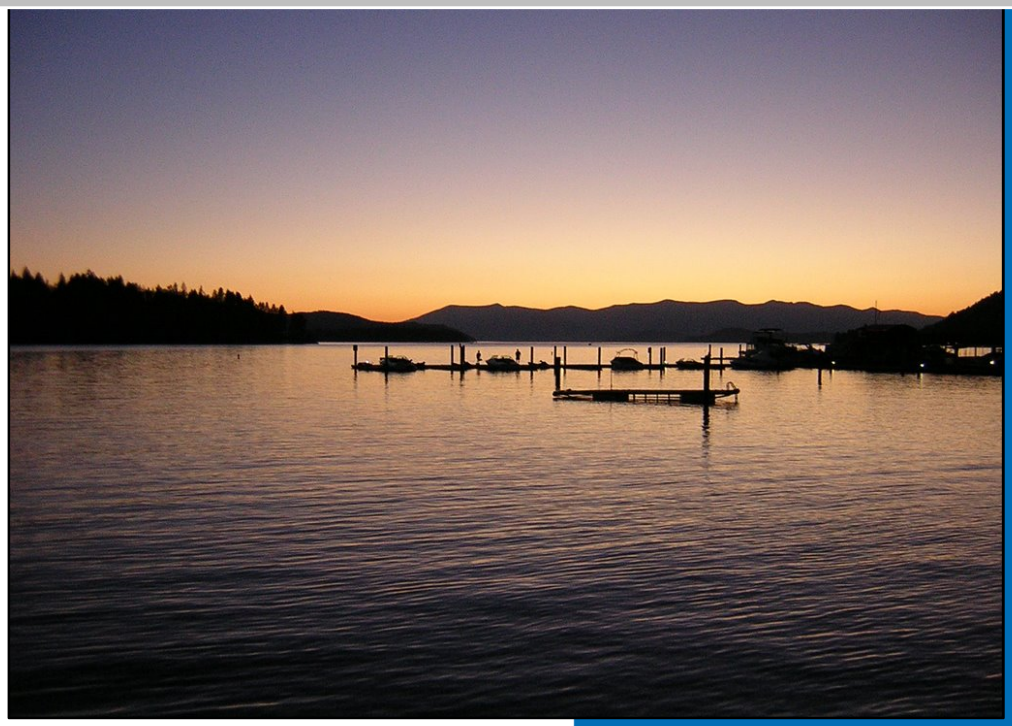
2018

Wastewater Facility Plan

Ellisport Bay Sewer District
Bonner County, Idaho



Prepared for:

Ellisport Bay Sewer District

May 30th, 2018

Prepared by:

T-O Engineers

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WASTEWATER FACILITY PLAN

5/30/2018

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ABBREVIATIONS, ACRONYMS, and UNITS OF MEASURE

µg/L .....micrograms per liter
µm .....micrometer
AC .....alternating current
ADD .....average day demand
BOD .....biochemical oxygen demand
CDHD .....Central District Health Department
CFM .....cubic feet per minute
CFS.....cubic feet per second
CIP .....clean-in-place
CIPP .....cured-in-place pipe
COD .....chemical oxygen demand
CT .....contact time
DEQ .....(Idaho) Department of Environmental Quality
EDU.....equivalent dwelling unit (ERU)
EID .....Environmental Information Document
EPA .....Environmental Protection Agency
EQ.....equalization
FEMA.....Federal Emergency Management Agency
FIRM .....Flood Insurance Rate Maps
FOG.....fats, oils and grease
FPS.....feet per second
GFD.....gallons per foot per day
GPCD .....gallons per capita per day
GPD .....gallons per day
GPM.....gallons per minute
HDPE.....high-density polyethylene
HP .....horsepower
HRT .....hydraulic retention time
ID.....inside/inner diameter
IDAPA.....Idaho Administrative Procedures Act
IDWR.....Idaho Department of Water Resources
IEC.....International Energy Code
IFC.....International Fire Code
I/I .....inflow and infiltration
IMC .....International Mechanical Code
ISRB.....Idaho Surveying and Rating Bureau
kVA.....kilovolt-ampere
kW.....kilowatt
LA .....land application
lb .....pound
LOI.....Letter of Intent
LPO.....Lake Pend Oreille
LSAS .....large soil absorption system
MBR .....membrane bioreactor
MCL.....maximum contaminant level
MDD.....maximum day demand
Mgal.....million gallons
MGD.....million gallons per day
mg/L.....milligrams per liter
mm.....millimeter
NFIP.....National Flood Insurance Program
NPA .....nitrate priority area
NPDES .....National Pollution Discharge Elimination System

NRCS.....National Resource Conservation Service
NTU .....Nephelometric Turbidity Units
O&M.....operations and maintenance
P&ID .....process and instrumentation diagrams
PFD .....process flow diagrams
PHD .....peak-hour demand
PLC.....programmable logic controller
ppm .....parts per million
psi.....pounds per square inch
PVC.....polyvinyl chloride
RI .....rapid infiltration
SBR .....sequence batch reactor
SCADA .....supervisory control and data acquisition
SCFM .....standard cubic feet per minute
SST.....stainless steel
SWD.....side water depth
SWTR.....Surface Water Treatment Rules
TDS .....total dissolved solids
TKN.....Total Kjeldahl Nitrogen
TOC.....total organic carbon
TRC .....total residual chlorine
TSS.....total suspended solids
UPC.....Uniform Plumbing Code
USCS .....United Soil Classification System
USDA .....U.S. Department of Agriculture
USDA-RD .....U.S. Department of Agriculture - Rural Development
USGS.....U.S. Geological Survey
UV.....ultraviolet
VFD ..... variable frequency drive
WRCC ..... Western Regional Climate Center
WWFP ..... wastewater facility plan
WWTF ..... wastewater treatment facility

1. INTRODUCTION

1.1 Background

The Ellisport Bay Sewer District (EBSD) will utilize a Wastewater Facility Plan to evaluate options for improving treated wastewater effluent quality and extending service lines to residents and eliminating septic tanks on the Hope Peninsula that contribute to non-point source pollution to Lake Pend Oreille (LPO). In addition, the development of potential new effluent reuse alternatives will be explored based upon the final effluent quality that can be achieved according to the treatment method selected.

The design criteria for the recommended alternative are outlined based on historic flow monitoring data collected by the Ellisport Bay Sewer District (EBSD), water quality sampling from various locations within the plant, and current and estimated future system user counts. The final design will be for a 180,000 GPD MBR treatment plant, based on maximum month per ERU flows of 164 GPD/ERU and a total of 1,084 ERU's in the expanded future EBSD boundary area.

The purpose of this document is to identify the collection system, treatment system, and reuse/discharge alternatives proposed for the revised facility plan and provide justification for the selected alternative. The feasibility of the selected alternative will be investigated through existing permitted discharges in Idaho and specifically in Lake Pend Oreille, with particular attention to addressing the concerns of nutrient effects identified in the Lake Pend Oreille Nearshore TMDL.

The alternatives investigated include a variety of green infrastructure components such as low energy pumps and motors and LEED criteria for operations and maintenance considerations. This includes development and screening of construction phasing to meet 20-year treatment system needs and 40-year collection system needs.

1.2 Purpose of Facility Plan

This Facility Plan is a planning document which serves the following purposes:

- describes the current site conditions;
- predicts wastewater flows and loads based on growth projections and phasing;
- proposes collection systems, treatment systems, and disposal methods; and
- Provides general guidance in selecting alternatives.

This facility plan has been created to comply with all the requirements of the following documents to ensure completeness:

- IDAPA 58.01.16.410, "Facility and Design Standards for Municipal Wastewater Treatment or Disposal Facilities: Facility Plans"

Per IDAPA's requirements for wastewater facility plans, this report addresses the following:

General

- Location: A general description and location of the system.
- Population: The estimated design population of the system including the number of connections and the number of EDUs proposed.

Wastewater

- Wastewater flows: Provide design data for domestic, commercial, and industrial wastewater generation, including average day, maximum day, maximum month, or peak hour flows.
- Collection: Identify and describe any anticipated or proposed wastewater collection systems. Include specific detail on any anticipated or proposed wastewater pumping stations and on any anticipated or proposed wastewater interceptor or trunk lines. (5-8-09)
- Treatment: Identify and describe any anticipated or proposed treatment works. Provide specific detail on the type and level of treatment and the required capacity of the treatment system.
- Disposal: Identify and describe any anticipated or proposed wastewater disposal system(s). Include specific information on the location and method of disposal and information on any existing disposal permits or estimated timelines to obtain anticipated required permits.
- Drinking water: Describe the drinking water distribution system with reference to the relationship to existing or proposed wastewater structures which may affect the operation and location of the wastewater system.

2. EXISTING AREA CONDITIONS

An overview of the affected environment for the proposed and alternate actions evaluated are discussed in the following sections. A detailed environmental report, including agency consultation, will be completed prior to final design of the project. The planning area referenced herein will describe the existing District boundary as recorded by Bonner County, Idaho, Appendix Q.

2.1 Planning Area

The planning area is approximately 16 miles east of Sandpoint, Idaho along State Highway 200. The District's existing wastewater collection system currently serves the Cities of Hope, East Hope, and several homes and businesses along Ellisport Bay.

The District is planning to expand its service area to encompass homes on the peninsula of Ellisport Bay, south and west of the existing collection system. New treatment to accommodate expansion and future regulations is also being evaluated. A site map showing the District's current facilities and planned service area is provided in Figure 1 and Appendix A.

2.2 Topography, Geology, and Soils

The planning area covers approximately 1,500 acres of differing terrain. At the northern end of the planning area, Hope and East Hope the slopes are between 17% and 40% with rocky features. To the south of East Hope, the slopes are much less steep. As the bay wraps around to the peninsula the topography is fairly flat then sloping up to a low mountain that forms the peninsula. The southern end of the planning area slopes down to the water on a hillside. Contour lines depicting the differing slopes are shown in Figure 2, Appendix A.

The planning area is within the Belt Series bedrock type which consists of metamorphic sedimentary deposits. These rocks were formed during the Precambrian period when shallow seas inundated northern Idaho. The topography was heavily formed by Ice Age floods associated with Glacial Lake Missoula and the Cordilleran ice sheet. Lake Missoula stretched for hundreds of miles across western Montana and north Idaho. An ice dam standing about 3,000 feet high was the plug, which held the huge volume of glacial water in place. The dam was located where the Clark Fork River meets Lake Pend Oreille in North Idaho. When that dam failed, torrents of water raced forward at the speed of 70 miles per hour stripping away soil, moving large boulders, and creating deep canyons in the bedrock. The steep terrain around Lake Pend Oreille is indicative of this event.

