test endpoints, $TU_c = 100/IC_{25}$.

(iii) IC_{25} means "25% inhibition concentration." The IC_{25} is a point estimate of the toxicant concentration, expressed in percent effluent, that causes a 25% reduction in a non-quantal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., Interpolation Method).

(iv) NOEC means "no observed effect concentration." The NOEC is the highest concentration of toxicant, expressed in percent effluent, to which organisms are exposed in a chronic toxicity test [full life-cycle or partial life-cycle (short term) test], that causes no observable adverse effects on the test organisms (i.e., the highest concentration of effluent in which the values for the observed responses are not statistically significantly different from the controls).

3. Quality Assurance

   a) The toxicity testing on each organism must include a series of six test dilutions and a control. The dilution series must include 100%, 50%, 25%, 12.5%, 6.25%, and 1% effluent.

   b) All quality assurance criteria and statistical analyses used for chronic tests and reference toxicant tests must be in accordance with *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002, and individual test protocols.

   c) In addition to those quality assurance measures specified in the methodology, the following quality assurance procedures must be followed:

      (i) If organisms are not cultured in-house, concurrent testing with reference toxicants must be conducted. If organisms are cultured in-house, monthly reference toxicant testing is sufficient. Reference toxicant tests must be conducted using the same test conditions as the effluent toxicity tests.

      (ii) If either of the reference toxicant tests or the effluent tests do not meet all test acceptability criteria as specified in the test methods manual, the permittee must re-sample and re-test within 14 days of receipt of the test results.

      (iii) Control and dilution water must be receiving water or lab water, as appropriate, as described in the manual. If the dilution water used is different from the culture water, a second control, using culture water must also be used. Receiving water may be used as control and dilution water upon notification of EPA and IDEQ. In no case shall water that has not met test acceptability criteria be used for either dilution or control.

4. Reporting

   a) The permittee must submit the results of the toxicity testing with the December DMR. All WET test results must be resubmitted with the next permit application.

   b) The report of toxicity test results must include all relevant information outlined in Section 10, Report Preparation, of *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002. In addition to toxicity test results, the permittee must report: dates of sample collection and initiation of each test; flow rate at the time of sample collection; and the results of the monitoring required in Part I.B of this permit, for parameters with a required monitoring frequency of once per quarter or more frequently.

5. Preparation of initial investigation toxicity reduction evaluation (TRE) workplan: Prior to initiation of the toxicity testing required by this permit, the permittee must submit to EPA a copy of the permittee's initial investigation TRE workplan. This plan shall describe the steps the permittee intends to follow in the event that chronic toxicity is detected above 100 TU_c, and must include at a minimum:
    a) A description of the investigation and evaluation techniques that would be used to identify potential causes/sources of toxicity, effluent variability, treatment system efficiency;
    b) A description of the facility's method of maximizing in-house treatment efficiency, good housekeeping practices, and a list of all chemicals used in operation of the facility; and
    c) If a toxicity identification evaluation (TIE) is necessary, who will conduct it (i.e., in-house or other).
    d) The initial investigation TRE workplan must be sent to the following address:

US EPA Region 10
Attn: NPDES WET Coordinator
1200 Sixth Avenue
Suite 900 OWW-191
Seattle, WA 98101-3140

6. Accelerated testing: If chronic toxicity is detected above 100 TU_c, the permittee must comply with the following:
    a) The permittee must implement the initial investigation TRE workplan within 48 hours of the permittee's receipt of the toxicity results demonstrating the exceedance.
    b) The permittee must conduct six more bi-weekly (every two weeks) chronic toxicity tests, over a 12-week period. This accelerated testing shall be initiated within 10 calendar days of receipt of the test results indicating the initial exceedance.
    c) The permittee must notify EPA of the exceedance in writing at the address in Part I.C.5.d, above, within 5 calendar days of receipt of the test results indicating the exceedance. The notification must include the following information:
        (i) A status report on any actions required by the permit, with a schedule for actions not yet completed.
        (ii) A description of any additional actions the permittee has taken or will take to investigate and correct the cause(s) of the toxicity.
        (iii) Where no actions have been taken, a discussion of the reasons for not taking action.

d) If implementation of the initial investigation workplan clearly identifies the source of toxicity to the satisfaction of EPA (e.g., a temporary plant upset), and none of the six accelerated chronic toxicity tests required under Part I.C.6.b are above 100 TUc, the permittee may return to the regular chronic toxicity testing cycle specified in Part I.C.2.a.

7. Toxicity Reduction Evaluation (TRE)

a) If implementation of the initial investigation workplan does not clearly identify the source of toxicity to the satisfaction of EPA, or any of the six accelerated chronic toxicity tests indicate toxicity above 100 TUc, then the permittee must begin implementation of the toxicity reduction evaluation (TRE) requirements below. Implementation of the TRE requirements shall begin within 10 calendar days of receipt of the accelerated chronic toxicity testing results demonstrating the exceedance.

b) In accordance with the permittee's initial investigation workplan and EPA manual EPA 833-B-99-002 (*Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*), the permittee must develop as expeditiously as possible a more detailed TRE workplan, which includes:

(i) Further actions to investigate and identify the cause of toxicity;

(ii) Actions the permittee will take to mitigate the impact of the discharge and to prevent the recurrence of toxicity; and

(iii) A schedule for these actions.

c) The permittee may initiate a TIE as part of the overall TRE process described in the EPA acute and chronic TIE manuals EPA/600/6-91/005F (Phase I), EPA/600/R-92/080 (Phase II), and EPA-600/R-92/081 (Phase III).

d) If a TIE is initiated prior to completion of the accelerated testing, the accelerated testing schedule may be terminated, or used as necessary in performing the TIE.

D. Surface Water Monitoring

The permittee must conduct surface water monitoring. The program must meet the following requirements:

1. A monitoring station must be established in the Pend Oreille River upstream of the City of Sandpoint outfall.
2. The permittee must seek approval of the surface water monitoring station from IDEQ.
3. A failure to obtain IDEQ approval of surface water monitoring station does not relieve the permittee of the surface water monitoring requirements of this permit.
4. To the extent practicable, surface water sample collection must occur on the same day as effluent sample collection.
5. Mercury must be analyzed as total recoverable.

6. Samples must be analyzed for the parameters listed in Table 3.
7. Quality assurance/quality control plans for all the monitoring must be documented in the Quality Assurance Plan required under Part II.B., "Quality Assurance Plan".
8. Submission of SW Monitoring
    a) Surface water monitoring results must be reported on DMRs. Results for parameters monitored quarterly must be reported on the DMRs for the last month of each quarter. Results for PCBs must be reported on the June and December DMRs.
    b) The permittee must submit all surface water monitoring results for the previous calendar year for all parameters in an annual report to EPA and IDEQ by January 31st of the following year and with the application (see Part V.B of this permit, *Duty to Reapply*). The file must be in the format of one analytical result per row and include the following information: name and contact information of laboratory, sample identification number, sample location in latitude and longitude (decimal degrees format), or other real-world coordinate system (e.g., State Plane), method of location determination (i.e., GPS, survey etc.), date and time of sample collection, water quality parameter (or characteristic being measured), analysis result, result units, detection limit and definition (i.e., MDL etc.), analytical method, date completed, and any applicable notes.
9. For all surface water monitoring, the permittee must use sufficiently sensitive analytical methods which meet the following:
    a) The method must detect and quantify the level of the pollutant, or
    b) The permittee must use a method that can achieve MLs less than or equal to those specified in *Appendix A: Minimum Levels*. The permittee may request different MLs. The request must be in writing and must be approved by EPA.
10. Surface water monitoring for PCBs must be conducted twice per year. The first sample must be taken no later than June 30, 2018. The permittee may discontinue receiving water sampling for PCB congeners after the first year if no quantifiable PCB congeners are measured during the first year. PCB congeners are considered less than quantifiable if:
    a) The concentrations of all PCB congeners are less than the minimum level, or
    b) Both of the following conditions are true:
        (i) The concentrations of all detected PCB congeners are less than three times the associated blank concentrations, and
        (ii) The concentration of total PCBs in the associated blank is less than 300 pg/L.
11. Sample frequency for total mercury, conductivity, dissolved copper, dissolved organic carbon, dissolved lead, total ammonia as N, temperature, pH, and total hardness:

a) River samples for the above parameters must be collected at least quarterly during calendar years 2019, 2020, and 2021. Quarters are defined as January – March, April – June, July – September, and October – December.

b) River sampling for total mercury, conductivity, dissolved copper, dissolved organic carbon, dissolved lead, total ammonia as N, temperature, pH, and total hardness may be discontinued after collecting at least 12 samples spaced at least 1 month apart.

Table 3: Receiving Water Monitoring Requirements

Parameter and Units	Locations	Sample Frequency	Sample Type
Total Mercury (ng/L)^{3}	Upstream^{3}	See notes 1 and 3	See note 8
Methylmercury in Fish Tissue (mg/kg)	See I.E.2.		
Conductivity (µmhos/cm)	Upstream	See notes 1 and 4	See note 7
Dissolved Copper (µg/L)	Upstream	See notes 1 and 4	See note 6
Dissolved Organic Carbon (mg/L)	Upstream	See notes 1 and 4	See note 6
Dissolved Lead (µg/L)	Upstream	See note 1	See note 6
Total Ammonia as N (µg/L)	Upstream	See note 1	See note 6
Temperature (°C)	Upstream	See note 1	See note 7
pH (s.u.)	Upstream	See notes 1 and 4	See note 7
Total Hardness (mg/L as $CaCO_3$)	Upstream	See notes 1 and 4	See note 6
PCB Congeners^{2}	Upstream	2/year^{5}	See note 8

Notes:
1. See I.D.11.
2. The permittee must use EPA Method 1668C for analysis of receiving water samples for PCBs, must target MDLs no greater than the MDLs listed in Table 2 of EPA Method 1668C (EPA-820-R-10-005), and must analyze for each of the 209 individual congeners.
3. See also Part I.E.2.d.
4. Samples for dissolved organic carbon, pH, hardness, conductivity and copper must be collected on the same day.
5. See Part I.D.10.
6. The permittee must analyze a discharge-weighted composite of at least four samples taken across the width of the river. Increments must be chosen using the equal discharge increment method described in Section 4.1.3 of the USGS *National Field Manual for the Collection of Water Quality Data*. Samples need not be isokinetic. If the permittee demonstrates and documents that the cross-section is well-mixed, one sample may be taken at the centroid of flow. Only one analysis is required.
7. A minimum of four in-situ measurements must be taken across the width of the river. Increments must be chosen using the equal discharge increment method described in Section 4.1.3 of the USGS *National Field Manual for the Collection of Water Quality Data*. If the permittee demonstrates and documents that the cross-section is well-mixed, one in-situ measurement may be taken at the centroid of flow. In-situ measurements must be taken consistent with the procedures in Section 3.3.4 of the Idaho Department of Environmental Quality's *Beneficial Use Reconnaissance Program Field Manual for Streams*.
8. At least one grab sample must be taken at the centroid of flow. Samples need not be isokinetic or depth-integrated.

E. Methylmercury Requirements

1. Mercury Minimization Plan

The permittee must develop and implement a mercury minimization plan that identifies potential sources of mercury and the measures to reduce or eliminate mercury loading. Written notice must be submitted to the EPA and the IDEQ that the plan has been developed and implemented by May 31, 2018. Any existing mercury minimization plan may be modified for compliance with this section. The mercury minimization plan must include the following:

a) A Program Plan which includes the City's commitments for:
    (i) Identification of potential sources of mercury that contribute to discharge concentrations;
    (ii) Reasonable, cost-effective activities to reduce or eliminate mercury loadings from identified sources;
    (iii) Tracking mercury source reduction implementation and mercury source monitoring;
    (iv) Monthly monitoring of POTW effluent;
    (v) Twice per year monitoring of POTW influent;
    (vi) Resources and staffing.

b) Implementation of cost-effective control measures for direct and indirect contributors, and

c) An annual status report submitted to the US EPA, which includes:
    (i) A list of potential mercury sources;
    (ii) A summary of actions taken to reduce or eliminate mercury discharges to progress toward meeting water quality standards;
    (iii) Mercury source reduction implementation, source monitoring results, influent and effluent, and results for the previous year;
    (iv) Proposed adjustments to the Program Plan based on findings from the previous year.

2. Fish Tissue Sampling

a) Objective: The objective of the Methylmercury Fish Tissue Monitoring program is to collect reliable methylmercury fish tissue data, within a specific geographic area, to determine if fish tissue concentrations of methylmercury are compliant with Idaho's methylmercury fish tissue criterion of 0.3 mg/kg. The monitoring program may also be used to advise the public on safe levels of fish consumption.

b) Requirements: The permittee must develop and submit a Methylmercury Fish Tissue Monitoring Plan to the Director of the Office of Water and Watersheds and the IDEQ for review and approval by November 30, 2018. A failure to obtain approval of the Methylmercury Fish Tissue Monitoring Plan from the IDEQ or the Director of the Office of Water and Watersheds does not relieve the permittee of the fish tissue monitoring requirements of this permit. At a minimum the plan must include the following elements:

- (i) Monitoring stations where fish tissue samples will be collected: At least one monitoring station must be located in the Pend Oreille River downstream from the discharge.
- (ii) Name, address of organization collecting and analyzing fish tissue samples. The organization must have experience in the collection and analysis of methylmercury fish tissue samples.
- (iii) Develop a sampling plan that specifies sample target species, sample number and size, timing of sample collection, and all essential fish collection, handling, and shipping information for field sampling teams collecting fish. The plan must include a project description, detailed standard operating procedures (SOPs) for fish collection, and instructions for completing field forms and labels and for shipping fish samples. Protocols must be consistent with Chapter 4 of *Implementation Guidance for the Idaho Mercury Water Quality Criteria* (Idaho Department of Environmental Quality, 2005).
- (iv) Identify all protocols related to sample preparation methods and analytical methods to be used on samples.
- (v) Identify data quality goals for all sample collection and handling activities and describe the Quality Assurance/Quality Control (QA/QC) techniques employed by field teams to support those goals.

c) Sample Frequency:

- (i) Fish tissue sampling is required at least once during calendar years in which both of the following conditions are true:
  - (a) The maximum monthly average effluent concentration of total mercury during the prior calendar year was greater than 0.027 µg/L, and
  - (b) The permittee did not perform fish tissue sampling during the prior calendar year.

d) Water Column Mercury Sampling: At each sample location where fish are collected a surface water sample must be collected and analyzed for total mercury using an analytical method which achieves a method detection limit of 1.8 ng/L or lower. This water column mercury sampling is required in addition to the receiving water mercury monitoring required in Part I.D of this permit.

e) Reporting Requirements: The permittee must submit a report which lists the name, address and phone number of the entity collecting and analyzing samples; sample locations; target species used; sample size; time samples were collected; analytical methods used; results, and any other information relevant to the monitoring program. The permittee must submit the report to the EPA, the IDEQ and the Idaho Fish Consumption Advisory Board by March 31st of the year following sampling.

f) Revision to the Methylmercury Monitoring Plan: Any revisions to the Methylmercury Monitoring Plan must be approved by the IDEQ and the Director of the Office of Water and Watersheds.

II. Special Conditions

A. Pretreatment Requirements

1. Implementation

The permittee must implement its pretreatment program in accordance with the legal authorities, policies, procedures, staffing levels and financial provisions described in its original approved pretreatment program submission entitled *Industrial Pretreatment Program for the City of Sandpoint, Idaho*, dated January 6, 1984, any program amendments submitted thereafter and approved by EPA, and the general pretreatment regulations (40 CFR 403) and any amendments thereof. At a minimum, the permittee must carry out the following activities:

a) Enforce prohibitive discharge standards as set forth in 40 CFR 403.5(a) and (b), categorical pretreatment standards promulgated pursuant to Section 307(b) and (c) of the Act (where applicable), and local limitations and BMPs developed by the permittee in accordance with 40 CFR 403.5(c), whichever are more stringent and are applicable to non-domestic users discharging wastewater into the permittee's collection system. Locally derived limitations must be defined as pretreatment standards under Section 307(d) of the Act.

b) Implement and enforce the requirements of the most recent and EPA-approved portions of local law and regulations (e.g. municipal code, sewer use ordinance) addressing the regulation of non-domestic users.

c) Update its inventory of non-domestic users at a frequency and diligence adequate to ensure proper identification of non-domestic users subject to pretreatment standards, but no less than once per year. The permittee must notify these users of applicable pretreatment standards in accordance with 40 CFR 403.8(f)(2)(iii).

d) Issue, reissue, and modify, in a timely manner, industrial wastewater discharge permits to at least all Significant Industrial Users (SIUs) and categorical industrial users. These documents must contain, at a minimum, conditions identified in 40 CFR 403.8(f)(1)(iii), including Best Management Practices, if applicable. The permittee must follow the methods described in its implementation procedures for issuance of individual permits.

e) Develop and maintain a data management system designed to track the status of the permittee's non-domestic user inventory, non-domestic user discharge characteristics, and their compliance with applicable pretreatment standards and requirements. The permittee must retain all records relating to its pretreatment program activities for a minimum of three years, as required by 40 CFR 403.12(o), and must make such records available to EPA upon request. The permittee must also provide public access to information considered effluent data under 40 CFR 2.

f) Establish, where necessary, legally binding agreements with contributing jurisdictions to ensure compliance with applicable pretreatment requirements in 40 CFR Part 403 by industrial users within these jurisdictions. These legally binding agreements must identify the agency responsible for the various pretreatment implementation and enforcement activities in the contributing jurisdiction and outline the specific roles, responsibilities and pretreatment activities of each jurisdiction.

g) Carry out inspections, surveillance, and monitoring of non-domestic users to determine compliance with applicable pretreatment standards and requirements. A complete inspection of all SIUs and sampling of all SIUs' effluent must be conducted at least annually.

h) Require SIUs to conduct wastewater sampling as specified in 40 CFR 403.12(e) or (h). Frequency of wastewater sampling by the SIUs must be appropriate for the character and volume of the wastewater but no less than twice per year. Sample collection and analysis must be performed in accordance with 40 CFR 403.12(b)(5)(ii) through (v) and 40 CFR 136. In cases where the Pretreatment Standard requires compliance with a Best Management Practice or pollution prevention alternative, the permittee must require the User to submit documentation to determine compliance with the Standard. If the permittee elects to conduct all non-domestic user monitoring for any SIU instead of requiring self-monitoring, the permittee must conduct sampling in accordance with the requirements of this paragraph, and the requirements of 40 CFR 403.12(g)(2).

i) Enforce and obtain remedies for any industrial user noncompliance with applicable pretreatment standards and requirements. This must include timely and appropriate reviews of industrial reports to identify all violations of the user's permit, the local ordinance, and federal pretreatment standards and requirements. Once violations have been uncovered, the permittee must take timely and appropriate action to address the noncompliance. The permittee's enforcement actions must follow its EPA-approved enforcement response procedures.

j) Publish, at least annually, in a newspaper or newspapers of general circulation that provides meaningful public notice within the jurisdiction(s) served by the POTW, a list of all non-domestic users which, at any time in the previous 12 months, were in significant noncompliance as defined in 40 CFR 403.8 (f)(2)(viii).

k) Maintain adequate staff, funds and equipment to implement its pretreatment program.

l) Conduct an analysis annually to determine whether influent pollutant loadings are approaching the maximum allowable headworks loadings calculated in the permittee's most recent local limits calculations. Any local limits found to be inadequate by this analysis must be revised. The permittee may be required to revise existing local limits or develop new limits if deemed necessary by EPA.

2. Spill Prevention and Slug Discharges

   The permittee must implement an accidental spill prevention program to reduce and prevent spills and slug discharges of pollutants from non-domestic users.

   a) Control mechanisms for SIUs must contain requirements to control slug discharges if determined by the POTW to be necessary [40 CFR 403.8(f)(1)(iii)(B)(6)].

   b) SIUs must be evaluated for the need for a plan or other action to control slug discharges within 1 year of being designated an SIU.

   c) SIUs must notify the POTW immediately of any changes at their facilities affecting the potential for a slug discharge [40 CFR 403.8(f)(2(vi)].

3. Enforcement Requirement

   Whenever EPA finds, on the basis of any available information, that the owner or operator of any source is introducing a pollutant into the POTW in violation of national pretreatment standards, including prohibited discharges, local limits, or categorical standards, or has caused interference or pass through, EPA may notify the owner or operator of the POTW of such violation. If, within 30 days after such notification has been sent by EPA to the POTW, the POTW fails to commence appropriate enforcement action to correct the violation, EPA may take appropriate enforcement action under the authority provided in section 309(f) of the Clean Water Act.

4. Modification of the Pretreatment Program

   If the permittee elects to modify any components of its pretreatment program, it must comply with the requirements of 40 CFR 403.18. No substantial program modification, as defined in 40 CFR 403.18(b), may be implemented prior to receiving written authorization from EPA.

5. Local Limits Evaluation

   By November 30, 2018, the permittee must submit to EPA a complete local limits evaluation pursuant to 40 CFR 403.5(c)(1). The study must take into account water quality in the receiving stream, inhibition levels for biological processes in the treatment plant, and sludge quality goals. The study must address at least the following pollutants: arsenic, 5-day biochemical oxygen demand, cadmium, chromium, copper, cyanide, lead, mercury, molybdenum, nickel, selenium, silver, total suspended solids, and zinc and any other pollutants of concern. The permittee must address total ammonia as N and total phosphorus as P if the POTW accepts indirect discharges of those pollutants. Submitted results of the study must include proposed local limits, maximum allowable headworks loadings, all supporting calculations, and all assumptions.

6. Control of Undesirable Pollutants

   The permittee must not allow introduction of the following pollutants into the publicly owned treatment works (POTW):

a) Pollutants which will create a fire or explosion hazard in the POTW, including, but not limited to, wastestreams with a closed cup flashpoint of less than 140 °F or 60 °C using the test methods specified in 40 CFR 261.21;

b) Pollutants which will cause corrosive structural damage to the POTW, but in no case, indirect discharges with a pH lower than 5.0, unless the POTW is designed to accommodate such indirect discharges;

c) Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW (including the collection system) resulting in interference;

d) Any pollutant, including oxygen demanding pollutants (BOD, etc.), released in an indirect discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW;

e) Heat in amounts which inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds 40 °C (104 °F) unless the Regional Administrator, upon request of the POTW, approves alternate temperature limits;

f) Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;

g) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems; and

h) Any trucked or hauled pollutants, except at discharge points designated by the POTW.

i) Water containing PCBs in excess of 3 µg/L or in excess of any applicable pretreatment local limit established by the POTW.

7. Requirements for Industrial users

The permittee must require any industrial user of its treatment works to comply with any applicable requirements in 40 CFR 403 through 471.

8. Sampling Requirements

a) Parameters: The permittee must sample influent and effluent from the POTW for arsenic, cadmium, chromium, copper, cyanide, lead, mercury, molybdenum, nickel, selenium, silver, and zinc. Metals must be analyzed and reported as total metals. If the POTW accepts ammonia from industrial sources, the permittee must also sample the POTW influent and effluent for ammonia. The permittee must sample sludge for arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, percent solids, selenium and zinc.

b) Sampling Locations, Frequency and Sample Type: The permittee must sample as described in Table 4.

Table 4: Pretreatment Monitoring - Sample Types and Frequency

Wastestream	Frequency	Sample Type
Influent and Effluent	As specified in Part I.B of this permit.	As specified in Part I.B of this permit.
Sludge	Once during the same time period that twice-yearly influent metals samples are taken	Grab

c) Analytical Methods: For influent and effluent pretreatment sampling, the permittee must use EPA-approved analytical methods that achieve the minimum level (ML) in Appendix A.

d) Sludge Sampling: Sludge samples must be taken as the sludge leaves the dewatering device or digesters.

e) Sludge Reporting: Metals concentrations in sludge must be reported in mg/kg, dry weight.

f) Reporting Results: Analytical results for each day's samples must be reported separately. Sample results must be submitted with the pretreatment annual report required in Part II.A.9, below.

9. Pretreatment Report

a) The permittee must submit an annual report pursuant to 40 CFR 403.12(i) that describes the permittee's program activities over the report year, which runs from September 1st through August 31st. This report must be submitted to the following address no later than October 1st of each year:

Pretreatment Coordinator
U.S. Environmental Protection Agency
Region 10, OWW-191
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

b) The pretreatment report must be compiled following the Region 10 Annual Report Guidance. At a minimum, the report must include:

(i) An updated non-domestic user inventory, including those facilities that are no longer discharging (with explanation), and new dischargers, appropriately categorized and characterized. Categorical users should have the applicable category noted as well as cases where more stringent local limits apply instead of the categorical standard.

(ii) Results of wastewater and sludge sampling at the POTW as specified in Part II.A.8 (above).

(iii) Calculations of removal rates for each pollutant for each day of sampling.

(iv) An analysis and discussion of whether the existing local limitations in the permittee's sewer use ordinance continue to be appropriate to prevent treatment plant interference and pass through of pollutants that could affect water quality or sludge quality. This should include a comparison between influent loadings and the most recent relevant maximum allowable headworks loadings calculated for the treatment plant.

(v) Status of program implementation, including:

- (a) Any planned modifications to the pretreatment program that have been approved by EPA, including staffing and funding updates.
- (b) A description of any interference, upset, or NPDES permit violations experienced at the POTW which were directly or indirectly attributable to non-domestic users, including:
  - (i) Date & time of the incident
  - (ii) Description of the effect on the POTW's operation
  - (iii) Effects on the POTW's effluent and biosolids quality
  - (iv) Identification of suspected or known sources of the discharge causing the upset
  - (v) Steps taken to remedy the situation and to prevent recurrence
- (c) Listing of non-domestic users inspected and/or monitored during the report year with dates and an indication compliance status.
- (d) Listing of non-domestic users planned for inspection and/or monitoring for the coming year along with associated frequencies.
- (e) Listing of non-domestic users whose permits have been issued, reissued, or modified during the report year along with current permit expiration dates.
- (f) Listing of non-domestic users notified of promulgated pretreatment standards and/or local standards during the report year as required in 40 CFR 403.8(f)(2)(iii).
- (g) Listing of non-domestic users notified of promulgated pretreatment standards or applicable local standards who are on compliance schedules. The listing must include the final date of compliance for each facility.

(vi) Status of enforcement activities including:

- (a) Listing of non-domestic users who failed to comply with applicable pretreatment standards and requirements, including:
  - (i) Summary of the violation(s).
  - (ii) Enforcement action taken or planned by the permittee.

(iii) Present compliance status as of the date of preparation of the pretreatment report.

(b) Listing of those users in significant noncompliance during the report year as defined in 40 CFR 403.8(f)(2)(viii) and a copy of the newspaper publication of those users' names.

(c) EPA may require more frequent reporting on those users who are determined to be in significant noncompliance.

B. Operation and Maintenance Plan

In addition to the requirements specified in Section IV.E. of this permit (Proper Operation and Maintenance), by May 31, 2018, the permittee must provide written notice to EPA and IDEQ that an Operation and Maintenance plan for the current wastewater treatment facility has been developed and implemented by May 31, 2018. The plan shall be retained on site and made available on request to EPA and IDEQ. Any changes occurring in the operation of the plant shall be reflected within the Operation and Maintenance plan.

C. Quality Assurance Plan (QAP)

The permittee must develop a quality assurance plan (QAP) for all monitoring required by this permit. The permittee must submit written notice to EPA and IDEQ that the Plan has been developed and implemented by May 31, 2018. Any existing QAPs may be modified for compliance with this section.

1. The QAP must be designed to assist in planning for the collection and analysis of effluent and receiving water samples in support of the permit and in explaining data anomalies when they occur.
2. Throughout all sample collection and analysis activities, the permittee must use the EPA-approved QA/QC and chain-of-custody procedures described in *EPA Requirements for Quality Assurance Project Plans* (EPA/QA/R-5) and *Guidance for Quality Assurance Project Plans* (EPA/QA/G-5). The QAP must be prepared in the format that is specified in these documents.
3. At a minimum, the QAP must include the following:
    a) Details on the number of samples, type of sample containers, preservation of samples, holding times, analytical methods, analytical detection and quantitation limits for each target compound, type and number of quality assurance field samples, precision and accuracy requirements, sample preparation requirements, sample shipping methods, and laboratory data delivery requirements.
    b) Map(s) indicating the location of each sampling point.
    c) Qualification and training of personnel.
    d) Name(s), address(es) and telephone number(s) of the laboratories used by or proposed to be used by the permittee.

4. The permittee must amend the QAP whenever there is a modification in sample collection, sample analysis, or other procedure addressed by the QAP.
5. Copies of the QAP must be kept on site and made available to EPA and/or IDEQ upon request.

D. Facility Planning Requirement

1. Design Criteria. The maximum design flows and waste loads for the permitted facility are:

Table 5. Facility Planning Values

Facility Design Criteria	Value	Units
Maximum Monthly Flow	5.0	mgd
Maximum Monthly Influent BOD_5 Loading	8340	lbs/day
Maximum Monthly Influent TSS Loading	8340	lbs/day
Maximum monthly flow means the largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average. Maximum monthly loading means the largest loading anticipated to occur during a continuous 30-day period, expressed as a daily average (for BOD_5 or TSS).		

2. Plan for maintaining adequate capacity
   a) Condition to trigger plan development
      (i) Each month, the Permittee must record the average daily flow and BOD_5 and TSS loading entering the facility for that month.
      (ii) When the actual flow or waste loads for any two months during a 12-month period exceed any of the facility planning values listed in Table 5, the permittee must develop a new or updated plan and schedule for continuing to maintain capacity and maintain compliance with effluent limits.
   b) Submittal. The plan must be submitted to IDEQ for approval within 18 months of exceeding the trigger.
   c) Plan and schedule content. The plan and schedule must identify the actions necessary to maintain adequate capacity and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan:
      (i) Analysis of the present design and proposed process modifications
      (ii) Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system
      (iii) Limits on future sewer extensions or connections or additional waste loads
      (iv) Modification or expansion of facilities
      (v) Reduction of industrial or commercial flows or waste loads

E. Emergency Response and Public Notification Plan

1. The permittee must develop and implement an overflow emergency response and public notification plan that identifies measures to protect public health from overflows that may endanger health and unanticipated bypasses or upsets that exceed any effluent limitation in the permit. At a minimum the plan must include mechanisms to:
    a) Ensure that the permittee is aware (to the greatest extent possible) of all overflows from portions of the collection system over which the permittee has ownership or operational control and unanticipated bypass or upset that exceed any effluent limitation in the permit;
    b) Ensure appropriate responses including assurance that reports of an overflow or of an unanticipated bypass or upset that exceed any effluent limitation in the permit are immediately dispatched to appropriate personnel for investigation and response;
    c) Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;
    d) Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained; and
    e) Provide emergency operations.
2. The permittee must submit written notice to EPA and IDEQ that the plan has been developed and implemented by May 31, 2018. Any existing emergency response and public notification plan may be modified for compliance with this section.

F. Schedules of Compliance

1. The permittee must comply with all effluent limitations and monitoring requirements in Parts I.B, I.C, and I.D beginning on the effective date of the permit, except those for which a compliance schedule is specified in Part II.F.2, below.
2. A schedule of compliance is authorized for the effluent limitations for total phosphorus in effect from June – September.
3. The permittee must achieve compliance with the applicable final effluent limitations as set forth in Part I.B (Table 1) of the permit no later than:
    a) November 30, 2022 for Option 1, or
    b) November 30, 2027 permit for Option 2.
4. While the schedules of compliance specified in Part II.F of the permit are in effect, the permittee must complete interim requirements and meet interim effluent limits and monitoring requirements as specified in Parts I.B, I.C, I.D and I.E of the permit.

5. By November 30, 2019, the permittee must notify EPA and DEQ in writing that a preferred compliance schedule option has been selected and demonstrate that funding for the preferred option is secured for Option 1 or has a City of Sandpoint approved strategy for obtaining funding for Option 2.
6. Option 1: Existing plant upgrades
   a) This option applies if the City of Sandpoint decides to upgrade their existing treatment plant to meet final effluent limits.
   b) By November 30, 2020, the permittee must provide for DEQ approval, a preliminary engineering report (PER) that examines how to improve effluent quality and meet effluent limits associated with phosphorus. This report must include details on how the proposed improvements will meet final effluent limits. The report shall include materials, costs, and a schedule for completion of the work.
   c) By November 30, 2021, final plans and specifications for the modifications proposed in the PER shall be submitted to DEQ for approval.
   d) By November 30, 2022, the permittee must have completed the plant upgrade and achieved compliance with final effluent limits and WQS as shown in Table 1 (Part I.B).
7. Option 2: New treatment plant
   a) This option applies if the City of Sandpoint decides to construct a new treatment plant that will meet final effluent limits.
   b) By November 30, 2020, a facility plan shall be submitted to DEQ for review and approval. The facility plan shall include outlining estimated costs and schedules for construction of a new wastewater treatment plant and implementation of technologies to achieve final effluent limitations. This schedule must include a timeline for pilot testing.
   c) By November 30, 2021, the permittee must provide EPA and DEQ with a progress report on funding for the new facility. Copy of notice of bond approval or notice of judicial confirmation is acceptable.
   d) By November 30, 2022, the permittee must provide EPA and DEQ with written notice that design has been completed and approved by DEQ.
   e) By November 30, 2023, the permittee must provide EPA and DEQ with a notice that bids for construction have been awarded to achieve final effluent limitations.
   f) By November 30, 2024 and 2025, the permittee must provide EPA and DEQ with brief progress reports of construction as they relate to meeting the compliance schedule timeline and final effluent limits.
   g) By November 30, 2026, the permittee must provide EPA and DEQ with written notice that construction has been substantively completed on the facilities to achieve final effluent limitations.

h) By November 30, 2027, the permittee must provide EPA and DEQ with a 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 of Part I.B.

III. Monitoring, Recording and Reporting Requirements

A. Representative Sampling (Routine and Non-Routine Discharges)

Samples and measurements must be representative of the volume and nature of the monitored discharge.

In order to ensure that the effluent limits set forth in this permit are not violated at times other than when routine samples are taken, the permittee must collect additional samples at the appropriate outfall whenever any discharge occurs that may reasonably be expected to cause or contribute to a violation that is unlikely to be detected by a routine sample. The permittee must analyze the additional samples for those parameters limited in Part I.B of this permit that are likely to be affected by the discharge.

The permittee must collect such additional samples as soon as the spill, discharge, or bypassed effluent reaches the outfall. The samples must be analyzed in accordance with paragraph III.C ("Monitoring Procedures"). The permittee must report all additional monitoring in accordance with paragraph III.D ("Additional Monitoring by Permittee").

B. Reporting of Monitoring Results

The permittee must submit monitoring data and other reports electronically using NetDMR.

1. Monitoring data must be submitted electronically to EPA no later than the 20th of the month following the completed reporting period. All reports required under this permit must be submitted to EPA as a legible electronic attachment to the DMR.
2. The permittee must sign and certify all DMRs, and all other reports, in accordance with the requirements of Part V.E, of this permit, Signatory Requirements.
3. The permittee must submit copies of the DMRs and other reports to IDEQ at the following address:

   Idaho Department of Environmental Quality
   2110 Ironwood Parkway
   Coeur d'Alene, ID 83814

4. Submittal of Reports as NetDMR Attachments. Unless otherwise specified in this permit, the permittee may submit all reports to EPA and IDEQ as NetDMR attachments rather than as hard copies. The file name of the electronic attachment must be as follows: YYYY_MM_DD_ID0020842_Report Type Name_Identifying Code, where YYYY_MM_DD is the date that the permittee submits the attachment.

5. The permittee may use NetDMR after requesting and receiving permission from US EPA Region 10. NetDMR is accessed from: https://netdmr.epa.gov/

C. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR 136, unless other test procedures have been specified in this permit or approved by EPA as an alternate test procedure under 40 CFR 136.5.

D. Additional Monitoring by Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the permittee must include the results of this monitoring in the calculation and reporting of the data submitted in the DMR.

Upon request by EPA, the permittee must submit results of any other sampling, regardless of the test method used.

E. Records Contents

Records of monitoring information must include:

1. the date, exact place, and time of sampling or measurements;
2. the name(s) of the individual(s) who performed the sampling or measurements;
3. the date(s) analyses were performed;
4. the names of the individual(s) who performed the analyses;
5. the analytical techniques or methods used; and
6. the results of such analyses.

F. Retention of Records

The permittee must retain records of all monitoring information, including, all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, copies of DMRs, a copy of the NPDES permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application. This period may be extended by request of EPA or IDEQ at any time.

G. Twenty-four Hour Notice of Noncompliance Reporting

1. The permittee must report the following occurrences of noncompliance by telephone within 24 hours from the time the permittee becomes aware of the circumstances:
   a) any noncompliance that may endanger health or the environment;
   b) any unanticipated bypass that exceeds any effluent limitation in the permit (See Part IV.F., "Bypass of Treatment Facilities");

- c) any upset that exceeds any effluent limitation in the permit (See Part IV.G., "Upset Conditions"); or
- d) any violation of a maximum daily discharge limitation for applicable pollutants identified by Part I.B.2.
- e) any overflow prior to the treatment works over which the permittee has ownership or has operational control. An overflow is any spill, release or diversion of municipal sewage including:
  - (i) an overflow that results in a discharge to waters of the United States; and
  - (ii) an overflow of wastewater, including a wastewater backup into a building (other than a backup caused solely by a blockage or other malfunction in a privately owned sewer or building lateral) that does not reach waters of the United States.