Existing soils in the watershed are derived from the erosion of Precambrian metasediments, granitic batholith, volcanic deposition, glacial outwash, and alluvium. Most soils are of loam material. Loam soils generally contain more nutrients, moisture and humus than sandy soils, have better drainage and infiltration of water and air than silty soils, and are easier to till than clay soils. The different type of loam soils each have slightly different characteristics, with some draining more efficiently than others. Overall, the soils found within the planning area consist of a silt loam, ranging from silty loam to very gravelly, coarse sandy loam on the steeper slopes. These soils are generally well drained and transmit water well. Soil classifications are detailed on the NRCS Soil Map in Appendix P.

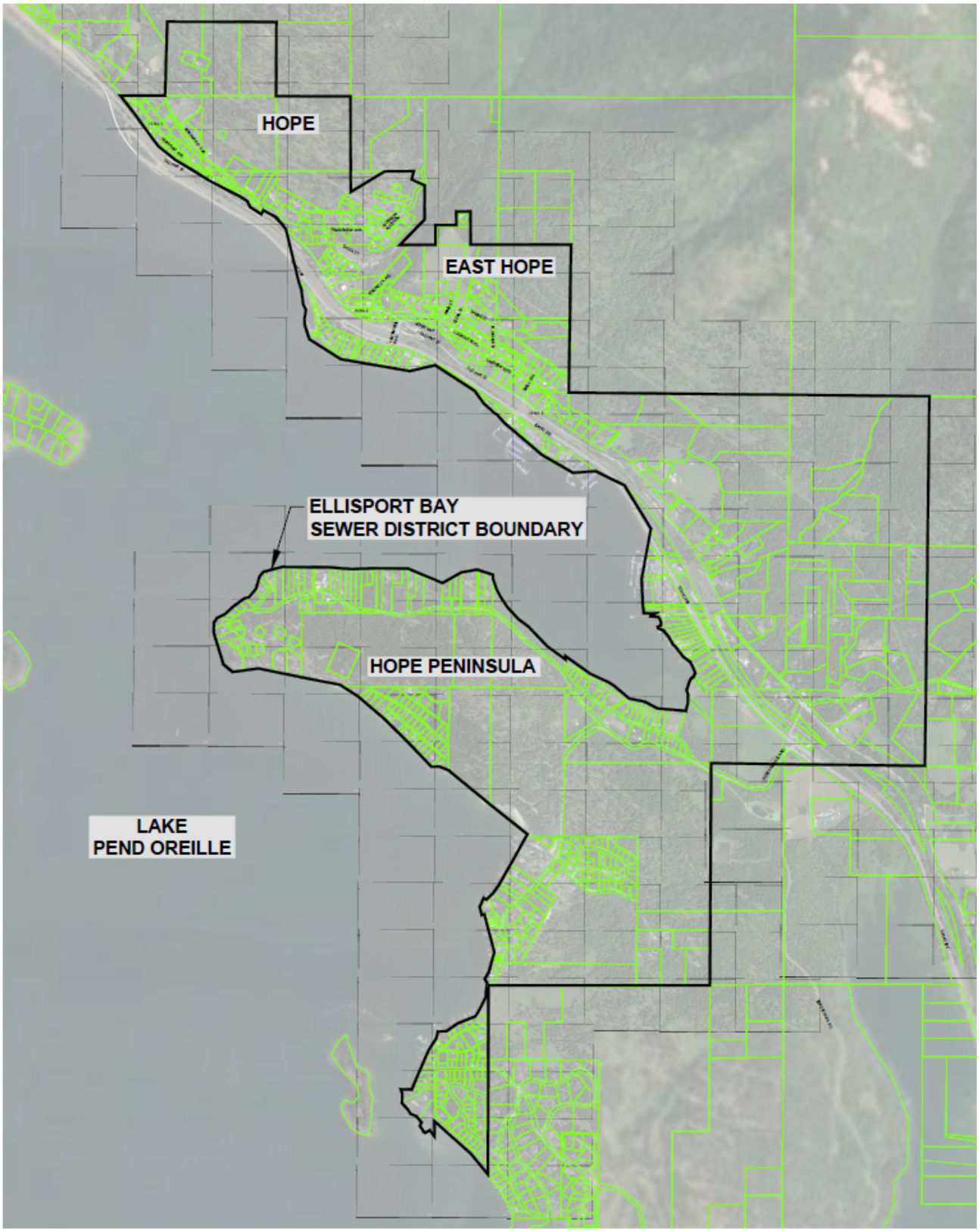


Figure 1 - Ellisport Bay Sewer District Boundary

2.3 Climate

Precipitation averages 31.96 inches per year, while snowfall averages 70 inches. The average high temperature ranges between 48°F in December to 82°F in July, while average low temperatures range from 28°F in December to 34°F in July. Most precipitation falls during the colder months of the year, while summers are relatively warm and dry.

Table 1 - WRCC Sandpoint Experimental Station, ID (108137) Climate Data 10/01/1910 - 06/10/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	32.3	38.0	46.3	57.2	66.3	73.2	82.1	81.1	70.6	57.0	41.6	34.1	56.6
Average Min. Temperature (F)	20.2	22.9	27.7	33.9	40.2	45.9	48.7	47	41	34	28.2	23.1	34.4
Average Total Precipitation (in.)	4.06	3.09	2.84	2.08	2.34	2.28	0.97	1.2	1.67	2.62	4.31	4.57	32.04
Average Total Snow Fall (in.)	22.9	13	6.5	0.8	0.0	0.0	0.0	0.0	0.0	0.5	6.6	20	70.3
Average Snow Depth (in.)	9	8	3	0	0	0	0	0	0	0	1	4	2
PREVAILING WINDS DATA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
COEUR D'ALENE AP, ID (KCOE)	NNE	NNE	S	S	S	S	S	S	S	S	NNE	NNE	NNE

2.4 Surface and Groundwater Hydrology

2.4.1 Surface Water Quality

The only EPA documented surface water within the planning area is the 3.1-mile-long Strong Creek that runs between Hope and East Hope. The creek is located on the east side of Lake Pend Oreille and is part of the lower Pack River watershed. Strong Creek is a second order creek with an annual average CFS of 1.8 and peak flow of 23 CFS. Bonner County has assessed Strong Creek as a high priority for restoration although noted it the watershed condition is good. Identified threats to the creek are from timber harvest, roads, dams/diversions, recreation and urbanization. The East Hope Water Department, which serves approximately 160 connections, relies on Strong Creek as its only public drinking water source.

Idaho DEQ recognizes Riser Creek which is south of Strong Creek although limited data was found on its features. The creek discharges to Lake Pend Oreille at the Riser Creek Marina.

Lake Pend Oreille is the largest and deepest lake in Idaho, spanning the District's entire western border. The U.S. EPA (Regions 8 and 10), in cooperation with the States of Montana, Idaho and Washington, completed the January, 1993, Clark Fork–Pend Oreille Basin Water Quality Study summarizing three years of water quality research in the Clark Fork–Pend Oreille Basin.

That study included a management plan for protection of the basin's water quality and multiple findings specifically for Lake Pend Oreille. Of those findings, they found that there is a high correlation between total phosphorus loading from nearshore and local tributaries and the degree of urban development. Nearby Strong Creek was not listed as a major contributor of phosphorus or nitrogen to the lake.

The EPA has the designated uses of Cold Water Aquatic Life, Salmonid Spawning, and Secondary Contact Recreation listed as impaired. A TMDL has been completed for Phosphorus (total) and multiple studies have been completed on the negative effects of the Clark Fork River phosphorus and nitrogen amounts discharging in to the lake from the Montana regulated river.

Non-point source pollution is also a contributing factor of the lake's water quality. The Natural Resource Component of the Bonner County Comprehensive Plan noted concern over the conversion of vegetated lands to lands of more intensive use and higher runoff, primarily residential development. The Hope-Ellisport sub watershed contained 13% of the nearshore developable land.

2.4.2 Sole Source Aquifer

The planning area is not within a sole source aquifer.

2.4.3 Ground Water Quality

The District owns one ground water well along Sam Own Rd. on the peninsula. The well is currently being operated to supply the EBSD operations building tap water and restroom. The well log indicates that ground water was encountered at 75' feet below ground surface, and then stopped. The well was drilled to 150' feet below ground surface and no additional water was produced. The well was pumped for one hour and only produced 0.25-0.5 gal/min (Appendix F). The well is only able to pump a total of about 400 gallons before it must rest for recharge.

The Idaho DEQ Online Source Water Assessment map indicates four public ground water wells near the discharge area of Riser Creek at Riser Creek Marina and five on the south side of the peninsula. Ground water quality data for the identified public water systems was reviewed on Idaho DEQ's Drinking Water Watch website. Overall, ground water quality is good at these sources although quantity is low. The larger water systems within the planning area rely on surface water for their public drinking water. The Idaho Department of Water Resources (IDWR) has three monitoring wells just north of Hope and the water quality is ranked as good.

The nearest public source ground water well is located approximately 650 feet east of the lower storage lagoon and serves the Hope Elementary School (PWS ID1090185). DEQ guidance indicates that a minimum horizontal distance of 1,000 feet be maintained between any public source well and a reuse site (DEQ 2016). Constructed in 1987, the well was installed with 8" diameter casing to a depth of 132 feet and a 23-foot sanitary seal. The well's construction is indicated to be *highly susceptible* to contamination by DEQ scoring standards because its construction does not meet the current facility design requirements (DEQ 2016).

In 2013, a DEQ-prepared report ("Ground Water Investigation Report, March 21, 2013) concluded that based on available data, the lower storage lagoon and the reuse site are potential sources of the elevated nitrate concentrations in the elementary school well. This finding is consistent with excessive seepage rates in the lower storage lagoon as well as suboptimal reuse site conditions including thick understory vegetation resulting in inconsistent loading and concentration of reuse water at the reuse site after application.

EBSD has begun working toward addressing these issues. High density understory vegetation has been cleared from the reuse site. EBSD has entered into a compliance agreement schedule with DEQ to bring the lower storage lagoon into compliance with maximum allowable seepage rates.

Activities in the schedule include repairs to the HDPE liner and a follow-up lagoon seepage test. Repairs to the liner have occurred however the follow-up seepage test has not been completed due to recent conditions on site and need for storage capacity. No definitive source for the contamination has been confirmed, and the school district continues to monitor the groundwater well water quality monthly (DEQ 2016). Further information is available in the DEQ Staff Analysis supporting reuse permit issuance for EBSD M-152-04 dated June 18, 2016.