2. The permittee must also provide a written submission within five days of the time that the permittee becomes aware of any event required to be reported under subpart 1 above. The written submission must contain:
   - a) a description of the noncompliance and its cause;
   - b) the period of noncompliance, including exact dates and times;
   - c) the estimated time noncompliance is expected to continue if it has not been corrected; and
   - d) steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
   - e) if the noncompliance involves an overflow, the written submission must contain:
     - (i) The location of the overflow;
     - (ii) The receiving water (if there is one);
     - (iii) An estimate of the volume of the overflow;
     - (iv) A description of the sewer system component from which the release occurred (e.g., manhole, constructed overflow pipe, crack in pipe);
     - (v) The estimated date and time when the overflow began and stopped or will be stopped;
     - (vi) The cause or suspected cause of the overflow;
     - (vii) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
     - (viii) An estimate of the number of persons who came into contact with wastewater from the overflow; and
     - (ix) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps.

3. The Director of the Office of Compliance and Enforcement may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the NPDES Compliance Hotline in Seattle, Washington, by telephone, (206) 553-1846.
4. Reports must be submitted to the addresses in Part III.B ("Reporting of Monitoring Results").

H. Other Noncompliance Reporting

The permittee must report all instances of noncompliance, not required to be reported within 24 hours, at the time that monitoring reports for Part III.B ("Reporting of Monitoring Results") are submitted. The reports must contain the information listed in Part III.G.2 of this permit ("Twenty-four Hour Notice of Noncompliance Reporting").

I. Public Notification

The permittee must immediately notify the public, health agencies and other affected entities (e.g., public water systems) of any overflow which the permittee owns or has operational control; or any unanticipated bypass or upset that exceeds any effluent limitation in the permit in accordance with the notification procedures developed in accordance with Part II.G.

J. Notice of New Introduction of Toxic Pollutants

The permittee must notify the Director of the Office of Water and Watersheds and IDEQ in writing of:

1. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to Sections 301 or 306 of the Act if it were directly discharging those pollutants; and
2. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
3. For the purposes of this section, adequate notice must include information on:
    a) The quality and quantity of effluent to be introduced into the POTW, and
    b) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.
4. The permittee must notify the Director of the Office of Water and Watersheds at the following address:

US EPA Region 10
Attn: NPDES Permits Unit Manager
1200 Sixth Avenue, Suite 900
OWW-191
Seattle, WA 98101-3140

IV. Compliance Responsibilities

A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application.

B. Penalties for Violations of Permit Conditions

1. Civil and Administrative Penalties. Pursuant to 40 CFR Part 19 and the Act, any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed the maximum amounts authorized by Section 309(d) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $52,414 per day for each violation).
2. Administrative Penalties. Any person may be assessed an administrative penalty by the Administrator for violating section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act. Pursuant to 40 CFR 19 and the Act, administrative penalties for Class I violations are not to exceed the maximum amounts authorized by Section 309(g)(2)(A) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $20,965 per violation, with the maximum amount of any Class I penalty assessed not to exceed $52,414). Pursuant to 40 CFR 19 and the Act, penalties for Class II violations are not to exceed the maximum amounts authorized by Section 309(g)(2)(B) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $20,965 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $262,066).
3. Criminal Penalties:

    a) Negligent Violations. The Act provides that any person who negligently violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both.

b) Knowing Violations. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

c) Knowing Endangerment. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the Act, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

d) False Statements. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both. The Act further provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with this permit.

D. Duty to Mitigate

The permittee must take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Bypass of Treatment Facilities

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2 and 3 of this Part.
2. Notice.
    a) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it must submit prior written notice, if possible at least 10 days before the date of the bypass.
    b) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required under Part III.G ("Twenty-four Hour Notice of Noncompliance Reporting").
3. Prohibition of bypass.
    a) Bypass is prohibited, and the Director of the Office of Compliance and Enforcement may take enforcement action against the permittee for a bypass, unless:
        (i) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
        (ii) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and
        (iii) The permittee submitted notices as required under paragraph 2 of this Part.
    b) The Director of the Office of Compliance and Enforcement may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph 3.a. of this Part.

G. Upset Conditions

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the permittee meets the requirements of paragraph 2 of this Part. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
2. Conditions necessary for a demonstration of upset. To establish the affirmative defense of upset, the permittee must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   a) An upset occurred and that the permittee can identify the cause(s) of the upset;
   b) The permitted facility was at the time being properly operated;
   c) The permittee submitted notice of the upset as required under Part III.G, "Twenty-four Hour Notice of Noncompliance Reporting;" and
   d) The permittee complied with any remedial measures required under Part IV.D, "Duty to Mitigate."
3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

H. Toxic Pollutants

The permittee must comply with effluent standards or prohibitions established under Section 307(a) and with standards for sewage sludge use or disposal established under section 405(d) of the Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

I. Planned Changes

The permittee must give written notice to the Director of the Office of Water and Watersheds as specified in Part III.J.4 and IDEQ as soon as possible of any planned physical alterations or additions to the permitted facility whenever:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or
2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this permit.
3. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application site.

J. Anticipated Noncompliance

The permittee must give written advance notice to the Director of the Office of Compliance and Enforcement and IDEQ of any planned changes in the permitted facility or activity that may result in noncompliance with this permit.

K. Reopener

This permit may be reopened to include any applicable standard for sewage sludge use or disposal promulgated under section 405(d) of the Act. The Director may modify or revoke and reissue the permit if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or controls a pollutant or practice not limited in the permit.

V. General Provisions

A. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 CFR 122.62, 122.64, or 124.5. The filing of a request by the permittee for a permit modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

B. Duty to Reapply

If the permittee intends to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. In accordance with 40 CFR 122.21(d), and unless permission for the application to be submitted at a later date has been granted by the Regional Administrator, the permittee must submit a new application by June 3, 2022.

C. Duty to Provide Information

The permittee must furnish to EPA and IDEQ, within the time specified in the request, any information that EPA or IDEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee must also furnish to EPA or IDEQ, upon request, copies of records required to be kept by this permit.

D. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or that it submitted incorrect information in a permit application or any report to EPA or IDEQ, it must promptly submit the omitted facts or corrected information in writing.

E. Signatory Requirements

All applications, reports or information submitted to EPA and IDEQ must be signed and certified as follows.

1. All permit applications must be signed as follows:
    a) For a corporation: by a responsible corporate officer.

   b) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

   c) For a municipality, state, federal, Indian tribe, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by EPA or IDEQ must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a) The authorization is made in writing by a person described above;

   b) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; and

   c) The written authorization is submitted to the Director of the Office of Compliance and Enforcement and IDEQ.

3. Changes to authorization. If an authorization under Part V.E.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.E.2. must be submitted to the Director of the Office of Compliance and Enforcement and IDEQ prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this Part must make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

F. Availability of Reports

In accordance with 40 CFR 2, information submitted to EPA pursuant to this permit may be claimed as confidential by the permittee. In accordance with the Act, permit applications, permits and effluent data are not considered confidential. Any confidentiality claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice to the permittee. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR 2, Subpart B (Public Information) and 41 Fed. Reg. 36902 through 36924 (September 1, 1976), as amended.

G. Inspection and Entry

The permittee must allow the Director of the Office of Compliance and Enforcement, EPA Region 10; IDEQ; or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

H. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to persons or property or invasion of other private rights, nor any infringement of federal, tribal, state or local laws or regulations.

I. Transfers

This permit is not transferable to any person except after written notice to the Director of the Office of Water and Watersheds as specified in Part III.J.4. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Act. (See 40 CFR 122.61; in some cases, modification or revocation and reissuance is mandatory).

J. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

VI. Definitions

1. “Act” means the Clean Water Act.
2. “Administrator” means the Administrator of the EPA, or an authorized representative.

3. "Average monthly discharge limitation" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.
4. "Average weekly discharge limitation" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.
5. "Best Management Practices" (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage areas.
6. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
7. "Chronic toxic unit" ("TUc") is a measure of chronic toxicity. TUc is the reciprocal of the effluent concentration that causes no observable effect on the test organisms by the end of the chronic exposure period (i.e., 100/"NOEC").
8. "Composite" - see "24-hour composite".
9. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.
10. "Director of the Office of Compliance and Enforcement" means the Director of the Office of Compliance and Enforcement, EPA Region 10, or an authorized representative.
11. "Director of the Office of Water and Watersheds" means the Director of the Office of Water and Watersheds, EPA Region 10, or an authorized representative.
12. "DMR" means discharge monitoring report.
13. "EPA" means the United States Environmental Protection Agency.
14. "Geometric Mean" means the n^{th} root of a product of n factors, or the antilogarithm of the arithmetic mean of the logarithms of the individual sample values.
15. "Grab" sample is an individual sample collected over a period of time not exceeding 15 minutes.
16. "IDEQ" means the Idaho Department of Environmental Quality.

17. "Inhibition concentration", IC, is a point estimate of the toxicant concentration that causes a given percent reduction (p) in a non-quantal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., Interpolation Method).
18. "Indirect Discharge" means the introduction of pollutants into a POTW from any non-domestic source regulated under section 307(b), (c) or (d) of the Act.
19. "Interference" is defined in 40 CFR 403.3.
20. "LC50" means the concentration of toxicant (e.g., effluent) which is lethal to 50 percent of the test organisms exposed in the time period prescribed by the test.
21. "Maximum daily discharge limitation" means the highest allowable "daily discharge."
22. "Method Detection Limit (MDL)" means the minimum concentration of a substance (analyte) that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
23. "Minimum Level (ML)" means either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the method detection limit (MDL). Minimum levels may be obtained in several ways: They may be published in a method; they may be sample concentrations equivalent to the lowest acceptable calibration point used by a laboratory; or they may be calculated by multiplying the MDL in a method, or the MDL determined by a lab, by a factor.
24. "NOEC" means no observed effect concentration. The NOEC is the highest concentration of toxicant (e.g., effluent) to which organisms are exposed in a chronic toxicity test [full life-cycle or partial life-cycle (short term) test], that causes no observable adverse effects on the test organisms (i.e., the highest concentration of effluent in which the values for the observed responses are not statistically significantly different from the controls).
25. "NPDES" means National Pollutant Discharge Elimination System, the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits . . . under sections 307, 402, 318, and 405 of the CWA.
26. "Pass Through" means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).
27. "QA/QC" means quality assurance/quality control.
28. "Regional Administrator" means the Regional Administrator of Region 10 of the EPA, or the authorized representative of the Regional Administrator.
29. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or

substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

30. "Significant Industrial User" means all industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N; and any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)). Upon a finding that an industrial user meeting above the criteria has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority (as defined in 40 CFR 403.12(a)) may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

31. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

32. "24-hour composite" sample means a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period. The composite must be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically. For GC/MS Volatile Organic Analysis (VOA), aliquots must be combined in the laboratory immediately before analysis. Four (4) (rather than eight) aliquots or grab samples should be collected for VOA. These four samples should be collected during actual hours of discharge over a 24-hour period and need not be flow proportioned. Only one analysis is required.

Appendix A

Minimum Levels

The Table below lists the maximum Minimum Level (ML) for pollutants that may have monitoring requirements in the permit. The permittee may request different MLs. The request must be in writing and must be approved by EPA. If the Permittee is unable to obtain the required ML in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a ML to EPA with appropriate laboratory documentation.

Conventional Parameters

Pollutant & CAS No. (if available)	**Minimum Level (ML) µg/L unless specified**
Biochemical Oxygen Demand	2 mg/L
Soluble Biochemical Oxygen Demand	2 mg/L
Chemical Oxygen Demand	10 mg/L
Total Organic Carbon	1 mg/L
Total Suspended Solids	5 mg/L
Total Ammonia (as N)	50
Dissolved oxygen	+/- 0.2 mg/L
Temperature	+/- 0.2° C
pH	N/A

Nonconventional Parameters

Pollutant & CAS No. (if available)	**Minimum Level (ML) µg/L unless specified**
Total Alkalinity	5 mg/L as CaCO3
Chlorine, Total Residual	50.0
Color	10 color units
Fluoride (16984-48-8)	100
Nitrate + Nitrite Nitrogen (as N)	100
Nitrogen, Total Kjeldahl (as N)	300
Soluble Reactive Phosphorus (as P)	10
Phosphorus, Total (as P)	10
Oil and Grease (HEM) (Hexane Extractable Material)	5,000
Salinity	3 practical salinity units or scale (PSU or PSS)
Settleable Solids	500 (or 0.1 mL/L)
Sulfate (as mg/L SO4)	0.2 mg/L

Pollutant & CAS No. (if available)	Minimum Level (ML) µg/L unless specified
Sulfide (as mg/L S)	0.2 mg/L
Sulfite (as mg/L SO3)	2 mg/L
Total dissolved solids	20 mg/L
Total Hardness	200 as CaCO3
Aluminum, Total (7429-90-5)	10
Barium Total (7440-39-3)	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)	2
Boron Total (7440-42-8)	10.0
Cobalt, Total (7440-48-4)	0.25
Iron, Total (7439-89-6)	50
Magnesium, Total (7439-95-4)	50
Molybdenum, Total (7439-98-7)	0.5
Manganese, Total (7439-96-5)	0.5
Tin, Total (7440-31-5)	1.5
Titanium, Total (7440-32-6)	2.5

Priority Pollutants

Pollutant & CAS No. (if available)	Minimum Level (ML) µg/L unless specified
METALS, CYANIDE & TOTAL PHENOLS	
Antimony, Total (7440-36-0)	1.0
Arsenic, Total (7440-38-2)	0.5
Beryllium, Total (7440-41-7)	0.5
Cadmium, Total (7440-43-9)	0.1
Chromium (hex) dissolved (18540-29-9)	1.2
Chromium, Total (7440-47-3)	1.0
Copper, Total (7440-50-8)	2.0
Lead, Total (7439-92-1)	0.16
Mercury, Total (7439-97-6)	0.0005
Nickel, Total (7440-02-0)	0.5
Selenium, Total (7782-49-2)	1.0
Silver, Total (7440-22-4)	0.2
Thallium, Total (7440-28-0)	0.36
Zinc, Total (7440-66-6)	2.5

Pollutant & CAS No. (if available)	**Minimum Level (ML) µg/L unless specified**
Cyanide, Total (57-12-5)	10
Cyanide, Weak Acid Dissociable	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	10
Phenols, Total	50
2-Chlorophenol (95-57-8)	2.0
2,4-Dichlorophenol (120-83-2)	1.0
2,4-Dimethylphenol (105-67-9)	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	2.0
2,4 dinitrophenol (51-28-5)	2.0
2-Nitrophenol (88-75-5)	1.0
4-nitrophenol (100-02-7)	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	2.0
Pentachlorophenol (87-86-5)	1.0
Phenol (108-95-2)	4.0
2,4,6-Trichlorophenol (88-06-2)	4.0
VOLATILE COMPOUNDS	
Acrolein (107-02-8)	10
Acrylonitrile (107-13-1)	2.0
Benzene (71-43-2)	2.0
Bromoform (75-25-2)	2.0
Carbon tetrachloride (56-23-5)	2.0
Chlorobenzene (108-90-7)	2.0
Chloroethane (75-00-3)	2.0
2-Chloroethylvinyl Ether (110-75-8)	2.0
Chloroform (67-66-3)	2.0
Dibromochloromethane (124-48-1)	2.0
1,2-Dichlorobenzene (95-50-1)	7.6
1,3-Dichlorobenzene (541-73-1)	7.6
1,4-Dichlorobenzene (106-46-7)	17.6
Dichlorobromomethane (75-27-4)	2.0

Pollutant & CAS No. (if available)	Minimum Level (ML) µg/L unless specified
1,1-Dichloroethane (75-34-3)	2.0
1,2-Dichloroethane (107-06-2)	2.0
1,1-Dichloroethylene (75-35-4)	2.0
1,2-Dichloropropane (78-87-5)	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6) 6	2.0
Ethylbenzene (100-41-4)	2.0
Methyl bromide (74-83-9) (Bromomethane)	10.0
Methyl chloride (74-87-3) (Chloromethane)	2.0
Methylene chloride (75-09-2)	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	2.0
Tetrachloroethylene (127-18-4)	2.0
Toluene (108-88-3)	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	2.0
1,1,1-Trichloroethane (71-55-6)	2.0
1,1,2-Trichloroethane (79-00-5)	2.0
Trichloroethylene (79-01-6)	2.0
Vinyl chloride (75-01-4)	2.0
BASE/NEUTRAL COMPOUNDS	
Acenaphthene (83-32-9)	0.4
Acenaphthylene (208-96-8)	0.6
Anthracene (120-12-7)	0.6
Benzidine (92-87-5)	24
Benzyl butyl phthalate (85-68-7)	0.6
Benzo(a)anthracene (56-55-3)	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) (205-99-2) 7	1.6
Benzo(j)fluoranthene (205-82-3) 7	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9) 7	1.6
Benzo(r,s,t)pentaphene (189-55-9)	1.0
Benzo(a)pyrene (50-32-8)	1.0

Pollutant & CAS No. (if available)	Minimum Level (ML) µg/L unless specified
Benzo(ghi)Perylene (191-24-2)	1.0
Bis(2-chloroethoxy)methane (111-91-1)	21.2
Bis(2-chloroethyl)ether (111-44-4)	1.0
Bis(2-chloroisopropyl)ether (39638-32-9)	0.6
Bis(2-ethylhexyl)phthalate (117-81-7)	0.5
4-Bromophenyl phenyl ether (101-55-3)	0.4
2-Chloronaphthalene (91-58-7)	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	0.5
Chrysene (218-01-9)	0.6
Dibenzo (a,h)acridine (226-36-8)	10.0
Dibenzo (a,j)acridine (224-42-0)	10.0
Dibenzo(a-h)anthracene (53-70-3)(1,2,5,6-dibenzanthracene)	1.6
Dibenzo(a,e)pyrene (192-65-4)	10.0
Dibenzo(a,h)pyrene (189-64-0)	10.0
3,3-Dichlorobenzidine (91-94-1)	1.0
Diethyl phthalate (84-66-2)	7.6
Dimethyl phthalate (131-11-3)	6.4
Di-n-butyl phthalate (84-74-2)	1.0
2,4-dinitrotoluene (121-14-2)	0.4
2,6-dinitrotoluene (606-20-2)	0.4
Di-n-octyl phthalate (117-84-0)	0.6
1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)	20
Fluoranthene (206-44-0)	0.6
Fluorene (86-73-7)	0.6
Hexachlorobenzene (118-74-1)	0.6
Hexachlorobutadiene (87-68-3)	1.0
Hexachlorocyclopentadiene (77-47-4)	1.0
Hexachloroethane (67-72-1)	1.0
Indeno(1,2,3-cd)Pyrene (193-39-5)	1.0
Isophorone (78-59-1)	1.0

Pollutant & CAS No. (if available)	Minimum Level (ML) µg/L unless specified
3-Methyl cholanthrene (56-49-5)	8.0
Naphthalene (91-20-3)	0.6
Nitrobenzene (98-95-3)	1.0
N-Nitrosodimethylamine (62-75-9)	4.0
N-Nitrosodi-n-propylamine (621-64-7)	1.0
N-Nitrosodiphenylamine (86-30-6)	1.0
Perylene (198-55-0)	7.6
Phenanthrene (85-01-8)	0.6
Pyrene (129-00-0)	0.6
1,2,4-Trichlorobenzene (120-82-1)	0.6
DIOXIN	
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (176-40-16) (2,3,7,8 TCDD)	See Part I.B.13.
PESTICIDES/PCBs	
Aldrin (309-00-2)	0.05
alpha-BHC (319-84-6)	0.05
beta-BHC (319-85-7)	0.05
gamma-BHC (58-89-9)	0.05
delta-BHC (319-86-8)	0.05
Chlordane (57-74-9)	0.05
4,4'-DDT (50-29-3)	0.05
4,4'-DDE (72-55-9)	0.05
4,4' DDD (72-54-8)	0.05
Dieldrin (60-57-1)	0.05
alpha-Endosulfan (959-98-8)	0.05
beta-Endosulfan (33213-65-9)	0.05
Endosulfan Sulfate (1031-07-8)	0.05
Endrin (72-20-8)	0.05
Endrin Aldehyde (7421-93-4)	0.05
Heptachlor (76-44-8)	0.05
Heptachlor Epoxide (1024-57-3)	0.05
PCB Congeners	See Part I.B.12.

Pollutant & CAS No. (if available)	Minimum Level (ML) µg/L unless specified
Toxaphene (8001-35-2)	0.5

Public Comment

Pursuant to 40 CFR 124.14(c), at this time, the EPA is only accepting comments on aspects of the draft permit that are different from those in the draft permit that was issued for public comment on October 31, 2014. These are as follows:

- Effluent limitations for total phosphorus and total residual chlorine have been changed.
- The permit now proposes a compliance schedule for the new water quality-based effluent limits for phosphorus proposed for the season of June – September.
- The draft permit now includes effluent limitations and requires more frequent monitoring for total ammonia as N. A compliance schedule is proposed for the new ammonia limits.
- Loading (lb/day) effluent limitations for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and mercury have been changed.
- The draft permit now requires effluent and receiving water monitoring for conductivity and dissolved organic carbon.
- The permit now requires effluent monitoring for hardness.
- The permit now allows the permittee to discontinue influent and effluent monitoring for 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD) after the first three samples if no quantifiable 2,3,7,8 TCDD is measured in the first three samples.
- The “Design Flow Requirement” (Part II.D) in the original draft permit has been re-titled as “Facility Planning Requirement” and re-written.
- The permit now requires monitoring for methylmercury in fish tissue once every two years.
- The permit no longer requires downstream receiving water monitoring for polychlorinated biphenyl (PCB) congeners.
- The permit now allows the permittee to discontinue upstream receiving water monitoring for PCB congeners after the first year if no quantifiable PCB congeners are measured during the first year.
- Influent sampling for mercury is now required on the same schedule as influent sampling for other metals.
- Sample collection and preservation procedures for cyanide now reference 40 CFR Part 136 instead of Standard Methods.
- The definition of “minimum level” has been changed to be identical to the definition in the sufficiently sensitive methods final rule (79 FR 49001).
- The definition of “24-hour composite” has been changed to be identical to the definition of “composite sample” in the instructions for EPA Form 3150-2C.
- The permit now requires DMRs and other reports to be submitted electronically using NetDMR by December 21, 2016.

Persons wishing to comment on the tentative determinations contained in the draft permit may do so in writing to the above address or by e-mail to “Nickel.Brian@epa.gov” within 30 days of the date of this public notice. Comments must be received within the 30 day period to be considered in the formulation of final determinations regarding the applications. All comments should include the name, address and telephone number of the commenter and a concise statement of the exact basis of any comment and the relevant facts upon which it is based. All written comments and requests should be submitted to the EPA at the above address to the attention of the Director, Office of Water and Watersheds.

Documents are Available for Review

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting the EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday at the address below. The draft permits, fact sheet, and other information can also be found by visiting the Region 10 NPDES website at http://EPA.gov/r10earth/waterpermits.htm.

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, OWW-191
Seattle, Washington 98101
(206) 553-0523 or
Toll Free 1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permits are also available at:

Idaho Department of Environmental Quality
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

EPA Idaho Operations Office
950 W Bannock
Suite 900
Boise, ID 83702
(208) 378-5746

Sandpoint Library
1407 Cedar Street
Sandpoint, ID 83864
(208) 263-6930

Table of Contents

Acronyms

1Q10	1 day, 10 year low flow
7Q10	7 day, 10 year low flow
30B3	Biologically-based design flow intended to ensure an excursion frequency of less than once every three years, for a 30-day average flow.
30Q5	30-day, 5 year low flow
30Q10	30 day, 10 year low flow
AML	Average Monthly Limit
AWL	Average Weekly Limit
BOD_5	Biochemical oxygen demand, five-day
BMP	Best Management Practices
°C	Degrees Celsius
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CSO	Combined Sewer Overflow
CV	Coefficient of Variation
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
HUC	Hydrologic Unit Code
IC	Inhibition Concentration
ICIS	Integrated Compliance Information System
IDEQ	Idaho Department of Environmental Quality
I/I	Infiltration and Inflow
lbs/day	Pounds per day
LTA	Long Term Average
mg/L	Milligrams per liter
ml	milliliters
ML	Minimum Level
µg/L	Micrograms per liter
mgd	Million gallons per day
MDL	Maximum Daily Limit or Method Detection Limit
N	Nitrogen

NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observable Effect Concentration
NPDES	National Pollutant Discharge Elimination System
OWW	Office of Water and Watersheds
O&M	Operations and maintenance
PCB	Polychlorinated biphenyl
POTW	Publicly owned treatment works
QAP	Quality assurance plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
RWC	Receiving Water Concentration
SS	Suspended Solids
SSO	Sanitary Sewer Overflow
s.u.	Standard Units
TCDD	Tetrachlorodibenzo-p-dioxin
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TRC	Total Residual Chlorine
TRE	Toxicity Reduction Evaluation
TSD	Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001)
TSS	Total suspended solids
TU_a	Toxic Units, Acute
TU_c	Toxic Units, Chronic
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WET	Whole Effluent Toxicity
WLA	Wasteload allocation
WQBEL	Water quality-based effluent limit
WQS	Water Quality Standards
WWTP	Wastewater treatment plant

I. Applicant

A. General Information

This fact sheet provides information on the draft NPDES permit for the following entity:

City of Sandpoint
Wastewater Treatment Plant
NPDES Permit # ID0020842

Physical Address:
723 South Ella Avenue
Sandpoint, Idaho 83864

Mailing Address:
1123 Lake Street
Sandpoint, Idaho 83864

Contact:
Ryan Luttmann, Public Works Director

II. Scope of Reopened Public Comment Period

Federal regulations state that comments filed during a reopened comment period shall be limited to the substantial new questions that caused its reopening, and that the public notice under 40 CFR 124.10 shall define the scope of the reopening (40 CFR 124.14). As stated in the public notice, the EPA is only accepting comments on permit conditions that are different from those proposed in the draft permit that was issued for public review and comment on October 31, 2014.

The EPA is making significant changes to the draft permit as it was proposed in October 2014. These changes result from comments made during the initial public comment period, computer modeling of the impact of the discharge, EPA guidance, and a revised draft Clean Water Act (CWA) Section 401 certification prepared by the Idaho Department of Environmental Quality (IDEQ). To allow the public an opportunity to comment on all of these changes, the EPA has decided to reopen the public comment period to accept comments on these specific changes. The changed conditions are as follows:

- Effluent limitations for total phosphorus and total residual chlorine have been changed.
- The permit now proposes a compliance schedule for the new water quality-based effluent limits for phosphorus proposed for the season of June – September.
- The draft permit now includes effluent limitations and requires more frequent monitoring for total ammonia as N. A compliance schedule is proposed for the new ammonia limits.
- Loading (lb/day) effluent limitations for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and mercury have been changed.
- The draft permit now requires effluent and receiving water monitoring for conductivity and dissolved organic carbon.
- The permit now requires effluent monitoring for hardness.

- The permit now allows the permittee to discontinue influent and effluent monitoring for 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD) after the first three samples if no quantifiable 2,3,7,8 TCDD is measured in the first three samples.
- The "Design Flow Requirement" (Part II.D) in the original draft permit has been re-titled as "Facility Planning Requirement" and re-written.
- The permit now requires monitoring for methylmercury in fish tissue once every two years.
- The permit no longer requires downstream receiving water monitoring for polychlorinated biphenyl (PCB) congeners.
- The permit now allows the permittee to discontinue upstream receiving water monitoring for PCB congeners after the first year if no quantifiable PCB congeners are measured during the first year.
- Influent sampling for mercury is now required on the same schedule as influent sampling for other metals.
- Sample collection and preservation procedures for cyanide now reference 40 CFR Part 136 instead of Standard Methods.
- The definition of "minimum level" has been changed to be identical to the definition in the sufficiently sensitive methods final rule (79 FR 49001).
- The definition of "24-hour composite" has been changed to be identical to the definition of "composite sample" in the instructions for EPA Form 3150-2C.
- The permit now requires DMRs and other reports to be submitted electronically using NetDMR by December 21, 2016.

III. Facility Information

In general, facility information is provided in the fact sheet for the initial public comment period dated October 31, 2014.

However, the 2014 fact sheet had incorrectly listed the design flow of the WWTP as 3.62 million gallons per day (mgd), when, in fact the design flow is 5.0 mgd. Since federal regulations state that "in the case of POTWs, permit effluent limitations, standards, or prohibitions shall be calculated based on design flow," a change to the design flow results in changes to several of the effluent limits.

A map of the treatment plant and discharge location is provided in Appendix A.

A. Permit History

The first NPDES permit was issued to this facility in June 1974. The most recent NPDES permit for the City of Sandpoint wastewater treatment plant (WWTP) was issued on November 30, 2001, became effective on January 5, 2002, and expired on January 5, 2007. An NPDES application for permit reissuance was submitted by the permittee on September 25, 2006. The EPA determined that the application was timely and complete. Therefore, pursuant to 40 CFR 122.6, the permit has been administratively extended and remains fully effective and enforceable.

The EPA issued a draft permit for public comment on October 31, 2014. The public comment period was scheduled to close on December 1, 2014, but was extended to January 30, 2015.

IV. Receiving Water

In general, the receiving water, including its low flow conditions, water quality standards, and beneficial use support status, is described in the fact sheet dated October 31, 2014.

This facility discharges to the Pend Oreille River near Sandpoint, Idaho. The outfall is located at river mile 117, about 1 mile downstream (i.e., west) of the U.S. Highway 95 bridge, and 17 feet below the surface of the water. The outfall is equipped with a diffuser which is 50 meters long. The far end of the diffuser is 281 meters (921 feet) from shore, and the near end is 231 meters (758 feet) from shore.

A. Low Flow Conditions

Low flow conditions are discussed in detail in Appendix C, and are generally the same as those used to develop the October 2014 draft permit.

The Kalispel Tribe had stated in comments filed during the initial public comment period that the effluent limits for phosphorus should be based on seasonal 30-day, 10 year low flow rates (30Q10) instead of the 10th percentile 365-day rolling harmonic mean flow of 10,259 CFS, as proposed in the October 2014 draft permit. Mixing calculations for phosphorus now use the seasonal 30Q10 flow rates. The seasonal 30Q10 flow rates are 6,640 CFS for June – September and 8,260 CFS for October – May.

B. Antidegradation

The IDEQ has completed an antidegradation review which is included in the draft 401 certification for this permit. See Appendix G for the State's draft 401 water quality certification. The EPA has reviewed this antidegradation review and finds that it is consistent with the State's 401 certification requirements and the State's antidegradation implementation procedures. Comments on the 401 certification including the antidegradation review can be submitted to the IDEQ as set forth above (see State Certification).

In its antidegradation review of the City of Sandpoint permit, the State of Idaho found that, because of the increase in the design flow of the POTW (from 3.0 mgd to 5.0 mgd), the discharge could increase the concentration of E. coli bacteria in the receiving water. The State of Idaho has determined that the increase in E. coli concentrations is insignificant, and that therefore no alternatives analysis or socioeconomic justification are required (see the draft certification at Page 4).

V. Effluent Limitations

A. Basis for Effluent Limitations

In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either technology-based limits or water quality-based limits. Technology-based limits are set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the water quality standards applicable to a waterbody are being met and may be more stringent than technology-based effluent limits. The basis for the effluent limits proposed in the draft permit is provided in appendices D, E and F.

B. Proposed Effluent Limitations

The following summarizes the proposed effluent limits that are in the draft permit.

1. The permittee must not discharge floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses.
2. Removal Requirements for BOD_5 and TSS: The monthly average effluent concentration must not exceed 15 percent of the monthly average influent concentration. Percent removal of BOD_5 and TSS must be reported on the Discharge Monitoring Reports (DMRs). For each parameter, the monthly average percent removal must be calculated from the arithmetic mean of the influent values and the arithmetic mean of the effluent values for that month. Influent and effluent samples must be taken over approximately the same time period.
3. The pH must be within the range of 6.5 – 9.0 standard units.

Table 2 below presents the proposed effluent limits for the City of Sandpoint. Effluent limits printed in bold, italic type are different from the limits in the October 2014 draft permit. The EPA is specifically requesting comments on these limits.

Table 2: Proposed Effluent Limits

Parameter	**Units**	**Effluent Limits**		
		Average Monthly Limit	**Average Weekly Limit**	**Maximum Daily Limit**
Five-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	—
	lb/day	***1251***	***1877***	—
	% Removal	85% (minimum)	—	—
Total Suspended Solids (TSS)	mg/L	30	45	—
	lb/day	***1251***	***1877***	—
	% Removal	85% (minimum)	—	—
E. coli	#/100 ml	126 (geometric mean)	—	406 (instantaneous maximum)
Total Residual Chlorine	mg/L	***0.348***	—	***0.912***
	lb/day	***14.5***	—	***38.0***
Ammonia, Total as N (Interim)	mg/L	***32.8***	—	***62.9***
	lb/day	***1368***	—	***2623***
Ammonia, Total as N (Final)	mg/L	***21.1***	—	***40.5***
	lb/day	***880***	—	***1689***
Mercury, Total	µg/L	0.56	—	1.1
	lb/day	***0.014***	—	***0.028***
Phosphorus, Total as P ***June – September (Interim)***	lb/day	***96***	***125***	—
Phosphorus, Total as P ***June – September (Final)***	lb/day	***61***	***79***	—
Phosphorus, Total as P ***October – May***	lb/day	***96***	***125***	—

C. Schedules of Compliance

Schedules of compliance are authorized by federal NPDES regulations at 40 CFR 122.47 and by Section 400.03 of the Idaho Water Quality Standards. The Idaho water quality standards allow for compliance schedules "when new limitations are in the permit for the first time." The federal regulation allows schedules of compliance "when appropriate," and requires that such schedules require compliance as soon as possible. When the compliance schedule is longer than 1 year, federal regulations require that the schedule shall set forth interim requirements and the dates for their achievement. The time between the interim dates shall generally not exceed 1 year, and when the time necessary to complete any interim requirement is more than one year, the schedule shall require reports on progress toward completion of these interim requirements. Federal regulations also generally require that interim effluent limits are at least as stringent as the final limits in the previous permit (40 CFR 122.44(l)(1)).

EPA policy states that, in order to grant a compliance schedule, a permitting authority must make a reasonable finding that the permittee cannot comply with the effluent limit immediately upon the effective date of the final permit (see the *US EPA NPDES Permit Writers' Manual* at Section 9.1.3). The proposed effluent limits for ammonia and phosphorus are new limits that are in the permit for the first time. The EPA has determined that the City cannot consistently comply with the proposed ammonia limits and the proposed phosphorus limits for the season of June – September.

In its draft Clean Water Act Section 401 certification, the State of Idaho proposed to authorize compliance schedules for the proposed ammonia limits and the proposed phosphorus limits for the season of June – September. Consistent with federal regulations (40 CFR 122.47(a)(3)), the schedules of compliance include interim milestones and reports of progress. The State of Idaho also specified interim limits which apply during the terms of the compliance schedules. The interim limits, as well as the final limits, are listed in Table 2, above.

VI. Monitoring Requirements

A. Basis for Effluent and Surface Water Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality.

The permit also requires the permittee to perform effluent monitoring required by parts B.6 and D of the NPDES Form 2A application, so that these data will be available when the permittee applies for a renewal of its NPDES permit.

The permittee is responsible for conducting the monitoring and for reporting results on DMRs or on the application for renewal, as appropriate, to the EPA.

Monitoring requirements printed in bold, italic type in Tables 3 and 4, below, are different from the limits in the October 2014 draft permit. The EPA is specifically requesting comments on these monitoring requirements.

B. Effluent Monitoring

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples must be used for averaging if they are conducted using the EPA-approved test methods (generally found in 40 CFR 136 or as specified in the permit).

Table 3, below, presents the proposed effluent monitoring requirements for the City of Sandpoint. The effluent sampling location must be after the last treatment unit and prior to discharge to the receiving water. The samples must be representative of the volume and nature of the monitored discharge. If no discharge occurs during the reporting period, "no discharge" shall be reported on the DMR.

The EPA is proposing more frequent monitoring for ammonia in order to determine compliance with the new water quality-based effluent limits for ammonia. The State of Idaho has begun negotiated rulemaking to adopt water quality criteria for copper based on the biotic ligand model, consistent with EPA recommendations. Monitoring for conductivity, dissolved organic carbon and hardness is required so that, when the State of Idaho adopts water quality criteria for copper based on the biotic ligand model, water quality criteria for copper can be evaluated. The EPA has changed the influent monitoring schedule for mercury to be consistent with influent monitoring requirements for other metals.

The permit now allows the permittee to discontinue influent and effluent monitoring for 2,3,7,8 TCDD after the first three samples if no quantifiable 2,3,7,8 TCDD is measured in the first three samples. Experience with other POTWs has shown that 2,3,7,8 TCDD may not be present in POTW influent or effluent in quantifiable amounts, and testing for 2,3,7,8 TCDD can be costly.

The EPA has also changed the sample collection and preservation procedures for cyanide. The permit now references 40 CFR Part 136 instead of Standard Methods.

Table 3: Effluent Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type
Flow	mgd	Effluent	Continuous	recording
Temperature	°C	Effluent	Continuous	recording
BOD_5	mg/L	Influent & Effluent	3/week	24-hour composite
	lb/day	Influent & Effluent		calculation[1]
	% Removal	% Removal	1/month	calculation[2]
TSS	mg/L	Influent & Effluent	3/week	24-hour composite
	lb/day	Influent & Effluent		calculation[1]
	% Removal	% Removal	1/month	calculation[2]
pH	standard units	Effluent	daily	grab
E. Coli	#/100 ml	Effluent	10/month	grab
Total Residual Chlorine	µg/L	Effluent	daily	grab
	lb/day	Effluent		calculation[1]
Total Ammonia as N	***mg/L***	***Effluent***	***3/week***	***24-hour composite***
	lb/day	***Effluent***		***calculation[1]***
Total Phosphorus	mg/L	Effluent	2/week	24-hour composite
	lb/day	Effluent		calculation[1]
Mercury, Total	µg/L	Effluent[4]	1/month	24-hour composite
	lb/day	Effluent[4]		calculation[1]
	µg/L	Influent[4]	***2/year[3]***	24-hour composite
Nitrate + Nitrite	mg/L	Effluent	1/quarter	24-hour composite
Total Kjeldahl Nitrogen	mg/L	Effluent	1/quarter	24-hour composite

Table 3: Effluent Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type
Soluble Reactive Phosphorus	mg/L	Effluent	1/month	24-hour composite
Arsenic, Total	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Cadmium, Total Recoverable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Chromium, Total	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Chromium VI, Dissolved	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Conductivity	***µmhos/cm***	***Effluent***	***1/month***	***24-hour composite***
Copper, Total Recoverable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Cyanide, weak acid dissociable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Dissolved organic carbon	***mg/L***	***Effluent***	***1/month***	***24-hour composite***
Lead, Total Recoverable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Nickel, Total Recoverable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Silver, Total Recoverable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Zinc, Total Recoverable	µg/L	Influent & effluent[4]	2/year[3]	24-hour composite
Whole Effluent Toxicity, Chronic	TU_c	Effluent	Annual	24-hour composite
PCB Congeners	pg/L	Influent & effluent	2/year	24-hour composite
2,3,7,8 TCDD	pg/L	Influent & effluent	2/year	24-hour composite
NPDES Application Form 2A Expanded Effluent Testing	—	Effluent	3x/5 years	—

Notes:
1. Loading is calculated by multiplying the concentration in mg/L by the flow in mgd and a conversion factor of 8.34. If the concentration is measured in µg/L, the conversion factor is 0.00834.
2. Percent removal is calculated using the following equation: (average monthly influent – average monthly effluent) ÷ average monthly influent.
3. Each twice yearly influent and effluent sampling event for these parameters must consist of three 24-hour composite samples taken within a calendar week.
4. Sludge must be sampled twice per year: once during the month of May and once during the month of November.

C. Surface Water Monitoring

Water Column Monitoring

Table 4, below, presents the proposed surface water monitoring requirements for the draft permit. Surface water monitoring results must be submitted with the DMRs.

The State of Idaho has begun negotiated rulemaking to adopt water quality criteria for copper based on the biotic ligand model, consistent with EPA recommendations. Monitoring for conductivity, dissolved organic carbon and hardness is required so that, when the State of Idaho adopts water quality criteria for copper based on the biotic ligand model, water quality criteria for copper can be evaluated.

The revised draft permit no longer proposes downstream receiving water monitoring for PCBs. Upstream receiving water sampling may be discontinued after the first year if no quantifiable PCB congeners are measured during the first year. PCB congeners are considered less than quantifiable if the concentrations are less than the minimum level, or if the concentrations of all detected PCB congeners are less than three times the associated blank concentration *and* the concentration total PCBs in the associated blank is less than 300 pg/L.

Methylmercury Fish Tissue Monitoring

The EPA's *Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion*, in Section 4.2.4, recommends biennial sampling of fish in waterbodies where recreational or subsistence harvesting is commonly practiced. Therefore, the revised draft permit proposes required monitoring for methylmercury in fish tissue once every two years.

Table 4: Receiving Water Monitoring Requirements

Parameter and Units	**Location**	**Frequency**
Total Mercury (ng/L)	Upstream	1/month[1]
Conductivity (µmhos/cm)	***Upstream***	***1/month[1]***
Dissolved Copper (µg/L)	Upstream	1/month[1]
Dissolved Lead (µg/L)	Upstream	1/month[1]
Dissolved organic carbon (mg/L)	***Upstream***	***1/month[1]***
Total Ammonia as N (µg/L)	Upstream	1/month[1]
Temperature (°C)	Upstream	1/month[1]
pH (s.u.)	Upstream	1/month[1]
Hardness (mg/L as $CaCO_3$)	Upstream	1/month[1]
PCB Congeners	***Upstream***	2/year[2]

Notes:
1. River samples must be grab samples collected at least once per month, every month, during the final full calendar year of the permit term.
2. The permittee may discontinue receiving water sampling for PCB congeners after the first year if no quantifiable PCB congeners are measured during the first year.

VII. Sludge (Biosolids) Requirements

The EPA Region 10 separates wastewater and sludge permitting. The EPA has authority under the CWA to issue separate sludge-only permits for the purposes of regulating biosolids. The EPA may issue a sludge-only permit to each facility at a later date, as appropriate.

Until future issuance of a sludge-only permit, sludge management and disposal activities at each facility continue to be subject to the national sewage sludge standards at 40 CFR Part 503 and any requirements of the State's biosolids program. The Part 503 regulations are self-implementing, which means that facilities must comply with them whether or not a permit has been issued.

VIII. Other Permit Conditions

A. Facility Planning Requirement

The "Design Flow Requirement" (Part II.D) in the original draft permit has been re-titled as "Facility Planning Requirement" and re-written. This provision requires the permittee to compare influent flow and BOD_5 and TSS loading to the design criteria. When the actual flow or waste loads exceed the design criteria for any 2 months during a 12-month period, the permittee must develop a new or updated plan and schedule for continuing to maintain capacity and maintain compliance with effluent limits within 18 months.

B. Reporting

The EPA proposes to revise Part III.B of the draft permit to require electronic reporting in NetDMR by December 21, 2016, consistent with the final NPDES Electronic Reporting Rule (80 FR 64097).

C. Definitions

The EPA's sufficiently sensitive methods final rule (79 FR 49001) includes an updated definition of the term "minimum level." The definition of "minimum level" in has been replaced with the definition in the sufficiently sensitive methods final rule.

The EPA has changed the definition of "24-hour composite" to be identical to the definition in the instructions for EPA Form 3510-2C. Although this is an NPDES permit application form for manufacturing, commercial, mining, and silvicultural operations, the EPA believes the definition of "composite sample" provided therein is valid for other types of discharges, including POTWs.

IX. Other Legal Requirements

A. Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. EPA has prepared a biological evaluation and determined that the discharge from the City of Sandpoint may affect, but is not likely to adversely affect bull trout and bull trout critical habitat (EPA 2016). EPA will seek concurrence from USFWS on the not likely to adversely affect determination.

B. Essential Fish Habitat

Essential fish habitat (EFH) is the waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires the EPA to consult with NOAA Fisheries when a proposed discharge has the potential to adversely affect EFH (i.e., reduce quality and/or quantity of EFH).

The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

The EPA has determined that issuance of this permit is not likely to adversely affect EFH in the vicinity of the discharge. The Pend Oreille River is not designated as EFH. The EPA has provided NOAA Fisheries with copies of the draft permit and fact sheet during the public notice period. Any comments received from NOAA Fisheries regarding EFH will be considered prior to reissuance of this permit.

C. State Certification

Section 401 of the CWA requires the EPA to seek State certification before issuing a final permit. As a result of the certification, the State may require more stringent permit conditions or additional monitoring requirements to ensure that the permit complies with water quality standards, or treatment standards established pursuant to any State law or regulation.

D. Permit Expiration

The permit will expire five years from the effective date.

X. References

EPA. 2010. *Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion*. United States Environmental Protection Agency. Office of Science and Technology. EPA-823-R-10-001. April 2010. http://water.epa.gov/scitech/swguidance/standards/criteria/health/upload/mercury2010.pdf

EPA. 2016. Biological Evaluation for Reissuance of the NPDES Permit for the City of Sandpoint Wastewater Treatment Plant.

Appendix A: Facility Information

General Information

NPDES ID Number:	ID0020842
Physical Location:	723 South Ella Avenue Sandpoint, Idaho 83864
Mailing Address:	1123 Lake Street Sandpoint, Idaho 83864
Facility Background:	The first NPDES permit was issued to this facility on June 14, 1974. The most recent NPDES permit for the City of Sandpoint wastewater treatment plant (WWTP) was issued on November 30, 2001, became effective on January 5, 2002, and expired on January 5, 2007. An NPDES application for permit reissuance was submitted by the permittee on September 25, 2006. The EPA determined that the application was timely and complete. Therefore, pursuant to 40 CFR 122.6., the permit has been administratively extended and remains fully effective and enforceable. The EPA issued a draft permit for public comment on October 31, 2014. The public comment period was scheduled to close on December 1, 2014, but was extended to January 30, 2015.

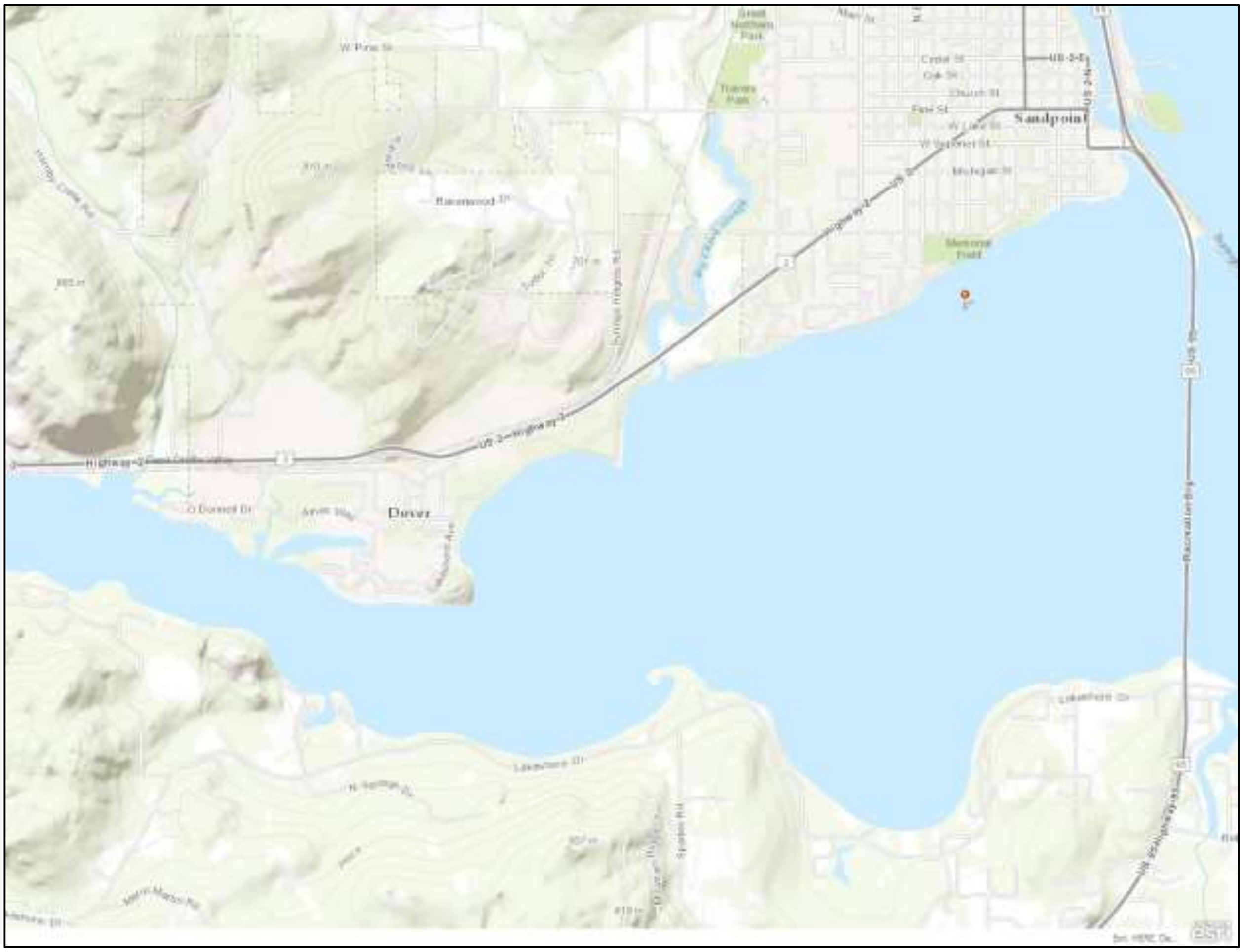
Facility Information

Type of Facility:	Publicly Owned Treatment Works (POTW)
Treatment Train:	Liquid stream: Grit removal, influent flow meter (Parshall flume), primary clarifiers, aeration basins, secondary clarifiers, chlorine disinfection, effluent flow meter (Parshall flume). Solid stream: Gravity thickener, anaerobic digestion, holding tank, belt filter press.
Flow:	Design flow is 5 mgd. The maximum monthly average flow measured between February 2002 and April 2012 was 6.7 mgd.
Outfall Location:	latitude 48° 15’ 40.5” longitude 116° 33’ 31”

Receiving Water Information

Receiving Water:	Pend Oreille River
Watershed:	Pend Oreille Lake (HUC 17010214)
Beneficial Uses:	Cold water aquatic life; primary contact recreation; domestic, agricultural and industrial water supply; wildlife habitats; and aesthetics.

Figure A-1: Outfall Location Map



Appendix C: Low Flow Conditions and Dilution

A. Low Flow Conditions

The low flow conditions of a water body are used to determine water quality-based effluent limits. In general, Idaho's water quality standards require criteria be evaluated at the following low flow receiving water conditions (See IDAPA 58.01.02.210.03) as defined below:

Table C-1: Critical Low Flows for use in Water Quality-based Permitting

Acute aquatic life	1Q10 or 1B3
Chronic aquatic life	7Q10 or 4B3
Non-carcinogenic human health criteria	30Q5
Carcinogenic human health criteria	harmonic mean flow
Ammonia	30B3 or 30Q10

1. The 1Q10 represents the lowest one day flow with an average recurrence frequency of once in 10 years.
2. The 1B3 is biologically based and indicates an allowable exceedance of once every 3 years.
3. The 7Q10 represents lowest average 7 consecutive day flow with an average recurrence frequency of once in 10 years.
4. The 4B3 is biologically based and indicates an allowable exceedance for 4 consecutive days once every 3 years.
5. The 30Q5 represents the lowest average 30 consecutive day flow with an average recurrence frequency of once in 5 years.
6. The 30Q10 represents the lowest average 30 consecutive day flow with an average recurrence frequency of once in 10 years.
7. The harmonic mean is a long-term mean flow value calculated by dividing the number of daily flow measurements by the sum of the reciprocals of the flows.

Idaho's water quality standards do not specify a low flow to use for the chronic ammonia criterion, however, the EPA's *Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia; Notice* (64 FR 719769 December 22, 1999) identifies the appropriate flows to be used.

The Kalispel Tribe had stated in comments filed during the initial public comment period that the effluent limits for phosphorus should be based on seasonal 30-day, 10 year low flow rates (30Q10) instead of the 10th percentile 365-day rolling harmonic mean flow of 10,259 CFS, as proposed in the October 2014 draft permit. Mixing calculations for phosphorus now use the seasonal 30Q10 flow rates. The seasonal 30Q10 flow rates are 6,640 CFS for June – September and 8,260 CFS for October – May.

The EPA determined critical low flows upstream of the discharge from the following USGS Stations: Pend Oreille River at Newport, Washington (#12395500) and Priest River near Priest River, Idaho (#12395000). The flows from the Priest River were subtracted from the flows in the Pend Oreille River at Newport (which is downstream from the Priest River) to estimate the critical low flows of the Pend Oreille River at the point of discharge (upstream from the Priest River). Table C-2 shows the estimated critical low flows of the Pend Oreille River at Sandpoint.

Table C-2: Critical Flows of the Pend Oreille River at Sandpoint

Flow Statistic	Flow (cfs)
1Q10	2,410
7Q10	3,880
30B3	8,090
30Q5	7,360
Harmonic Mean	16,800
30Q10 (June – September)	6,640
30Q10 (October – May)	8,260

B. Mixing Zones and Dilution

In some cases a dilution allowance or mixing zone is permitted. A mixing zone is an area where an effluent discharge undergoes initial dilution and may be extended to cover the secondary mixing in the ambient water body. A mixing zone is an allocated impact zone where the water quality standards may be exceeded as long as acutely toxic conditions are prevented (EPA 2014). The federal regulations at 40 CFR 131.13 states that "States may, at their discretion, include in their State standards, policies generally affecting their application and implementation, such as mixing zones, low flows and variances."

The Idaho Water Quality Standards at IDAPA 58.01.02.060 provides Idaho's mixing zone policy for point source discharges. The policy allows the IDEQ to authorize a mixing zone for a point source discharge after a biological, chemical, and physical appraisal of the receiving water and the proposed discharge.

The following formula is used to calculate a dilution factor based on the allowed mixing.

$$D = \frac{\mathrm{Q_e} + \mathrm{Q_u} \times \%\mathrm{MZ}}{\mathrm{Q_e}}$$

Where:

D = Dilution Factor

Q_e = Effluent flow rate (set equal to the design flow of the WWTP)

Q_u = Receiving water low flow rate upstream of the discharge (1Q10, 7Q10, 30B3, etc.)

%MZ = Percent Mixing Zone

In general, mixing zones may not include more than 25% of the volume of the stream flow (IDAPA 58.01.02.060.01.h.i.2). However, IDEQ may authorize mixing zones larger than 25% if certain conditions are met (IDAPA 58.01.02.060.01.i).

Table C-3: Dilution Factors for the City of Sandpoint

Criteria	Flow Statistics	Authorized MZ	Dilution Factor
Acute aquatic life	1Q10	15.1%	48:1
Chronic aquatic life	7Q10	25.0%	126:1
Chronic ammonia	30B3	12.1%	128:1
Human health non-carcinogen	30Q5	25.0%	239:1
Human health carcinogen	Harmonic Mean	25.0%	544:1
Narrative nutrient criterion (IDAPA 58.01.02.200.06)	30Q10 (June – September)	47.0%	404.4:1
	30Q10 (October – May)	60.0%	641.6:1

C. References

EPA. 2014. *Water Quality Standards Handbook Chapter 5: General Policies. United States Environmental Protection Agency. Office of Water*. EPA 820-B-14-004. September 2014. http://www.epa.gov/wqs-tech/water-quality-standards-handbook

Appendix D: Basis for Effluent Limits

The following discussion explains the derivation of technology and water quality based effluent limits proposed in the draft permit. Part A discusses technology-based effluent limits, Part B discusses water quality-based effluent limits in general, Part C discusses the State's anti-degradation policy, and Part D presents a summary of the facility specific limits.

A. Technology-Based Effluent Limits

Federal Secondary Treatment Effluent Limits

The CWA requires POTWs to meet performance-based requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," which all POTWs were required to meet by July 1, 1977. The EPA has developed and promulgated "secondary treatment" effluent limitations, which are found in 40 CFR 133.102. These technology-based effluent limits apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. The federally promulgated secondary treatment effluent limits are listed in Table C-1.

Table D-1: Secondary Treatment Effluent Limits
(40 CFR 133.102)

Parameter	Average Monthly Limit	Average Weekly Limit	Range
BOD_5	30 mg/L	45 mg/L	—
TSS	30 mg/L	45 mg/L	—
Removal Rates for BOD_5 and TSS	85% (minimum)	—	—
pH	—	—	6.0 – 9.0 s.u.

Mass-Based Limits

The federal regulation at 40 CFR 122.45(f) requires that effluent limits be expressed in terms of mass, if possible. The regulation at 40 CFR 122.45(b) requires that effluent limitations for POTWs be calculated based on the design flow of the facility. The mass based limits are expressed in pounds per day and are calculated as follows:

Mass based limit (lb/day) = concentration limit (mg/L) × design flow (mgd) × 8.34[1]

Since the design flow for this facility is 5.0 mgd, the technology based mass limits for BOD_5 and TSS are calculated as follows:

Average Monthly Limit = 30 mg/L × 5.0 mgd × 8.34 = 1251 lbs/day

Average Weekly Limit = 45 mg/L × 5.0 mgd × 8.34 = 1877 lbs/day

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[1] 8.34 is a conversion factor equal to the density of water in pounds per gallon.

Chlorine

Chlorine is often used to disinfect municipal wastewater prior to discharge. The City of Sandpoint WWTP uses chlorine disinfection.

A 0.5 mg/L average monthly limit for chlorine is derived from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after 15 minutes of contact time. Therefore, a wastewater treatment plant that provides adequate chlorine contact time can meet a 0.5 mg/L total residual chlorine limit on a monthly average basis. In addition to average monthly limits (AMLs), NPDES regulations require effluent limits for POTWs to be expressed as average weekly limits (AWLs) unless impracticable. For technology-based effluent limits, the AWL is calculated to be 1.5 times the AML, consistent with the "secondary treatment" limits for BOD_5 and TSS. This results in an AWL for chlorine of 0.75 mg/L.

Since the federal regulations at 40 CFR 122.45 (b) and (f) require limitations for POTWs to be expressed as mass based limits using the design flow of the facility, mass based limits for chlorine are calculated as follows:

Monthly average Limit= 0.5 mg/L x 5.0 mgd x 8.34 = 20.9 lbs/day

Weekly average Limit = 0.75 mg/L x 5.0 mgd x 8.34 = 31.3 lbs/day

The EPA has determined that water quality-based effluent limits, which are more stringent than the above-described technology-based effluent limits, are necessary for chlorine.

B. Water Quality-based Effluent Limits

Statutory and Regulatory Basis

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards. Discharges to State or Tribal waters must also comply with limitations imposed by the State or Tribe as part of its certification of NPDES permits under section 401 of the CWA. Federal regulations at 40 CFR 122.4(d) prohibit the issuance of an NPDES permit that does not ensure compliance with the water quality standards of all affected States.

The NPDES regulation (40 CFR 122.44(d)(1)) implementing Section 301(b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State or Tribal water quality standard, including narrative criteria for water quality, and that the level of water quality to be achieved by limits on point sources is derived from and complies with all applicable water quality standards.

The regulations require the permitting authority to make this evaluation using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

Reasonable Potential Analysis

When evaluating the effluent to determine if the pollutant parameters in the effluent are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State/Tribal water quality criterion, the EPA projects the receiving water concentration (downstream of where the effluent enters the receiving water) for each pollutant of concern. The EPA uses the concentration of the pollutant in the effluent and receiving water and, if appropriate, the dilution available from the receiving water, to project the receiving water concentration. If the projected concentration of the pollutant in the receiving water exceeds the numeric criterion for that specific pollutant, then the discharge has the reasonable potential to cause or contribute to an excursion above the applicable water quality standard, and a water quality-based effluent limit is required.

Sometimes it may be appropriate to allow a small area of the receiving water to provide dilution of the effluent. These areas are called mixing zones. Mixing zone allowances will increase the mass loadings of the pollutant to the water body and will decrease treatment requirements. Mixing zones can be used only when there is adequate receiving water flow volume and the concentration of the pollutant in the receiving water is less than the criterion necessary to protect the designated uses of the water body.

Mixing zones must be authorized by the State. The IDEQ's draft certification proposes to authorize mixing zones as specified in Table C-3, above, for the following parameters:

- Ammonia
- Arsenic (aquatic life and human health criteria)
- Chlorine
- Chromium III
- Chromium VI
- Copper
- Cyanide
- Lead
- Nickel
- Nitrate + Nitrite
- Phosphorus
- Silver
- Zinc

If IDEQ does not grant the mixing zones in its final certification of this permit, the water quality-based effluent limits will be re-calculated such that the criteria are met before the effluent is discharged to the receiving water.

Procedure for Deriving Water Quality-based Effluent Limits

The first step in developing a water quality-based effluent limit is to develop a wasteload allocation (WLA) for the pollutant. A wasteload allocation is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of water quality standards in the receiving water. Wasteload allocations are determined in one of the following ways:

1. TMDL-Based Wasteload Allocation

Where the receiving water quality does not meet water quality standards, the wasteload allocation is generally based on a TMDL developed by the State. A TMDL is a determination of the amount of a pollutant from point, non-point, and natural background sources that may be discharged to a water body without causing the water body to exceed the criterion for that pollutant. Any loading above this capacity risks violating water quality standards.

There are no TMDLs that establish wasteload allocations for the City of Sandpoint discharge.

2. Mixing zone based WLA

When the State authorizes a mixing zone for the discharge, the WLA is calculated by using a simple mass balance equation. The equation takes into account the available dilution provided by the mixing zone, and the background concentrations of the pollutant. The WLAs for ammonia, chlorine, and total phosphorus for the City of Sandpoint were derived using a mixing zone.

3. Criterion as the Wasteload Allocation

In some cases a mixing zone cannot be authorized, either because the receiving water is already at, or exceeds, the criterion, the receiving water flow is too low to provide dilution, or the facility can achieve the effluent limit without a mixing zone. In such cases, the criterion becomes the wasteload allocation. Establishing the criterion as the wasteload allocation ensures that the effluent discharge will not contribute to an exceedance of the criteria. The wasteload allocation for E. coli was calculated using the criterion as the wasteload allocation.

Once the wasteload allocation has been developed, the EPA applies the statistical permit limit derivation approach described in Chapter 5 of the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001, March 1991, hereafter referred to as the TSD) to obtain monthly average, and weekly average or daily maximum permit limits. This approach takes into account effluent variability, sampling frequency, in addition to water quality standards.

Summary - Water Quality-based Effluent Limits

The water quality based effluent limits in the draft permit are summarized below.

pH

The Idaho water quality standards at IDAPA 58.01.02.250.01.a, require pH values of the river to be within the range of 6.5 to 9.0. Mixing zones are generally not granted for pH, therefore the most stringent water quality criterion must be met before the effluent is discharged to the receiving water. The prior permit required daily monitoring of the effluent pH. The data ranged from 6.5 – 7.8 standard units. The pH range of the effluent is within the State’s water quality criterion of 6.5 – 9.0 standard units, therefore no mixing zone is necessary for this discharge. The EPA is retaining the water quality based limits in the permit because the NPDES regulations require that the permit include the more stringent of either technology based limits or water quality based effluent limits.

Phosphorus

As explained in Appendix E, EPA has determined that the phosphorus in the City of Sandpoint discharge has the reasonable potential to cause or contribute to excursions above the State of Idaho's narrative water quality criterion for excess nutrients. In determining reasonable potential and calculating effluent limits, EPA considered the results of CE-QUAL-W2 modeling of the Pend Oreille River (Cope 2015) as well as EPA's Clean Water Act Section 304(a) recommended water quality criteria for total phosphorus in rivers and streams (EPA 2000). EPA has therefore established water quality-based effluent limits for total phosphorus in the draft permit.

E. coli

The Idaho water quality standards state that waters of the State of Idaho that are designated for recreation, are not to contain E. coli bacteria in concentrations exceeding 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 (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, although it is not, in and of itself, a violation of water quality standards. 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.).

The goal of a water quality-based effluent limit is to ensure a low probability that water quality standards will be exceeded in the receiving water as a result of a discharge, while considering the variability of the pollutant in the effluent. Because a single sample value exceeding 406 organisms per 100 ml indicates a likely exceedance of the geometric mean criterion, the EPA has imposed an instantaneous (single grab sample) maximum effluent limit for E. coli of 406 organisms per 100 ml, in addition to a monthly geometric mean limit of 126 organisms per 100 ml, which directly implements the water quality criterion for E. coli. This will ensure that the discharge will have a low probability of exceeding water quality standards for E. coli.

Regulations at 40 CFR 122.45(d)(2) require that effluent limitations for continuous discharges from POTWs be expressed as average monthly and average weekly limits, unless impracticable. Additionally, the terms "average monthly limit" and "average weekly limit" are defined in 40 CFR 122.2 as being arithmetic (as opposed to geometric) averages. It is impracticable to properly implement a 30-day geometric mean criterion in a permit using monthly and weekly arithmetic average limits. The geometric mean of a given data set is equal to the arithmetic mean of that data set if and only if all of the values in that data set are equal. Otherwise, the geometric mean is always less than the arithmetic mean. In order to ensure that the effluent limits are "derived from and comply with" the geometric mean water quality criterion, as required by 40 CFR 122.44(d)(1)(vii)(A), it is necessary to express the effluent limits as a monthly geometric mean and an instantaneous maximum limit.

Chlorine

EPA has determined that the concentration effluent limits for total residual chlorine in the prior permit are not adequately stringent to ensure that the discharge does not have the reasonable potential to cause or contribute to an excursion above water quality criteria for chlorine.

Therefore, the EPA has calculated new, more stringent water quality-based effluent limits for total residual chlorine.

Residues

The Idaho water quality standards require that surface waters of the State be free from floating, suspended or submerged matter of any kind in concentrations impairing designated beneficial uses. The draft permit contains a narrative limitation prohibiting the discharge of such materials.

Ammonia

A reasonable potential calculation showed that the City of Sandpoint WWTP discharge has the reasonable potential to cause or contribute to a violation of the water quality criteria for ammonia. Therefore, the draft permit proposes water quality-based effluent limits for ammonia.

Dissolved Oxygen and BOD_5

The effect of the oxygen-demanding pollution in the City of Sandpoint discharge upon dissolved oxygen (DO) concentrations in the Pend Oreille River was determined using the CE-QUAL-W2 model, version 3.7. CE-QUAL-W2 is a two-dimensional water quality model for rivers, estuaries, lakes, and reservoirs.[2]

Modeling showed that the City of Sandpoint discharge, with BOD set equal to the technology-based effluent limit, combined with the discharges from other point sources to the Pend Oreille River (the City of Priest River and the City of Dover), would not cause violations of the State of Idaho's water quality criterion for DO, for the cold water aquatic life use (a minimum of 6.0 mg/L at all times). The predicted DO was never less than about 7.6 mg/L under any scenario evaluated (Cope 2015). Therefore, the EPA does not expect that a discharge of BOD at the technology-based effluent limit would cause violations of the cold water aquatic life criterion for DO (6.0 mg/L).

Therefore, water quality-based effluent limits for BOD_5 are not necessary. The BOD_5 effluent limits proposed in the draft permit are the technology-based effluent limits of 40 CFR 133.102(a).

Mercury

In order to ensure that there is no loss of assimilative capacity in the Pend Oreille River for mercury, consistent with the State of Idaho's antidegradation policy, the maximum daily mercury limit has been set equal to the maximum measured effluent concentration of total recoverable mercury, which is 1.1 µg/L, and the loading effluent limits in the permit are based on the previously-permitted design flow of 3 mgd as opposed to the current design flow of 5 mgd. The average monthly limit is back-calculated from the maximum daily limit based on estimated effluent variability (CV = 0.6).

As shown in Table F-2, effluent limits for mercury based solely on the numeric criteria and the authorized mixing zones would be less stringent than the proposed effluent limits. Thus, the

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[2] http://www.ce.pdx.edu/w2/

proposed effluent limits for mercury will also ensure compliance with the numeric water quality criteria for mercury in the water column.

See also the draft Clean Water Act Section 401 certification at Pages 4 and 5.

C. Antidegradation

The proposed issuance of an NPDES permit triggers the need to ensure that the conditions in the permit ensure that Tier I, II, and III of the State's antidegradation policy are met. An anti-degradation analysis was conducted by the IDEQ. See Appendix G for the antidegradation analysis.

D. Facility Specific Limits

Table D-2 summarizes the numeric effluent limits that are in the proposed permit. The final limits are the more stringent of technology treatment requirements, water quality based limits or limits retained as the result of anti-backsliding analysis or to meet the State's anti-degradation policy.

Table D-2: Proposed Effluent Limits and Bases

Parameter	**Units**	**Effluent Limits**			
		Average Monthly Limit	**Average Weekly Limit**	**Maximum Daily Limit**	**Basis for Limits**
Five-Day Biochemical Oxygen Demand (BOD$_5$)	mg/L	30	45	—	Clean Water Act (CWA) Section 301(b)(1)(B), 40 CFR 122.45(f), 40 CFR 133 (technology-based, mass limits)
	lb/day	1251	1877	—	
Total Suspended Solids (TSS)	mg/L	30	45	—	CWA Section 301(b)(1)(B), 40 CFR 122.45(f), 40 CFR 133 (technology-based, mass limits)
	lb/day	1251	1877	—	
E. coli	#/100 ml	126 (geometric mean)	—	406 (instantaneous maximum)	CWA Section 301(b)(1)(C), 40 CFR 122.4(d), 40 CFR 122.44(d), IDAPA 58.01.02.251.01 (water quality-based)
Total Residual Chlorine	mg/L	0.348	—	0.912	CWA Section 301(b)(1)(C), 40 CFR 122.4(d), 40 CFR 122.44(d), IDAPA 58.01.02.060, 58.01.02.210 (water quality-based, with mixing zone)
	lb/day	14.5	—	38.0	
Total Ammonia as N	mg/L	21.1	—	40.5	CWA Section 301(b)(1)(C), 40 CFR 122.4(d), 40 CFR 122.44(d), IDAPA 58.01.02.060, 58.01.02.250.02.d (water quality-based, with mixing zone)
	lb/day	880	—	1689	
Mercury, Total	µg/L	0.56	—	1.1	CWA Section 301(b)(1)(C), 40 CFR 122.4(d), 40 CFR 122.44(d), 40 CFR 131.21, IDAPA 58.01.02.051, 58.01.02.052, 58.01.02.060, (water quality-based, previously approved State water quality standards with mixing zone, antidegradation)
	lb/day	0.014	—	0.028	
Phosphorus, Total as P (June – September)	lb/day	61	—	79	CWA Section 301(b)(1)(C), 40 CFR 122.4(d), 40 CFR

Table D-2: Proposed Effluent Limits and Bases

Parameter	Units	Effluent Limits			
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Basis for Limits
Phosphorus, Total as P (October – May)	lb/day	96	—	125	122.44(d)(1)(vi)(B), IDAPA 58.01.02.060, 58.01.02.200.06 (water quality-based, narrative criteria, with mixing zone)

E. References

Cope, Ben. 2015. "Pend Oreille River Model Simulation of Point Source Impacts." Memorandum from Ben Cope, U.S. EPA Region 10 Office of Environmental Assessment to Brian Nickel, U.S. EPA Region 10 Office of Water and Watersheds. October 15, 2015.

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control*. US Environmental Protection Agency. Office of Water. EPA/505/2-90-001. March 1991. http://www.epa.gov/npdes/pubs/owm0264.pdf

EPA. 2000. *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria: Rivers and Streams in Nutrient Ecoregion II*. EPA 822-B-00-015. December 2000. http://www2.epa.gov/sites/production/files/documents/rivers2.pdf

Appendix E: Reasonable Potential and Effluent Limit Calculations for Total Phosphorus

EPA has determined that the discharge of total phosphorus from the City of Sandpoint wastewater treatment plant has the reasonable potential to cause or contribute to violations of Idaho's water quality criteria for nutrients. Therefore, effluent limits for phosphorus are required. The basis for the phosphorus limits in the draft permit is described in detail below.

A. Applicable Water Quality Criteria

Narrative Water Quality Criterion

The State of Idaho has a narrative water quality criterion which reads "surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses" (IDAPA 58.01.02.200.06).

Limiting Nutrient

Several studies have concluded that phosphorus is the nutrient most likely limiting algae growth in Lake Pend Oreille, upstream from the discharge (Tetra Tech 2002). Phosphorus is generally the limiting nutrient in freshwaters. This is because blue-green algae can "fix" elemental nitrogen from the air as a nutrient source or utilize nitrogen in the water column at very low concentrations and thereby grow in a low-nitrogen environment (EPA 1999). Therefore, phosphorus is the most likely limiting nutrient in the Pend Oreille River.

Interpretation of the Narrative Criterion for Nutrients

Permitting authorities may establish effluent limits based on narrative criteria, as provided for in 40 CFR 122.44(d)(1)(vi). This regulation allows permitting authorities to "(e)stablish effluent limits using a calculated numeric water quality criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use" (40 CFR 122.44(d)(1)(vi)(A)), or to "(e)stablish effluent limits on a case-by-case basis, using EPA's water quality criteria, published under section 304(a) of the CWA, supplemented where necessary by other relevant information" (40 CFR 122.44(d)(1)(vi)(B)). Where appropriate, permitting authorities may also establish effluent limits for an indicator parameter (40 CFR 122.44(d)(1)(vi)(C)).

In this case, the EPA proposes to interpret Idaho's narrative criterion for nutrients consistent with the EPA's Clean Water Act Section 304(a) criteria, consistent with 40 CFR 122.44(d)(1)(vi)(B), and specifically the total phosphorus (TP) criterion recommended in *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria: Rivers and Streams in Nutrient Ecoregion II* ("Ecoregion II River Nutrient Criteria"). The recommended TP criterion for aggregate ecoregion II is 10.0 μg/L TP.

The recommended TP criterion from the Ecoregion II River Nutrient Criteria is close to the average TP target for the nearshore waters of Lake Pend Oreille that was selected by IDEQ in the *Total Maximum Daily Load (TMDL) for Nutrients for the Nearshore Waters of Pend Oreille Lake, Idaho*, ("Nearshore TMDL") which is 9 μg/L, and it is higher than the average euphotic zone TP target for Lake Pend Oreille in the Montana and Idaho Border nutrient load agreement (7.3 μg/L). Rivers generally have a higher capacity to assimilate nutrients than lakes. For example, the EPA-recommended criterion for TP in lakes in this same aggregate ecoregion is 8.8 µg/L, as opposed to 10.0 µg/L for rivers and streams. Thus, it is reasonable that the interpretation of the narrative nutrient criterion for TP, for the Pend Oreille River (10.0 µg/L), is a somewhat higher concentration than the TP targets for the lake (7.3 – 9 µg/L).

Duration, Frequency and Basis for Seasonal Limits

In addition to the magnitude (numeric value) of the criterion, water quality criteria may include an averaging period and an allowable excursion frequency as well. The Ecoregion II River Nutrient Criteria state the following:

> "EPA does not recommend identifying nutrient concentrations that must be met at all times, rather a seasonal or annual averaging period…is considered appropriate. However, these seasonal or annual central tendency measures should apply each season or each year, except under the most extraordinary of conditions (Page 6)."