2.5 Flora, Fauna, and Natural Communities

The US Fish and Wildlife Service's (USFWS) online Information for Planning and Conservation (IPaC) tool was used to develop a list of threatened and endangered species that could be impacted by this project. The IPaC report indicates that Bull Trout, Canada Lynx, North American Wolverine and the Grizzly Bear may be indirectly impacted by a project. The Bull Trout is categorized as threatened and has final designated critical habitat within the planning area.

The IPaC Trust Resource Report is included as Appendix M. The USFWS and the Idaho Fish and Game Department will be consulted during the environmental review process prior to construction to determine mitigation measures that may be required to reduce potential impacts to species and habitat.

2.6 Floodplains

Multiple Flood Insurance Rate Maps (FIRM) are associated with the planning area and are included in Appendix N. Very minimal floodplain exists within the planning area due to the steep terrain. During the environmental review process the Idaho Department of Water Resources (IDWR) and the US Army Corps of Engineers (USACE) will be consulted regarding any necessary flood plain mitigation measures.

2.7 Wetlands

A wetland map from the USFWS National Wetlands Inventory for the planning area is included in Appendix O. A small area of wetlands are identified on the map and include freshwater emergent and fresh water Forested/Shrub wetlands. These are mainly found in a drawdown and fluctuation zone around the edge of the reservoir and are defined as provided a supportive environment for plant communities for at least five months out of the year. During the environmental review process the USFWS and USACE will be consulted regarding potential necessary construction mitigation and/or required permitting.

2.8 Wild and Scenic Rivers

There are no wild or scenic rivers within the planning area.

2.9 Agricultural Lands

The majority of the planning area is noted as not suitable for farmland. A soil map depicting the area soils identified as suitable for farmland is included in Appendix P. The Natural Resources Conservation Service (NRCS) will be consulted during the environmental review process concerning any permanent conversion of agricultural lands, which is not anticipated.

2.10 Air Quality

EPA developed primary and secondary federal air quality standards known as National Ambient Air Quality Standards (NAAQS) for six criteria pollutants, as shown in Table 1.

Table 2: NAAQS Criteria Air Pollutants

Particulate Matter	(PM)	Ozone	(O_3)
Carbon Monoxide	(CO)	Nitrogen Dioxide	(NO_2)
Sulfur Dioxide	(SO_2)	Lead	(Pb)

These standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children and pregnant women, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, vegetation, and buildings. The State of Idaho has adopted these federal air quality standards in the Rules for the Control of Air Pollution in Idaho (IDAPA 58.01.01.575-587).

The project planning area is not in an IDEQ-defined area of concern for air quality. Due the proximity of forested land, smoke from regional forest fires can degrade air quality during the summer months. The environmental review document will consult IDEQ regarding air quality concerns, and proper mitigation measures will be identified for the contractor during construction to mitigate dust and equipment emissions.

Proposed wastewater system construction is not expected to affect this attainment area classification; however, short term environmental controls will be required to minimize potential local air quality impacts during:

- Soils handling such as site excavation and backfilling
- Equipment operation and construction traffic
- Potential methods that may be used to control air emissions during construction include:
- Application of water to suppress dusts during material movement
- Utilization of existing buildings or vegetative barriers as windscreen around soils excavation or bulk material storage to reduce wind erosion
- Using chemical dust suppressants if they will not cause adverse environmental impacts
- Inspecting and ensuring motorized equipment used onsite are appropriately tuned and not emitting excessive or unburnt exhaust emissions
- Discouraging the use of high sulfur diesel fuel

2.11 Noise, Odor, and Light

Excessive noise, odors, and light, which impair the emotional health of humans and animals, are legitimate subjects of environmental regulation according to Idaho's Board of Environmental Quality. However, the State of Idaho does not have regulations controlling noise, odors, and light. The Noise Control Act of 1972 directed EPA to publish scientific information describing the effects of different qualities and quantities of noise and to define acceptable levels under various conditions, which would protect public health and welfare with an adequate margin of safety.

The EPA collaborated with other Federal agencies and the scientific community to publish a guidance document known as the "Levels Document". The Levels Document serves as regulatory guidance and is not an enforceable regulatory standard. Therefore, DEQ encourages local communities to develop and implement local guidelines or standards for managing noise levels that follow EPA guidelines. Administrative noise controls may include:

- A "buy quiet" or "rent quiet" policy ensuring all equipment used onsite is equipped and functioning with the most recent air and noise emission controls.

- Scheduling work during times of the day when the noise(s) are least conspicuous.
- Utilize existing buildings or topography for construction activities that will serve as a noise barrier.

The rural location of the project planning area lends itself to relatively low noise levels. Most noise is generated by automobile and truck traffic.

Local site or yard lighting may be increased to accommodate site security and safety following the construction of the wastewater systems; however, lighting impacts following construction of the proposed wastewater collection and treatment systems are not expected to cause a health threat.

2.12 Energy Production and Consumption

Most power consumption in the area will be residential and light commercial, with little or no industrial power consumption. No energy will be produced by the wastewater system, as no anaerobic digestion is planned or proposed.

Energy consumption is necessary to operate the four sewer lift stations with and the treatment/land application facilities. Energy is required to pump wastewater into the lagoons, aerate the lagoons, and to operate the discharge pumps for the reuse system. Future improvements will consider energy efficient motors and offer variable frequency drives (VFDs) when available to reduce energy consumption.

Energy consumption for the wastewater treatment system will consist mainly of loads from pumps, aeration blowers, and UV disinfection. The majority of equipment used in the wastewater treatment system will require three-phase, 480V service.

2.13 Land Use

Bonner County has zoned most of the planning area as rural with the shoreline of Ellisport Bay and around the peninsula as recreation (Appendix Q). Land use within the planning area is residential and commercial with recreation being the driver for development. Multiple resorts are concentrated along the lake's shoreline of Ellisport Bay and several more are located on the Peninsula. The US Forest Service also operates a camp ground and day use area within the planning area. Development of the peninsula has been restricted by Bonner County due to limited options for wastewater disposal.

2.14 Housing, Commercial, and Industrial Development

The planning area has seen an increase in residential and commercial development due to the desirable scenic views and multiple recreational opportunities the area offers. The existing communities of Hope and East Hope, as well as along Ellisport Bay, are generally made up of older homes and resorts while along the peninsula larger, upscale development has increased in the recent years. The vicinity has no industrial areas and development of such areas is unlikely.

2.15 Cultural Resources

The Idaho State Historical Preservation Office (SHPO) has no listed historical properties within the project planning area, and it is not within any tribal reservations. Official consultation with the Coeur d'Alene Tribal Historic Preservation Officer (THPO) will be completed as part of the environmental review process.

2.16 Utility Use

Outside of sewer service provided by the District, the planning area includes multiple utilities including:

- Hope Water System;
- East Hope Water Department;
- Avista Power.

Additional private sewer systems are located within the planning area that mostly serve the seasonal-transient population.

2.17 Environmental Justice

The EBSD exercises environmental justice in providing utilities to its citizens. It maintains the same level of service to citizens regardless of race, color, national origin, or income. EBSD maintains this commitment to environmental justice with the implementation and enforcement of environmental laws, regulations, and policies.

2.18 Socioeconomic Profile and Population

Economic and demographic data may be compiled by the U.S. Census Bureau and the Idaho Department of Labor at either the county or zip code level depending on the type of data in question. The District is located Bonner County, Idaho and the planning area can be approximated by the boundaries of zip code 83836. This zip code includes the communities of Hope, East Hope, and the unincorporated areas along Hwy 200 and the peninsula. The remaining portion of the zip code is minimally developed and consists primarily of National Forest land.

The total service area population is estimated at 1,033 people with approximately 99% identifying themselves as white. Individuals below the poverty level are approximately 21.4% although this number is anticipated not to be an accurate representation due to the unique mix of high and low to moderate-income residences within the planning area. The median household income (MHI) of the zip code is estimated at $45,580. A map of the zip code area and detailed population data are included as Appendix R.

2.19 Public Health and Safety Considerations

The current disposal facility requires use of a buffer zone for disposal of Class C effluent. The proposed expansion of the EBSD service area will seek to improve the treated effluent quality to remove additional nutrients and pathogens from treated effluent. This will eliminate the need for buffers to reuse areas and greatly reduce the chance of pathogenesis from contact with treated effluent. Additionally, the highly treated effluent will be treated to higher quality than background groundwater and surface water in the area, eliminating any degradation to habitat and primary contact recreation in LPO.

2.20 Wastewater Discharge and Permitting

All disposal of treated effluent will be under a DEQ Reuse permit. Currently plant effluent is discharged under IDEQ Reuse Permit M-152-04. The effluent is land applied to 41.14 acres of adjacent native forest area to five zones via spray irrigation. The crop considered for IWR is native forest land for the entire application area.

3. EXISTING WASTEWATER SYSTEM OVERVIEW

The District currently serves the communities of Hope and East Hope, Idaho, along the eastern shore of Lake Pend Oreille in Bonner County, in the panhandle of northern region of the state.

3.1 Existing Sewer Collection System and Lift Stations

The District customers are serviced by a combination of gravity collection lines and individual pump stations to collect and convey sewage to the treatment facility. Individual pump station installation, operation, and maintenance are the responsibility of the home owner. Current physical connections to the system include are indicated in Table 3 below.

Table 3 - Current Physical Connections to EBSD Collection System

AREA ↓	RESIDENTIAL	COMMERCIAL
HOPE	61	4
HOPE TOTAL	**65**	
EAST HOPE	170	7
EAST HOPE TOTAL	**177**	
TOTAL HOPE & EAST HOPE	**231**	**11**
TOTAL ALL	**242**	
UNDEVELOPED LOTS IN DISTRICT	**114**	
POSSIBLE BUILDOUT OF CONNECTIONS, CURRENT COLLECTION SYSTEM	**315**	
**Source: Ellisport Bay Sewer District Records as of 10/18/2017*		

The existing collection system was constructed from 1997 through 1999. The system was designed for an initial average day flow of 49,000 gallons per day (GPD) and future flows of 69,500 GPD. Gravity collection lines consist of 8-inch HDPE SDR 26 sewer pipe. There is approximately 22,300 feet of gravity collection pipe and 115 standard precast concrete manholes. A site plan showing the existing collection system is included in Figure 2, Appendix A.

Four sewer pump lift stations collect and convey raw sewage to the wastewater treatment site. Lift Station No. 1 serves the City of Hope, Lift Station No. 2 serves the City of East Hope, and Lift Station No. 3 serves Holiday Shores Resort.

Each lift station receives flow from gravity collection lines and individual pump stations within the specific lift station drainage area and pump the collected flow to the downstream lift station. In general terms, Lift Station No. 1 collects flow from the community of Hope, pumps to Lift Station No. 2, which receives part of the sewer flow from the community of East Hope, which in turn pumps to Lift Station #3 which gathers the remaining flow from East Hope. Lift station No. 3 receives and conveys the combined system flow via a pressure line to Lift Station No. 4 located at the treatment site. All force mains are equipped with combination air release/vacuum relief valves at, or near pipeline high points. No individual service line connections are made to the force mains. The force mains are constructed of 6-inch (from LS No. 1 to LS No. 3) and 8- inch (from LS No. 3 to LS No. 4) HDPE SDR 17 pressure pipe. The total force main length is approximately 15,300 feet.

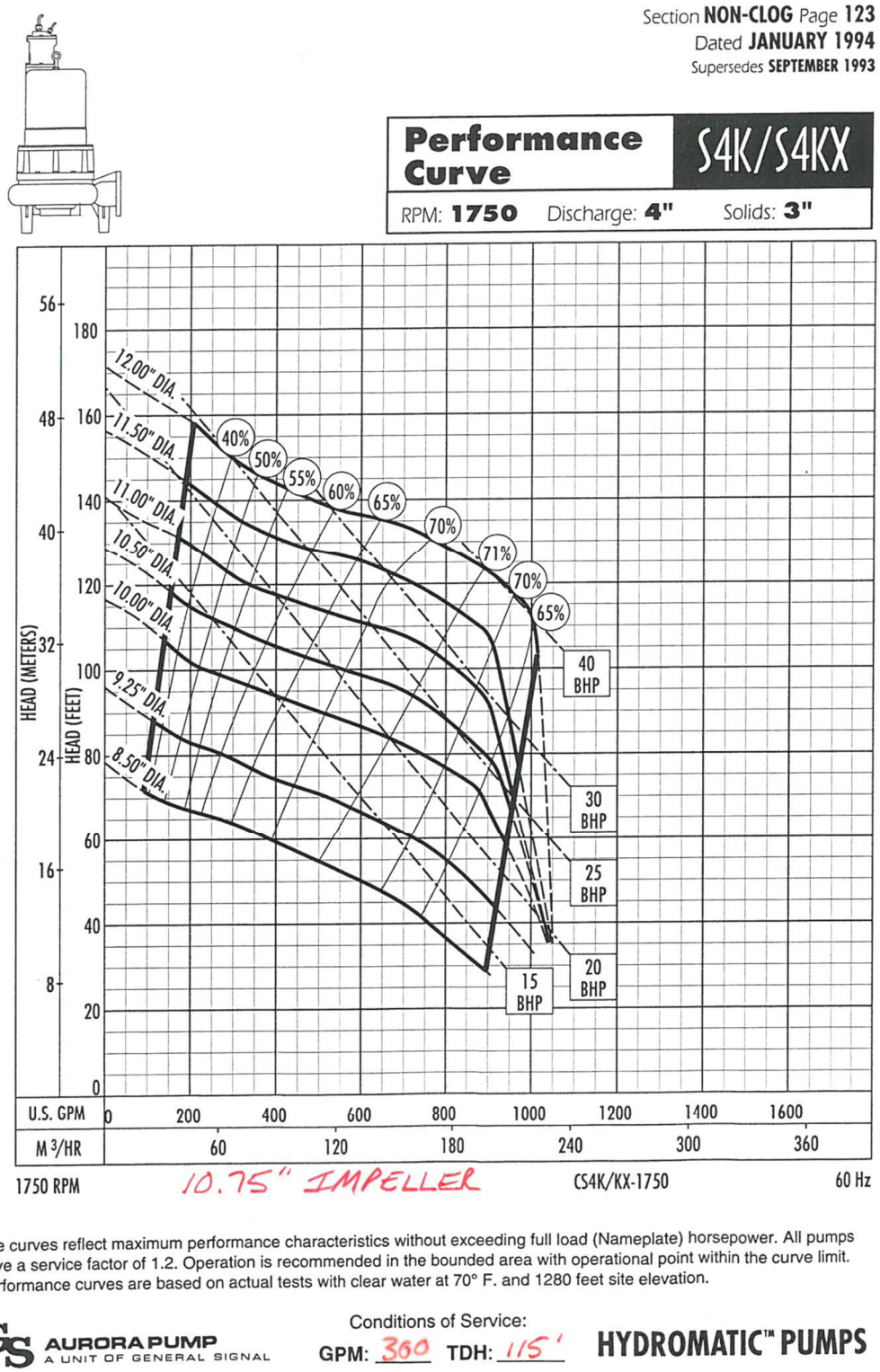
Lift Stations No. 1, No. 2 and No. 3 are duplex, submersible style pump stations with associated electrical, controls, and exterior valve vaults. Each submersible lift station also has carbon filter canister for odor control. Lift Station No. 4 is located at the treatment site and pumps up to the

primary treatment lagoon cell. Lift station No. 4 is a duplex, wet well/dry well configuration with 50 HP vertical non-clogging, flooded suction pumps.

Level control systems for the pumping stations include Milltronics MultiRanger Plus- Model PL-513 controllers, with Milltronics ST 25C ultra-sonic transducers. Floats are available as emergency backup to the Milltronics system. Alarms generated are sent to a Zetron- Model 1512 Sentridial Auto-dialer to call out Operators.

Emergency power generation is available from a single trailer mounted generator, outfitted to accommodate all four pump stations. There are no permanent generators at the pump stations. Pump station capacities allow for systematic pumping in series moving the mobile generator from station to station if a power outage is long term or affects all stations.

Current alarm conditions monitored are: High level, low level, power failure, over-temp and seal fail. All pump stations are 3 phase electrical, 240/480-volt systems and are equipped with a generator interface connecter. Lift Station No. 1 and No. 3 have Hydromatic S4KX -20 HP submersible pumps developing 300 GPM at 115' TDH. Lift Station No. 2 has Hydromatic S4PX 7.5 HP pumps developing 300 GPM at 40' TDH. Lift Stations No. 1, No. 2, and No. 3 are all duplex wet well configuration. Lift Station No. 4 is a wet well/dry well duplex configuration and has Fairbanks Morse 50 HP pumps developing 350 GPM at 195' TDH. Pump curves are shown in Figures 1, 2, and 3.



The curves reflect maximum performance characteristics without exceeding full load (Nameplate) horsepower. All pumps have a service factor of 1.2. Operation is recommended in the bounded area with operational point within the curve limit. Performance curves are based on actual tests with clear water at 70° F. and 1280 feet site elevation.