A ten-year average excursion frequency or a 10% probability of an excursion in any given year is typical for water quality-based permitting (e.g. the use of 1-in-10 year low flows for toxics permitting) and is consistent with the criteria document's recommendation that nutrient targets be achieved each year, except under extraordinary conditions.

Therefore, the numeric interpretation of Idaho's narrative nutrient criterion, for TP, in this case, is an seasonal average total phosphorus concentration of 10.0 µg/L (0.0100 mg/L), which is not to be exceeded more than once every ten years.

B. Reasonable Potential to Cause or Contribute to WQS Violations

Federal regulations require that effluent limitations in NPDES permits "must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which…are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality (40 CFR 122.44(d)(1)(i))."

To determine reasonable potential for TP, the EPA used a mass balance to determine whether the discharge would cause the TP concentration in the Pend Oreille River, downstream from the discharge, to exceed the criterion. The EPA also considered the magnitude of the effluent TP loading relative to the TP loading in the Pend Oreille River.

Critical Low Flow Condition

The critical low river flow condition used in reasonable potential and effluent limit calculations should be consistent with the averaging period and excursion frequency associated with the numeric interpretation of Idaho's narrative nutrient criterion. As explained above, the averaging period for the interpreted narrative criterion is seasonal, and the excursion frequency is once every 10 years.

In the October 2014 draft permit, the EPA had proposed TP effluent limits that were the same year-round and that were based on interpreting the narrative nutrient criterion as an annual average value. The EPA had proposed to use the 10th percentile 365-day rolling harmonic mean flow, which is consistent with an annual averaging period and an excursion frequency of once every 10 years. The 10th percentile 365-day average harmonic mean flow for the Pend Oreille River upstream from the Priest River is 10,259 CFS.

The Kalispel Tribe stated in comments filed during the initial public comment period that the effluent limits for phosphorus should be based on seasonal 30-day, 10 year low flow rates (30Q10) instead of the 10th percentile 365-day rolling harmonic mean flow.

Although it is somewhat conservative to use a 30-day low flow to calculate water quality-based effluent limits for a criterion which is averaged over a season lasting several months, the EPA believes it is reasonable to use the 30Q10 low flow rates for this purpose. Mixing calculations for phosphorus now use the seasonal 30Q10 flow rates. The seasonal 30Q10 flow rates are 6,640 CFS for June – September and 8,260 CFS for October – May.

Upstream Concentration

NPDES regulations require EPA to consider existing controls on point and non-point sources of pollution when performing a reasonable potential analysis (40 CFR 122.44(d)(1)(ii)). This is accomplished by considering the upstream concentration of the pollutant of concern in the reasonable potential analysis. EPA has assumed an upstream TP concentration of 7.3 µg/L, which is the area-weighted euphotic-zone average TP target for Lake Pend Oreille in the *Montana and Idaho Border Nutrient Load Memorandum of Agreement*.

The EPA believes this is a reasonable estimate of the upstream TP concentration because the Lake Pend Oreille Waterkeeper measured an average TP concentration of 6.8 µg/L at City Beach, upstream from the discharge, in the summer of 2013 (July – October) and because the Idaho Department of Environmental Quality measured an average TP concentration of 7.2 µg/L at the railroad bridge, upstream from the discharge, during the summer of 2009 (June – September) (IDEQ 2009).

Effluent Concentration

The effluent concentration used in the reasonable potential analysis was the maximum effluent concentration reported by the City on its DMRs between June 2010 and August 2015, which was 5.33 mg/L.

Projected Downstream Concentration

The projected downstream concentration of TP was calculated as follows:

$$C_d = \frac{C_e - C_u}{D} + C_u$$

Where:

C_d = Receiving water concentration downstream of the effluent discharge (that is, the concentration at the edge of the mixing zone)
C_e = Maximum projected effluent concentration
C_u = Measured upstream receiving water concentration
D = Dilution Factor

Reasonable potential analyses may consider the dilution of the effluent in the receiving water where appropriate (40 CFR 122.44(d)(1)(ii)). The EPA believes it is appropriate to consider the dilution of the effluent in the receiving water in this case. The effluent flow rate is very small relative to the river flow and there is no indication that the central tendency of the upstream concentration of TP currently exceeds the criterion. The dilution factors for the reasonable potential analysis were calculated using the mixing zones authorized by IDEQ, as follows:

June – September

$$D = \frac{Q_e + 0.47 \times Q_u}{Q_e}$$

$$D = \frac{7.736 + (0.47 \times 6640)}{7.736}$$

$$D = 404.4$$

Thus:

$$C_d = \frac{5.33 \text{ mg/L} - 0.0073 \text{ mg/L}}{404.4} + 0.0073 \text{ mg/L}$$

$$\mathbf{C_d = 0.0205 \text{ mg/L} = 20.5\ \mu g/L}$$

October – May

$$D = \frac{Q_e + 0.60 \times Q_u}{Q_e}$$

$$D = \frac{7.736 + (0.60 \times 8260)}{7.736}$$

$$D = 641.6$$

Thus:

$$C_d = \frac{5.33 \text{ mg/L} - 0.0073 \text{ mg/L}}{641.6} + 0.0073 \text{ mg/L}$$

$$\mathbf{C_d = 0.0156 \text{ mg/L} = 15.6\ \mu g/L}$$

The projected concentrations of TP at the edges of the authorized mixing zones are greater than the interpreted narrative criterion. Therefore, the discharge has the reasonable potential to cause or contribute to excursions above Idaho's narrative water quality criterion for nutrients.

Relative Contribution to In-Stream Loading

EPA estimated the upstream loading of TP using the same upstream TP concentration and flow used in the mass balance above. The estimated upstream loading of TP in the river is thus:

June – September

0.0073 ppm × 4,291 mgd × 8.34 lb/gallon = 261 lb/day

October – May

0.0073 ppm × 5,338 mgd × 8.34 lb/gallon = 325 lb/day

The effluent loading was estimated from the quarterly effluent TP monitoring data. First, the EPA estimated a TP load for each quarter by multiplying the effluent TP concentration measured for that quarter by the maximum of the three monthly average effluent flow rates reported for that quarter. The EPA then calculated the average of the quarterly effluent loads calculated in this manner. The estimated average effluent loading of TP is 65.3 lb/day.

The estimated average effluent loading of TP is thus 25% of the TP loading in the Pend Oreille River upstream from the discharge (65.3 ÷ 261 = 0.25) from June – September and 20% of the TP loading in the Pend Oreille River upstream from the discharge (65.3 ÷ 325 = 0.20) from October – May.

Reasonable Potential Summary

As explained above, the projected concentration of TP at the edges of the mixing zones are greater than the interpreted narrative criterion (10.0 µg/L).

In addition, the average effluent TP loading is 20 – 25% of the TP loading in the Pend Oreille River upstream from the discharge, under 30Q10 river flow conditions. The EPA considers this to be a significant contribution to the TP loading in the river.

Therefore, the TP in the City of Sandpoint's discharge has the reasonable potential to cause or contribute to excursions above Idaho's narrative water quality criterion for excess nutrients, and effluent limits are required for TP.

C. Basis for Proposed Effluent Limits

Compliance with Interpreted Narrative Criterion at the Edge of a Mixing Zone

Upstream Concentration

To calculate effluent limits for TP, EPA has used the same upstream TP concentration used to determine reasonable potential (7.3 µg/L).

Mixing Zone Size

In general, mixing zones in Idaho may not encompass more than 25% of the volume of the stream flow (IDAPA 58.01.02.060.01.h). However, IDEQ may authorize mixing zones larger than 25% if certain conditions are met (IDAPA 58.01.02.060.01.i).

The effluent limits are based on mixing zones encompassing 47% of the flow of the receiving water from June – September and 60% of the flow of the receiving water from October - May. IDEQ has authorized mixing zone of these sizes in its draft Clean Water Act Section 401 certification. These mixing zones provide dilution factors of 404.4:1 from June – September and 641.6 from October – May.

Wasteload Allocation

According to Page 6-13 of the *U.S. EPA Permit Writers' Manual* and Section 5.4 of the *Technical Support Document for Water Quality-based Toxics Control,* wasteload allocations need not be established by a TMDL, but may instead be calculated for an individual point source as part of the permitting process. The wasteload allocation is the amount of phosphorus that the permittee may discharge, while ensuring a level of water quality that is derived from and complies with all applicable water quality standards (40 CFR 122.44(d)(1)(vii)(A)). This is calculated as follows:

$$C_e = WLA = D \times (C_d - C_u) + C_u$$

Where:
C_e = Effluent concentration

C_d = Downstream concentration (the numeric interpretation of the narrative criterion)
C_u = Upstream concentration
D = Dilution Factor

June – September

$$\begin{aligned} \text{WLA} &= 404.4 \times (0.01\ \mu\text{g/L} - 0.0073\ \mu\text{g/L}) + 0.0073\ \mu\text{g/L} \\ &= 1.099\ \text{mg/L} \end{aligned}$$

October – May

$$\begin{aligned} \text{WLA} &= 641.6 \times (0.01\ \mu\text{g/L} - 0.0073\ \mu\text{g/L}) + 0.0073\ \mu\text{g/L} \\ &= 1.740\ \text{mg/L} \end{aligned}$$

Translating the Wasteload Allocation to Effluent Limits

As stated above, the numeric interpretation of the narrative criterion for phosphorus is a seasonal average value. Therefore, the WLA is also a seasonal average value. However, effluent limits in NPDES permits for POTWs that discharge continuously must be expressed as average monthly and average weekly limits (40 CFR 122.45(d)(2)).

EPA has used the procedures in Chapter 5 of the *Technical Support Document for Water Quality-based Toxics Control* or TSD, to calculate average monthly and average weekly limits that are consistent with the seasonal average WLA calculated above. As explained on Page 6-11 of the *U.S. EPA NPDES Permit Writers' Manual*, the procedures of the TSD were originally developed to address toxic pollutants but have been appropriately used to address conventional and nonconventional pollutants (such as TP) as well.

As explained in Section 5.2.2 of the TSD, "all permit limits, whether technology-based or water quality-based, are set at the upper bounds of acceptable performance. The purpose of a permit limit is to specify an upper bound of acceptable effluent quality." In Section 5.3.1, the TSD states that "the limits must 'force' treatment plant performance, which, after considering acceptable effluent variability, will only have a low statistical probability of exceeding the WLA and will achieve the desired loadings."

Because effluent discharges are not constant, an effluent limit that specifies the maximum allowable average discharge over a short period of time (e.g., a month or week) must be set higher than the long-term average discharge that the limit is intended to achieve. If such a short-term effluent limit were set equal to a seasonal average WLA, it would be more stringent than intended.[3]

Since the numeric interpretation of the criterion is a seasonal average value, EPA will consider the wasteload allocation calculated above to be a long term average. In Table 5-2, the TSD provides an equation for calculating an average monthly permit limit that is consistent with a

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[3] In Section 5.3.1, the TSD specifically recommends against setting a relatively short-term maximum permit limit equal to a relatively long term WLA, because the limit would be overly stringent. The TSD's specific example of this is setting the maximum daily limit equal to the chronic WLA.

long term average wasteload allocation, along with a table of results for the equation for various values of the coefficient of variation (CV) and various sampling frequencies.

In this case, the coefficient of variation for the effluent phosphorus load is equal to 0.354. EPA proposes a sampling frequency for TP of twice per week. This will result in at least 8 TP samples per month.

Probability Basis

The probability basis is the probability that the permittee will comply with the average monthly effluent limit, if the permittee's long term average and coefficient of variation are consistent with the assumptions used in the calculation of the average monthly limit. In general, for toxics permitting, Section 5.5.4 of the TSD recommends the use of the 95th percentile (5% exceedance probability) for the average monthly limit. This is a conservative approach, which is justified when establishing effluent limits for toxic pollutants, but this conservatism is not necessary when establishing effluent limits for nutrients, where the goal is to achieve a certain seasonal average loading or concentration. Therefore, EPA has used the 99th percentile (1% exceedance probability) to calculate the average monthly limit.

Average Monthly Limit

Using the equation shown in Table 5-2 of the TSD, the CV of 0.354, the 99th percentile probability basis, and the required sampling frequency of 8 samples per month, the multiplier to convert the seasonal average wasteload allocation to an average monthly limit is 1.326. Thus, the average monthly limit, if expressed as a concentration, is:

June – September

$$\text{AML} = 1.099 \text{ mg/L} \times 1.326 = 1.46 \text{ mg/L}$$

October – May

$$\text{AML} = 1.740 \text{ mg/L} \times 1.326 = 2.31 \text{ mg/L}$$

Average Weekly Limit

In general, effluent limits for POTWs must be stated as average monthly limits and average weekly limits (40 CFR 122.45(d)(2)). To calculate the average weekly limit, the EPA has used the same equation used to calculate the average monthly limit, but has reduced the number of samples from 8 (which is the minimum number of samples per month) to two (which is the number of samples per week). This results in a ratio between the seasonal average WLA to the average weekly limit of 1.721:1. Thus, the average weekly limit is:

June – September

$$\text{AWL} = 1.099 \text{ mg/L} \times 1.721 = 1.89 \text{ mg/L}$$

October – May

$$\text{AWL} = 1.740 \text{ mg/L} \times 1.721 = 2.99 \text{ mg/L}$$

Mass Limits

NPDES regulations require that, in general, effluent limits be expressed in terms of mass (40 CFR 122.45(f)). EPA has converted these concentration-based limits into mass limits using the design flow of the treatment plant, as follows:

June – September

Avg. Monthly Mass Limit = 1.46 parts per million × 5 million gallons/day × 8.34 lb/gallon

=61 lb/day

Avg. Weekly Mass Limit = 1.89 parts per million × 5 million gallons/day × 8.34 lb/gallon

=79 lb/day

October – May

Avg. Monthly Mass Limit = 2.31 parts per million × 5 million gallons/day × 8.34 lb/gallon

=96 lb/day

Avg. Weekly Mass Limit = 2.99 parts per million × 5 million gallons/day × 8.34 lb/gallon

=125 lb/day

While NPDES permit limits may be expressed as both concentration and mass, concentration limits are not necessary in this case. This is because nutrients are “far field” pollutants that exert their impact upon water quality over long distances. Furthermore, during the low flow season of June – September, the receiving water provides a dilution factor of 404.4:1 at the edge of the authorized mixing zone. Section 5.7.1 of the TSD recommends that concentration limits be established for effluents discharging into waters with less than 100-fold dilution. Here, there is more than 100-fold dilution, so the effluent concentration will be insignificant, as long as the permittee complies with the mass limits in the draft permit. Thus, the TP limits in the draft permit are expressed exclusively as mass.

CE-QUAL-W2 Modeling

The effect of the phosphorus in the City of Sandpoint discharge upon water quality in the Pend Oreille River was determined using the CE-QUAL-W2 model, version 3.7. CE-QUAL-W2 is a two-dimensional water quality model for rivers, estuaries, lakes, and reservoirs.

Modeling showed that the City of Sandpoint’s discharge of phosphorus, combined with the discharges from other point sources to the Pend Oreille River (the City of Priest River and the City of Dover), would not cause violations of the State of Idaho’s water quality criteria for DO or pH, and that periphyton accumulations and water column chlorophyll a concentrations are below nuisance thresholds (Cope 2015).

D. References

Cope, Ben. 2015. “Pend Oreille River Model Simulation of Point Source Impacts.” Memorandum from Ben Cope, U.S. EPA Region 10 Office of Environmental Assessment to Brian Nickel, U.S. EPA Region 10 Office of Water and Watersheds. October 15, 2015.

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control*. US Environmental Protection Agency. Office of Water. EPA/505/2-90-001. March 1991. http://www.epa.gov/npdes/pubs/owm0264.pdf

EPA. 1999. *Protocol for Developing Nutrient TMDLs*. EPA 841-B-99-007. November 1999. http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/2000_01_10_tmdl_nutrient_nutrient.pdf

EPA. 2000. *Ambient Water Quality Criteria Recommendations: Information Supporting the* Development of State and Tribal Nutrient Criteria: Rivers and Streams in Nutrient Ecoregion II. EPA 822-B-00-015. December 2000. http://www2.epa.gov/sites/production/files/documents/rivers2.pdf

EPA. 2010. *U.S. Environmental Protection Agency NPDES Permit Writers' Manual*. Office of Wastewater Management. Water Permits Division. State and Regional Branch. EPA-833-K-10-001. September 2010. http://water.epa.gov/polwaste/npdes/basics/upload/pwm_2010.pdf

IDEQ. 2009. "2009 Monitoring Results and QA/QC." https://www.deq.idaho.gov/media/578409-_about_regions_pend_oreille_river_tribs_wag_monitoring_results_2009.pdf

Montana Department of Environmental Quality, Idaho Department of Environmental Quality, and Tri-State Water Quality Council. *Montana and Idaho Border Nutrient Load Memorandum of Agreement*. April 2002. https://www.deq.idaho.gov/media/892728-montana-idaho-border-nutrient-load-memorandum-of-agreement-0402.pdf

Tetra Tech, Inc. and Tri-State Water Quality Council. 2002. *Total Maximum Daily Load (TMDL) for Nutrients for the Nearshore Waters of Pend Oreille Lake, Idaho*. April 2002. https://www.deq.idaho.gov/media/464368-_water_data_reports_surface_water_tmdls_pend_oreille_lake_ns_pend_oreille_ns_nutrient_entire.pdf

Appendix F: Reasonable Potential and Water Quality-Based Effluent Limit Calculations

Part A of this appendix explains the process the EPA has used to determine if the discharge authorized in the draft permit has the reasonable potential to cause or contribute to a violation of Idaho's federally approved water quality standards. Part B demonstrates how the water quality-based effluent limits (WQBELs) in the draft permit were calculated.

A. Reasonable Potential Analysis

The EPA uses the process described in the Chapter 3 of the *Technical Support Document for Water Quality-based Toxics Control* or TSD (EPA 1991) to determine reasonable potential. To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the EPA compares the maximum projected receiving water concentration to the water quality criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is reasonable potential, and a water quality-based effluent limit must be included in the permit. This following section discusses how the maximum projected receiving water concentration is determined

Mass Balance

For discharges to flowing water bodies, the maximum projected receiving water concentration is determined using the following mass balance equation:

$$C_dQ_d = C_eQ_e + C_uQ_u \qquad \text{Equation 1}$$

where,

C_d = Receiving water concentration downstream of the effluent discharge (that is, the concentration at the edge of the mixing zone)

C_e = Maximum projected effluent concentration

C_u = Receiving water upstream concentration

Q_d = Receiving water flow rate downstream of the effluent discharge = Q_e+Q_u

Q_e = Effluent flow rate (set equal to the design flow of the WWTP)

Q_u = Receiving water low flow rate upstream of the discharge (1Q10, 7Q10 or 30B3)

<u>Upstream Receiving Water Concentration</u>

If ambient water quality data are available, these data were used to determine the upstream receiving water concentration (C_u). In general, for water quality criteria for toxic pollutants, the 95th percentile concentration is used, unless there are too few data points to calculate the 95th percentile, in which case the maximum concentration is used.

There were no ambient water quality data available for mercury in the water column. However, Lake Pend Oreille, upstream from the discharge, is impaired due to concentrations of methylmercury in fish tissue that exceed the State of Idaho's methylmercury fish tissue criterion. The concentration of methylmercury in fish tissue in Lake Pend Oreille is 0.611 mg/kg (IDEQ 2011). The EPA used the measured concentration of methylmercury in fish tissue in Lake Pend Oreille and the trophic level 2 national bioaccumulation factor (BAF) to estimate the concentration of mercury in the water column, in Lake Pend Oreille, for the purposes of determining reasonable potential to exceed and deriving effluent limits from the acute and chronic water quality criteria for mercury in the water column. The estimated water column concentration of mercury in Lake Pend Oreille is 5.09 ng/L, or 0.00509 µg/L.

There were no ambient water quality data available for Lake Pend Oreille or the Pend Oreille River, for copper. Therefore, the EPA has used the median concentration of dissolved copper in the Clark Fork River at the Cabinet Gorge Dam (2 µg/L) to estimate the upstream copper concentration (Hydrosolutions 2011).

When the mass balance equation is solved for C_d, it becomes:

$$C_d = \frac{C_e \times Q_e + C_u \times Q_u}{Q_e + Q_u} \qquad \text{Equation 2}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with 100% of the receiving stream.

If the mixing zone is based on less than complete mixing with the receiving water, the equation becomes:

$$C_d = \frac{C_e \times Q_e + C_u \times (Q_u \times \%MZ)}{Q_e + (Q_u \times \%MZ)} \qquad \text{Equation 3}$$

Where:

% MZ = the percentage of the receiving water flow available for mixing.

If a mixing zone is not allowed, dilution is not considered when projecting the receiving water concentration and,

$$C_d = C_e \qquad \text{Equation 4}$$

A dilution factor (D) can be introduced to describe the allowable mixing. Where the dilution factor is expressed as:

$$D = \frac{Q_e + Q_u \times \%MZ}{Q_e} \qquad \text{Equation 5}$$

After the dilution factor simplification, the mass balance equation becomes:

$$C_d = \frac{C_e - C_u}{D} + C_u \qquad \text{Equation 6}$$

If the criterion is expressed as dissolved metal, the effluent concentrations are measured in total recoverable metal and must be converted to dissolved metal as follows:

$$C_d = \frac{CF \times C_e - C_u}{D} + C_u \qquad \text{Equation 7}$$

Where C_e is expressed as total recoverable metal, C_u and C_d are expressed as dissolved metal, and CF is a conversion factor used to convert between dissolved and total recoverable metal.

The above equations for C_d are the forms of the mass balance equation which were used to determine reasonable potential and calculate wasteload allocations.

Maximum Projected Effluent Concentration

When determining the projected receiving water concentration downstream of the effluent discharge, the EPA's TSD recommends using the maximum projected effluent concentration (C_e) in the mass balance calculation (see equation 3, page C-5).

When determining the maximum projected effluent concentration of arsenic, the EPA has made the conservative assumption that all of the arsenic in the discharge is inorganic. The human health water quality criteria for arsenic are applicable only to the inorganic form of arsenic (IDAPA 58.01.02.210.01). Similarly, the EPA has used the total chromium concentration to determine reasonable potential for both chromium III and chromium VI.

To determine the maximum projected effluent concentration (C_e) the EPA has developed a statistical approach to better consider the effects of effluent variability, as required by 40 CFR 122.44(d)(1)(ii). The approach combines knowledge of effluent variability as estimated by a coefficient of variation (CV) with the uncertainty due to a limited number of data points to project an estimated maximum concentration for the effluent. Once the CV for each pollutant parameter has been calculated, the reasonable potential multiplier (RPM) used to derive the maximum projected effluent concentration (C_e) can be calculated using the following equations:

First, the percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - \text{confidence level})^{1/n} \qquad \text{Equation 8}$$

where,

p_n = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 99% = 0.99

and

$$\text{RPM} = \frac{C_{99}}{C_{P_n}} = \frac{e^{Z_{99} \times \sigma - 0.5 \times \sigma^2}}{e^{Z_{P_n} \times \sigma - 0.5 \times \sigma^2}} \qquad \text{Equation 9}$$

Where,

σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile)
Z_{P_n} = z-score for the P_n percentile (inverse of the normal cumulative distribution function at a given percentile)
CV = coefficient of variation (standard deviation ÷ mean)

The maximum projected effluent concentration is determined by simply multiplying the maximum reported effluent concentration by the RPM:

$$C_e = (\text{RPM})(\text{MRC}) \qquad \text{Equation 10}$$

where MRC = Maximum Reported Concentration

Reasonable Potential

The discharge has reasonable potential to cause or contribute to an exceedance of water quality criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the most stringent criterion for that pollutant.

Results of Reasonable Potential Calculations

It was determined that the facility's discharges of chlorine, mercury and ammonia have the reasonable potential to cause or contribute to an exceedance of water quality criteria at the edge of the mixing zone. The results of the calculations are presented in Table F-1 of this appendix.

B. WQBEL Calculations

The following calculations demonstrate how the water quality-based effluent limits (WQBELs) in the draft permit were calculated. The WQBELs for chlorine and ammonia are derived from aquatic life criteria. The following discussion presents the general equations used to calculate the water quality-based effluent limits. The calculations for all WQBELs based on aquatic life criteria are summarized in Table F-2.

Calculate the Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated using the same mass balance equations used to calculate the concentration of the pollutant at the edge of the mixing zone in the reasonable potential analysis (Equations 6 and 7, above). To calculate the wasteload allocations, C_d is set equal to the acute or chronic criterion and the equation is solved for C_e. The calculated C_e is the acute or chronic WLA. Equation 6 is rearranged to solve for the WLA, becoming:

$$C_e = WLA = D \times (C_d - C_u) + C_u \qquad \text{Equation 11}$$

Idaho's water quality criteria for some metals are expressed as the dissolved fraction, but the Federal regulation at 40 CFR 122.45(c) requires that effluent limits be expressed as total recoverable metal. Therefore, the EPA must calculate a wasteload allocation in total recoverable metal that will be protective of the dissolved criterion. This is accomplished by dividing the WLA expressed as dissolved by the criteria translator, as shown in equation 12. As discussed in Appendix B, the criteria translator (CT) is equal to the conversion factor from the water quality standards, because site-specific translators are not available for this discharge.

$$C_e = WLA = \frac{D \times (C_d - C_u) + C_u}{CT} \qquad \text{Equation 12}$$

The next step is to compute the "long term average" concentrations which will be protective of the WLAs. This is done using the following equations from the EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a \times e^{(0.5\sigma^2 - z\,\sigma)} \qquad \text{Equation 13}$$

$$LTA_c = WLA_c \times e^{(0.5\sigma_4^2 - z\sigma_4)} \qquad \text{Equation 14}$$

where,

σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile probability basis)
CV = coefficient of variation (standard deviation ÷ mean)
σ_4^2 = $\ln(CV^2/4 + 1)$

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits as shown below.

Derive the maximum daily and average monthly effluent limits

Using the TSD equations, the MDL and AML effluent limits are calculated as follows:

$$\mathrm{MDL} = \mathrm{LTA} \times e^{(z_m\sigma - 0.5\sigma^2)} \quad \text{Equation 15}$$

$$\mathrm{AML} = \mathrm{LTA} \times e^{(z_a\sigma_n - 0.5\sigma_n^2)} \quad \text{Equation 16}$$

where σ, and σ^2 are defined as they are for the LTA equations above, and,

σ_n^2 = ln(CV^2/n + 1

z_a = 1.645 (z-score for the 95th percentile probability basis)

z_m = 2.326 (z-score for the 99th percentile probability basis)

n = number of sampling events required per month. With the exception of ammonia, if the AML is based on the LTA_c, i.e., $LTA_{minimum} = LTA_c$), the value of ''n'' should is set at a minimum of 4. For ammonia, In the case of ammonia, if the AML is based on the LTA_c, i.e., $LTA_{minimum} = LTA_c$), the value of "n" should is set at a minimum of 30.

Table F-2, below, details the calculations for water quality-based effluent limits.

Table F-1: Reasonable Potential Calculations

Effluent Percentile value	99%																
				State Water Quality Standard		Max concentration at edge of...											
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L		Pn	ug/L	CV	s	n				COMMENTS
Ammonia (mg/L)	1.00	1.00	0.040	0.882	0.300	0.866	0.350	YES	0.962	32.0	0.41	0.39	120	1.240	48	128	
Arsenic (Aquatic Life)	1.00	1.00		340	150	12.26	4.66	NO	0.933	130	5.12	1.82	66	4.53	48	126	
Arsenic (Human Health)	1.00	1.00			10		2.46	NO	0.933	130	5.12	1.82	66	4.53		239	
Chlorine	1.00	1.00		19.0	11.0	22.9	8.70	YES	N/A	1100	N/A	N/A	N/A	1.00	48	126	Previous Max. Daily Conc. Limit
Chromium III	0.32	0.86		355	46	0.18	0.19	NO	0.933	14.0	0.98	0.82	66	1.98	48	126	
Chromium VI	0.98	0.96		15.7	10.6	0.57	0.21	NO	0.933	14.0	0.98	0.82	66	1.98	48	126	
Copper	0.96	0.96	2.00	9.87	6.93	3.29	2.49	NO	0.933	42.0	0.60	0.55	66	1.58	48	126	
Cyanide	1.00	1.00		22.0	5.2	0.07	0.03	NO	0.933	2.00	0.60	0.55	66	1.59	48	126	
Lead	0.88	0.88		34.2	1.3	1.66	0.63	NO	0.933	40.0	1.30	0.99	66	2.28	48	126	
Mercury	1.00	1.00	0.00509	2.100	0.012	0.041	0.019	YES	0.933	1.10	0.60	0.55	66	1.59	48	126	
Nickel	1.00	1.00		287	31.9	0.094	0.036	NO	0.599	1.43	0.60	0.55	9	3.16	48	126	
Nitrate + Nitrite (mg/L)	1.00	1.00	0.1000		10.0		0.114	NO	0.883	2.40	0.33	0.32	37	1.43		239	
Silver	0.85			1.28		0.070		NO	0.215	0.70	0.60	0.55	3	5.62	48		
Zinc	0.98	0.99		71.8	72.4	8.09	3.10	NO	0.933	253	0.59	0.54	66	1.57	48	126	
WET	1.00	1.00		3.00	1.00	0.23	0.09	NO	0.215	2.00	0.60	0.55	3	5.62	48	126	

Table F-2: Effluent Limit Calculations

Statistical variables for permit limit calculation	
LTA Probability Basis	99%
MDL Probability Basis	99%
AML Probability Basis	95%

Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.

											Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations							
					Permit Limit Calculation Summary													
	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator	Metal Criteria Translator	Ambient Concentration	Water Quality Standard Acute	Water Quality Standard Chronic	Average Monthly Limit (AML)	Maximum Daily Limit (MDL)	Comments	WLA Acute	WLA Chronic	LTA Acute	LTA Chronic	Limiting LTA	Coeff. Var. (CV)	# of Samples per Month	
PARAMETER			Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L		ug/L	ug/L	ug/L	ug/L	ug/L	decimal	n	
Mercury	48.0	126.4	1.00	1.00	0.0051	2.100	0.012	**0.72**	**1.44**		101	0.878	32.3	0.463	0.463	0.60	4.00	1.00
Ammonia (mg/L)	48.0	126.4	1.00	1.00	0.04	0.88	0.30	**21.1**	**40.5**		40.5	32.9	17.5	27.8	17.5	0.41	12.00	1.00
Chlorine	48.0	126.4	1.00	1.00		19.00	11.00	**348**	**912**		912	1390	293	733	293	0.60	30.00	1.00

Note: The mercury effluent limits calculated above are based solely on the numeric criteria and authorized mixing zones. The proposed effluent limits for mercury in the draft permit are more stringent and are based on the State of Idaho's antidegradation policy.

C. References

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control*. US Environmental Protection Agency. Office of Water. EPA/505/2-90-001. March 1991.
http://www.epa.gov/npdes/pubs/owm0264.pdf

Appendix G: Clean Water Act Section 401 Certification

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2110 Ironwood Parkway • Coeur d'Alene, Idaho 83814 • (208) 769-1422
www.deq.idaho.gov

C.L. "Butch" Otter, Governor
John H. Tippets, Director

February 23, 2016

Mr. Michael Lidgard
US Environmental Protection Agency, Region 10
1200 6th Avenue, OW-130
Seattle, WA 98101

RE: Revised Draft §401 Water Quality Certification for the Draft NPDES Permit No. ID-0020842 for the City of Sandpoint Wastewater Treatment Plant

Dear Mr. Lidgard:

The State of Idaho Department of Environmental Quality (DEQ) received a revised preliminary draft NPDES permit dated November 19, 2015. After review of the draft permit and fact sheet, DEQ submits the enclosed draft §401 water quality certification which includes a narrative description of our antidegradation review for this permit and conditions necessary to meet these rules. After the public comment period ends, DEQ will address any comments, review the proposed final permit and issue a final certification decision.

Please direct any questions to June Bergquist at 208.666.4605 or june.bergquist@deq.idaho.gov .

Sincerely,

Daniel Redline
Regional Administrator
Coeur d'Alene Regional Office

Enclosure

C: Nicole Deinarowicz, DEQ State Office
Brian Nickel, EPA Region 10, Seattle
Kody Van Dyk, Public Works Director City of Sandpoint

Idaho Department of Environmental Quality

Draft §401 Water Quality Certification

February 23, 2016

NPDES Permit Number(s): ID002842 City of Sandpoint Wastewater Treatment Plant

Receiving Water Body: Pend Oreille River

Pursuant to the provisions of Section 401(a)(1) of the Federal Water Pollution Control Act (Clean Water Act), as amended; 33 U.S.C. Section 1341(a)(1); and Idaho Code §§ 39-101 et seq. and 39-3601 et seq., the Idaho Department of Environmental Quality (DEQ) has authority to review National Pollutant Discharge Elimination System (NPDES) permits and issue water quality certification decisions.

Based upon its review of the above-referenced permit and associated fact sheet, DEQ certifies that if the permittee complies with the terms and conditions imposed by the permit along with the conditions set forth in this water quality certification, then there is reasonable assurance the discharge will comply with the applicable requirements of Sections 301, 302, 303, 306, and 307 of the Clean Water Act, the Idaho Water Quality Standards (WQS) (IDAPA 58.01.02), and other appropriate water quality requirements of state law.

This certification does not constitute authorization of the permitted activities by any other state or federal agency or private person or entity. This certification does not excuse the permit holder from the obligation to obtain any other necessary approvals, authorizations, or permits.

Antidegradation Review

The WQS contain an antidegradation policy providing three levels of protection to water bodies in Idaho (IDAPA 58.01.02.051).

- Tier 1 Protection. The first level of protection applies to all water bodies subject to Clean Water Act jurisdiction and ensures that existing uses of a water body and the level of water quality necessary to protect those existing uses will be maintained and protected (IDAPA 58.01.02.051.01; 58.01.02.052.01). Additionally, a Tier 1 review is performed for all new or reissued permits or licenses (IDAPA 58.01.02.052.07).
- Tier 2 Protection. The second level of protection applies to those water bodies considered high quality and ensures that no lowering of water quality will be allowed unless deemed necessary to accommodate important economic or social development (IDAPA 58.01.02.051.02; 58.01.02.052.08).
- Tier 3 Protection. The third level of protection applies to water bodies that have been designated outstanding resource waters and requires that activities not cause a lowering of water quality (IDAPA 58.01.02.051.03; 58.01.02.052.09).

DEQ is employing a water body by water body approach to implementing Idaho's antidegradation policy. This approach means that any water body fully supporting its beneficial uses will be considered high quality (IDAPA 58.01.02.052.05.a). Any water body not fully supporting its beneficial uses will be provided Tier 1 protection for that use, unless specific circumstances warranting Tier 2 protection are met (IDAPA 58.01.02.052.05.c). The most recent federally approved Integrated Report and supporting data are used to determine support status and the tier of protection (IDAPA 58.01.02.052.05).

Pollutants of Concern

The Sandpoint Wastewater Treatment Plant discharges the following pollutants of concern: BOD_5, TSS, *E. coli*, chlorine, mercury, temperature, pH, phosphorus, ammonia, nitrate + nitrite, Kjeldahl nitrogen, arsenic, cadmium, total chromium, chromium VI, copper, cyanide, lead, nickel, silver, zinc and whole effluent toxicity (WET). Effluent limits have been developed for BOD_5, TSS, pH, *E. coli*, chlorine, ammonia, mercury and phosphorus. No effluent limits are proposed for temperature, nitrate + nitrite, Kjeldahl nitrogen, arsenic, cadmium, total chromium, chromium VI, copper, cyanide, lead, silver, zinc and WET. Although these pollutants are present in detectable amounts, none of the pollutants have a reasonable potential to exceed WQS. The Sandpoint Wastewater Treatment Plant intends to increase their design flow. Limits for their current permit were calculated using a 3.0 mgd (million gallons per day) design flow and the draft permit uses a 5.0 mgd design flow.

Receiving Water Body Level of Protection

The Sandpoint Wastewater Treatment Plant discharges to the Pend Oreille River within the Pend Oreille Lake Subbasin assessment unit (AU) 17010214PN002_08 (Pend Oreille Lake to Priest River). This AU has the following designated beneficial uses: cold water aquatic life, domestic water supply, and primary contact recreation. In addition to these uses, all waters of the state are protected for agricultural and industrial water supply, wildlife habitat, and aesthetics (IDAPA 58.01.02.100).

According to DEQ's 2012 Integrated Report, this AU is not fully supporting one or more of its assessed uses. The cold water aquatic life use is not fully supported. Causes of impairment include total dissolved nitrogen gas (gas super-saturation) and temperature. As such, DEQ will provide Tier 1 protection (IDAPA 58.01.02.051.01) for the aquatic life use. The contact recreation beneficial use is unassessed. DEQ must provide an appropriate level of protection for the contact recreation use using information available at this time (IDAPA 58.01.02.052.05.c). Fecal coliform and *E. coli* monitoring from a USGS monitoring station near Newport, WA and the Sandpoint Water Treatment Plant indicate this use is fully supported (see Appendix A of this certification); therefore, DEQ will provide Tier 2 protection in addition to Tier 1, for the recreation beneficial use (IDAPA 58.01.02.051.01; 58.01.02.051.02).