Figure 2 - Lift Stations #1 and #3 Pump Curve

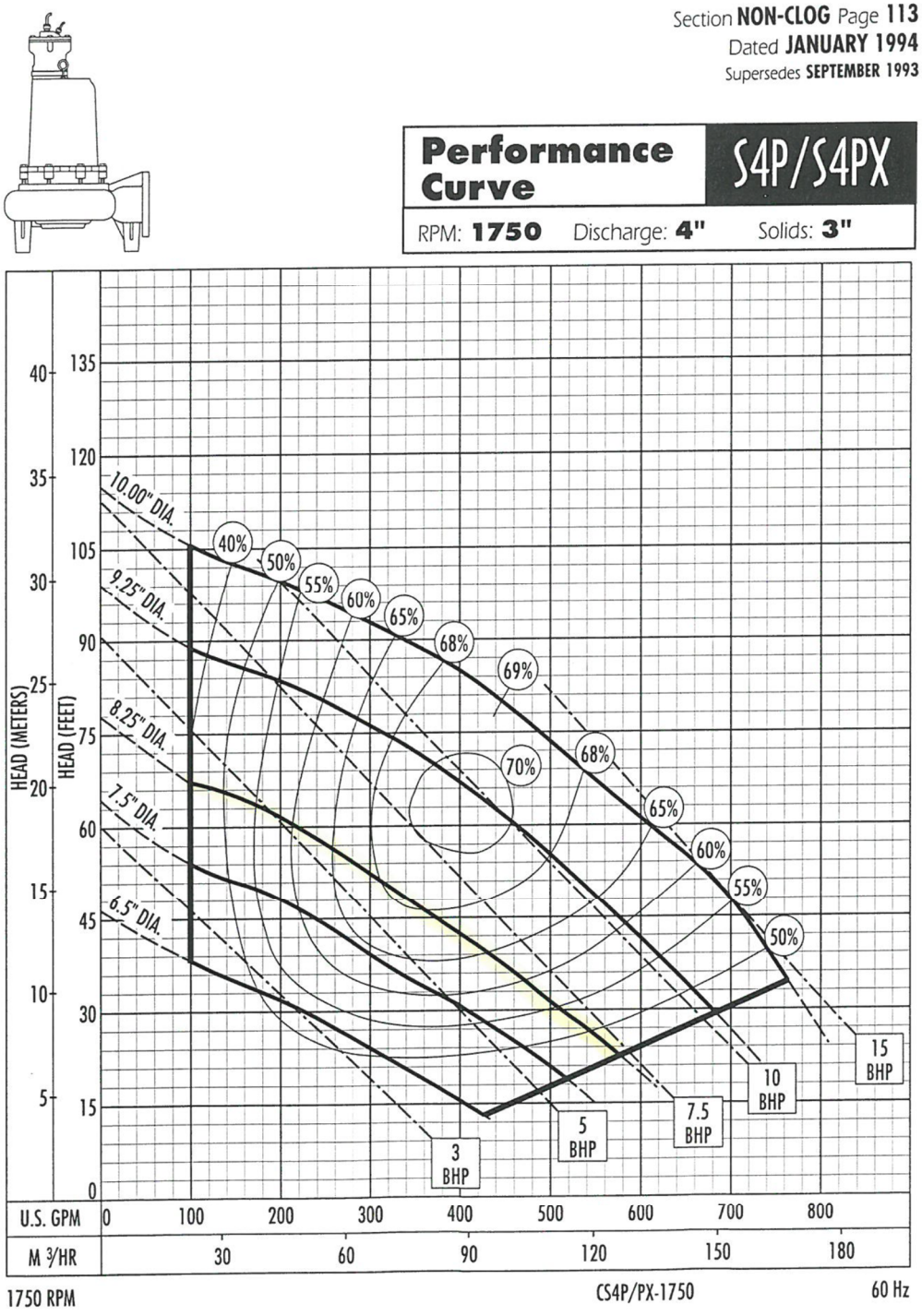


Figure 3 - Lift Station #2 Pump Curve

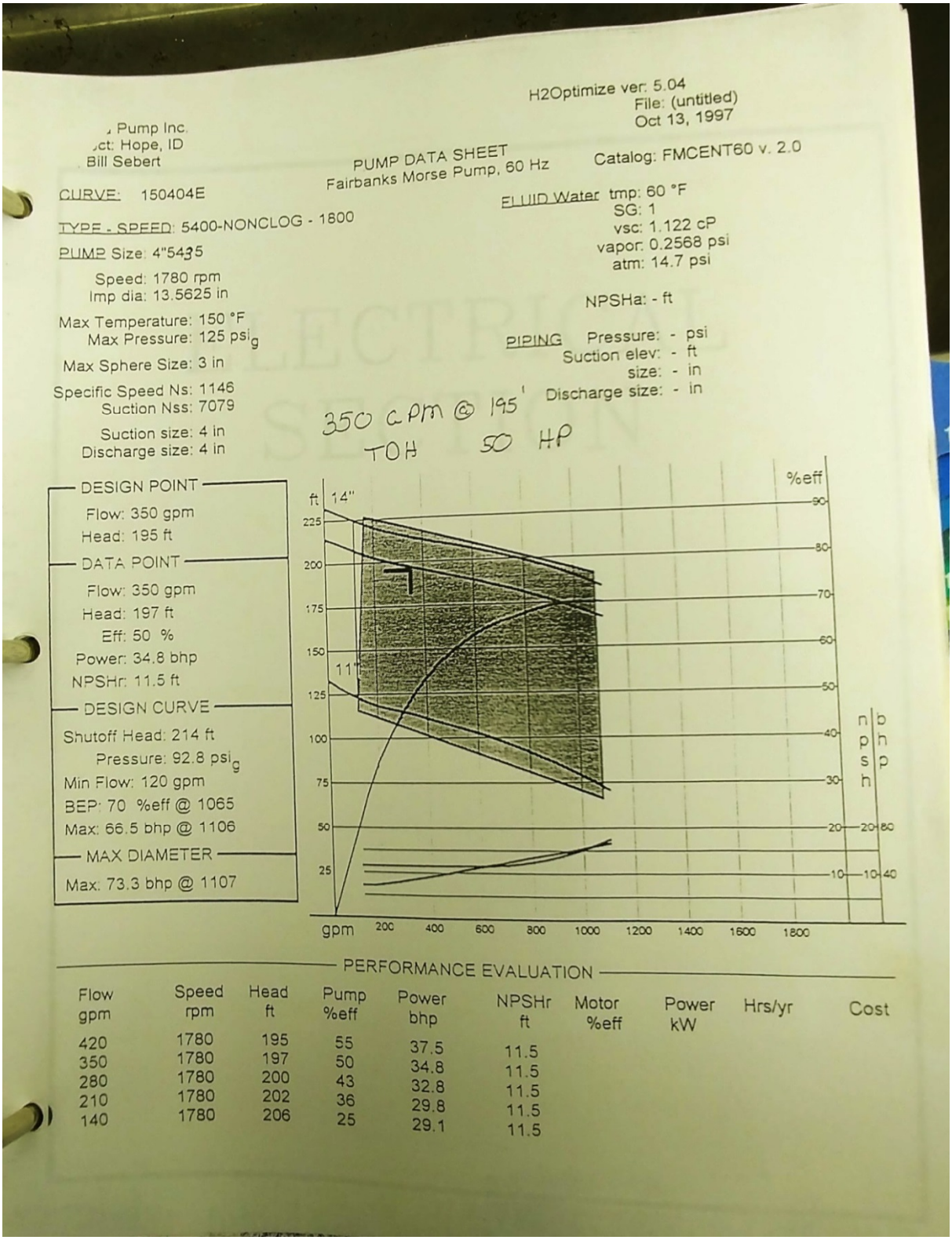


Figure 4 - Lift Station #4 Data Sheet & Pump Curve

3.1.1 Existing Collection System Summary and Deficiencies

The collection system was among the first in Idaho to be constructed with HDPE curvilinear piping. The system has experienced very few problems since, both in piping and pumping conveyance. The system has required only minimal routine maintenance according the operator. Inflow and infiltration have been negligible, also per the system operator. Normal maintenance and repairs have occurred on the system as is expected on a 15+ year old system (i.e. bearings, seals, couplers etc.), but the system has had no serious or catastrophic events. Excessive odors or corrosion have not been reported nor identified.

The primary concerns associated with the existing sewer collection system are related to the pump station electrical and control components, site security, and emergency operation/redundancy. Currently pump station running hours are not being tracked, but as the system ages this may become necessary, both for preventative maintenance and tracking pump efficiency. The submersible pump electrical feed connections are housed in a below grade concrete vault with conduit piped directly into the pump station wet well with no seals. Off-gas and moisture from the wet well migrate into the electrical connection box causing some corrosion and makes changing the pumps out challenging from a maintenance perspective and an outside contractor must be hired to remove the pumps. A photo of the electrical vault configuration is shown in Photo 1.

Photo 1: Lift Station Electrical Vault

The alarm autodialing systems at each pump station and the treatment facility are unreliable. The equipment is outdated and very difficult to accurately set to call the correct number during an alarm event. A single voice over phone line is connected to each lift station and the treatment facility. Replacement of the autodialing systems should be considered in the near future.

Site security at each of the submersible lift stations (No. 1, 2, and 3) is limited. Although there is 6-foot chain link fence with privacy slats installed, the gates are not locked and there is no barbed wire at the top of the fence to prevent unauthorized entry. The electrical and control panels are

exposed with exterior control functions and are not locked. There is a potential for people to enter the lift station site and tamper with the control functions. A photo of the control panels is provided in Photo 2.

Photo 2 - Lift Station Control Panels

Emergency operation and redundancy is limited during an extended power or pump outage. As noted previously, there is no on-site standby generator at the pump stations. If there is a system wide power outage, the District owns a single trailer-mounted 60 kW portable diesel generator that must be moved to power lift stations #1, #2, and #3.

The system operator reported that power outages over the last decade have been minimal and of short duration. Typically, outages last less than one hour, and occur about five to six times per year. Outages of less than one hour have little effect on the system, as the lift station capacity is sufficient to contain flows during this duration. Longer duration outages of two to six hours occur on average once per year and require the use of the District's trailer-mounted gen-set. Though it is seldom used, the portable gen-set is maintained and kept in a state of readiness should power outages occur. Outages of durations longer than six hours have not been experienced in the recent history of the system (in the past ten years).

Each submersible pump station does have a bypass connection provided in the exterior valve vault. If necessary, the District can rent a portable pump to draw liquid from the wet well and pump into the force main bypass connection. The District does not own a portable pump for this use.

A single pump in Lift Station No. 3 does not have adequate capacity to pump peak flow resulting in limited redundancy. According to the available pump curves, Lift Station No. 2 and Lift Station No. 3 have identical pumping capacities of 300 GPM per pump. When Lift Station No. 2 is pumping into Lift Station No. 3, while Lift Station No. 3 is collecting the service area sewer flow, the liquid level in the wet well raises and both pumps must operate simultaneously to keep pace with the incoming

flow. Increasing the capacity of the Lift Station No. 3 pumps should be considered to provide full pumping redundancy during peak flow events.

In summary, the existing collection system deficiencies identified include:

1. No standby power generation at each site.
2. Though lift stations are plumbed for bypass capabilities, the District does not own a portable pump.
3. Electrical junctions and configurations at submersible lift stations require a contractor to be hired for pump removal and replacement.
4. Submersible pump wiring junction boxes are not sealed in below grade vaults.
5. Lift stations 1-3 have exterior pump controls in unsecure cabinets.
6. Lift stations 1-3 have fencing, but do not provide necessary safety or security of equipment.
7. Alarm dialers are aged and inefficient, extremely difficult and cumbersome to program.
8. LS 3 pumps have limited peak flow capacity.
9. Not tracking pump run time and no flow monitoring capability.

3.1.1.1 Lift Station Operation Under Variable Flows

From an operational perspective, one of the challenges with the pump stations is the variable seasonal flow, particularly low flows, which can result in odors and corrosion. During low flow periods, the pumping on/off levels can be adjusted to reduce the residence time of the raw sewage contained in the wet wells. This will help mitigate odor and corrosion issues associated with long retention times. Another operational suggestion is to periodically (once or twice a year during the low-flow period) introduce "flushing" water into the system. This water could be furnished from a hydrant or water truck. Chemical addition could also be considered during low flow conditions to reduce the potential for odor and corrosion conditions. However, the existing facilities are in good condition, have been in operation for several years, and at this time chemical addition is not recommended.

3.1.2 Infiltration and Inflow Analysis

Inflow and infiltration (I/I) are non-sewer flows entering the collection system. These flows are the result of surface water (inflow) commonly entering through manhole lids or illicit connections (i.e. storm drains, roof drains, etc.), or high groundwater (infiltration). The Idaho DEQ considers per capita flows above 120 GPCD to be excessive.

The existing population served by the District is approximately 300 people. Considering the District's current average daily flow of 26,775 GPD, this results in a per capita flow of 89 GPCD. The average daily flows are less than the Idaho DEQ threshold of 120 GPCD and do not vary significantly throughout the year. Therefore, I/I is not considered a significant issue within the District's collection system.

3.1.3 Existing Sewer Users and Rates

Currently the EBSD includes services for:

- 28 commercial users;
    - Total of 28 commercial users;
    - Total of 70 hookups;
    - 12.0 ERU's of these are currently vacant lots not using the system but with the ability to do so;

  - 7.0 speculative ERU's, which have been issued and are counted in the system but do not currently pay or discharge for service.
- 245 Residential users;
  - Total of 245 residential users;
  - Total of 231 hookups;
  - 64.0 ERU's of these are currently vacant lots not using the system but with the ability to do so.
  - 18.0 speculative ERU's, which have been issued and are counted in the system but do not currently pay or discharge for service.
- 257 active O&M accounts;
- 76 total vacant lots ERU's;

Table 4 summarizes the specific ERU allotment by user and user type (commercial or residential). Current EBSD rates are:

- $125.10/quarter per active ERU
- $38.40/quarter per vacant lot

Portions of the service area are part of a LID assessed additional fees per ERU.