Protection and Maintenance of Existing Uses (Tier 1 Protection)

As noted above, a Tier 1 review is performed for all new or reissued permits or licenses, applies to all waters subject to the jurisdiction of the Clean Water Act, and requires demonstration that existing uses and the level of water quality necessary to protect existing uses shall be maintained and protected. In order to protect and maintain designated and existing beneficial uses, a permitted discharge must comply with narrative and numeric criteria of the Idaho WQS, as well as other provisions of the WQS such as Section 055, which addresses water quality limited waters. The numeric and narrative criteria in the WQS are set at levels that ensure protection of designated beneficial uses. The effluent limitations and associated requirements contained in the Sandpoint Wastewater Treatment Plant permit are set at levels that ensure compliance with the narrative and numeric criteria in the WQS.

Water bodies not supporting existing or designated beneficial uses must be identified as water quality limited, and a total maximum daily load (TMDL) must be prepared for those pollutants causing impairment. A central purpose of TMDLs is to establish wasteload allocations for point source discharges, which are set at levels designed to help restore the water body to a condition that supports existing and designated beneficial uses. Discharge permits must contain limitations that are consistent with wasteload allocations in the approved TMDL. The Pend Oreille River does not yet have an approved TMDL for temperature or total dissolved nitrogen gas.

Prior to the development of the TMDL, the WQS require the application of the antidegradation policy and implementation provisions to maintain and protect uses (IDAPA 58.01.02.055.04). As previously stated, the cold water aquatic life use in this Pend Oreille River AU is not fully supported due to excess total dissolved nitrogen gas and temperature. The City's discharge was found to have no reasonable potential to exceed WQS for total dissolved nitrogen gas and temperature (2012 Fact Sheet page 11). Because of the low temperature of the effluent and that total dissolved gas is not a pollutant found in municipal discharges, the City's discharge complies with IDAPA 58.01.02.054.04. The other pollutants of concern either have effluent limits that ensure compliance with WQS or there is no reasonable potential to exceed WQS.

In summary, the effluent limitations and associated requirements contained in the Sandpoint Wastewater Treatment Plant permit are set at levels that ensure compliance with the narrative and numeric criteria in the WQS. Therefore, DEQ has determined the permit will protect and maintain existing and designated beneficial uses in the Pend Oreille River in compliance with the Tier 1 provisions of Idaho's WQS (IDAPA 58.01.02.051.01 and 58.01.02.052.07).

High-Quality Waters (Tier 2 Protection)

The Pend Oreille River is considered high quality for recreational uses. As such, the water quality relevant to recreational uses of the Pend Oreille River must be maintained and protected, unless a lowering of water quality is deemed necessary to accommodate important social or economic development.

To determine whether degradation will occur, DEQ must evaluate how the permit issuance will affect water quality for each pollutant that is relevant to recreational uses of the Pend Oreille River (IDAPA 58.01.02.052.05). These include the following: mercury, *E. coli*, zinc, nickel, cyanide, arsenic and nutrients. Effluent limits are set in the proposed and existing permit for only mercury, E.coli, and nutrients (discussion below).

For a reissued permit or license, the effect on water quality is determined by looking at the difference in water quality that would result from the activity or discharge as authorized in the current permit and the water quality that would result from the activity or discharge as proposed in the reissued permit or license (IDAPA 58.01.02.052.06.a). For a new permit or license, the effect on water quality is determined by reviewing the difference between the existing receiving water quality and the water quality that would result from the activity or discharge as proposed in the new permit or license (IDAPA 58.01.02.052.06.a).

If degradation will occur, DEQ must then determine whether the degradation is significant. A Tier 2 analysis is not required for insignificant degradation. If the discharge will cause a cumulative decrease in assimilative capacity that is equal to or less than 10% from conditions in the Pend Oreille River as of July 1, 2011, then DEQ may determine the degradation is insignificant, taking into consideration the size and character of the discharge and the magnitude of its effect on the receiving water (IDAPA 58.01.02.052.08.a).

Pollutants with Limits in the Current and Proposed Permit: *E. coli*

For pollutants that are currently limited and will have limits under the reissued permit, the current discharge quality is based on the limits in the current permit or license (IDAPA 58.01.02.052.06.a.i), and the future discharge quality is based on the proposed permit limits (IDAPA 58.01.02.052.06.a.ii). For the Sandpoint Wastewater Treatment Plant permit, this means determining the permit's effect on water quality based upon the limits for *E. coli* in the current and proposed permits. Table 1 provides a summary of the current permit limits and the proposed or reissued permit limits.

Effluent limits for *E. coli* in the proposed permit are the same as the previous permit and are protective of beneficial uses. However, the proposed increased design flow (3.0 mgd to 5.0 mgd) will theoretically increase the concentration of *E. coli* bacteria at the edge of a mixing zone. A Tier 2 analysis, however, is only required if the degradation is determined to be significant and significant degradation occurs when the discharge of the pollutant will cumulatively decrease the remaining assimilative capacity by more than 10% percent or, if less than 10%, when determined by the Department to be significant (IDAPA 58.01.02.052.08.a). Sandpoint's new design flow will reduce the assimilative capacity of *E. coli* by <1%. Since this value is less than 10% of the remaining assimilative capacity and determined by the Department to be an insignificant increase, no alternatives analysis or socioeconomic justification are required for the increase of *E. coli* in the Pend Oreille River (see Appendix A of this certification for the analysis).

New Permit Limits for Pollutants Currently Discharged: Mercury, Phosphorus

When new limits are proposed in a reissued permit for pollutants in the existing discharge, the effect on water quality is based upon the current discharge quality and the proposed discharge quality resulting from the new limits. Current discharge quality for pollutants that are not currently limited is based upon available discharge quality data (IDAPA 58.01.02.052.06.a.i). Future discharge quality is based upon proposed permit limits (IDAPA 58.01.02.052.06.a.ii).

The proposed permit for Sandpoint Wastewater Treatment Plant includes new limits for mercury and phosphorus (Table 1). Since the current permit does not contain effluent limits for mercury or phosphorus, the proposed limits are based on discharge monitoring report (DMR) data and the existing ambient water quality in the Pend Oreille River. Due to the limited amount of phosphorus data and its variability, the entire record to date was used to develop the new effluent limits. The amount of the river necessary to dilute phosphorus in the WWTP effluent to meet a criteria of 10µg/L (see Revised Fact Sheet Appendix E) exceeds twenty-five percent. This need for a larger mixing zone triggered a closer examination of this mixing zone through data collection and modeling which is summarized in Appendices C and D of this certification.

Modeling reports are available upon request by calling the contact shown at the end of this certification.

Results of the modeling are reflected in the new effluent limits and a compliance schedule. Details of how the effluent limits were calculated can be found in Appendices E and F of the Revised Fact Sheet. Specifically, to ensure that there is no loss of assimilative capacity in the Pend Oreille River for mercury, the loading effluent limits in the permit are based on the currently permitted design flow of 3mgd and the maximum daily mercury limit is equal to the maximum measured concentration of mercury, which is 1.1µg/L. These limits will also ensure that the numeric water column criteria for mercury[1] will be met at the edges of the chronic and acute mixing zones (Table 4). New permit limits for phosphorus assure that there will be no degradation (see discussion in Appendix B of this certification). In conclusion, by limiting phosphorus loads with new effluent limits and modeling to verify effects of these new limits; restricting mercury discharges to those currently discharged; and requiring the execution of a mercury minimization plan (permit part I.E.); there should be no degradation of water quality as it relates to recreational beneficial uses.

Pollutants with No Limits: Arsenic, Zinc, Cyanide and Nickel

There are several pollutants of concern (arsenic, zinc, cyanide and nickel) relevant to Tier 2 protection of recreation that currently are not limited and for which the proposed permit also contains no limit (Table 1). For such pollutants, a change in water quality is determined by reviewing whether changes in production, treatment, or operation that will increase the discharge of these pollutants are likely (IDAPA 58.01.02.052.06.a.ii). The Sandpoint Wastewater Treatment Plant has proposed a design flow increase of 2.0 mgd. There have been no changes in the industrial sector of Sandpoint that might increase their discharge concentration of these pollutants. However, the proposed increased design flow (3.0 mgd to 5.0 mgd) will theoretically increase the concentration of these pollutants at the edge of a mixing zone. A Tier 2 analysis, however, is only required if the degradation is determined to be significant and significant degradation occurs when the discharge of the pollutant will cumulatively decrease the remaining assimilative capacity by more than 10% percent or, if less than 10%, when determined by the Department to be significant (IDAPA 58.01.02.052.08.a). As shown in Appendix E of this certification, the increase in the design flow will not decrease the remaining assimilative capacity for these pollutants by more than 10%. Therefore, DEQ has determined there will be no significant degradation. Continued monitoring of new or increased discharges to the treatment system and their pollutants is required by part III. J. of the new permit to detect any changes as future flow increases. As such, the proposed permit should maintain the existing high water quality in the Pend Oreille River.

In summary, DEQ concludes that this discharge permit complies with the Tier 2 provisions of Idaho's WQS (IDAPA 58.01.02.051.02 and IDAPA 58.01.02.052.06).

[1] The water column criteria for mercury remain in effect for Clean Water Act purposes even though it is not listed in Idaho's WQS. See EPA letter to DEQ dated December 12, 2008 at this link: http://www.deq.idaho.gov/epa-actions-on-proposed-standards for details.

Table 1. Comparison of current and proposed permit limits for pollutants of concern relevant to uses receiving Tier 2 protection.

Pollutant	**Units**	**Current Permit**			**Proposed Permit**			**Change**[a]
		Average Monthly Limit	**Average Weekly Limit**	**Max Daily Limit**	**Average Monthly Limit**	**Average Weekly Limit**	**Max Daily Limit**	
Pollutants with limits in both the current and proposed permit								
Five-Day BOD	mg/L	30	45	—	30	45	—	I[b]
	lb/day	750	1100	—	1251	1877	—	
	% removal	85%	—	—	85%	—	—	
TSS	mg/L	30	45	—	30	45	—	I[b]
	lb/day	750	1100	—	1251	1877	—	
	% removal	85%	—	—	85%	—	—	
pH	standard units	6.5–9.0 all times			6.5–9.0 all times			NC
E. coli	no./100 mL	126	—	406	126	—	406	NC
Total Residual Chlorine	mg/L	0.45	1.1	—	0.348	—	0.912	D
	lb/day	—	—	—	14.5	—	38.0	
Pollutants with new limits in the proposed permit								
Total Phosphorus (June-Sept)	µg/L	1/qtr	—	Report	—	—	—	
	lb/day	—	—	—	61	79	—	NC
Total Phosphorus (Oct-May)	µg/L	—	—	—	—	—	—	
	lb/day	—	—	—	96	125	—	NC
Mercury	µg/L	2/yr	—	Report	0.56	—	1.1	NC
	lb/day	—	—	—	0.014	—	0.028	
Ammonia	mg/L	—	—	—	21.1	—	40.5	D
	lb/day	—	—	—	880	—	1689	D
Pollutants with no limits in both the current and proposed permit								
Temperature	°C	1/day	—	Report	—	continuous		NC
Total Ammonia	mg/L	1/mo	—	Report	—	1/mo	Report	NC
Nitrate + Nitrite	mg/L	1/qtr	—	Report	—	1/qtr	Report	NC
Kjeldahl Nitrogen	mg/L	1/qtr	—	Report	—	1/qtr	Report	NC
Arsenic	µg/L	2/yr	—	Report	—	2/yr	Report	NC
Cadmium	µg/L	"	—	Report	—	"	Report	NC
Total Chromium	µg/L	"	—	Report	—	"	Report	NC
Chromium VI	µg/L	"	—	Report	—	"	Report	NC
Copper	µg/L	"	—	Report	—	"	Report	NC
Cyanide	µg/L	"	—	Report	—	"	Report	NC
Lead	µg/L	"	—	Report	—	"	Report	NC
Nickel	µg/L	"	—	Report	—	"	Report	NC
Silver	µg/L	"	—	Report	—	"	Report	NC
Zinc	µg/L	"	—	Report	—	"	Report	NC

[a] NC = no change in effluent limit from current permit; I = increase of pollutants from current permit; D = decrease of pollutants from current permit.

[b] EPA determined that the current water quality based effluent limits for TSS and BOD were unnecessary and that technology based effluent limits for these pollutants would not violate the dissolved oxygen WQS (Revised Fact Sheet Appendix D). Since the Pend Oreille River only receives Tier 1 protection for cold water aquatic life, pollutants significant to this use can be increased up to the WQS criteria (IDAPA58.01.02.052.07).

Conditions Necessary to Ensure Compliance with Water Quality Standards or Other Appropriate Water Quality Requirements of State Law

Compliance Schedules

Pursuant to IDAPA 58.01.02.400.03, DEQ may authorize compliance schedules for water quality-based effluent limits issued in a permit for the first time. Sandpoint Wastewater Treatment Plant cannot reliably achieve compliance with the effluent limits for ammonia and the phosphorus limits for the season of June - September; therefore, DEQ authorizes a compliance schedule and interim requirements as set forth below. This compliance schedule provides the permittee a reasonable amount of time to achieve the final effluent limits as specified in the permit. At the same time, the schedule ensures that compliance with the final effluent limits is accomplished as soon as possible. At the request of the City of Sandpoint, this schedule includes two options, one that utilizes their existing treatment plant and the other which allows time for the construction of a new treatment plant.

Requirements for Compliance Schedule Option 1 and 2

1. The permittee must comply with all effluent limitations and monitoring requirements in Part I.B., I.C. and I.D. beginning on the effective date of the permit, except those for which a compliance schedule is specified in Part II.F of the final permit.

2. The permittee must achieve compliance with the applicable final effluent limitations as set forth in Part I.B. (Table 1) of the permit no later than:

   a. Five (5) years after the effective date of the final permit for Option 1, or
   b. Ten (10) years after the effective date of the final permit for Option 2.

3. While the schedules of compliance specified in Part II.F of the permit are in effect, the permittee must complete interim requirements and meet interim effluent limits and monitoring requirements as specified in Parts I.B, I.C, I.D and I.E of the permit.

4. By one (1) year after the effective date of the final permit, the permittee must notify EPA and DEQ in writing that a preferred compliance schedule option has been selected and demonstrate that funding for the preferred option is secured for Option 1 or has a City of Sandpoint approved strategy for obtaining funding for Option 2.

Option 1 Existing Plant Upgrades – 5 Year Schedule

This option applies if the City of Sandpoint decides to upgrade their existing treatment plant to meet final effluent limits.

1. By three (3) years after the effective date of the final permit, the permittee must provide for DEQ approval, a preliminary engineering report (PER) that examines how to improve effluent quality and meet effluent limits associated with phosphorus and ammonia. This report must include details on how the proposed improvements will meet final effluent limits. The report shall include materials, costs, and a schedule for completion of the work.

2. By four (4) years after the effective date of the final permit, final plans and specifications for the modifications proposed in the PER shall be submitted to DEQ for approval.

3. By five (5) years after the effective date of the final permit, the permittee must have completed the plant upgrade and achieved compliance with final effluent limits and WQS as shown in Table 3.

Option 2 New Treatment Plant – 10 Year Schedule

This option applies if the City of Sandpoint decides to construct a new treatment plant that will meet final effluent limits.

Interim Requirements for Option 2 Compliance Schedule

1. By three (3) years after the effective date of the final permit a facility plan shall be submitted to DEQ for review and approval. The facility plan shall include outlining estimated costs and schedules for construction of a new wastewater treatment plant and implementation of technologies to achieve final effluent limitations. This schedule must include a timeline for pilot testing.

2. By four (4) years after the effective date of the final permit, the permittee must provide EPA and DEQ with a progress report on funding for the new facility. Copy of notice of bond approval or notice of judicial confirmation is acceptable.

3. By five (5) years after the effective date of the final permit, the permittee must provide EPA and DEQ with written notice that design has been completed and approved by DEQ.

4. By six (6) years after the effective date of the final permit, the permittee must provide EPA and DEQ with a notice that bids for construction have been awarded to achieve final effluent limitations.

5. By seven (7) and eight (8) years after the effective date of the final permit, the permittee must provide EPA and DEQ with brief progress reports of construction as they relate to meeting the compliance schedule timeline and final effluent limits.

6. By nine (9) years after the effective date of the final permit, the permittee must provide EPA and DEQ with written notice that construction has been substantively completed on the facilities to achieve final effluent limitations.

7. By ten (10) years after the effective date of the final permit, the permittee must provide EPA and DEQ with a 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 of Part I.B.

Table 2. Interim Limits for Both Options

Parameter	Units	Average Monthly Limit	Average Weekly Limit
Phosphorus (June-September)	lb/day	96	125
Ammonia	mg/L	32.8	62.9
	lb/day	1368	2623

Table 3. Final Limits for Both Options

Parameter	Units	Average Monthly Limit	Average Weekly Limit	Percent Mixing Zone
Phosphorus (June-September)	lb/day	61	79	47% of the 30Q10 flow (6,640 cfs)
Phosphorus (October-May)	lb/day	96	125	60% of the 30Q10 flow (8,260 cfs)
Ammonia	mg/L	21.1	Max Daily Limits 40.5	Acute: 15.1% of the 1Q10 flow (2,401cfs) Chronic: 12.1% of the 30B3 flow (8,090cfs)
	lb/day	880	1689	

Mixing Zones

Due to Sandpoint's desire for a design flow increase, DEQ and EPA modeled various scenarios related to the phosphorus mixing zone and downstream conditions in the Pend Oreille River. EPA did additional modeling to examine the mixing zones for pollutants of concern which have acute and chronic aquatic life criteria, including ammonia, chlorine and mercury. These modeling efforts resulted in more stringent limits for phosphorus, ammonia and chlorine. The mixing zones for these pollutants and the rationale behind their use are described in detail in the modeling documentation and reports available from DEQ upon request. Pursuant to IDAPA 58.01.02.060, DEQ authorizes the mixing zones summarized in Table 4 for the current outfall location.

Table 4: Mixing Zones

Pollutant	Mixing Zone (% of critical flow volumes of the Pend Oreille River)
ammonia final limit	acute 15.1 chronic 12.1
arsenic	acute 15.1 chronic and human health 25
chlorine	acute 15.1 chronic 25
chromium III	acute 15.1 chronic 25
chromium IV	acute 15.1 chronic 25
copper	acute 15.1 chronic 25
cyanide	acute 15.1 chronic 25
lead	acute 15.1 chronic 25
mercury	acute 15.1 chronic 25
nickel	acute 15.1 chronic 25
nitrate + nitrite	25
zinc	acute 15.1 chronic 25
Phosphorus, June-September final limit	47
Phosphorus, October-May	60

Other Conditions

This certification is conditioned upon the requirement that any material modification of the permit or the permitted activities—including without limitation, any modifications of the permit to reflect new or modified TMDLs, wasteload allocations, site-specific criteria, variances, or other new information—shall first be provided to DEQ for review to determine compliance with Idaho WQS and to provide additional certification pursuant to Section 401.

Right to Appeal Final Certification

The final Section 401 Water Quality Certification may be appealed by submitting a petition to initiate a contested case, pursuant to Idaho Code § 39-107(5) and the "Rules of Administrative Procedure before the Board of Environmental Quality" (IDAPA 58.01.23), within 35 days of the date of the final certification.

Questions or comments regarding the actions taken in this certification should be directed to June Bergquist, Coeur d'Alene Regional Office at 208.666.4605 or via email at june.bergquist@deq.idaho.gov.

DRAFT

Daniel Redline
Regional Administrator
Coeur d'Alene Regional Office

Appendix A

E. coli Significance Test

Background

The Pend Oreille River is considered high quality for recreational uses. To prevent the lowering of water quality with respect to *E. coli*, DEQ must ensure that the design flow increase proposed by the Sandpoint WWTP draft permit does not cumulatively decrease the remaining assimilative capacity of the river by more than ten percent taking into account the size and character of the discharge and the magnitude of its effect on the receiving water (IDAPA 58.01.02.052.08.a).

Assimilative capacity is determined by comparing the background (ambient) concentration of a pollutant with the Water Quality Standard (WQS). The difference between these two numbers is the remaining assimilative capacity.

Only two data sets were found to use for the establishment of a background level of *E. coli* concentration in the river above the WWTP discharge. There were 18 fecal coliform samples collected by the USGS at their monitoring station near Newport, WA from 1990 through 1995. The maximum value was 17 cfu/100ml and the average was 4 cfu/100ml. The other data set were 26 samples taken by the Sandpoint Water Treatment Plant in 2008-2009; however, those samples were drawn from a 14-25 foot depth depending on season, and may not be representative of bacteria levels closer to the surface where most recreational use occurs. The maximum value of this data set was 3 cfu/100ml. A background value of 4 cfu/100ml was selected for this analysis.

Analysis

- Background concentration upstream of Sandpoint discharge: 4 cfu/100ml
- *E. coli* effluent limit that must be met at the "end of the pipe" i.e. no mixing zone authorized: 126 cfu/100ml
- Remaining assimilative capacity: 126 – 4 = 122 cfu/100ml
- Ten percent of 122 cfu/100ml is: 12.2 ≈ 12 cfu/100ml. This is the amount of *E. coli* that can be added to the river before the amount becomes significant.
- Sandpoint proposes to increase their current design flow from 3.0 mgd (4.64 cfs) to 5.0 mgd (7.7 cfs).
- Effluent concentration (from draft permit average monthly limit): 126 cfu/100ml
- In-river 30Q5 flow (critical low flow for non-carcinogenic human health criteria; see Revised Fact Sheet Appendix C) = 7,360 cfs

Results
Current Mixed Concentration = 4.08 cfu/100ml
Proposed Mixed Concentration = 4.13 cfu/100ml

4.13 – 4.08 = 0.05 cfu/100ml (or 0.05/122 = 0.04%) is the reduction in assimilative capacity from the current design flow to the proposed design flow. This proposed increase of *E. coli* does not exceed 10% of the remaining assimilative capacity and considering the character of the discharge and magnitude of its effect on the Pend Oreille River, the Department has determined that this decrease is not a significant degradation of river water quality.

Formula used to calculate mixed concentrations:

Mixed Concentration = Cm = [(Ce * Qe) +(Cu * Qu)] / (Qe+Qu)

Where:

Cm = Mixed Concentration (µg/L)
Ce = Effluent Concentration (µg/L)
Qe = Effluent Volume (liters, calculated as flow rate in cfs * constant 28.316)
Cu = Upstream concentration (µg/L)
Qu = Upstream Volume (liters, calculated as flow rate in cfs * constant 28.316)

Appendix B

Phosphorus and Antidegradation Review

Background

The Pend Oreille River is considered high quality for recreational uses and therefore, receives Tier 2 protection. Excess nutrients in a waterbody can create visible slime growths or other nuisance aquatic growths, impairing designated uses such as contact recreation. Pend Oreille River has a designated use for primary contact recreation. Phosphorus is likely the limiting nutrient for the growth of algae and other aquatic plants. To prevent the lowering of water quality with respect to total phosphorus, DEQ must ensure that the design flow increase proposed by the Sandpoint WWTP draft permit does not increase phosphorus in the river.

Analysis

- Background concentration upstream of Sandpoint discharge (see Revised Fact Sheet Appendix E): 7.3µg/L
- Phosphorus target concentration to be met at edge of a 47.2% mixing zone (see Revised Fact Sheet Appendix E and IDAPA 58.01.02.200.06): **10µg/L**
- Sandpoint proposes to increase their current design flow from 3 mgd (4.64 cfs) to 5 mgd (7.74 cfs).
- Current effluent concentration as calculated for the reasonable potential analysis (Revised Fact Sheet Appendix E) is *5330µg/L which is the maximum effluent concentration between June 2010 and August 2015.
- Proposed effluent limits for June-Sept is 1463µg/L and Oct-May is 2302µg/L (Fact Sheet Appendix E)
- In-river 30Q10 flow June- September = 6640 cfs and October – May 8260 cfs

*IDAPA 58.01.02.052.06.a.iii indicates that the change in water quality for new permit limits for an existing discharge shall be calculated using the same statistical procedures used to determine the new effluent limits. The 5330 µg/L concentration is what was used by EPA in the reasonable potential analysis Fact Sheet Appendix E.

Results

Current Mixed Concentration = summer: 11.0 µg/L winter: 10.3µg/L

Both current concentrations exceed 10µg/L and therefore do not meet the water quality standard which is why EPA developed water quality-based effluent limits. These limits were verified and modified (a reduction) by CORMIX and CE-QUAL-W2 modeling efforts presented in Appendix C and D of this certification. The proposed water quality based limits are June-Sept 61 lbs/day (equivalent to a concentration of 1463µg/L) and Oct-May 96 lbs/day (equivalent to a concentration of 2302μg/L). Using the proposed effluent limits and the new design flow of 5mgd the results are as follows:

Proposed Mixed Concentrations = summer: 8.99μg/L winter: 9.45μg/L

Both seasons show a lowering of phosphorus in the river between current and proposed conditions and therefore, no degradation.

Formula used to calculate mixed concentrations:

Mixed Concentration = Cm = [(Ce * Qe) +(Cu * Qu)] / (Qe+Qu)

Where:

Cm = Mixed Concentration (μg/L)
Ce = Effluent Concentration (μg/L)
Qe = Effluent Volume (liters, calculated as flow rate in cfs * constant 28.316)
Cu = Upstream concentration (μg/L)
Qu = Upstream Volume (liters, calculated as flow rate in cfs * constant 28.316)

Appendix C

CORMIX Modeling of Phosphorus Plumes

Background

When DEQ considers authorizing a mixing zone that exceeds 25% of the volume of the receiving water, a mixing zone study may be performed to learn more about the effluent plume. CORMIX is an EPA-supported model for the analysis of wastewater discharges. This study was prompted because the draft permit added a first time effluent limit for phosphorus that would require a mixing zone greater than 25%.

Treated effluent from the Sandpoint WWTP is discharged through a 3-foot diameter pipe laid on the bed of Pend Oreille River. The discharge pipe is positioned perpendicular to the riverbank in the vicinity of Birch Street and S. Ella Avenue in Sandpoint, Idaho. The pipe extends 925 feet into the river and is equipped with a 164-foot multiport diffuser. To put the flow values that are used in the modeling efforts into context, the average flow in the Pend Oreille River during July (1990-2012) was 26,396 cfs.

Summer months are significant in that phosphorus from this discharge will be utilized by aquatic plants and algae which could adversely affect recreational uses of the river. As discussed in Appendix B, phosphorus is likely the limiting nutrient in the Pend Oreille River. It fuels the growth of aquatic plants which can impair recreational use by obstructing boat operation, entangling swimmers, create cloudy and objectionable smelling water, and coating the bottom with slimy algae growths and/or dense mats of plants that preclude fishing. By definition, the area within a mixing zone exceeds the water quality standard and therefore could experience these issues. Based on comments received from the first draft permit, some residents and river users indicate that this area of the river in the vicinity and downstream of the outfall already experience some adverse consequences due to excess phosphorus. DEQ has been supplied photos and monitoring data to support these claims. For these reasons, the mixing zone size is an important consideration that warrants closer examination.

In addition to being the growing season, summer is typically when low flow conditions can occur and are the most challenging for mixing effluent and meeting provisions of the Idaho WQS for mixing zones (IDAPA 58.01.02.060). Specifically, the mixing zone rules most challenging for this discharge include:

d. Mixing zones, individually or in combination with other mixing zones, shall not cause unreasonable interference with, or danger to, beneficial uses. Unreasonable interference with, or danger to, beneficial uses includes, but is not limited to, the following: (4-11-15)

> vi. Conditions which impede or prohibit recreation in or on the water body. Mixing zones shall not be authorized for E. coli.

h. Mixing zones shall meet the following restrictions; provided, however, that the Department may authorize mixing zones that vary from the restrictions under the circumstances set forth in Subsection 060.01.i. below:

> i. For flowing waters: (4-11-15)

(1)The width of a mixing zone is not to exceed twenty-five percent (25%) of the stream width; and (4-11-15)

(2)The mixing zone shall not include more than twenty-five percent (25%) of the low flow design discharge conditions as set forth in Subsection 210.03.b. of these rules. (4-11-15)

j. The following elements shall be considered when designing an outfall: (4-11-15)

i. Encourage rapid mixing to the extent possible. This may be done through careful location and design of the outfall; and (4-11-15)

ii. Avoid shore-hugging plumes in those water bodies where the littoral zone is a major supply of food and cover for migrating fish and other aquatic life or where recreational activities are impacted by the plume. (4-11-15)

DEQ may authorize a mixing zone that varies from the above rules, however it must not cause an unreasonable interference with, or danger to, beneficial uses and must meet certain other rules. To obtain a larger mixing zone, the discharger must provide DEQ with an analysis that demonstrates a larger mixing zone is needed given, siting, technological, and managerial options (IDAPA 58.01.02.060.i.ii). In this case, the proposed mixing zone is 47.2% June-September and 60% October-May. The City of Sandpoint's justification is available from DEQ upon request.

River Features That Affect the Discharge

The Pend Oreille River is regulated by the Albani Falls dam located 27 river miles downstream of Sandpoint's outfall and is operated by the Army Corps of Engineers. A summer pool is maintained after spring runoff until early September when Pend Oreille Lake and the Pend Oreille River above the dam are drawn down for power generation. At the point of discharge, the river is approximately 1.8 miles wide but approximately 1.3 miles downstream, the river narrows considerably. Upstream of the discharge, a mile-long earthen jetty extends from the north riverbank carrying US Highway 95 across the river. This jetty creates an opening of approximately 1.1 miles for river passage. The discharge is located in an area protected from the main river flow by the jetty (see Image 1).

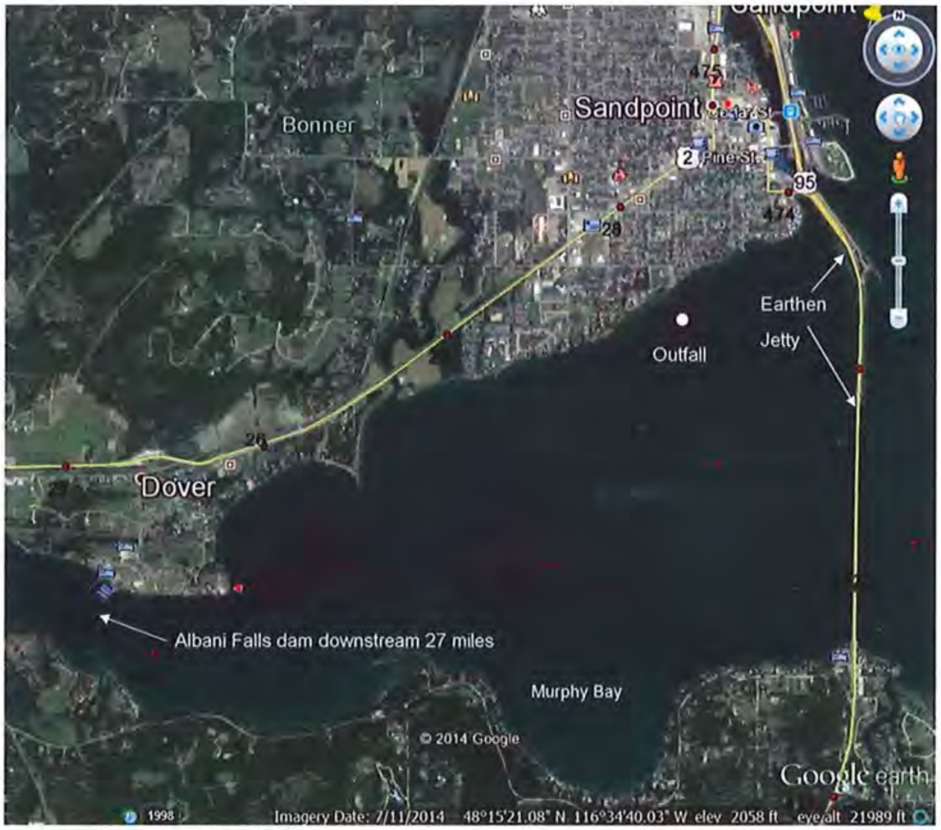


Image 1 Sandpoint Outfall and Surrounding Features

The early CORMIX modeling scenarios completed in 2013 and referenced in the first draft certification for this permit used higher concentrations of phosphorus, a lower design flow of the WWTP, a stratified temperature profile, an assumption of river current, and a larger critical river flow. The resulting plume from each of the CORMIX model runs was overlain on an aerial photo of the river as shown in Image 2. Site-specific information regarding the velocity of the river in the vicinity of the diffuser during various times of the summer was not available so estimates were made based on flow data elsewhere in the river and other available physical measurements.

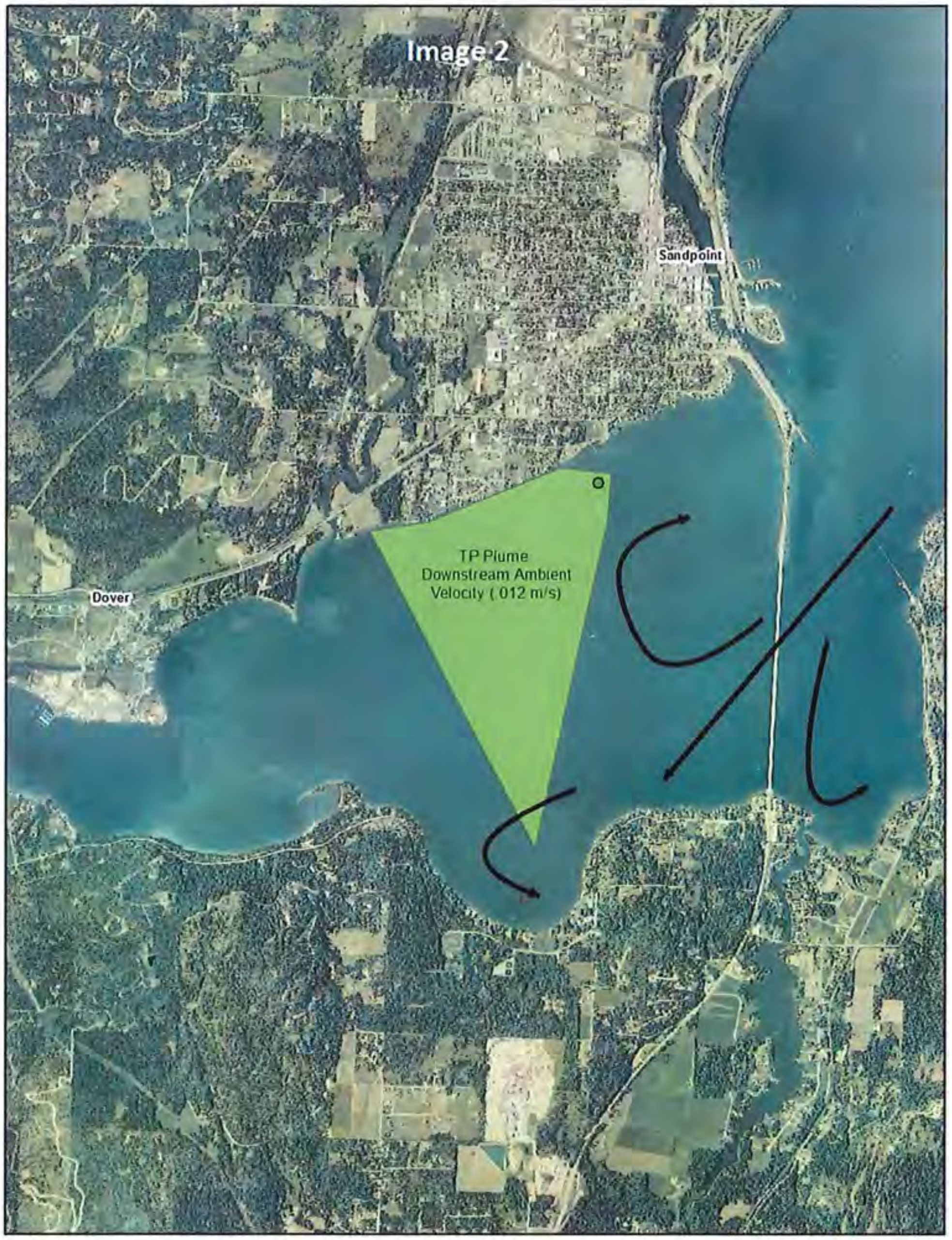


Image 2 Early CORMIX Modeling Scenario Phosphorus Concentration of 2867µg/L; Facility Design Flow of 3.62mgd and River Flow of 8,448cfs

In Image 2, the effluent plume, which is the area that exceeds background phosphorus concentrations, is shaded in green. Also, under this scenario, due to the lack of temperature stratification from the bottom to the surface of the river and an assumption that a weak current exists, the plume rises slowly and begins to spread out rather than rapidly moving downstream. The pattern of spread is subject to localized currents from various forces such as shape of the river, wind, rainfall, boat traffic, etc. The black arrows attempt to show where these localized currents might be located due to the shape of the river. The CORMIX model cannot predict the exact shape and size of this plume under these conditions so the green triangle shape could be highly altered depending on these localized currents. Higher river velocities would lessen the significance of localized currents. The plume extends almost bank to bank and there is a mile-long shore-hugging plume.

As a result of the above modeling effort, it became apparent that site specific data would greatly help verify or change modeling assumptions. There was also the additional challenge to develop effluent limits that accommodated the City's desire for a 2mgd design flow increase and addressed public comment concerns about mixing zone size and the potential for adverse effects to river water quality.

In response to this need, DEQ collected additional data during the summer of 2015 and it was used to run both CORMIX and another model, CE-QUAL-W2, that can examine nutrient inputs to the river as a whole. This additional modeling effort using the CE-QUAL-W2 model is detailed in Appendix D of this certification.

Results of the additional data collection and further examination of other data collection efforts indicated that flow at the diffuser location is limited largely to local phenomena rather than river flow (DEQ Staff Report 8-3-15). Temperature profiles also indicate a summertime uniform temperature in the diffuser area which inhibits mixing. DEQ Staff Report dated 12-17-15 presents the outcome of mapping the river depths to determine the location of the river's thalweg (low flow channel). Results indicate that in the vicinity of the outfall the river's main flow closely follows the southern bank which is the opposite side of the river than the outfall and a distance of approximately 1.4 miles. This reinforces initial observations that during lower flows, the outfall is in a slack water location.

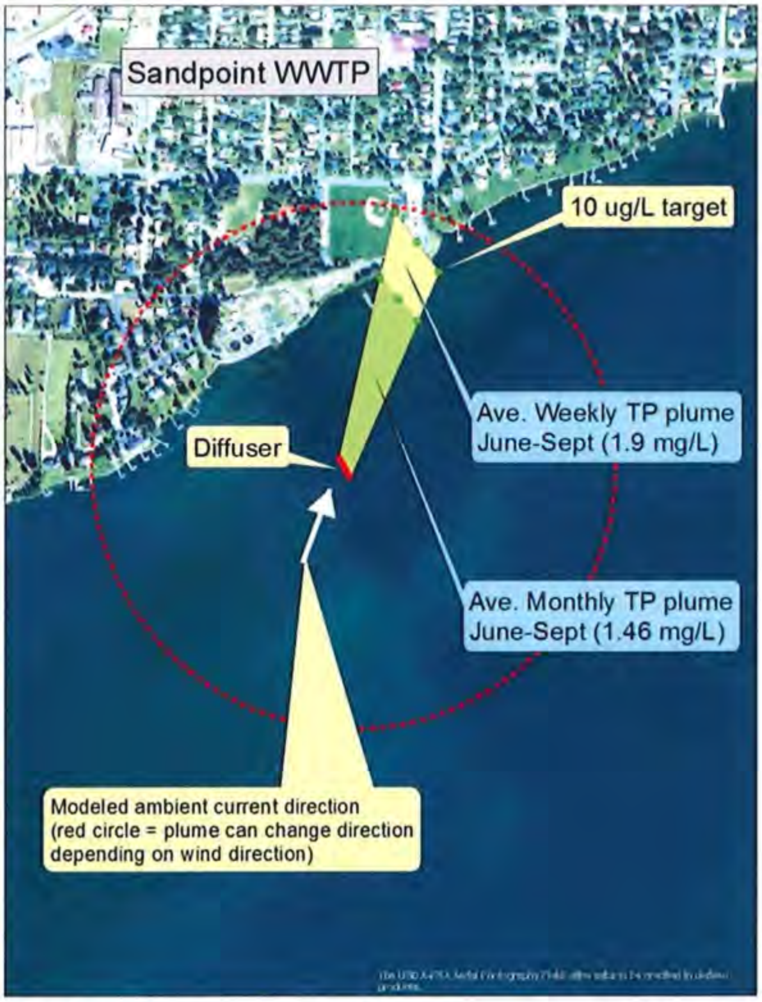


Image 3 Revised CORMIX Modeling Scenario Phosphorus Concentrations of 1463µg/L and 1899µg/L; Facility Design Flow of 5mgd; River Flow of 6,640cfs

Image 3 illustrates the results of the CORMIX modeling effort that used the additional 2015 river data and a lower summertime phosphorus concentration of 1463µg/L (which is equivalent to the proposed permit limit of 61lbs/day from June-September). It also examined the average weekly permit limit of 79 lbs/day (June-September) which is equivalent to a concentration of 1899µg/L. The green shaded area represents the average monthly limit mixing zone and the yellow shaded area represents an additional area of mixing allowed by the average weekly limit. The red dotted line indicates that the mixing zone can pivot in any direction due to slack water at the diffuser location. The shape of the mixing zone is also variable depending on wind direction and speed, boat traffic and localized currents. The model also reflects a lower critical flow than shown in Image 2 based on comments from the Kalispel Tribe.

In conclusion, existing conditions in the river indicate that the shape and size of the phosphorus plume created by the Sandpoint WWTP are not ideal. The point of discharge is in a slack water area and does not benefit from the main river flow during summer pool conditions. Increasing the amount of phosphorus as illustrated in Image 2, even by a relatively small amount, greatly increases the size of the plume during low flow conditions. An increase is likely to be problematic for recreational uses and does not comply with DEQ's mixing zone policy.

After reducing phosphorus concentrations during the critical low flow time period from the first draft permit, modeling results as illustrated in Image 3 reduced shore hugging plumes and shows a more localized mixing zone. These conditions better align with the mixing zone policy. Appendix D of this certification further investigates the effects of the proposed phosphorus limits on the river.

Appendix D

CE-QUAL-W2 Phosphorus Modeling for Sandpoint WWTP

Background

In the 2008 Integrated Report, total phosphorus was added as a cause of impairment to the Pend Oreille River (the 31.8 mile long segment from Pend Oreille Lake to Priest River). After collection of data throughout this river length in 2009, DEQ concluded that the river was not impaired due to this nutrient and phosphorus was removed as a pollutant in the 2010 Integrated Report. DEQ also concluded at that time that the Pend Oreille River has little or no remaining assimilative capacity for phosphorus (2.7µg/L before considering any of the three municipal discharges into the Pend Oreille River. See discussion in Appendix B). Ten percent of 2.7ug/L is only a 0.027ug/L of phosphorus that can be increased without an approved alternatives analysis and socioeconomic justification.

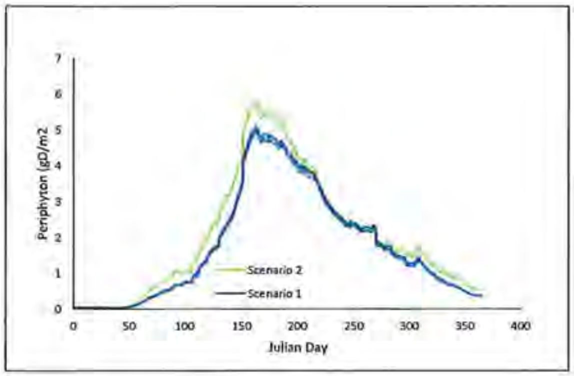
DEQ also recognizes that effluent limits for phosphorus in the proposed permit are based on very little effluent data. The current permit only requires quarterly monitoring. The quarters are based on the calendar year and the phosphorus monitoring data is reported on the last day of each quarter. The discharge monitoring reports (DMRs) do not indicate the day the actual samples were collected or the effluent flow associated with that timeframe. These factors can create a wide margin of error.

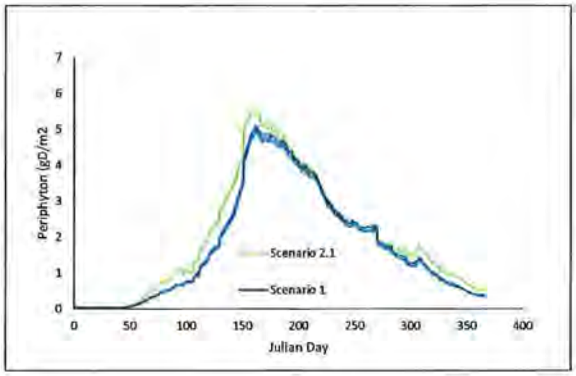
Additional examination of the phosphorus monitoring data show that it is widely distributed (effluent flow 1 to 6.7mgd and concentrations from 0.8 to 5.33mg/L). Reasons for this spread are not clear since there are not enough data to determine correlations. Determining exactly what amount of phosphorus is currently being discharged to ensure no further loss of assimilative capacity is problematic given this data. For this and the above reasons, DEQ and EPA have approached the new effluent limits for phosphorus cautiously using the previously discussed CORMIX modeling to examine mixing zone characteristics and following this with the CE-QUAL-WE modeling scenarios to look at effects downriver of the proposed phosphorus effluent limits. Although the data is limited, there were some seasonal differences which allowed development of seasonal limits that reflect discharge amounts as reported on DMRs. These seasonal limits were used for the CE-QUAL-W-2 modeling scenarios.

Modeling Approach

The CORMIX modeling (Appendix C of this certification) examined the near field area of the discharge. A different type of model must be used to examine the future conditions further downstream. Fortunately, a CE-QUAL-W-2 model, which can examine far field effects of a proposed discharge, had been developed by the Army Corps of Engineers to examine temperature changes as a result of the Albani Falls dam on the Pend Oreille River. This model was revised in 2011by Portland State University to investigate various phosphorus scenarios in the river. In 2015 it was used by EPA to investigate the consequences of the proposed phosphorus permit limits for Sandpoint.

The initial modeling scenario examined the consequence of a 5mgd phosphorus discharge during the *July-September* timeframe of 61lbs/day (1.46 average monthly concentrations) contrasted with baseline conditions determined in 2009. Results of the model run were largely satisfactory except for periphyton biomass during the month of June. During this timeframe, periphyton biomass significantly departed from the existing condition. To improve the outcome of this timeframe, the month of June was included in the summertime seasonal timeframe with a limit of 61lbs/day. This reduced the load of phosphorus in June from 96 lbs/day to 61 lbs/day. The model was re-run and the outcome was satisfactory and the effluent limits revised to reflect this reduction. Below are graphs that illustrate the modeling results. Existing periphyton conditions are indicated by the blue lines and proposed conditions are the green lines. The 96 lbs/day of phosphorus in June scenario is on the left and the proposed permit limit of 61 lbs/day in June is on the right.





Conclusion

Because the phosphorus load in the river from this discharge, given the proposed limits, is approximately 23% of the total load in the river, this discharge has the potential for significant water quality effects. As we have stated, current amounts of phosphorus discharged from the facility are an approximation due to lack of a robust dataset. The proposed permit requires the collection of an adequate number of phosphorus samples to correct this problem. To compensate for the lack of data, modeling was completed, and as a result, effluent limits and critical flows were adjusted to provide an acceptable outcome.

Appendix E

Arsenic, Zinc, Cyanide, Nickel Significance Test

Background

The Pend Oreille River is considered high quality for recreational uses. To prevent the lowering of water quality with respect to arsenic, zinc, cyanide and nickel, DEQ must ensure that the design flow increase proposed by the Sandpoint WWTP draft permit does not decrease the remaining assimilative capacity of the river for each of these metals by more than ten percent, taking into account the size and character of the discharge and the magnitude of its effect on the receiving water (IDAPA 58.01.02.052.08.a).

Assimilative capacity is determined by comparing the background (ambient) concentration of a pollutant with the Water Quality Standard (WQS or criteria). The difference between these two numbers is the remaining assimilative capacity. Arsenic, zinc, cyanide and nickel have criteria related to human health (IDAPA 58.01.02.210.01) and thus are considered recreational uses. However, zinc cyanide and nickel also have cold water aquatic life criteria and they are much lower values than their human health criteria. Because cold water aquatic life in this waterbody receives Tier 1 protection, the more restrictive criteria must be used for this analysis.

Upstream data for these metals was extremely limited to absent. Therefore, several conservative assumptions had to be made to complete this analysis. Upstream monitoring of these metals has been included in the draft permit.

Analysis

- Background concentrations upstream of the Sandpoint discharge for cyanide and nickel is assumed to be zero due to lack of data. Arsenic and zinc were measured in the Clark Fork River below the Cabinet Gorge dam. Results were arsenic ≤ 1 μg/L and zinc ranged from no detection to 80μg/L with an average of 4μg/L. For this analysis zinc will be assumed to be the average value of the Clark Fork data due to the distance from the discharge and arsenic will be one half the detection limit or 0.5μg/L. To summarize background concentrations are:

  Zinc 4μg/L Arsenic 0.5μg/L Cyanide 0μg/L Nickel 0μg/L

- Remaining assimilative capacity and 10% of remaining assimilative capacity:

  Zinc 72μg/L- 4μg/L = 68μg/L X .10 = 6.8μg/L

  Arsenic 10μg/L – 0.5μg/L = 9.5μg/L X .10 = 0.95μg/L

  Cyanide 5.2μg/L – 0 = 5.2μg/L X .10 = 0.5μg/L

  Nickel 52μg/L – 0 = 52μg/L X .10 = 5μg/L

  These values are the amount of metals that can be added to the river before the amount becomes significant.
- Sandpoint proposes to increase their current design flow from 3 mgd (4.64 cfs) to 5.0 mgd (7.7 cfs).

- Effluent concentration 92nd percentile (from DMR data):
  Zinc 141µg/L
  Arsenic 7µg/L
  Cyanide 0.6µg/L
  Nickel 0µg/L (no detection in DMR data 2001-2011)
- In-river 7Q10 flow (critical low flow for chronic aquatic life criteria; see Revised Fact Sheet Appendix C) = 3,880 cfs

Results

Zinc Current Mixed Concentration = 4.16µg/L	Proposed Concentration=4.27µg/L
Arsenic Current Mixed Concentration = 0.508 µg/L	Proposed Concentration=0.512µg/L
Cyanide Current Mixed Concentration = 0.0007µg/L	Proposed Concentration=0.0012µg/L
Nickel Current Mixed Concentration = 0µg/L	Proposed Concentration = 0µg/L

The additional load of zinc will decrease the remaining assimilative capacity by 0.011µg/L or 0.16% of the remaining assimilative capacity of 6.8µg/L.

The additional load of arsenic will decrease the remaining assimilative capacity by 0.004µg/L or 0.42% of the remaining assimilative capacity of 0.95µg/L.

The additional load of cyanide will decrease the remaining assimilative capacity by 0.0005µg/L or 0.1% of the remaining assimilative capacity of 0.5µg/L.

There will be no additional load of nickel.

The additional load of zinc, arsenic, cyanide and nickel resulting from the design flow increase, will not exceed 10% of the remaining assimilative capacity for any of these pollutants, and considering the size and character of the discharge and the magnitude of its effect, these increases of pollutants are not a significant degradation of river water quality.

Formula used to calculate mixed concentrations:

Mixed Concentration = Cm = [(Ce * Qe) +(Cu * Qu)] / (Qe+Qu)

Where:

Cm = Mixed Concentration (µg/L)
Ce = Effluent Concentration (µg/L)
Qe = Effluent Volume (liters, calculated as flow rate in cfs * constant 28.316)
Cu = Upstream concentration (µg/L)
Qu = Upstream Volume (liters, calculated as flow rate in cfs * constant 28.316)

APPENDIX B

Geotechnical Report

STRATA

December 20, 2024
File: CD24060E

Mr. Kyle Meschko, P.E.
Mr. Levi McPhee, DBIA
Keller Associates, Inc.
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814

RE: **Geotechnical Feasibility Study**
Sandpoint WWTP PER
723 South Ella Avenue
Sandpoint, Idaho 83864

Greetings:

STRATA is pleased to provide this Geotechnical Feasibility Study (report) for the Sandpoint Wastewater Treatment Plant (WWTP) preliminary engineering report (PER) project located in Sandpoint, Idaho. We performed limited subsurface exploration at the site, complete laboratory testing, and provide this subsequent report with high-level geotechnical engineering opinions and considerations to assist early project planning and design stages. We accomplished geotechnical services referencing our authorized proposal dated September 4, 2024.

The following report provides an overview of on-site soils and groundwater level at the time of exploration, feasibility considerations for shallow, intermediate, and deep foundations, considerations for new concrete slabs on grade, and generic earthwork considerations for soil reuse, surcharge loading, dewatering, and drainage. The geotechnical information presented herein must be read and understood in its entirety; portions or individual sections of our preliminary evaluation cannot be relied upon without the supporting text. Additionally, we recommend a comprehensive geotechnical engineering evaluation, including additional subsurface exploration, laboratory testing, and design analyses be complete once the building layout, planned grades, and structural loading conditions are available. After final design is complete and the project moves into the construction phase, we recommend STRATA be retained to provide monitoring, testing, and consultation services to verify our evaluation recommendations are followed.

We appreciate the opportunity to assist Keller and the City of Sandpoint with this project and look forward to our continued involvement during the design and construction phases. Please contact us if you have any questions or comments.

Sincerely,
STRATA

PROFESSIONAL ENGINEER
LICENSED
12-20-2024
17107
STATE OF IDAHO
RYAN M. LEWIS

Ryan Lewis

Steven J. Litalien, E.I.
Staff Engineer

Ryan M. Lewis, P.E.
Senior Engineer

SJL/RML/sl

208.772.2428 | 1016 W. Hayden Ave, Hayden, Idaho 83835 stratageotech.com

STRATA

Geotechnical Feasibility Study

Sandpoint WWTP PER
723 South Ella Avenue
Sandpoint, Idaho 83864

December 20, 2024

Prepared for:
Mr. Kyle Meschko, P.E.
Mr. Levi McPhee, DBIA
Keller Associates, Inc.
601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814

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INTRODUCTION

STRATA performed our services referencing our authorized proposal dated September 4, 2024:

1. Coordinated with Keller Associates, Inc. and the City of Sandpoint to delineate exploration schedules, locations, utility issues, cleanup expectations, site access issues, and other exploration-specific considerations.
2. Conducted a site visit to establish and mark proposed exploration locations prior to public utility locating.
3. Contacted the North Idaho 811 utility notification center prior to exploration to identify known public utilities within 50 feet of proposed boring locations (required by Idaho state law).
4. Subcontracted a trailer-mounted drill rig and operator to advance four exploratory borings to depths between 41.5 and 101.5 feet below the ground surface. We obtained Standard Penetration Test (SPT) soil samples at 2.5- to 10.0-foot intervals, extending to each boring's termination depth. Additionally, we collected relatively undisturbed Shelby tube samples at select locations.
5. Logged the subsurface profiles, visually described, and classified the soil encountered referencing the *Unified Soil Classification System* (USCS). We staked/painted and labeled each location following drilling to assist future surveying. Additionally, we documented exploration locations using a commercially available global positioning system (GPS) device.
6. Accomplished laboratory testing on samples obtained during fieldwork referencing *ASTM International* test standards. Laboratory test results were used to assist soil classification and characterize soil engineering parameters. Laboratory testing included:
    - Grain size evaluations
    - In-place moisture content
    - Unit weight
    - Atterberg limits
    - pH/resistivity/sulfate content
    - One-Dimensional Consolidation
    - Direct Shear
7. Provided a high-level discussion of the following geotechnical items that will impact initial planning and design stages of the project:
    - Overview of on-site soils and groundwater levels
    - Foundation feasibility considerations (shallow foundations, intermediate foundations, and deep foundations)
    - Slab on-grade feasibility considerations
    - Earthwork considerations
8. Prepared this stamped report deliverable, including exploration logs, laboratory test results, and related visual aids.

PROJECT UNDERSTANDING

We understand the City of Sandpoint (City) plans to upgrade and replace existing treatment facilities at their current wastewater treatment plant (WWTP) to meet or exceed discharge permit requirements. The City has selected Keller Associates, Inc. (Keller) to provide a preliminary engineering report (PER) for these upgrades. On behalf of the City, Keller selected STRATA to provide a geotechnical report to assist with the PER.

Site Conditions

The project site is located at 723 South Ella Avenue in Sandpoint, Idaho, approximately 2,200-feet south of US-2. The existing City WWTP is sited on an approximately 4-acre lot bound by residential structures to the north and west, and the Pend Oreille River delta with Lake Pend Oreille to the south. The area immediately to the north of the site contains multi-use pathways and is moderately treed and lightly vegetated with grass and shrubs. The WWTP has approximately 20 existing structures including treatment digesters, storage tanks, clarifiers, auxiliary support buildings, and associated yard piping.

Proposed Construction

The location, planned grades, dimensions, and structural loads of new or replacement structures is subject to change pending the geotechnical findings presented in this geotechnical feasibility study and the City's needs. Improvements currently include a new administration/lab building, new primary clarifiers and primary solids pumping building, new grit removal building, new chemical storage building for phosphorus removal, new intermediate pump station, new UV disinfection building, new secondary clarifier, and upgrades to existing structures. In addition to new structures and improvements to existing structures, the project will include new or replacement yard piping.

FIELD AND LABORATORY EVALUATION

Field Exploration

We explored subsurface conditions at the site by advancing four borings throughout the existing WWTP on September 16 and 17, 2024. Plate 1 illustrates the approximate boring locations documented in the field with a commercially available GPS unit.

We advanced boring B-2 to 101.5 feet below the ground surface and borings B-1, B-3, and B-4 to 41.5 feet below the ground surface using a trailer-mounted G-2400 drill rig equipped with 6-inch outside-diameter, hollow-stem augers.

We obtained soil samples within the undocumented fill and native soil at 2.5- to 10.0-foot intervals via standard penetration testing (SPT) using 2-inch-diameter split spoon samplers. We advanced the SPT samplers 18 inches with a 140-pound hammer falling 30 inches. We obtained the SPT N-value by counting the number of hammer blows required to advance the sampler over the interval from 6 to 18 inches. The blow counts for each 6-inch sampler segment are presented on the boring logs. The term "WOH" is used to represent when the SPT sampler advances 18-inches under the "weight of hammer". The SPT N-values reported on the boring logs are raw, uncorrected values. We also obtained relatively undisturbed Shelby tube samples at select locations and bulk samples from auger cuttings.

Mr. Steven Litalien, E.I. visually described, classified, and logged the subsurface conditions encountered during exploration referencing the USCS. Appendix A presents exploration logs and a USCS explanation for soil description, which should be used to help interpret terms used throughout this report and on the exploration logs.

Following exploration completion, we loosely backfilled borings with a combination of bentonite and on-site cuttings finished approximately level with the surrounding ground surface. STRATA staked the boring locations prior to departing the site.

Subsurface Conditions

General

In general, we encountered a surficial topsoil layer above a combination of variable density native and fill clay and sand soil underlain by very soft and highly compressible lean clay. We did not encounter bedrock within the upper 101.5 feet of the soil profile. We encountered a discernible groundwater elevation in boring B-2 and B-4 ranging from 9.7 to 10.0 feet below the ground surface. We were unable to distinguish a groundwater elevation in boring B-1 or B-3 due to the fine-grained nature of on-site soils that exhibit extremely low permeability. However, we expect the groundwater level across the site will likely match the water elevation in the nearby Pend Orielle River delta to the south.

Topsoil

We encountered a 3- to 6-inch-thick layer of topsoil at each boring location. The topsoil contained grass, roots, and organic material.

Upper Silty Sand (SM) Fill

Below topsoil in borings B-1 and B-3, we encountered tan silty sand (SM) fill that was loose to medium dense and moist to wet. The SM layer extended to 2.5-feet below the ground surface in B-1 and extended to 3 feet below the ground surface in B-3. We measured a moisture content of 6.2 percent within the SM soil encountered in boring B-1.

Upper Silt with Sand (ML) Fill

Below topsoil in boring B-2 and B-4, we encountered silt with sand (ML) fill that extended to 17.5 and 2.5 feet below the ground surface, respectively. The ML fill was tan to gray, moist to wet, and soft to stiff. We measured a moisture content ranging from 7.6 to 21.7 percent; moisture content increased with increasing depth. The percent passing the No. 200 sieve (fines content) of the fill ML layer was 81.9 percent.

Upper Lean Clay (CL) Fill

Below the upper silty sand (SM) or upper silt with sand (ML) fill layer in borings B-1, B-3, and B-4, we encountered lean clay (CL) fill that extended 10.5 to 15.0 feet below the ground surface. The upper CL fill layer was tan, gray, and brown, moist to wet, and soft to stiff. The moisture content of the upper CL fill ranged from 28.4 to 29.9 percent. We measured a liquid limit of 33, a plasticity index of 12, an internal friction angle of 24.1 degrees, and a cohesion intercept of 157 pounds per square foot (psf).

Lower Native Silty Sand (SM) and Clayey Sand (SC)

Below lean clay fill in B-1, B-3, and B-4, we encountered a combination of native silty sand (SM) and clayey sand (SC). The lower native SM and SC layers extended to 30 feet below the ground surface in B-1 and B-3 and to 22.5 feet below the ground surface in B-4. The SM and SC layers were brown to gray, very loose to medium dense, and moist to wet. We measured a moisture content of 24.2 percent at 15 feet below the ground surface.

Lower Native Lean Clay (CL)

Below the lower native silty sand (SM) layer in B-1, upper silt with sand (ML) fill layer in B-2, and lower clayey sand (SC) layer in B-3 and B-4, we encountered a lower native lean clay layer (CL) with 100 percent passing the No. 200 sieve that extended to each boring's termination depth. The lower native CL layer was gray, wet (moisture content of 39.4 percent), and very soft with blow counts typically WOH and pocket penetrometer values of zero. The lower native CL layer is highly compressive and exhibits negligible infiltration rates. We measured an internal friction angle of 20.9 degrees and a cohesion intercept of 119 psf at 25 feet below the ground surface. The in-situ dry density was 80.3 pounds per cubic foot (pcf), the liquid limit was 37, and the plasticity index was 14.

Groundwater

Groundwater was encountered at 9.7 feet in B-2 and 10.0 feet in B-4. Due to the fine-grained nature and low permeability of on-site native and fill soils, we were unable to measure a groundwater level in B-1 and B-3. However, given enough time, we anticipate the depth to groundwater in B-1 and B-3 will match elevations measured in B-2, B-4 and the surrounding lake to the south. Note that groundwater can vary with seasonal changes in irrigation, infiltration, precipitation, and adjacent site developments. We recommend that designers assume the groundwater table will match the existing ground surface elevation throughout the rainy season and plan for uplift forces acting on below-grade structures.

Subsurface Variability

Exploratory borings only allow observation of a relatively small sample of the subsurface conditions at the site. Variations may exist beyond and below exploration locations. Such variations will not be apparent until construction and may impact project schedules and costs. Where such variations exist, it may affect the opinions and recommendations presented in this report as well as construction timing and costs and we must be contacted to review the encountered conditions and our recommendations to make any necessary revisions. We recommend additional subsurface exploration via soil borings and cone penetration (CPT) testing be accomplished at the site once final structure locations and grades have been established.

Laboratory Testing

We performed laboratory testing on select soil samples collected in the field referencing *ASTM International* (ASTM) test standards. We used laboratory test results to verify soil classification and to estimate soil engineering properties. Laboratory testing included grain size evaluations, Atterberg limits, in-situ moisture contents, in-situ unit weight, pH/resistivity/sulfate content, direct shear, and one-dimensional consolidation testing. Index laboratory test results are presented on exploratory logs in Appendix A. Graphical test results are provided in Appendix B.

GEOTECHNICAL OPINIONS AND CONSIDERATIONS

We present the following geotechnical opinions and considerations to assist early project planning and design stages for the Sandpoint WWTP PER project planned in Sandpoint, Idaho. The information presented below is based on our experience with similar soil and geologic conditions, findings from our field and laboratory evaluation, preliminary geotechnical engineering analyses, and our understanding of the planned construction. We understand development plans will change, and we should be contacted to review the project modifications, perform additional field and laboratory testing, and update our preliminary recommendations as necessary.

General Project Considerations Discussion

The project site is particularly challenging given the thick pockets of undocumented fill, compressibility of underlying native clay, presence of shallow groundwater, and presence of on-site structures that cannot be damaged during or post-construction. Construction of new structures should be designed to prevent additional differential settlement and damage of adjacent structures. In summary, we do not recommend soil surcharge loading to induce settlement at the site or new structures be supported on shallow foundations. We recommend new structures be supported by either intermediate (aggregate piers) or deep foundations (driven open-ended pipe piles), no re-use of on-site native or fill soils, on-site dewatering as needed to achieve finished subgrade elevation, and new below-grade structures be design against potential uplift forces caused by shallow groundwater. Furthermore, we recommend new concrete slab-on-grades be constructed on a minimum 2-feet of non-frost susceptible soil and stormwater disposal design plan on negligible infiltration rates. Lastly, utilities should be constructed using flexible pipe connections and all imported structural fill should be placed on a geotextile separation fabric placed above on-site soils.

Earthwork

On-Site Soil Re-use

The surficial on-site soil within the upper 15 feet of the soil profile is typically fine-grained soil that is over optimum moisture content and highly moisture sensitive. As such, our opinion is re-use of on-site soil will be extremely difficult to impractical for this project. We recommend the design team plan on all soil placed to achieve site grades comprise imported structural fill.

Excavations and Slopes

We anticipate on-site native soil and undocumented fill may be excavated using conventional excavation techniques. We expect temporary excavations can safely be excavated to a slope of 1.5H:1V (horizontal to vertical). Permanent slopes will likely need to be constructed to a maximum slope of 2.5H:1V and will depend on the length of slope, proximity to structures, and surcharge loading conditions.

Additionally, we recommend all excavations be accomplished with smooth blade equipment. We do not recommend the earthwork contractor attempt to scarify and recompact the exposed subgrade soils. Attempts to repair soft spots at the exposed subgrade elevation will likely require 1 to 2 feet of additional soil removal followed by replacement using a 3- to 6-inch-minus shot rock in combination with a geotextile separation fabric.

We strongly recommend earthwork construction take place during dry weather conditions (May through October). In soft or wet soil areas and during wet weather conditions, earthwork contractors must be familiar with the hazards of using rubber-tired equipment, which exerts a point load on the subgrade. Staggering wheel paths, using tracked equipment to traverse exposed subgrades and other techniques are important processes that reduce the potential for subgrade pumping, rutting, and contractor rework.

Earthwork should not be performed immediately after rainfall, or until soil can dry sufficiently to allow construction traffic without disturbing the subgrade. Potential disturbance and the moisture-sensitive soil at the project site will likely require isolated removal and replacement during construction. We recommend any soil exhibiting pumping, rutting, weaving, or otherwise exhibiting unstable performance be remediated.

Geotextile Separation Fabrics

We recommend a nonwoven or woven geotextile separation fabric be placed between all native and fill soil and any imported structural fill. Geotextiles should meet requirements outlined in the subgrade separation geotextile property requirements provided in *Section 2050 – Construction Geotextiles* of the ISPWC. Geotextiles shall be applied directly on approved subgrade, taut, overlapped at least 18 inches or otherwise placed according to manufacturers' recommendations.

Geotextile fabrics may be useful in situations with soft, pumping, and rutting subgrade soil conditions but cannot be used to reduce or eliminate the risk of undocumented fill settlement associated with fill compression/ consolidation or debris decay.

De-watering Considerations

Prior to excavating to finished subgrade elevations, we recommend the earthwork contractor install monitoring wells throughout the site and dewater the site a minimum 3 feet below the bottom of planned excavation elevation. Dewatering in fine-grained soils can be time consuming (take several months to accomplish) and challenging; dewatering must be appropriately designed for the on-site conditions and may include a combination of shoring, sumps, pumps, or other dewatering techniques.

Surcharge Loading Considerations

Given the proximity of planned new structures to existing structures, we highly discourage the use of soil surcharge loading to induce settlement of the on-site native or fill soils. Soil surcharge loads placed adjacent existing structures can cause additional settlement below a portion of the existing structure and result in differential settlement and structure cracking. Additionally, our experience indicates soil surcharge loads may need to be placed and left 6 to 12 months prior to new construction at this site, given the fine-grained nature of on-site soil, low permeability, and long drainage paths required to induce settlement.

Site Grading and Drainage

Any runoff from precipitation or snowmelt must be routed away from the new structures to the maximum extent practical and must not be allowed to infiltrate or be diverted towards existing or new structures. Runoff or water migrating along the ground surface must be conveyed away from structures by an appropriately designed series of ditches, swales or other surface water management procedures.

We recommend the ground surface outside of any structure be sloped a minimum of 5 percent away for a minimum of 10 feet to rapidly convey surface water or roof runoff away from structures. Stormwater should be routed away from structures and should be disposed of in a suitable location greater than 20 feet from structures and in a suitable location as determined by the civil engineer.

Foundation Design Considerations

General Discussion

We present the following foundation design considerations for shallow, intermediate, and deep foundations. Note the site is potentially liquefiable, which should be explored further with CPT testing.

Shallow Foundations

Given the thick pockets of variable density undocumented fill throughout the site, we do not recommend new structures be supported on shallow foundations. Shallow foundations placed on undocumented fill may result in excess of 6 inches of total settlement and 3 inches of differential settlement. Furthermore, if the on-site undocumented fill is completely removed from new building footprints and replaced with structural fill, the heavier imported structural fill may result in excessive differential settlement of adjacent structures, similar to a soil surcharge load situation.

Intermediate Foundations

In our experience, this site is a good candidate for structures being supported on intermediate foundations, including aggregate piers and/or rigid inclusions. To maintain acceptable total and differential settlement tolerances, intermediate foundations should be placed below new footings and slabs. Soil dewatering is not required prior to installing intermediate foundations. Aggregate piers can be constructed by driving a hollow mandrel through the soft soil and backfilled with thin lifts of compacted aggregate. Compaction is achieved using high frequency impact hammers that deliver vertical ramming energy that densifies the aggregate and increases lateral stress in the soil matrix. The system serves to reduce settlement by replacing the low-density and weak soil below structures with a stiffer composite soil matrix. Additionally, use of intermediate foundations will not require removal and replacement of on-site undocumented fill encountered throughout the site. Due to the high groundwater level and soft soil conditions, we recommend the contractor plan on constructing a gravel working pad (if necessary) to support aggregate pier equipment during construction. The thickness of gravel working pad will depend on the weight and configuration of equipment used. Typical aggregate pier installation depths range from 15 to 30 feet deep with spacing between 6 and 10 feet apart and can result in allowable bearing pressures ranging from 3,000 to 4,000 psf, while maintaining acceptable total and differential settlement tolerances.

Deep Foundations

Deep foundations may also be used to support new on-site structures but are typically more expensive to install than intermediate foundations when structural loads are in the low to mid-range (less than 50-kip column loads and less than 3 klf continuous loads). Near this project site, we have seen the use of micropiles and driven open- and close-ended steel pile or H-pile successfully support new structures. Design for micropiles and driven piles should rely exclusively on side friction and neglect end bearing. Micropiles are typically installed 30 to 50 feet deep and driven piles can be installed as deep as needed to achieve required structural design loads. Based on our previous experience in the area, pore water pressure dissipation following driven pile installation can take 5 to 7 days or longer; as such, a restrike should be performed following driven pile installation and specifications should require an adequate amount of time between initial install and restrike (i.e. greater than the typical 24 hour “setup” duration). Similar to intermediate foundation systems, dewatering of the site is not required for deep foundations and removal of on-site undocumented fill is also not required. It may be necessary to construct structural concrete grade beams to span between individual deep foundations to prevent excessive interior slab settlement.

Utility Construction

Given the potential for new structure settlement, we recommend the design team plan to use flexible pipe connections at the site. Additionally, we recommend all new utility lines be constructed in trenches that are lined with a geotextile fabric. Utility lines should be backfilled with imported structural fill.

Seismicity

STRATA utilized site soil and geologic data, the project location, the *2018 International Building Code* (IBC), the *National Earthquake Hazards Reduction Program* (NEHRP), and Chapter 20 of the *American Society of Civil Engineers* (ASCE) 7-16 to establish a Seismic Site Classification of “E” at the project site. Given the high groundwater table and loose soil conditions within the upper 30 feet of the soil profile, the site may be subject to liquefaction under earthquake loading. Liquefaction potential of the site should be further evaluated via CPT testing and should be accounted for in the intermediate and deep foundation design.

Concrete Slab-on-Grade Considerations

The on-site soil is highly frost susceptible, meaning the surficial soil will expand and shrink below new unheated slabs if the soil is moist and freezes. To combat the negative impacts of frost heave, we recommend replacing the upper exposed subgrade soil below new slabs with a minimum 2 feet of non-frost susceptible soil (clean sand or gravel). Additionally, concrete slab-on-grades should be supported by a minimum 6 inches of imported crushed aggregate.

ADDITIONAL RECOMMENDED SERVICES

The information contained in this report is based on our understanding of the planned construction. We were not provided structural loads, final new building locations, or a grading plan. We recommend STRATA be retained to perform additional subsurface exploration (specifically CPT testing), laboratory testing, and design analyses once additional information is known. We recommend STRATA provide a subsequent comprehensive geotechnical engineering evaluation with specific recommendations for each structure. Following our completion of a geotechnical engineering evaluation, we further recommend STRATA be retained to review the final design to verify our recommendations have been correctly interpreted. Further, verification of the subsurface conditions during construction is an important part of the geotechnical design process. We recommend you retain STRATA to be on-site during subgrade preparations and foundation construction to verify the conditions encountered during exploration are exposed during construction and our recommendations are followed.

EVALUATION LIMITATIONS

This report has been prepared to assist early project planning and design stages for the Sandpoint WWTP PER project planned in Sandpoint, Idaho. Our geotechnical feasibility study did not include a site specific geohazard evaluation, liquefaction analysis, or lateral spreading analysis. Our report also did not include foundation design recommendations specific to any planned structure or loading condition. Our services consist of professional opinions and considerations provided in accordance with generally accepted geotechnical engineering principles and practices as they exist at this time, and in the area of this report. This report has been prepared specifically for this project and exclusively for the use of Keller Associates, Inc. and the City of Sandpoint. We do not authorize its use by firms other than the design team, as a reference document to support the design process. The geotechnical information provided herein are based on the premise that STRATA will continue our project involvement to observe and document our recommendations are implemented during construction, and to confirm conditions between exploration locations. This acknowledgement is in lieu of any express or implied warranty.