Table 4 - EBSD Existing Users / ERU's Summary

DESCRIPTION ↓	# USERS	# ERU's (ACTIVE O&M)	# ERU's VACANT	# ERU's SPECULATIVE
HOPE & EAST HOPE COMMERCIAL				
CITY OF EAST HOPE CITY HALL	1	1.0		
CITY OF EAST HOPE FIRE STATION	1	1.0		
CITY OF HOPE CITY HALL	2	2.0		
FRONTIER COMMUNICATIONS	1	1.0		
HOLIDAY SHORES BOAT / R&S PROPERTIES	1	1.0		
HOLIDAY SHORES CONDOS #1	1	8.0		
HOLIDAY SHORES CONDOS #2	1	16.0		
HOPE CIRCLE	1	4.0		
HOPE CIRCLE USPS	1	1.0		
ICE HOUSE-STEVENS	1	2.0		
KRAMER MARINA	1	2.5		
LPOSD	1	8.0		
MILL HARBOR DEV. LOTS 1-6	6	0.0	6.0	
MTN WEST DEV.- 6 PROPERTIES	6	0.0	6.0	5.0
OLD CHURCH / LOCKWOOD	1	1.0		2.0
HOLIDAY SHORES CAFÉ	1	9.0		
HOLIDAY SHORES MARINA	1	1.0		
COMMERCIAL TOTAL:	**28**	**58.5**	**12.0**	**7.0**
HOPE & EAST HOPE RESIDENTIAL				
PRIVATE RESIDENCES	**245**	**198.5**	**64.0**	**18.0**
TOTAL CURRENT CUSTOMERS (RES. + COM.):	**273.0**	**257.0**	**76.0**	**25.0**
TOTAL ERU's ACTIVE + VACANT:		**333.0**		
TOTAL ERU's ACTIVE + VACANT + SPECULATIVE:		**358.0**		

**Source: Ellisport Bay Sewer District Records as of 10/18/2017*

3.2 Existing Treatment Facility Overview

The existing plant was designed by Ruen-Yeager & Associates according to the 1995 Facility Plan. The daily flow to the plant in the original design was estimated at 205 GPD/ERU for 239 existing ERU's at the time, corresponding to an average daily flow of 49,000 GPD. The future flow for the plant was estimated at 69,500 GPD including flow for 325 ERU's and some additional allowance.

The plant design included an upper aerated treatment lagoon (2.5 MG) equipped with surface aerators, an upper storage lagoon (3.5 MG), and a lower storage lagoon (15 MG). Treated plant effluent was to be held in the lower storage lagoon during the non-growing season until it could be land applied on 41.14 acres of adjacent native forest area. The current plant is configured according to the future design criteria (69,500 GPD) indicated in the 1995 Facility Plan.

3.2.1 Existing Facility Design Criteria

Design criteria for the facility are as follows (from the 1995 Facility Plan document):

Table 5 - Ruen-Yeager 1995 Facility Plan Design Criteria

DESIGN CRITERIA

The following criteria were used to develop the proposed system:

AVERAGE DAILY FLOW	69,500 GPD
INFLUENT BOD_5	150 MG/L
EFFLUENT BOD_5	30 MG/L
INFLUENT TKN	40 MG/L
SUSPENDED SOLIDS	100 MG/L
OXYGEN REQUIREMENTS	1.5 LBS O_2/LB BOD_5

The basis for loadings in the 1995 design criteria are unknown, as testing data is not specifically referenced in the Facility Plan.

3.2.2 Process Flow

From the collection system wastewater is fed to two upper aerated treatment lagoons normally operated in series. The aerated lagoons discharge to a lower storage lagoon, where effluent is held until it can be disinfected and pumped to the land application sites via irrigation pumps. Details of each lagoon appear in Table 6.

3.3 Wastewater Treatment Facility Unit Components

3.3.1 Influent Pumping, Flow Measurement, and Headworks

The combined influent from lift station #1, #2, and #3 is gathered at lift station #4 near the facultative lagoon. Influent flow to the plant is measured with an electronic flow meter installed at the discharge to Lift Station #4. From LS #4, influent is pumped through about 931 feet of 8" SDR 17 HDPE piping to the upper lagoons.

Under normal operation, flow is directed to the aerated 2.5 MG upper lagoon where it is treated and then discharged by gravity through an outlet structure containing a weir and gate valves, and through an additional 142 feet of 12" SDR 17 HDPE to the upper 3.5 MG storage (treatment) lagoon. If desired, the upper aeration lagoon can be bypassed by actuating valves to send flow from LS #4 directly to the upper storage lagoon for holding. Alternatively, effluent from the upper

aerated lagoon can be allowed to bypass the upper storage lagoon and discharge directly to the lower storage (polishing) lagoon.

3.3.2 Aerated Lagoons

There are two lagoons in the upper area of the treatment zone fed by Lift Station #4. Each lagoon includes an underdrain system beneath its 60 mil HDPE liner that drains to its normal outlet structure. The underdrains are intended to redirect shallow groundwater away from the lagoons to prevent buoyant uplift of the liners and consist of a 2'x2' trench of 1-1/4" washed drain rock with a 4" perforated HDPE pipe wrapped in geotextile fabric.

From the upper storage (or treatment) lagoons, effluent flows through a 12" SDR 17 HDPE pipe, through an outlet structure containing a weir and gate valves and is then discharged through 38 feet of 4" SDR 17 HDPE piping to a manhole where pipe size is transitioned to 8" SDR 17 HDPE. Piping outside the manhole is equipped with buried gate valves on influent and effluent pipes.

Table 6 - EBSD Treatment Facility - Current Lagoons in Operation

	UPPER AERATION LAGOON	UPPER STORAGE LAGOON	LOWER STORAGE LAGOON
Total Storage Capacity (MG)	2.5	3.5	15.0
Lagoon Bottom	2,330.0	2,325.0	2,148.5
Lagoon Top	2,343.0	2,341.0	2,175.0
Normal (full) WSE	2,339.0	2,338.0	2,172.0
Normal Depth at Center	9.0	13.0	23.5
Influent Pipe Invert	2,333.0	2,328.0	2,155.0
Effluent Pipe Invert	2,331.5	2,331.5	2,152.0 / 2,164.0
Lagoon Freeboard (min.)	3.0'	3.0'	3.0'
Aerated?	*Yes, for treatment of BOD*	*Yes, for treatment of BOD*	*Yes, for odor*
Source: Record Drawings for Ellisport Bay Sewer District Treatment Site 1998			

3.3.3 Aeration Equipment

Per the 1995 Facility Plan, aeration requirements are met assuming 1.5 pounds of O_2 are required to treat every pound of BOD influent to a minimum effluent quality of 30 mg/L BOD. No additional allowance is included to maintain a DO residual or allow for meet oxygen demand for nitrification to occur.

The upper treatment lagoon (2.5 MG capacity) originally had surface aerators installed. Recent work at the plant includes the replacement of the original surface aerators in the upper treatment lagoon with two (2) diffused aeration units, and the upgrading of the upper storage lagoon to act as an additional aerated treatment lagoon with the installation of two (2) identical diffused aeration units (aeration unit details appear in Section 3.3.2). This results in an expanded aerated treatment lagoon capacity of 6.0 MG, with no effect on overall plant HRT. The surface aerators were replaced by the fine bubble diffusers as this type of aeration is regarded as more efficient and has lower maintenance requirements and is less prone to damage during the winter.

Each diffused aeration unit is an identical ADS Model LTC stainless steel disk module. Each module consists of the following:

- 100' of LDPE 1% carbon black weighted fine bubble aeration tubing;
- 304 stainless steel welded frame, tube holders, and hardware;

- Vinyl-coated aircraft cables and HDPE floatation marker;
- HDPE compression connectors and feeder restraint sleeve.

The performance of the ADS units includes the following ratings:

- Dimensions 4' diameter by 3" high, and weight of 38 pounds each;
- Optimum air supply of 8.1 SCFM;
- Max air pressure of 100 PSI;
- Fluid turnover rate of 25 MGD at 15' water depth.

All four (4) of the diffusers are fed via a single 7.5 HP compressor located in a ventilated enclosure. The compressor is a Busch Mink Model MM 1104BP oil-less unit, fed by 3 phase 230V power. The unit discharges to a common header with a check valve and isolation valves allowing individual diffusers to be isolated from the air supply. Each diffuser is fed by dedicated ¾" I.D. self-sinking feeder tubing.

3.3.4 Facultative (Polishing) Lagoon

The lower storage (polishing) lagoon receives flow through 8" SDR 17 HDPE piping transitioning to 12" SDR 17 HDPE piping through a manhole near the lagoon.

The lower storage lagoon is pumped down as far as land application conditions allow at the end of the growing season. The low level is usually approximately 1' above the lower suction pipe for the irrigation pumps. This allows for one of the upper treatment lagoons to be completely drained in case repairs or maintenance are required, and still accommodate influent flow throughout the non-growing season.

Over the period of 2006-2016, an average of 10,694,636 gallons of treated wastewater was land applied per growing season. This accounts for approximately 1.1 times the actual influent flow to the plant, according to flow meter records from lift station #4. The meteorological and soil conditions in the EBSD service area contribute to a net positive water balance, meaning an average excess of 1.1 times wastewater flow must be accounted for in the storage lagoon volume, as the combined surface area of the three lagoons captures a net gain of inflow in the form of precipitation and inflow (see Section 3.3.6 for land application operations details).

Three (3) diffused aeration units have been installed in the lower storage lagoon for seasonal use to address occasional odor complaints in the area. The three diffusers are identical to the units installed in the upper treatment lagoons and are fed via a single 7.5 HP compressor identical to the unit installed at the upper treatment lagoons.

3.3.5 Disinfection

Chlorine in the form of 12.5% sodium hypochlorite ($NaHCO_3$) solution is typically delivered to the operations building at the lower storage lagoon at the beginning of the growing season in four 55-gallon barrels. Each barrel is then loaded into the 500-gallon day tank with a bilge pump. Sufficient sodium hypochlorite for only a single growing season is kept onsite to avoid excessive storage requirements and chemical degradation over long storage periods.

A single Neptune Model 525-A-N1 1/3 HP diaphragm pump doses sodium hypochlorite solution to the discharge of the irrigation pump. The dosing pump is capable of injecting up to 7 GPH at 100 PSI, however the irrigation pump discharge pressure is about 175 PSI. The speed of the dosing pump is manually adjusted to 30-40% pump stroke speed whenever the irrigation pump is active.

The dosing pump discharges through 5/8" PE tubing and into the 6" irrigation pump discharge line via a vertical saddle tap.

There is no live monitoring of chlorine residual, all pump control is manual. The 1,126 linear feet of 18" C-905 PVC discharge pipe from the irrigation pumps provides a minimum of 35 minutes of chlorine contact time prior to discharge into the first sprinkler head (or on to one of the five land application zones). Contact time is estimated to be about 34 minutes when the full pump capacity of 400 GPM is being irrigated. Annual reuse permit reporting indicate that average chlorine residual is about 2.2 mg/L (DEQ 2016).

3.3.6 Reuse/Land Application

All disposal of treated effluent occurs under a DEQ Reuse permit. Currently plant effluent is discharged under IDEQ Reuse Permit M-152-04. The effluent is land applied to 41.14 acres of adjacent native forest area to five zones via spray irrigation. Application details by zone are outlined in Table 7.