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STRATA	PREPARED BY STRATA Hayden, ID	PROJECT Name: Sandpoint WWTP PER Number: CD24060E	LOCATION Sandpoint, ID	SYMBOL KEY ⊗ Boring	PLATE 1 Exploration Location Plan

Appendix A

Unified Soil Classification Systems (USCS)

Exploratory Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
COURSE GRAINED SOIL MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	●	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			○	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH >12% FINES	▥	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SANDS >50% COARSE FRACTION PASSES #4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	∘	SW	WELL-GRADED SANDS, GRAVELY SANDS
			•	SP	POORLY-GRADED SANDS, GRAVELY SANDS
		SANDS WITH >12% FINES	▥	SM	SILTY SANDS, SAND-SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND CLAY MIXTURES
FINE GRAINED SOIL MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	INORGANIC	▥	ML	INORGANIC SILTS, SANDY OR CLAYEY SILTS
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAYS
		ORGANIC	▥	OL	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE	INORGANIC	▥	MH	INORGANIC SILTS, MICACEOUS SILTS, PLASTIC SILTS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		ORGANIC	▨	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			▤	PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOIL

BORING LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
▯	STANDARD 2-INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER
▯	MODIFIED CALIFORNIA 3-INCH OUTSIDE DIAMETER SAMPLER
▯	ROCK CORE
▮	SHELBY TUBE 3-INCH OUTSIDE DIAMETER SAMPLER

ADDITIONAL MATERIAL SYMBOLS

GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
■	AC	ASPHALT CONCRETE
▲	CC	CEMENT CONCRETE
⩘	TS	TOPSOIL
▩	FL	FILL

TEST PIT LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
BG	BAGGIE SAMPLE
▨	BULK SAMPLE
RG	RING SAMPLE

GROUNDWATER SYMBOLS

GRAPH SYMBOL	DESCRIPTION
▽	GROUNDWATER LEVEL AT TIME OF DRILLING
▽	GROUNDWATER LEVEL AT END OF DRILLING
▼	GROUNDWATER LEVEL 24 HOURS AFTER DRILLING COMPLETION
04-10-18	DATE OF GROUNDWATER READING

SHORTHAND NOTATION

SPT - STANDARD PENETRATION TEST
PL - PLASTIC LIMIT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
MC - MOISTURE CONTENT
DD - DRY DENSITY
WD - WET DENSITY
UC - UNCONFINED COMPRESSION
OC - ORGANIC CONTENT
BGS - BELOW GROUND SURFACE
N.E. - NOT ENCOUNTERED

MATERIAL DESCRIPTION CONTACT

——— DISTINCT SOIL LAYER CONTACT WITHIN SOIL PROFILE

------ APPROXIMATE SOIL LAYER CONTACT WITHIN SOIL PROFILE

NOTES

1. MIXED UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS ARE USED TO INDICATE DUAL SOIL CLASSIFICATIONS.
2. THE SPT N-VALUE, REPORTED IN BLOWS PER FOOT, IS THE SUM OF THE NUMBER OF BLOWS REQUIRED TO DRIVE THE STANDARD SPLIT SPOON SAMPLER A DISTANCE OF 12-INCHES AFTER AN INITIAL 6-INCHES OF PENETRATION. IF A TOTAL OF 50 BLOWS ARE INSUFFICIENT TO ADVANCE ANY OF THE THREE 6-INCH INTERVALS, THE PENETRATION DEPTH AFTER 50 BLOWS IS ALSO REPORTED.

EXPLORATION LOG KEY - SOIL

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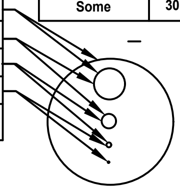
GRAIN SIZE

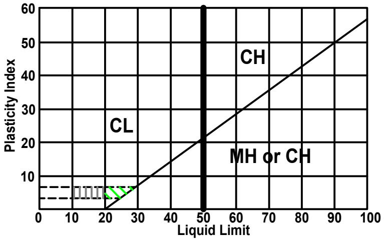
DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-size.
Cobbles		3" - 12"	3" - 12"	Fist-size to basketball-size.
Gravel	coarse	3/4" - 3"	3/4" - 3"	Thumb-sized to fist sized.
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized.
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized.
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized.
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized.
Fines		Passing #200	<0.0029"	Flour-sized and smaller.



MODIFIERS

DESCRIPTION	%
Trace	<5
Few	5-10
Little	15-25
Some	30-45

PLASTICITY CHART



STRATIFICATION

DESCRIPTION	THICKNESS
Parting	1/16 - 1/4"
Lense	1/4 - 4"
Layer	4 - 12"

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness.
Frequent	More than one per foot of thickness.

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to touch.
Moist	Slightly damp, some apparent moisture.
Wet	Saturated, visible free water, soil is below water table.

APPARENT RELATIVE DENSITY OF COARSE-GRAINED SOIL

APPARENT DENSITY	SPT blows/ft	CALIFORNIA SAMPLER blows/ft	D & M SAMPLER blows/ft	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	0-4	<4	<5	0-15	Easily penetrated with 1/2" reinforcing rod pushed by hand.
Loose	5-10	5-12	5-15	15-35	Difficult to penetrate with 1/2" reinforcing rod pushed by hand.
Medium Dense	11-30	12-35	15-40	35-65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Dense	31-50	35-60	40-70	65-85	Difficult to penetrate a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Very Dense	>50	>60	>70	85-100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer.

CONSISTENCY FINE-GRAINED SOIL

		TORVANE	POCKET PENETROMETER	
CONSISTENCY	SPT blows/ft	UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by thumb. Extrudes between thumb and finger when squeezed in hand.
Soft	2-3	0.125-0.25	0.25-0.5	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Firm	4-7	0.25-0.5	0.5-1.0	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Stiff	8-14	0.5-1.0	1.0-2.0	Indented about 1/2 inch by thumb only with great effort.
Very Stiff	15-30	1.0-2.0	2.0-4.0	Readily indented with difficulty by thumbnail.
Hard	>30	>2.0	>4.0	Indented with difficulty by thumbnail.

REACTION WITH HCI

None	No visible reaction.
Weak	Some reaction, with bubbles forming slowly.
Strong	Violent reaction, with bubbles forming immediately.

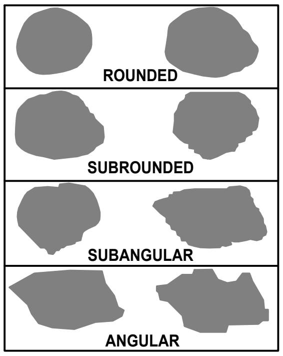
CEMENTATION

Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

STRUCTURE

Stratified	Alternating layers of varying material or color with layers at least 1/4" thick; note thickness.
Laminated	Alternating layers of varying material or color with layers at least 1/2" thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small macular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soil, such as small lenses or sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and thickness throughout.

PARTICLE SHAPE



EXPLORATION LOG KEY - SOIL

STRATA

STRATA

BORING NUMBER: B-1

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/17/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.264146, -116.560432

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

DEPTH TO GROUNDWATER (FEET) N/A

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2084		**Topsoil** - 6 inches											
		Fill - **Silty Sand** (**SM**), tan, moist, medium dense, fine-grained sand	SM		14"	4 6 11	17		6.20				
		Fill - **Lean Clay** (**CL**), brown, moist, very soft to firm			16"	2 4 3	7						
2080													
	5												
			CL		18"	2 1 4	5	2	28.40				
2075					18" 18"	x 1 1	2	1	29.90	85.30	100	LL-33 PI-12	Internal Friction Angle - 24.1° Cohesion Intercept - 157 psf
	10												
		Silty Sand (**SM**), brown to gray, moist to wet, loose to medium dense, fine-grained sand			16"	1 3 4	7	1					A second hole was advanced approximately 5 feet west of B-1 to obtain a shelby tube sample at 7.5 feet BGS resulting in a SPT and shelby tube at the same depth.
2070	15												
					18"	7 7 11	18		24.20				
2065													Auger cuttings and samples saturated at 17.5 feet BGS and below.
	20		SM		12"	3 4 7	11						Color turned gray in tip of SPT
2060	25												
					18"	x x 4	4						

BORING NUMBER: B-1

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/17/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.264146, -116.560432

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

DEPTH TO GROUNDWATER (FEET) N/A

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2055	30	**Silty Sand** (**SM**), brown to gray, moist to wet, loose to medium dense, fine-grained sand	SM										
		Lean Clay (**CL**), gray, wet, very soft			18"	WOH WOH WOH		0					
2050	35		CL		18"	WOH WOH WOH		0					
2045	40				18"	WOH WOH WOH		0					

Drilled to Depth

STRATA

BORING NUMBER: B-2

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/16/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.26371, -116.5606

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

DEPTH TO GROUNDWATER (FEET) 9.7'

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2074		**Topsoil** - 3.5 inches											
		Fill - **Silt with Sand** (**ML**), tan to gray, moist to wet, soft to stiff, fine to medium-grained sand, chunks of gray CL encountered throughout			12"	3 5 5	10						
					14"	1 2 1	3		13.70				
2070													
	5				8"	3 4 5	9	.5					
					8"	5 5 4	9		21.70		81.9	LL-25 PI-0	
2065			ML										
	▼ 10				8"	3 4 4	8						
2060													
	15				6"	5 2 1	3						
		Lean Clay (**CL**), gray, wet, very soft											
2055													
	20				0"								
			CL		18"	WOH WOH WOH		0					
2050													
	25				16.25"			0	39.40	80.30	100	LL-37 PI-14	Internal Friction Angle - 20.9° Cohesion Intercept - 119 psf
					18"	WOH WOH WOH		0					

STRATA

BORING NUMBER: B-2

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/16/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.26371, -116.5606

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

DEPTH TO GROUNDWATER (FEET) 9.7'

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2045		**Lean Clay** (**CL**), gray, wet, very soft											
	30				18"	WOH WOH WOH		0					
2040													
	35				18"	WOH WOH WOH		0					
2035													
	40				18"	WOH WOH WOH		0					
			CL										
2030													
	45				18"			0					
2025													
	50				18"	WOH WOH 2	2						
2020													
	55					WOH WOH WOH							

STRATA

BORING NUMBER: B-2

PROJECT Sandpoint WWTP PER
DATE COMPLETED 09/16/2024
PROJECT NO. CD24060E
CLIENT Keller & Associates, Inc.
LOGGED BY S. Litalien
LATITUDE / LONGITUDE 48.26371, -116.5606
BORING DIAMETER 6 in
STATION / OFFSET - / - -
EQUIPMENT G-2400
DEPTH TO GROUNDWATER (FEET) 9.7'

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
		Lean Clay (**CL**), gray, wet, very soft											
2015	60				18"	WOH WOH WOH		0					
2010	65					WOH WOH WOH							
2005	70		CL		18"	WOH WOH WOH		0					
2000	75				18"	WOH WOH WOH		0					
1995	80				0"			0					
					18"	WOH WOH WOH		0					
1990													

STRATA

BORING NUMBER: B-2

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/16/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.26371, -116.5606

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

DEPTH TO GROUNDWATER (FEET) 9.7'

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
		Lean Clay (**CL**), gray, wet, very soft	CL										
1985	90				18"	WOH WOH WOH		0					
1980	95												
1975	100				18"	WOH WOH WOH		0					
1970	105												
1965	110												

STRATA

BORING NUMBER: B-3

PROJECT Sandpoint WWTP PER
PROJECT NO. CD24060E
LOGGED BY S. Litalien
BORING DIAMETER 6 in
EQUIPMENT G-2400
DATE COMPLETED 09/17/2024
CLIENT Keller & Associates, Inc.
LATITUDE / LONGITUDE 48.263528, -116.562025
STATION / OFFSET - / - -
DEPTH TO GROUNDWATER (FEET) N/A

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2084		**Topsoil** - 3 inches											
		Fill - **Silty Sand** (**SM**), tan, moist, loose, fine-grained sand	SM		16"	6 5 3	8						
2080		**Fill** - **Lean Clay** (**CL**), brown, moist to wet, soft to firm			18"	2 2 2	4		19.30				
	5				18"	3 3 3	6	1.5					
2075					18"	2 1 2	3	.5	32.40				
	10		CL		12"	x 3 4	7	.5					
													Auger cuttings and samples saturated at 12.5 feet BGS and below.
2070	15	**Clayey Sand** (**SC**), gray, wet, very loose to loose, fine-grained sand			16"	6 5 3	8						
2065	20		SC		18"	WOH WOH 1	1						
2060	25				18"	WOH WOH WOH		0					

BORING NUMBER: B-3

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/17/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.263528, -116.562025

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

DEPTH TO GROUNDWATER (FEET) N/A

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2055	30	**Clayey Sand** (**SC**), gray, wet, very loose to loose, fine-grained sand	SC										
		Lean Clay (**CL**), gray, wet, very soft	CL		18"	WOH WOH WOH		0					
2050	35				18"	WOH WOH WOH		0					
2045	40				18"	WOH WOH WOH		0					

Drilled to Depth

STRATA

BORING NUMBER: B-4

PROJECT Sandpoint WWTP PER
DATE COMPLETED 09/17/2024
PROJECT NO. CD24060E
CLIENT Keller & Associates, Inc.
LOGGED BY S. Litalien
LATITUDE / LONGITUDE 48.263136, -116.56199
BORING DIAMETER 6 in
STATION / OFFSET - / - -
EQUIPMENT G-2400
▽ **DEPTH TO GROUNDWATER (FEET)** 10'

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
2077 2075		**Topsoil** - 3 inches **Fill** - **Silt with Sand** (**ML**), tan, moist, very stiff, fine-grained sand	ML		16"	5 11 10	21		7.60				
	5	**Fill** - **Lean Clay** (**CL**), tan and gray, moist to wet, firm to stiff, fine-grained sand			18"	2 3 3	6						
2070					10"	1 2 2	4		23.20				
	▽10		CL		6"	5 5 7	12		19.10				
2065					14"	4 5 6	11						
2060	15	**Clayey Sand** (**SC**), gray, wet, very loose, fine-grained sand			18"	2 4 3	7						
2055	20		SC		18"	WOH WOH WOH							
2050	25	**Lean Clay** (**CL**), gray, wet, very soft	CL		18"	WOH WOH WOH		0					

STRATA

BORING NUMBER: B-4

PROJECT Sandpoint WWTP PER

DATE COMPLETED 09/17/2024

PROJECT NO. CD24060E

CLIENT Keller & Associates, Inc.

LOGGED BY S. Litalien

LATITUDE / LONGITUDE 48.263136, -116.56199

BORING DIAMETER 6 in

STATION / OFFSET - / - -

EQUIPMENT G-2400

▽ **DEPTH TO GROUNDWATER (FEET)** 10'

Elevation (ft)	Depth (ft)	Material Description	Graphic	Sample Type	Recovery (in or %)	Blow Counts/6" or %RQD	Uncorrected N-Value	Pocket Penetrometer (TSF)	Moisture Content (%)	Dry Density (pcf)	Passing No. 200 (%)	Liquid Limit & Plasticity Index	Remarks
		Lean Clay (**CL**), gray, wet, very soft	CL										
	30				18"	WOH WOH WOH		0					
2045													
	35				18"	WOH WOH WOH		0					
2040													
	40				18"	WOH WOH WOH		0					

Appendix B
Laboratory Test Results

STRATA

Summary of Laboratory Test Results

Project: Sandpoint WWTP PER

Client: Keller Associates, Inc.

Project Number: CD24060E

Date: 10/18/2024

Sample Source	Depth (Feet)	Lab Number	Soil Classification	Dry Unit Weight (pcf)	In Situ Moisture, %	Passing No. 200,%	Atterberg Limits LL	Atterberg Limits PI	Fines Class.
B-1	7.5 - 9.0	56352	Lean Clay (CL)	85.3	29.9	100	33	12	CL
B-2	25.0 - 26.5	56353	Lean Clay (CL)	80.3	39.4	100	37	14	CL

Reviewed By: Keith Wildman

Keith Wildman
Laboratory Services Coordinator

ASTM D6913-17

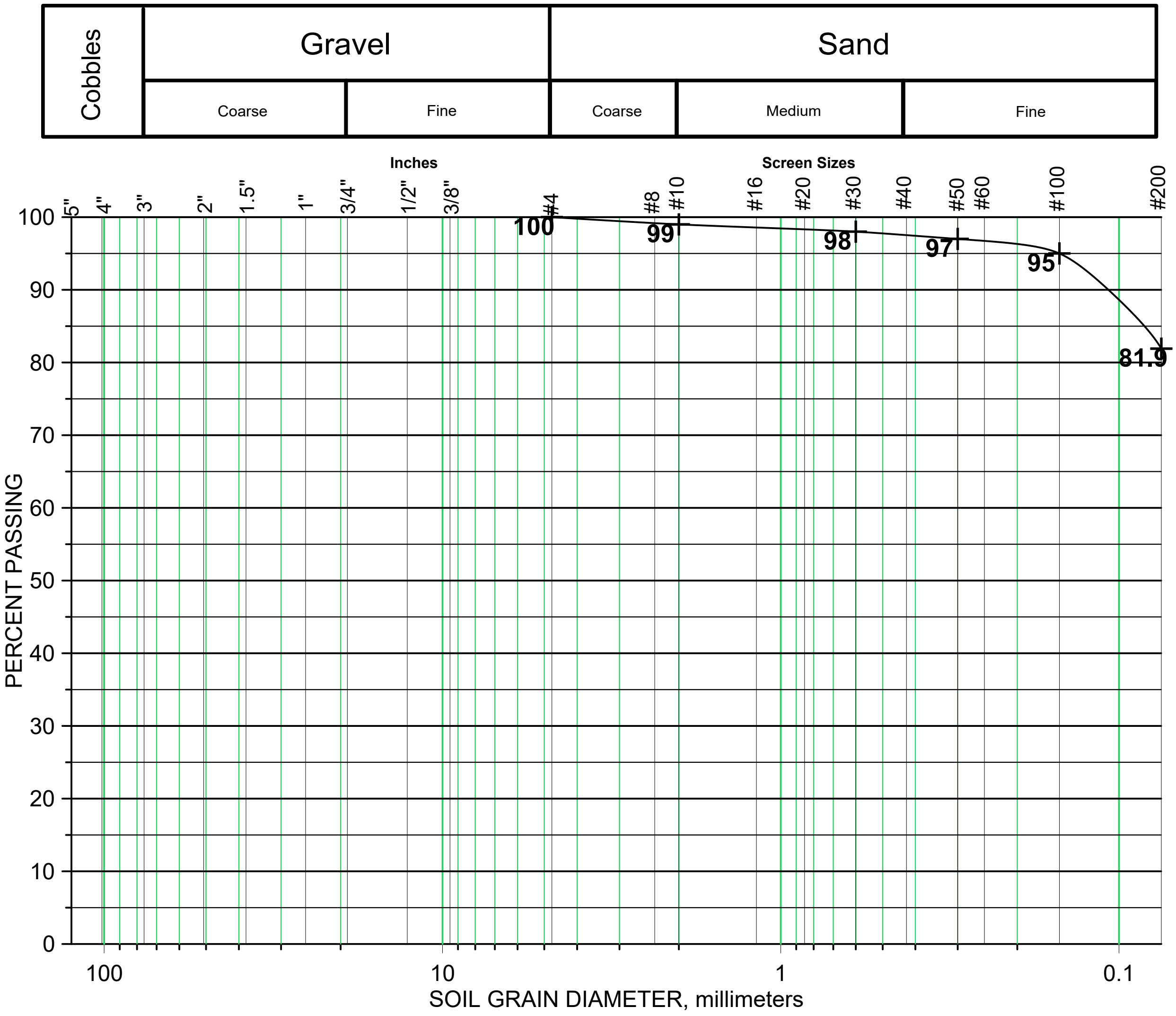
Report Date: 10/4/24

Hayden
1016 West Hayden Avenue
Hayden, ID 83835
Phone: 208.772.2428

Client	Project
Keller Associates, Inc. 601 Sherman Ave Suite 1 Coeur d'Alene, ID 83814	CD24060E Sandpoint WWTP PER 723 South Ella Avenue Sandpoint, ID 83864

SAMPLE INFORMATION

SAMPLE NO.:	55982	**SAMPLE DATE:**	9/17/2024
SPECIMEN SIZE:	Bulk	**TEST DATE:**	10/4/2024
USCS CLASSIFICATION:	Silt with Sand (ML)	**SAMPLED BY:**	S. Litalien
		TESTED BY:	J. Imel
METHOD:	ASTM D1452 - Sampling by Auger Boring	**BORING NO.:**	B-2
		DEPTH (FT):	6.0'-9.0'



Reviewed by S. Litalien, E.I.
Staff Engineer

STRATA

ASTM D3080

Report Date: 10/18/2024

Boise
8653 W. Hackamore Dr.
Boise, ID 83709
Phone: 208.376.8200

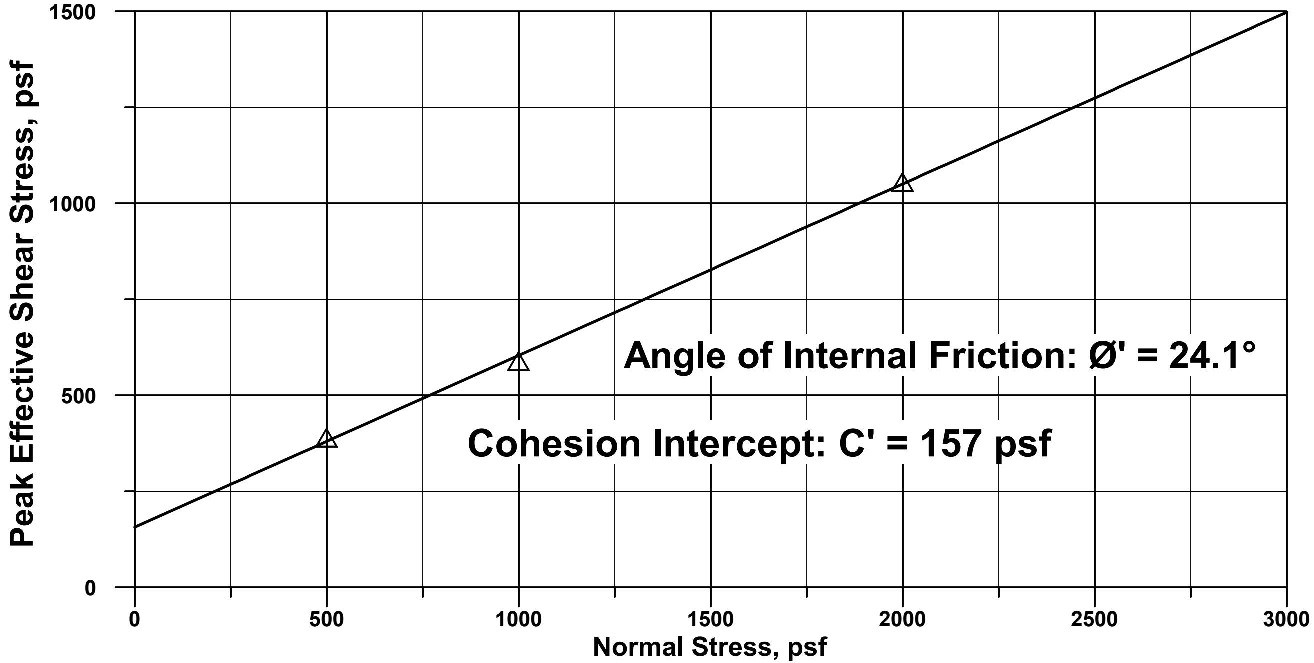
Client
Keller Associates, Inc.
601 Sherman Ave Suite 1
Coeur d'Alene, ID 83814

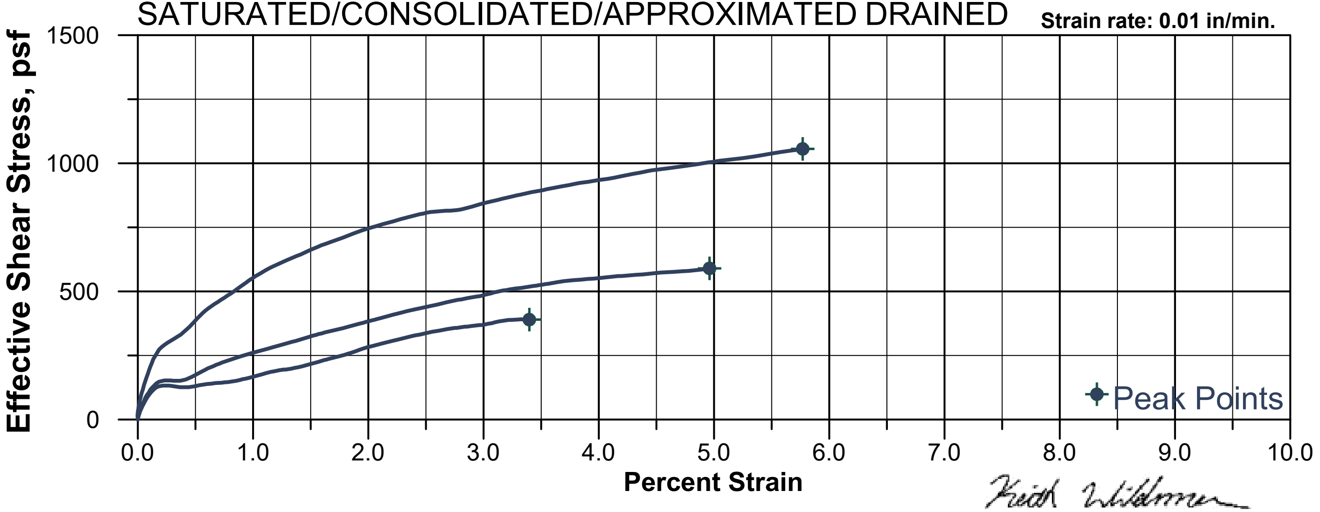
Project
CD24060E
Sandpoint WWTP PER
723 S Ella Street
Sandpoint, ID 83864

SAMPLE INFORMATION

SAMPLE NO.: 56352
SPECIMEN SIZE: Tube
USCS CLASSIFICATION: Lean Clay (CL)
SAMPLE DATE: 9/17/2024
TEST DATE: 10/10/2024
SAMPLED BY: S. Litalien
TESTED BY: J. Bingaman
SOURCE.: B-1
LOCATION: 7.5' - 9.0'
SAMPLE CONDITION: Good

APPARATUS: SoilsTest
SAMPLE PREP: Insitu
MOISTURE CONTENT: 29.9%
DRY UNIT WEIGHT: 85.3 pcf





REMARKS: None

Keith Wildman
Reviewed by Keith Wildman
Laboratory Services Coordinator

STRATA

Boise
8653 W. Hackamore Dr
Boise, ID 83709
Phone: 208.376.8200

ASTM D2435

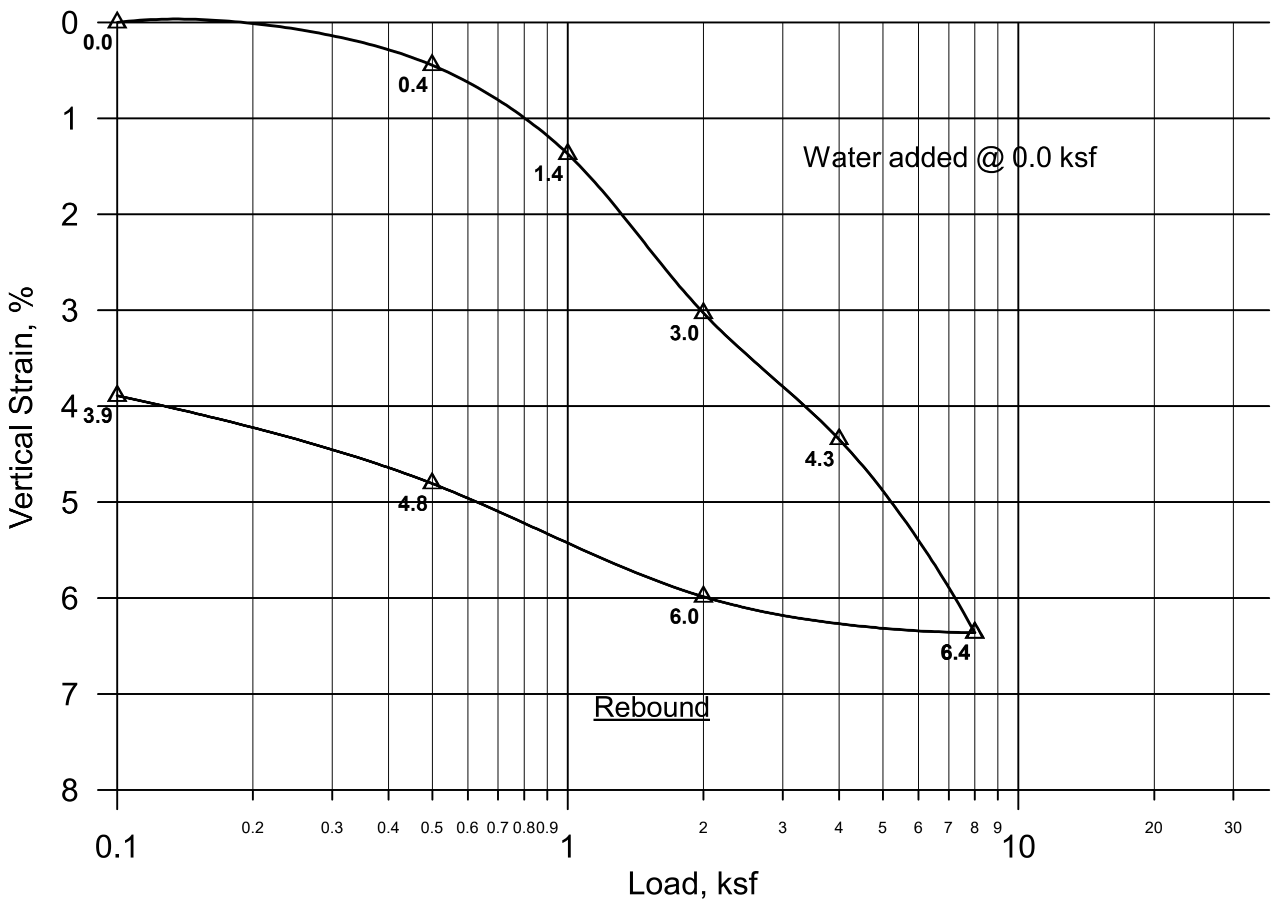
Report Date: 10/18/2024

Client	**Project**
Keller Associates, Inc. 601 Sherman Ave Suite 1 Coeur d'Alene, ID 83814	CD24060E Sandpoint WWTP PER 723 S Ella Street Sandpoint, ID 83864

SAMPLE INFORMATION

SAMPLE No.:	56352	**SAMPLE DATE:**	9/17/2024	**BORING No.:**	B-1
SPECIMEN SIZE:	Tube	**TEST DATE:**	10/08/2024	**DEPTH (FT):**	7.5' - 9.0'
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	J. Bingaman		

APPARATUS:	Humboldt Load Frame	**INITIAL MOISTURE CONTENT:**	29.9%
SAMPLE PREP:	Intact	**FINAL MOISTURE CONTENT:**	37.6%
TEST WATER:	Tap	**DRY UNIT WEIGHT:**	85.3 pcf
METHOD:			



REMARKS: None

Keith Wildman
Reviewed by Keith Wildman
Laboratory Services Coordinator

ASTM D3080

Report Date: 10/18/2024

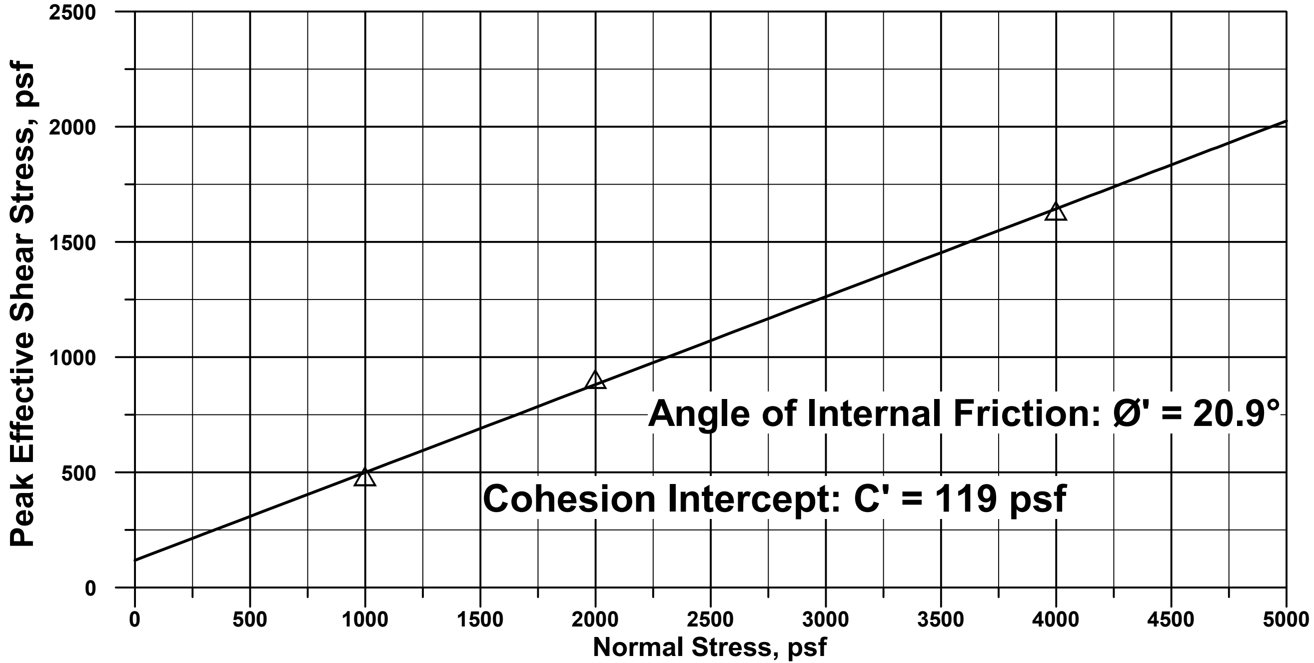
Boise
8653 W. Hackamore Dr.
Boise, ID 83709
Phone: 208.376.8200

Client
Keller Associates, Inc.
601 Sherman Ave Suite 1
Coeur d'Alene, ID 83814

Project
CD24060E
Sandpoint WWTP PER
723 S Ella Street
Sandpoint, ID 83864

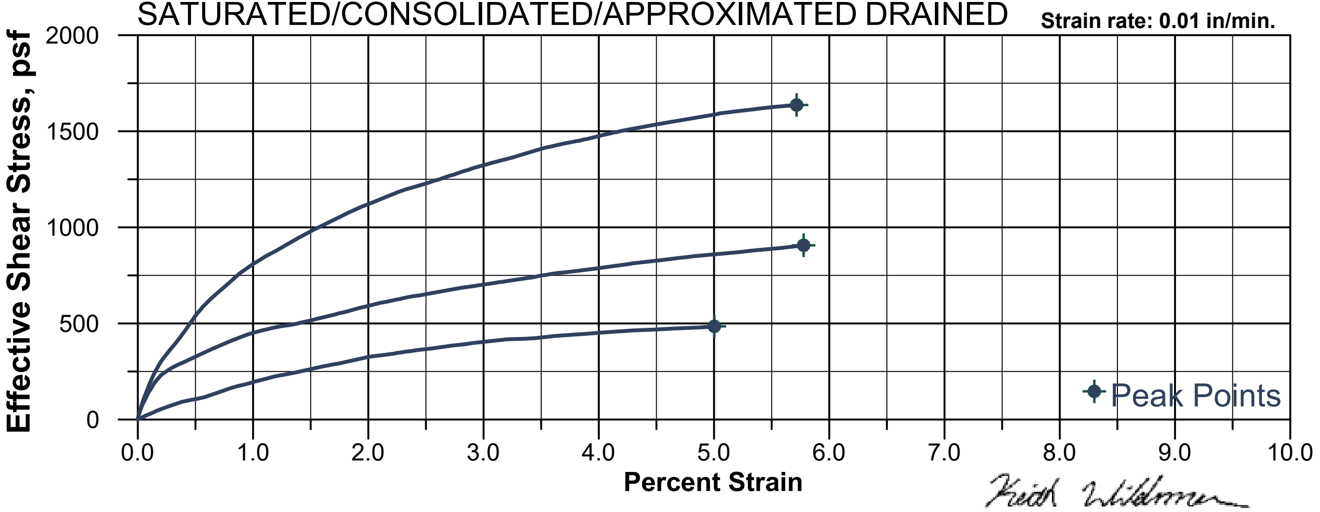
SAMPLE INFORMATION

SAMPLE NO.:	56353	**SAMPLE DATE:**	9/17/2024	**SOURCE.:**	B-2
SPECIMEN SIZE:	Tube	**TEST DATE:**	10/11/2024	**LOCATION:**	25.0' - 26.5'
USCS CLASSIFICATION:	Lean Clay (CL)	**SAMPLED BY:**	S. Litalien	**SAMPLE CONDITION:**	Good
		TESTED BY:	J. Bingaman		
APPARATUS:	SoilsTest	**MOISTURE CONTENT:**	39.4%		
SAMPLE PREP:	Insitu	**DRY UNIT WEIGHT:**	80.3 pcf		



SATURATED/CONSOLIDATED/APPROXIMATED DRAINED

Strain rate: 0.01 in/min.