Table 7 - EBSD Current Land Application Permit Hydraulic & Nutrient Loading

UNIT	SIZE (acres)	SERIAL #	GS IWR	N (lb/acre)	P (lb/acre)
ZONE #1	8.32	MU-152-01	0.75xIWR		
ZONE #2	8.17	MU-152-02	0.75xIWR		
ZONE #3	8.30	MU-152-03	IWR	87	20
ZONE #4	8.17	MU-152-04	IWR		
ZONE #5	8.18	MU-152-05	IWR		
TOTAL:	41.14				
Growing Season is May 1 through October 31 (184 days)					

Treated effluent is stored in the lower storage lagoon during the non-growing season. Once the growing season starts and land conditions permit irrigation, one of two vertical turbine pumps discharges flow at 400 GPM to one of the five zones. Effluent is dosed with 12.5% sodium hypochlorite for disinfection prior to irrigation. Treated, disinfected effluent is pumped through the 18" chlorine contact pipe before breaking into 6" submain and 8" main HDPE feeder lines for the first sprinkler zones. The 6" and 8" pipe are buried in a common trench along the access road between the lower and upper lagoons. Each irrigation zone is protected with a pressure reducing control valve. Lateral piping conveys reuse water to solid set sprinkler heads on six-foot risers spaced at 40 feet. Individual sprinkler head capacity ratings are 9 GPM (0.25 inches/hour) (DEQ 2016).

The operating irrigation pump is switched daily, with each typically operated 4-12 hours per day depending on conditions at the irrigation zones and lower storage lagoon level. Normally two zones are irrigated per day. One of the pumps was completely replaced after the 2017 growing season.

The irrigation water requirement (IWR) determined by the 2016 DEQ Staff Analysis uses climate characteristic data from the Coeur d'Alene 1E station 101956 (available from the ET-Idaho website at http://data.kimberly.uidaho.edu/ETIdaho/stninfo.py?station=101956). As there is no precipitation deficit data available for native forests, a surrogate composition IWR value is used that combines *Orchards – Apples and Cherries no ground cover* to represent tree canopy and *Grass Pasture, high management* used to represent the understory. The Silvicultural Plan prepared for

EBSD (Robinson 2004) states that the native forest in the reuse area consists of 80% canopy cover and 20% understory. The recommended irrigation water requirement based on 80% exceedance by DEQ staff appears in Figure 5. The permit continues to utilize an irrigation efficiency of 70%.

Month	Irrigation Water Requirement (inches)		Irrigation Water Requirement (million gallons)				
	100% IWR MU-152-03 MU-152-04 MU-152-05	75% IWR MU-152-01 MU-152-02	MU-152-01	MU-152-02	MU-152-03	MU-152-04	MU-152-05
May	2.67	2.00	0.452	0.444	0.601	0.592	0.593
Jun	5.49	4.12	0.930	0.914	1.237	1.218	1.220
Jul	8.86	6.65	1.501	1.474	1.997	1.966	1.968
Aug	6.50	4.87	1.101	1.081	1.465	1.442	1.444
Sep	3.46	2.59	0.586	0.575	0.779	0.767	0.768
Oct	0.10	0.07	0.017	0.017	0.022	0.022	0.022
Total	27.07	20.30	4.59	4.50	6.10	6.01	6.01

Figure 5 - Recommended Irrigation Water Requirement Based on 80% Exceedance (Reuse Permit M-152-04, DEQ Staff Analysis 2016)

3.3.7 Site Utilities

Power supplied to the site is three-phase, 230/460V, 60 Hz. Power supply includes wiring for five total areas in control panels near the operations building at the lower storage lagoon.

3.4 Existing Plant Capacity

A plant capacity analysis was recently performed to determine the overall plant capacity and determine the impact of adding additional ERU's to the system. The analysis included a declining balance accounting based on each unit process of the treatment plant as currently operated.

The results of the unit capacity analysis under current active O&M ERU allocation is included in Appendix E. The plant currently receives flow from 257 active ERU's (26,774 GPD). The analysis indicated up to 283 active ERU's at average day flows (29,483 GPD) can be accommodated before any upgrade to current plant equipment is required. At that point, an additional capacity of 86 ERU's (343 ERU's total, 35,734 GPD) can be accommodated through the installation of an additional diffused aeration unit in the upper treatment lagoons. The blower currently installed has the capacity to supply one additional diffused aeration unit. The installation of additional aerators beyond a single unit would require another blower or a larger capacity blower to be installed but could be used to further expand the plant's treatment capability in the future.

The capacity analysis assumes typical per ERU flow and loading based on data from the past 10 years, thus it is strongly recommended that plant operation and effluent quality be analyzed as any additional ERU's are brought online to ensure they do not significantly alter the past average plant conditions and result in a decline in treated effluent quality.

3.4.1 Short-Term vs. Long-Term Capacity Upgrades

While the capacity analysis indicates some additional new ERU's can be added to the system by minor upgrades to current plant equipment, overall the current facility is unlikely to be able to incorporate the ERU's associated with existing and proposed development on the Hope Peninsula. This expansion of the collection system would more than double the current hydraulic flow and loading to the plant, resulting in a decline in treated effluent quality. Additionally, the lower storage lagoon would likely require expansion to be able to store all the additional flow during the non-growing season, and the land application site would be unable to handle the additional hydraulic loading based on the climatic and soil conditions of the site.

3.5 Historic Plant Performance

Onsite inspections and effluent testing indicate the plant seems to be well-maintained and operated with care. The plant has operated as intended with no violations to the effluent quality conditions of the reuse permit and providing all wastewater and soil monitoring for nutrient loading, hydraulic loading, and disinfection requirements.

Due to the low observed daily flows and the long, 222-day HRT of wastewater in the lagoon system under average flow conditions, treatment at the plant is exceedingly efficient, producing an average effluent quality well below land application permit limit requirements for nutrients.

The system has occasionally produced complaints regarding odors from the lower storage lagoon, however this has recently been addressed with the installation of seasonal-use diffused aeration units operated as required.

3.5.1 Effluent Quality

Overall treatment and effluent quality is typically very high (see Table 8) due to the care with which the system is operated and maintained, as well as the following relevant features of the current system's users and operations:

- Light hydraulic and constituent loading (compared to normal literature values) to the system as indicated by historical flow and water quality testing records;
- A lack of significant commercial dischargers;
- Historic 30-40% vacancy rate in the area (according to 2000 and 2010 US census data);
- Extended treatment HRT in excess of 200 days based on full capacity of three (3) lagoons.

Table 8 - EBSD Treatment Plant Effluent and Historical Land Application Effluent Quality Testing Results

TEST	UNITS	EFF RESULT - 08/01/17 Sample*	OBSERVED % REM. (INF & EFF TESTING)**	HISTORICAL LAND APP QUAL (AVE)**	HISTORICAL LAND APP QUAL (MAX)**
Alkalinity ($CaCO_3$)	mg/L	35.8	82%	-	-
BOD_5	mg/L	11	90%	-	-
C-BOD_5	mg/L	5.13	96%	-	-
COD	mg/L	67.4	88%	-	-
Filtered COD	mg/L	58.0	68%	-	-
TSS	mg/L	13	94%	-	-
Ammonia (NH_3)	mg/L	0.295	99%	-	-
Nitrate-N	mg/L	2.50	NA	0.14	7.06
TKN	mg/L	3.01	94%	11.08	17.09
TP	mg/L	3.02	53%	3.80	9.86
Ortho-P	mg/L	2.95	37%	-	-
pH	S.U	7.21	-	-	-

**Effluent testing from Lower Lagoon grab sampling*
**Observed percent removal based on limited 2017 influent & effluent testing*
***Historical data from 2006-2016 land application reports to IDEQ*

3.5.2 Violations/Inspections/Complaints

The following violations have been reported for the EBSD:

- On November 7th, 2014, EBSD received a written letter from IDEQ regarding a failed lagoon seepage test for the 15 MG lower lagoon, which did not maintain the required 0.25 inches allowable seepage rate.
    - EBSD responded with a letter dated November 26th, 2014 and proposed a correction plan along with a revised CAS.
    - No immediate response was received, so EBSD met with IDEQ in the summer of 2015 to propose a revised CAS, dated July 17th, 2015.
    - DEQ confirmed EBSD is operating under a CAS dated March 18th, 2014, which qualifies the district as High-Level Noncompliance for the incident.
    - Lagoon liner inspection was not able to be fully completed in February 2015 due to snow and ice coverage of the bottom.
    - Plans for an official retest in 2016/2017 were not able to be completed due to weather issues.
    - An official test is now planned for June/July of 2018, provided the lower storage lagoon can be completely filled at this time and weather conditions allow.
- Some concerns have been brought up regarding increasing nitrate concentrations in a nearby groundwater well serving Hope Elementary school. The well is located approximately 650 feet from the nearest portion of the lower storage lagoon. The reuse site and lower storage lagoon were identified by DEQ as possible sources for the nitrate,

however no definitive source for the contamination has been confirmed. The school district continues to monitor the groundwater well water quality monthly (DEQ 2016). Further information is available in the DEQ-prepared report "Ground Water Investigation Report, Marct 21, 2013" and DEQ "M-152-04 Ellisport Bay Sewer Board, Staff Analysis supporting reuse permit issuance" from June 18, 2016.

- A letter dated March 12th, 2011 from a local resident indicated there have been odor issues from the lagoons as detected from adjacent properties and Hope Elementary. EBSD installed diffused aeration in the lower storage lagoon to decrease odor generation from anoxic zones in the winter of 2016. No subsequent odor complaints have been filed.

DEQ's most recent Staff Analysis (June 18th, 2016) indicates that EBSD has demonstrated substantial compliance with the terms and conditions listed in their previous reuse permits through annual report submittals and DEQ site inspections. A full listing of compliance activities related to the reuse permit M-152-04 are available in the DEQ Staff Analysis dated June 18th, 2016.

4. FUTURE CONDITIONS - POPULATION FORECASTS AND WASTEWATER FLOWS

4.1 Planning Period

The area population and growth record were analyzed based on U.S. Census Bureau data from 1910-2010, with special attention to recent population trends in not only the towns of Hope and East Hope, but of the Bonner County area. It is anticipated that growth and vacancy rates will follow the trend of the larger area over time. In addition, this will provide a conservative design that will accommodate future growth.

4.2 Sewer Use Ordinances and Fees

Future sewer rates will be based upon the use of LID's to raise funds for collection system expansion in specific expansion areas of the district with the corresponding requirements for treatment plant capacity upgrades. All EBSD users will contribute to upgrading the treatment plant to improve effluent quality based on the need to diversify and expand reuse and disposal options as the district grows.