REMARKS: None

Keith Wildman
Reviewed by Keith Wildman
Laboratory Services Coordinator

ASTM D2435

Report Date: 10/18/2024

Boise
8653 W. Hackamore Dr
Boise, ID 83709
Phone: 208.376.8200

Client

Keller Associates, Inc.
601 Sherman Ave Suite 1
Coeur d'Alene, ID 83814

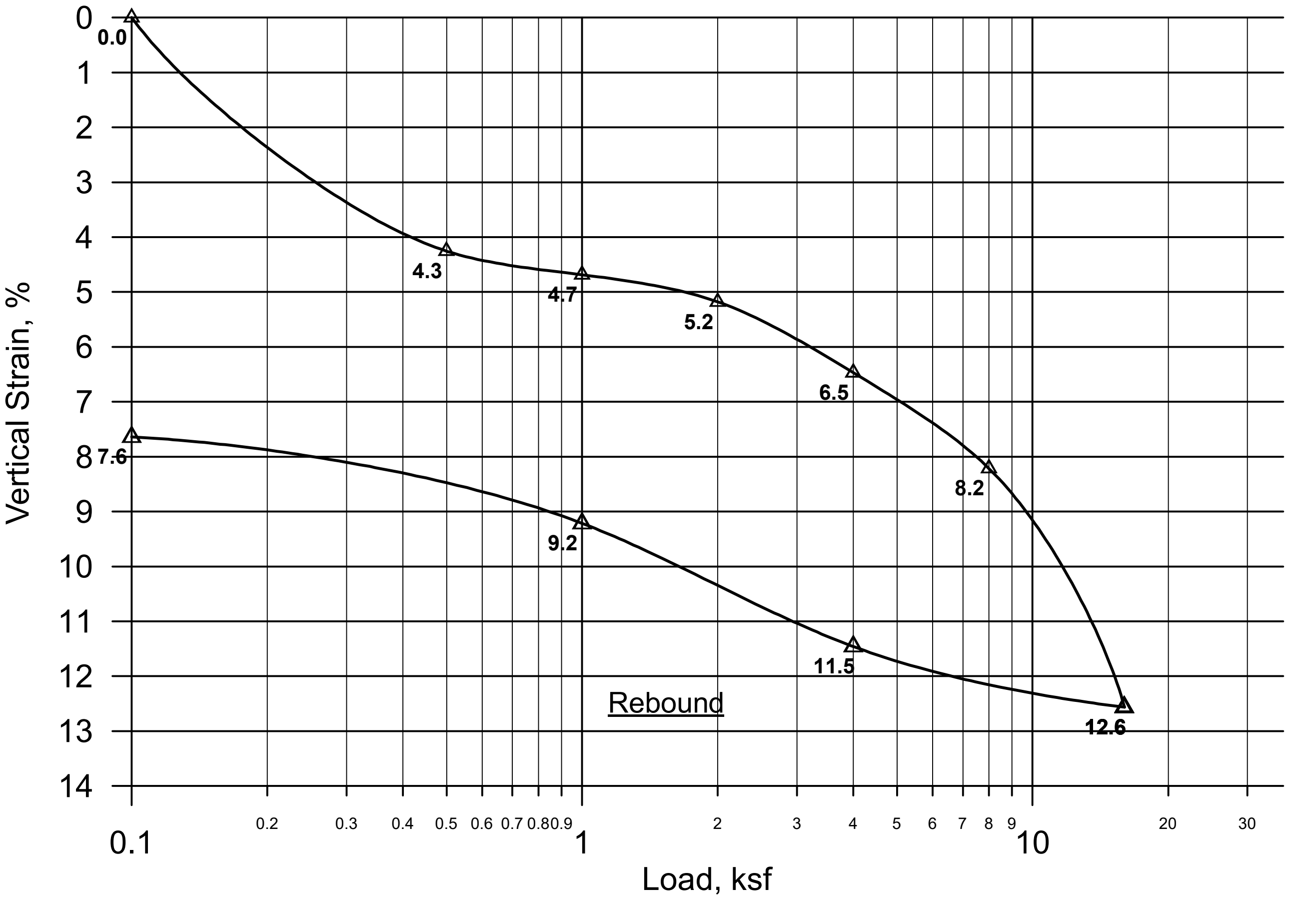
Project

CD24060E
Sandpoint WWTP PER
723 S Ella Street
Sandpoint, ID 83864

SAMPLE INFORMATION

SAMPLE No.: 56353
SPECIMEN SIZE: Tube
USCS CLASSIFICATION: Lean Clay (CL)
SAMPLE DATE: 9/17/2024
TEST DATE: 10/08/2024
SAMPLED BY: S. Litalien
TESTED BY: J. Bingaman
BORING No.: B-2
DEPTH (FT): 25.0' - 26.5'
SAMPLE CONDITION: Good

APPARATUS: Humboldt Load Frame
SAMPLE PREP: Intact
TEST WATER: Tap
INITIAL MOISTURE CONTENT: 39.4%
FINAL MOISTURE CONTENT: 42.8%
DRY UNIT WEIGHT: 80.3 pcf



REMARKS: None

Keith Wildman
Reviewed by Keith Wildman
Laboratory Services Coordinator

ANATEK LABS

Analytical Results Report For:

Strata, Inc. - Hayden

Project Number:

CD24060E

Anatek Work Order:

WEJ0291

Anatek Moscow - 1282 Alturas Drive - Moscow, ID 83843 - 208-883-2839 - moscow@anateklabs.com - FL NELAP E87893
Anatek Spokane - 504 E Sprague Ste. D - Spokane, WA 99202 - 509-838-3999 - spokane@anateklabs.com - FL NELAP E871099
Anatek Yakima - 4802 Tieton Drive - Yakima, WA 98908 - 509-225-9404 - yakima@anateklabs.com - FL NELAP E871190
Anatek Wenatchee - 3019 Gs Center Rd - Wenatchee, WA 98801 - 509-701-8362

Anatek Labs, Inc.
1282 Alturas Drive - Moscow, ID 83843 - (208) 883-2839 - email moscow@anateklabs.com
504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Client:	Strata, Inc. - Hayden	Work Order:	WEJ0291
Address:	1016 W. Hayden Avenue Hayden, ID 83835	Project:	CD24060E
		Reported:	10/18/2024 16:33
Attn:	Michael Woodworth		

Analytical Results Report

Sample Location:	B-1 3.0'-6.0'		
Lab/Sample Number:	WEJ0291-01	Collect Date:	09/17/24 00:00
Date Received:	10/03/24 14:47	Collected By:	Steve Litalien
Matrix:	Soil		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
% Solids	89.6	%	0.100	10/9/24 10:40	BAM	SM 2540 G	
pH	7.36 @ 25°C	pH Units in Water	1.00	10/4/24 12:33	ALH	EPA 9045D	H3
Resistivity	7100	ohms-cm	1.00	10/4/24 12:10	ALH	ASTM G 57a	
Sulfate	1.70	mg/kg dry	1.39	10/18/24 14:25	BAM	EPA 300.0	

Authorized Signature,

Blake Sattler

Blake Sattler for Kathleen Sattler, Lab Manager

H3	Sample was received past holding time.
PQL	Practical Quantitation Limit
ND	Not Detected
MCL	EPA's Maximum Contaminant Level
Dry	Sample results reported on a dry weight basis
*	Not a state-certified analyte
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was spiked or duplicated.

This report shall not be reproduced except in full, without the written approval of the laboratory
The results reported related only to the samples indicated.

Quality Control Data

Inorganics

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BEJ0287 - W Wet Chem										
Calibration Check (BEJ0287-CCV1)					Prepared & Analyzed: 10/04/24 12:33					
pH	5.98			pH Units in Water	6.00		99.7	0-200		
Batch: BEJ0950 - W Ions										
Blank (BEJ0950-BLK1)					Prepared & Analyzed: 10/18/24 10:15					
Sulfate	ND		1.50	mg/kg wet						
Blank (BEJ0950-BLK2)					Prepared & Analyzed: 10/18/24 14:46					
Sulfate	ND		1.50	mg/kg wet						
LCS (BEJ0950-BS1)					Prepared & Analyzed: 10/18/24 10:56					
Sulfate	3.79			mg/L	4.00		94.8	90-110		

Docusign Envelope ID: 5EE2A76D-4E89-4CD2-946B-7BB5457EC0A8

WEJ0291

Due: 10/18/24

ANATEK LABS

Chain of Custody Record

Anatek Labs,
1282 Alturas Drive, Moscow ID 8
504 E Sprague Ste D, Spokane WA

Company Name: STRATA
Address: 1016 W. Hayden Ave.
City: Hayden State: ID Zip: 83835
Phone: 208-772-2428
Email Address(es): slitalien@stratageotech.com

Project Manager: Steve Litalien
Project Name & #: CD24060E
Purchase Order #:
Sampler Name & Phone: Steve Litalien; 208-818-7535

Turn Around

Please refer to our normal turn around times at www.anateklabs.com/pricing-lists

☑ Normal
☐ Next Day*
☐ 2nd Day*
☐ Other*________

☐ Phone
☑ Email

*All rush order requests must have prior approval

List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	pH/ASTM 4972	Resistivity ASTM G 187	Sulfate EPA 300.0
				Preservative:				
	B-1 3.0'-6.0'	9/17/2024	Soil	1	0.5	X	X	X

Note Special Instructions/Comments

	Printed Name	Signature	Company	Date	Time
Relinquished by	Jarod Imel		STRATA	10/3/24	4:47
Received by	Blake Sattler		Anatek	10/3/24	14:47
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? [✓ Y] N
Labels & Chains Agree? [✓ Y] N
Containers Sealed? [✓ Y] N
No VOC Head Space? ~~Y N~~
Cooler? ~~Y N~~
Ice/Ice Packs Present? ~~Y N~~

Temperature (°C): 21.2°C IR-6
Number of Containers: Client container
Shipped Via: Hand
Preservative: — N/A

Date & Time: 10/3/24 14:47
Inspected By: BAS

Samples submitted to Anatek Labs may be subcontacted to other accredited labs if necessary. This message serves as notice of this possibility. Subcontracted analyses will be clearly noted on the analytical report.

Form COC01.02 - Eff 1 Mar 2021

Page 1 of 1

STRATA

APPENDIX C

Flow and Load Tech Memo

DRAFT Technical Memorandum

TO: Holly Ellis, Project Manager, City of Sandpoint

FROM: Keller Associates, Inc. – Dallin Stephens, PE

DATE: September 30, 2024

SUBJECT: Summary of Calculations for Keller's 2045 Flow and Load Projections

1. INTRODUCTION

The purpose of this technical memorandum is to update flow and load projections for the City of Sandpoint's Wastewater Treatment Plant Facility. These provisions update previously developed flows and loadings as described below and will be utilized for the Preliminary Engineering Report design criteria.

TABLE 1 – 2045 FLOW AND LOAD PROJECTIONS

	2022 (Stantec)	2042 (Stantec)	2045 (Keller)
Growth Rate (%)	-	2.4	2.5
Population	9,100	14,000	16,016
Flow Projections			
Average Day Flow (MGD)	-	-	3.0
Average Dry Weather Flow (MGD)	1.6	2.1	2.4
Maximum Month Flow (MGD)	-	-	5.5
Peak Day Flow (MGD)	12.1	10.8	12.4
Peak Hour Flow (MGD)	-	-	14.0

	2023 (DMR)	2045 (Keller)
Loading Projections (Maximum Month Average)		
BOD_5 (PPD)	3,000	7,600
TSS (PPD)	4,600	10,800
Phosphorus as P (PPD)	100	170
TKN as N (PPD)	320	570

MGD: Million Gallons per Day
PPD: Pounds per Day

2. POPULATION

The estimated 2045 population was calculated using a 2.5% average annual growth rate from a starting population of 8,639 (2020 U.S. Census). The estimated 2022 and 2042 populations were documented in the 2023 City of Sandpoint Collection System Evaluation (Evaluation) developed by Stantec Consulting Services Inc and were calculated using a 2.4% average annual growth rate. A 2.5% average annual growth rate was selected to match the City's comprehensive plan growth rate.

3. INFLUENT FLOWS

Flow projections are shown in **Table 1**. The Evaluation presented Average Dry Weather Flow (ADWF) and Peak Day Flow (PDF) for 2022 and 2042. The 2042 ADWF and PDF were extrapolated to 2045 using a ratio of the 2045 population projection to the 2042 population projection. Peaking factors were identified in the Evaluation and were used to calculate Average Day Flow (ADF) and Maximum Month Flow (MMF) projections from the 2045 ADWF. The 2038 Peak Hour Flow (PHF) was presented in the 2019 Wastewater Treatment Plant Facility Planning Study (FPS) by J-U-B Engineers, Inc. The 2038 PHF was extrapolated to 2045 using a ratio of the 2038 PHF (13.0 MGD) to the 2038 MMF (5.1 MGD) and applying that ratio to the projected 2045 MMF.

4. INFLUENT LOADING

Loading projections for 5-Day Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) were calculated using 2020-2023 monthly reports that were shared by the City of Sandpoint. The monthly reports included daily influent flow data and influent BOD_5 and TSS loading data. To find the maximum month average loading rates for BOD_5 and TSS, monthly averages of the given influent loading data for both parameters were taken. The highest monthly average was identified and converted into a per capita loading rate. This per capita loading rate was found and multiplied by the projected population to yield the 2045 loading projections.

Because the monthly reports do not include influent phosphorus or Total Kjeldahl Nitrogen (TKN) data, the 2023 and 2045 phosphorus and TKN loading projections were calculated using standard per capita loading rates from Metcalf and Eddy, 5th edition, multiplied by the respective estimated populations. These were multiplied by the peaking factor of 1.3 established in the FPS.

5. NOTES ON PROJECTIONS

The flow projections assume that new development will have reduced infiltration and inflow (I/I) contributions and that industrial contributions will grow at the same rate as established in the Evaluation.

APPENDIX D

Pathway Feasibility

Technical Memorandum

DRAFT

TO: Holly Ellis, Project Manager, City of Sandpoint

FROM: Keller Associates, Inc. – Jeff Sorenson, PE

DATE: April 1, 2025

SUBJECT: Shared Use Pathway

1. INTRODUCTION

The purpose of this technical memorandum is to present findings from the evaluation of a shared-use pathway between the Wastewater Treatment Plant (WWTP) and Lake Pend Oreille. The WWTP site sits on a bench above the Lake, and there is a narrow stretch of ground between the perimeter fence and the top of slope down to the lake. The distance between the fence and the top of slope ranges from approximately 7 feet to 11 feet. The slope down to the lake water level varies but generally exceeds 2H:1V. A conceptual design was developed in a CAD program to determine the feasibility of a 12-feet wide pathway.

Figure 1: Vicinity Map

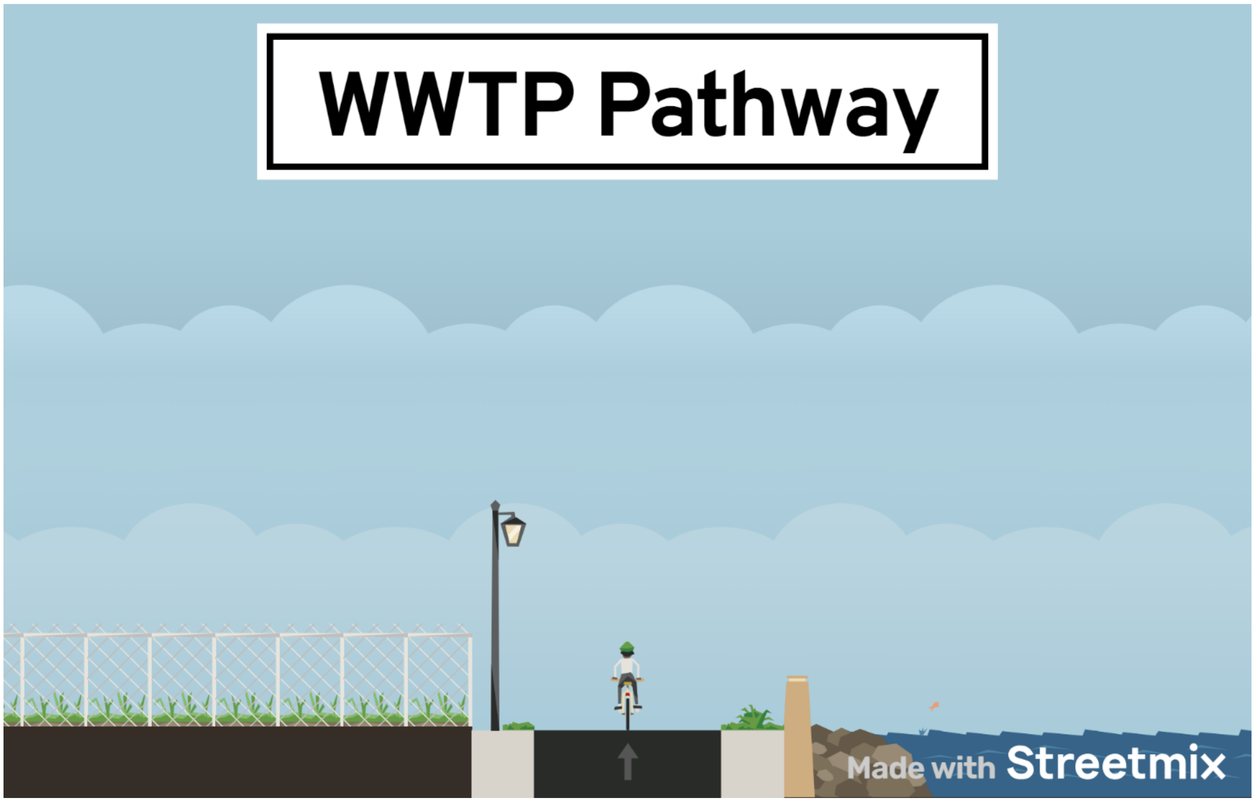
2. DESIGN CONSIDERATIONS

Design parameters for the pathway layout were based on 2012 American Association of State Highway and Transportation Officials (AASHTO) Guide For the Development of Bicycle Facilities 4th Edition, the leading resource for design criteria of shared-use pathways. Americans with Disabilities Act (ADA) and Public Rights of Way Accessibility Guidelines (PROWAG) requirements were also considered.

Assumptions for the pathway include the following:

- 12-feet asphalt travel surface
- 2-feet gravel shoulders 6H:1V or flatter
- 1.5% cross slope, sloping towards the lake
- Maximum profile grade of 5%
- 3-inches of plant mix pavement over 6-inches of ¾" crushed aggregate base

The below figure shows a conceptual streetscape section of the pathway.



3. CONCEPTUAL REVIEW

Refer to the attached figure and the below narratives for two pathway concepts reviewed as part of this planning effort.

3.1. CONCEPT 1 - RETAIN EXISTING FENCE AND INTERIOR ROADWAY

There is not enough room between the existing boundary fence and the toe of slope down to the lake to construct a 12-feet pathway without significant ancillary construction. Significant embankment and/or retaining walls would be required. New embankment and retaining walls would likely encroach within the ordinary high-water mark of Lake Pend Oreille. Such encroachment would require coordination and permitting with USACE, Idaho Department of Lands, IDEQ, and other agencies. Per the AASHTO guidance, a safety rail will be necessary between the path and adjacent slope. Concept modeling shows that narrowing the pathway traveled surface to10-feet also requires embankments and/or retaining walls and safety barrier.

3.2. CONCEPT 2 – SHIFT PATH NORTH (ASSUME RECONFIGURE SITE LAYOUT)

If the existing WWTP site is reconfigured and allows relocation of the existing perimeter fence and interior roadway then a pathway could be constructed north of the existing toe of slope to contain pathway cut/fill limits on the existing bench and not spill down to the water line. This would reduce pathway construction costs compared to Concept 1. However, this assumes the existing site will be redesigned, including relocation of the existing interior access roadway and perimeter fencing.

4. OPINION OF PROBABLE COST

Concept level cost estimates were prepared using Idaho Transportation Department average unit prices and bid tabulations for the North Idaho region for the past 5 years. The estimate ranges are summarized as follows. More detailed cost breakdowns are attached to this memorandum. These estimate ranges are rough order of magnitude estimates and will ultimately vary depending on adjacent construction, timing of the project, and other factors.

Concept 1: $445,000 to $1,037,000

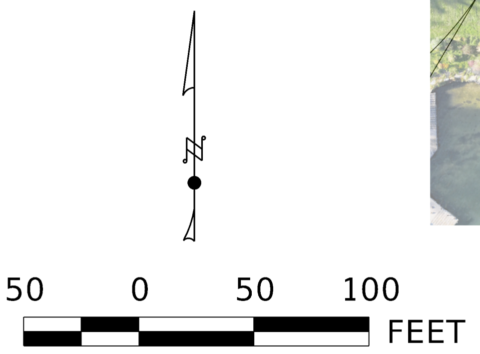
Concept 2: $96,000 to $224,000

5. ATTACHMENTS

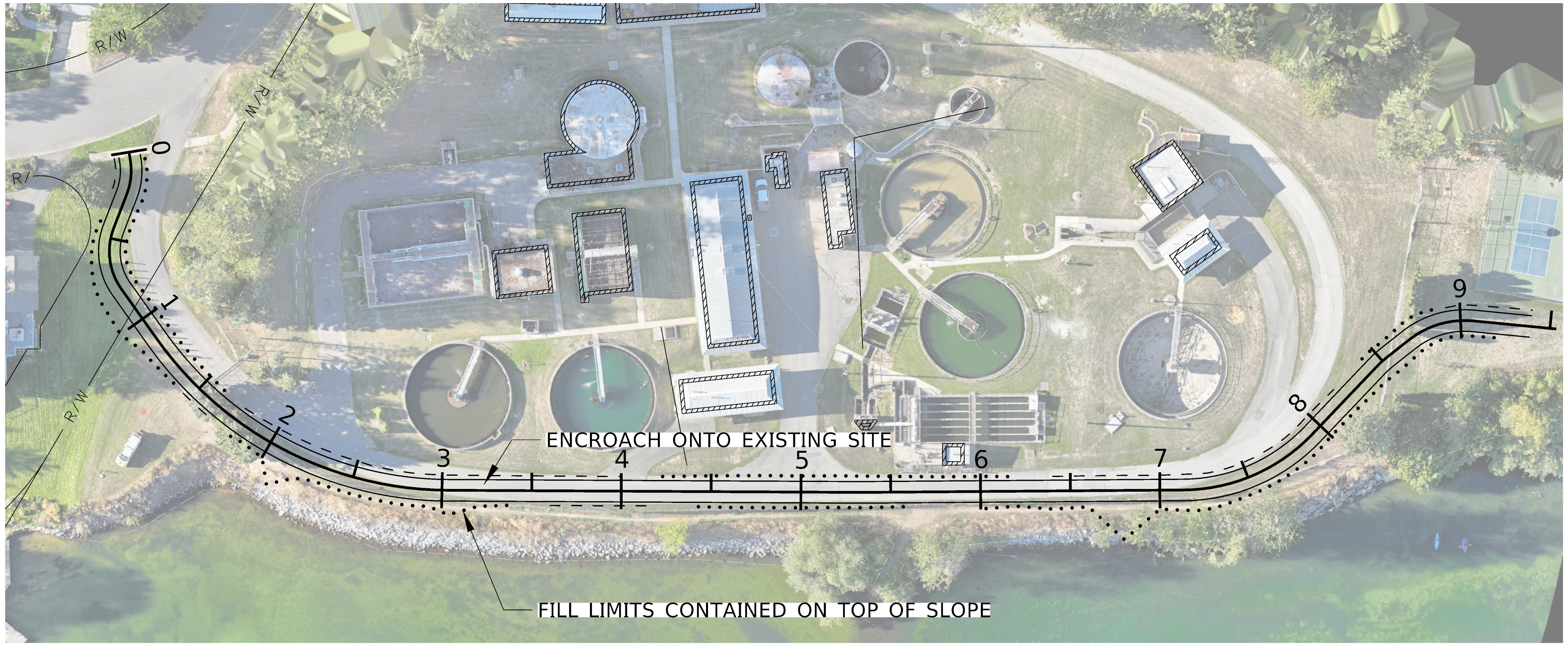
Conceptual Exhibit

Opinions of Probable Cost

CONCEPT 1 - SHIFT PATHWAY SOUTH AND LARGELY MANTAIN EXISTING FENCE AND ROAD



CONCEPT 2 - SHIFT PATHWAY NORTH (ASSUME RECONFIGURE EXISTING SITE)



KELLER ASSOCIATES

601 Sherman Avenue, Suite 1
Coeur d'Alene, Idaho 83814
(208) 758-8601

NOT FOR
DRAFT
CONSTRUCTION

NO.	REVISIONS	DATE

CITY OF SANDPOINT

WASTEWATER TREATMENT PLANT

PATHWAY CONCEPTS EXHIBIT

DRAWN:
CHECK:

VERIFY SCALE: Scales based on 22"x34" prints.

1-1/2 Inches

PROJECT NO.
PAGE

SHEET NO.

KELLER ASSOCIATES
100 E Bower St, Suite 110 Meridian, Idaho 83642
Phone: 208.288.1992 - kellerassociates.com

Project: WWTP Pathway
Engineer: Jeff Sorenson
Client: Sandpoint
Printed: 4/1/2025

ENGINEER'S OPINION OF MOST PROBABLE CONSTRUCTION COST

CONCEPT 1 - RETAINING WALLS

CONSTRUCTION ITEM	QUANTITY	UNITS	UNIT PRICE	COST
EXCAVATION	210	CY	$ 30	$ 6,300
3/4" AGGREGATE FOR BASE	650	TON	$ 40	$ 26,000
GRANULAR BORROW	500	CY	$ 35	$ 17,500
SUPERPAVE HMA PAVEMENT	230	TON	$ 170	$ 39,100
CONSTRUCTION SURVEYING	1	LS	$ 7,500	$ 7,500
RETAINING WALL	3100	SF	$ 80	$ 248,000
UNKNOWN ITEMS			30%	$ 103,320
			SUB-TOTAL	**$ 447,720**
MOBILIZATION, BONDING, & INSURANCE			10%	$ 44,772
CONSTRUCTION CONTINGENCY (CHANGE ORDERS)			5%	$ 22,386
			CONSTRUCTION SUB-TOTAL	**$ 514,878**
SOFT COSTS				
CONSTRUCTION ADMINISTRATION			15%	$ 77,232
			SOFT COST SUB-TOTAL	**$ 77,232**

OPINION OF CONSTRUCTION COST	**$ 592,110**

OPINION RANGE ROUNDED TO NEAREST THOUSAND	**-25%**
	$ 445,000
	75%
CLASS V, -25% TO +75%	**$ 1,037,000**

The opinion of most probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

KELLER ASSOCIATES
100 E Bower St, Suite 110 Meridian, Idaho 83642
Phone: 208.288.1992 - kellerassociates.com

Project: WWTP Pathway
Engineer: Jeff Sorenson
Client: Sandpoint
Printed: 4/1/2025

ENGINEER'S OPINION OF MOST PROBABLE CONSTRUCTION COST

CONCEPT 2 - RELOCATE PERIMETER FENCE

CONSTRUCTION ITEM	QUANTITY	UNITS	UNIT PRICE	COST
EXCAVATION	210	CY	$ 30	$ 6,300
3/4" AGGREGATE FOR BASE	600	TON	$ 40	$ 24,000
SUPERPAVE HMA PAVEMENT	230	TON	$ 170	$ 39,100
CONSTRUCTION SURVEYING	1	LS	$ 5,000	$ 5,000
UNKNOWN ITEMS			30%	$ 22,320
			SUB-TOTAL	**$ 96,720**
MOBILIZATION, BONDING, & INSURANCE			10%	$ 9,672
CONSTRUCTION CONTINGENCY (CHANGE ORDERS)			5%	$ 4,836
			CONSTRUCTION SUB-TOTAL	**$ 111,228**
SOFT COSTS				
CONSTRUCTION ADMINISTRATION			15%	$ 16,685
			SOFT COST SUB-TOTAL	**$ 16,685**

OPINION OF CONSTRUCTION COST	**$ 127,913**

OPINION RANGE ROUNDED TO NEAREST THOUSAND	**-25%**
	$ 96,000
	75%
CLASS V, -25% TO +75%	**$ 224,000**

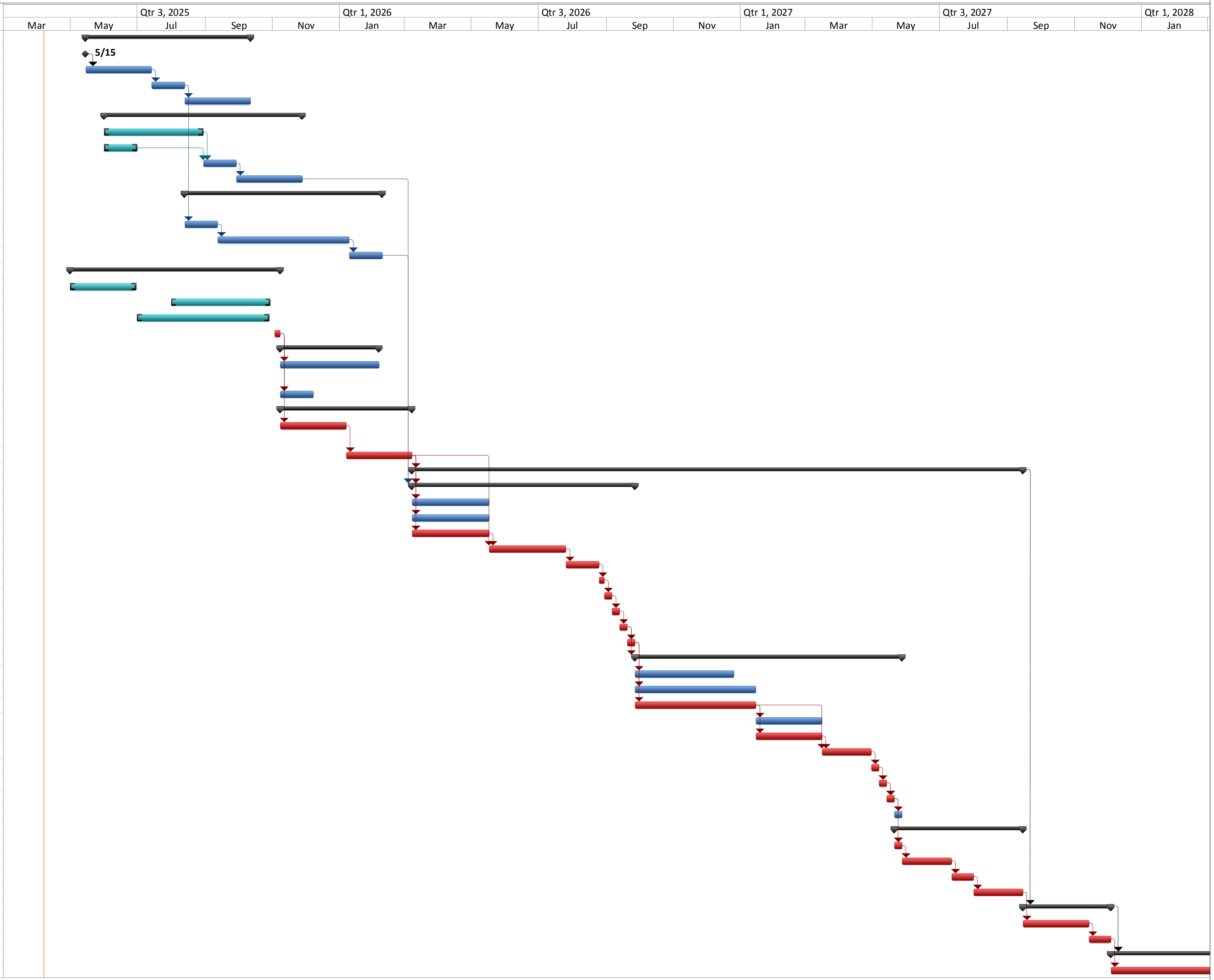
The opinion of most probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

APPENDIX F

Schedule

CITY OF SANDPOINT WWTP DESIGN THROUGH CONSTRUCTION TRADITIONAL DELIVERY - SCHEDULE

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1	⇨	**Preliminary Engineering Report**	**150 days**	**Thu 5/15/25**	**Sat 10/11/25**	
2	⇨	Submit to IDEQ for Review	0 days	Thu 5/15/25	Thu 5/15/25	
3	⇨	IDEQ review and comments	60 days	Thu 5/15/25	Sun 7/13/25	2
4	⇨	Update PER and resubmit IDEQ	30 days	Mon 7/14/25	Tue 8/12/25	3
5	⇨	IDEQ review and approval	60 days	Wed 8/13/25	Sat 10/11/25	4
6	⇨	**Complete Facility Plan**	**180 days**	**Sun 6/1/25**	**Thu 11/27/25**	
7	📌	Enviromental	90 days	Sun 6/1/25	Fri 8/29/25	
8	📌	Public Outreach	30 days	Sun 6/1/25	Mon 6/30/25	
9	⇨	Resubmit FP package to DEQ	30 days	Sat 8/30/25	Sun 9/28/25	7,8
10	⇨	DEQ approval	60 days	Mon 9/29/25	Thu 11/27/25	9
11	⇨	**Advance PER to 30% Plans (City Funded)**	**180 days**	**Wed 8/13/25**	**Sun 2/8/26**	
12	⇨	Engineering Contracting	30 days	Wed 8/13/25	Thu 9/11/25	4
13	⇨	30% Plans Development	120 days	Fri 9/12/25	Fri 1/9/26	12
14	⇨	City review and Update	30 days	Sat 1/10/26	Sun 2/8/26	13
15	⇨	**Revenue Bond**	**191 days**	**Thu 5/1/25**	**Fri 11/7/25**	
16	📌	Contract with Bond Attorney	60 days	Thu 5/1/25	Sun 6/29/25	
17	📌	Bond Paper Work/Advertisement	90 days	Fri 8/1/25	Wed 10/29/25	
18	📌	Public Outreach	120 days	Tue 7/1/25	Tue 10/28/25	
19	📌	Revenue Bond Vote - Pass	5 days	Mon 11/3/25	Fri 11/7/25	
20	⇨	**Funding**	**90 days**	**Sat 11/8/25**	**Thu 2/5/26**	
21	⇨	IDEQ SRF Funding Execution of Agreement	90 days	Sat 11/8/25	Thu 2/5/26	19
22	⇨	USDA-RD Application	30 days	Sat 11/8/25	Sun 12/7/25	19
23	⇨	**Contracting**	**120 days**	**Sat 11/8/25**	**Sat 3/7/26**	
24	⇨	Engineering Final Design Contract	60 days	Sat 11/8/25	Tue 1/6/26	19
25	⇨	City execute design contract	60 days	Wed 1/7/26	Sat 3/7/26	24
26	⇨	**Engineering Final Design**	**556 days**	**Sun 3/8/26**	**Tue 9/14/27**	**25**
27	⇨	**60% Package**	**203 days**	**Sun 3/8/26**	**Sat 9/26/26**	**25,10,14**
28	⇨	60% Site Civil	70 days	Sun 3/8/26	Sat 5/16/26	25
29	⇨	60% Structural	70 days	Sun 3/8/26	Sat 5/16/26	25
30	⇨	60% Mechanical	70 days	Sun 3/8/26	Sat 5/16/26	25
31	⇨	60% Electrical	70 days	Sun 5/17/26	Sat 7/25/26	30,25
32	⇨	60% Controls	30 days	Sun 7/26/26	Mon 8/24/26	31
33	⇨	60% Spec Table of Contents	5 days	Tue 8/25/26	Sat 8/29/26	32
34	⇨	60% QA/QC	7 days	Sun 8/30/26	Sat 9/5/26	33
35	⇨	60% Finalize from QA/QC	7 days	Sun 9/6/26	Sat 9/12/26	34
36	⇨	60% Workshop	7 days	Sun 9/13/26	Sat 9/19/26	35
37	⇨	60% City Review Period	7 days	Sun 9/20/26	Sat 9/26/26	36
38	⇨	**90% Design Package**	**243 days**	**Sun 9/27/26**	**Thu 5/27/27**	**36**
39	⇨	90% Site Civil	90 days	Sun 9/27/26	Fri 12/25/26	37
40	⇨	90% Structural	110 days	Sun 9/27/26	Thu 1/14/27	37
41	⇨	90% Mechanical	110 days	Sun 9/27/26	Thu 1/14/27	37
42	⇨	90% Electrical	60 days	Fri 1/15/27	Mon 3/15/27	41
43	⇨	90% Controls	60 days	Fri 1/15/27	Mon 3/15/27	41
44	⇨	90% Specifications	45 days	Tue 3/16/27	Thu 4/29/27	41,43
45	⇨	90% QA/QC	7 days	Fri 4/30/27	Thu 5/6/27	44
46	⇨	90% Finalize QA/QC	7 days	Fri 5/7/27	Thu 5/13/27	45
47	⇨	90% Workshop	7 days	Fri 5/14/27	Thu 5/20/27	46
48	⇨	90% City Review	7 days	Fri 5/21/27	Thu 5/27/27	47
49	⇨	**Agency Review**	**117 days**	**Fri 5/21/27**	**Tue 9/14/27**	
50	⇨	IDEQ Submittal	7 days	Fri 5/21/27	Thu 5/27/27	47
51	⇨	IDEQ Review	45 days	Fri 5/28/27	Sun 7/11/27	50
52	⇨	Revise and Resubmit	20 days	Mon 7/12/27	Sat 7/31/27	51
53	⇨	IDEQ Review and Approval	45 days	Sun 8/1/27	Tue 9/14/27	52
54	⇨	**Bidding and Award**	**80 days**	**Wed 9/15/27**	**Fri 12/3/27**	**26**
55	⇨	Advertise	60 days	Wed 9/15/27	Sat 11/13/27	53
56	⇨	Bid Review and Award	20 days	Sun 11/14/27	Fri 12/3/27	55
57	⇨	**Construction**	**900 days**	**Sat 12/4/27**	**Tue 5/21/30**	**54**
58	⇨	Construction	900 days	Sat 12/4/27	Tue 5/21/30	56



Project: Sandpoint WWTP PER Sc
Date: Mon 4/7/25

Task	▬	Summary	▬	External Milestone	◆	Inactive Summary	▭	Manual Summary Rollup	▬	Finish-only	]	Critical Split	┈
Split	┈	Project Summary	▬	Inactive Task	▭	Manual Task	▬	Manual Summary	▬	Deadline	⇩	Progress	▬
Milestone	◆	External Tasks	▬	Inactive Milestone	◇	Duration-only	▬	Start-only	[	Critical	▬		