4.3 Existing and Future Land Uses

The area surrounding the cities of Hope, East Hope, and the Hope peninsula is primarily residential. Due to economic factors and along with the rest of Bonner County, the area served by EBSD is experiencing new expanded growth predominantly in the form of new construction of full-time and part-time residences.

4.4 Economic Activities

Summer tourism plays the largest role in the economy of the planning area. Employment peaks in the summer and decreases in the winter months, driven by tourism and recreation. The service industries focused around outdoor summer recreation, resorts and second homes are the source of most employment. It is anticipated that most future economic activities will be in these same areas. In addition, the area is characterized by high vacancy rates according to census data.

4.5 Population Forecast

4.5.1 Future Growth within Existing EBSD Boundaries

To conservatively account for future growth, US Census Bureau population data from the years 2000 and 2010 is considered for not only Hope and East Hope, but also for the Hope Peninsula area, the zip code containing the EBSD service area, and all of Bonner County. In addition, average annual population growth rates from 1920-2014 are also considered (see Table 9).

The data show variable growth in the towns and unincorporated area within the EBSD boundaries. For this reason, a conservative growth rate of 1.24% per year was assumed, in accordance with Bonner County overall average population growth from 1920-2014. The resulting population growth is divided by 2.1 (the census data indicated average household size in the area) and modified by a vacancy rate of 16% (40% is average 200-2010 vacancy rate) to estimate the future number of ERU's due to population growth. The resulting future ERU's estimated to be added to the system from the current EBSD area is 150 ERU's.

Table 9 - EBSD Area Population & Housing - Historic Data & Future Projections

	Hope	East Hope	Agg. Hope / East Hope	EBSD Area	Zip Code 83836	Bonner County
CENSUS 2000						
Population	79	200	279	-	1,046	36,835
Total Housing Units	57	150	207	-	739	19,646
Occupied	34	104	138	-	455	14,639
Vacant	23	46	69	-	284	4,953
% Vacant	40%	31%	33%	-	38%	25%
Seasonal Use	18	26	44	-	225	3,764
% Seasonal Use	32%	17%	21%	-	30%	19%
Ave Household Size	2.32	1.92	2.03	-	2.30	2.49
CENSUS 2010						
Population	86	210	296	1,326	1,033	40,877
Total Housing Units	59	181	240	630	916	24,669
Occupied	34	109	143	-	485	17,100
Vacant	25	72	97	-	431	7,569
% Vacant	42%	40%	40%	-	47%	31%
Seasonal Use	14	63	77	-	369	5,808
% Seasonal Use	24%	35%	32%	-	40%	24%
Ave Household Size	2.53	1.93	2.10	2.10	2.13	2.37
% CHANGE 2000-2010						
Population	8.86%	5.00%	6.09%	-	-1.24%	10.97%
Total Housing Units	3.51%	20.67%	15.94%	-	23.95%	25.57%
Occupied	0.00%	4.81%	3.62%	-	6.59%	16.81%
Vacant	8.70%	56.52%	40.58%	-	51.76%	52.82%
Seasonal Use	-22.22%	142.31%	75.00%	-	64.00%	54.30%
Ave Household Size	9.05%	0.52%	3.64%	-	-7.39%	-4.82%
1920-2014					**State of Idaho**	**Bonner Co**
Avg Annual Pop. Growth	-0.27%	0.74%	0.35%	-	1.56%	1.24%
Use Avg Annual Growth	1.24%	*use conservative Bonner County rate instead of low Hope/East Hope area*				
Years in Future	20	*(20 years from 2017)*				
Avg Household Size	2.10	*2010 Census Area*				
FUTURE GROWTH - 2037	**Hope**	**East Hope**	**Agg. Hope/East**	**EBSD Area**	**ZIP 83836**	
Population	110	269	379	1,698	1,322	
Growth (capita)	24	59	83	371	289	
Potential Future ERU's	11	28	39	177	137	
# EBSD Area Tax Parcels	1058	*Bonner County Assessor Data*				
Design Future Growth ERU's	150	*(assuming 16% vacancy, plus some growth through currently inactive accounts)*				

4.5.2 Future Growth – Hope Peninsula Expansion

In addition to accommodating new growth in the Hope and East Hope City areas, the EBSD seeks to add service for residents of the Hope Peninsula area, who currently utilize onsite systems consisting mainly of septic tanks and conventional drain fields for disposal. Future population growth on the peninsula is estimated to cap at about 420 people (200 additional ERU's), as land area with development potential is limited. A summary of the existing private residential, resort, campground, and estimated future ERU's for the peninsula are summarized in Table 11.

4.6 Wastewater Flow Projections

Wastewater flow projections are based on historic flow data from the plant influent lift station (Lift Station #4) and the land application irrigation pumps from 2006 – 2016. A summary of the flow data appears in Table 10. The data indicates daily flow to the plant is lower than originally estimated in the plant's design. Average day flow is 104 GPD/ERU, with flow during the maximum month of the period at 164 GPD/ERU.

Table 10 – Historic EBSD Treatment Facility Influent Wastewater Flows & Reuse Flows Monitoring Data 2006 - 2016

2006-2016 DATA - HOPE & EAST HOPE, RESIDENTIAL & COMMERICAL ↓	VALUE	UNIT
INFLUENT FLOW		
AVERAGE DAILY FLOW	26,775	GPD
MAX MONTH DAILY FLOW	48,323	GPD
AVERAGE MONTHLY FLOW	814,394	GAL/MO
MAX MONTHLY FLOW	1,470,000	GAL/MO
AVERAGE ANNUAL FLOW	9,772,727	GAL/YR
MAX ANNUAL FLOW	11,681,000	GAL/YR
FLOW/ERU		
AVERAGE DAILY FLOW/ERU (AVERAGE MONTH)	104	GPD/ERU
MAX MONTH DAILY FLOW/ERU	164	GPD/ERU
IRRIGATION		
AVERAGE MONTH - GS	2,504,712	GAL
MAX MONTH - GS	5,085,000	GAL
AVERAGE ANNUAL FLOW	10,694,636	GAL
MAX ANNUAL FLOW	12,300,000	GAL

The users of the EBSD system are presented in Table 11 in terms of Equivalent Residential Units (ERU's) separated by area and commercial or residential designation for determining design flows to the treatment system. The number of ERU's estimated for each establishment are based on IDAPA 58.01.03 guidance.

Table 11: Equivalent Residential Units (ERU's) by Current and Future EBSD Users

DESCRIPTION ↓	# USERS	# ERU's (ACTIVE O&M)	# ERU's VACANT	# ERU's SPECULATIVE	# ERU's (FUTURE)
HOPE & EAST HOPE COMMERCIAL					
CITY OF EAST HOPE CITY HALL	1	1.0			1.0
CITY OF EAST HOPE FIRE STATION	1	1.0			1.0
CITY OF HOPE CITY HALL	2	2.0			2.0
FRONTIER COMMUNICATIONS	1	1.0			1.0
HOLIDAY SHORES BOAT / R&S PROPERTIES	1	1.0			1.0
HOLIDAY SHORES CONDOS #1	1	8.0			8.0
HOLIDAY SHORES CONDOS #2	1	16.0			16.0
HOPE CIRCLE	1	4.0			4.0
HOPE CIRCLE USPS	1	1.0			1.0
ICE HOUSE-STEVENS	1	2.0			2.0
KRAMER MARINA	1	2.5			2.5
LPOSD	1	8.0			8.0
MILL HARBOR DEV. LOTS 1-6	6	0.0	6.0		6.0
MTN WEST DEV.- 6 PROPERTIES	6	0.0	6.0	5.0	11.0
OLD CHURCH / LOCKWOOD	1	1.0		2.0	3.0
HOLIDAY SHORES CAFÉ	1	9.0			9.0
HOLIDAY SHORES MARINA	1	1.0			1.0
COMMERCIAL TOTAL:	**28**	**58.5**	**12.0**	**7.0**	**77.5**
HOPE & EAST HOPE RESIDENTIAL					
PRIVATE RESIDENCES	**245**	**198.5**	**64.0**	**18.0**	**280.5**
TOTAL CURRENT CUSTOMERS:	**273**	**257**	**76**	**25**	**358.0**
FUTURE HOPE PENINSULA - RESIDENTIAL					
ISLAND VIEW RESORT	-	0.0	0.0	0.0	35.0
BEYOND HOPE RESORT	-	0.0	0.0	0.0	40.0
RED FIR RESORT	-	0.0	0.0	0.0	6.0
SAMOWEN CAMPGROUND	-	0.0	0.0	0.0	45.0
EXISTING SEPTIC TRANSFERS**	-	0.0	0.0	0.0	250.0
NEW DEVELOPMENTS (estimate)	-	0.0	0.0	0.0	200.0
PENINSULA TOTAL:	**-**	**0.0**	**0.0**	**0.0**	**576.0**
TOTAL ALL:	**934.0**	*(includes all vacancies and speculative ERU's)*			
FUTURE GROWTH:	**150.0**	*(existing EBSD service area)*			
TOTAL ALL FUTURE:	**1084.0**				

**Source Ellisport Bay Sewer District Records as of 10/18/2017*

***ERU counts and estimates include a conservative estimate of potential septic transfers to ensure appropriate capacity is accommodated in future facility design*

The residences in the EBSD generate approximately 104 GPD per home. The max month flow during the data period occurred in December 2007, resulting in a max month flow of 188 GPD per home. The average max month per ERU flow over the period however is 139 GPD/ERU. Incorporating a safety factor of about 1.2, the system is designed to treat a projected max month daily flow of 164 GPD per home. A max month flow of 164 GPD/ERU has not been exceeded in the period from 2011-present. Additionally, this covers the 75th percentile of max month flow per year over the entire record period.

Table 12 - Summary of Current Design Flow Data and Future Estimates for EBSD

SCENARIO ↓	# ERU's	AVE. / EST. DAILY FLOW (DATA)	MAX MO DAILY FLOW (DATA)	90th PERC. / EST. DAILY FLOW (DATA)	MAX MONTH IN PERIOD (DATA)
EXISTING FACILITY		**GPD**	**GPD**	**GPD**	**GPD**
2006-2017 DATA - HOPE & EAST HOPE, RESIDENTIAL & COMMERCIAL	257	26,775	42,148	33,507	43,710
FUTURE GROWTH	**# ERU's**	**Based on 2006-2017 AVG/ERU**	**Based on 2006-2017 MAX MO/ERU**	**Based on 250 GPD/ERU**	
TRANSFER EXISTING PENINSULA SEPTIC TANKS	250	26,044	41,000	62,500	
NEW PENINSULA DEVELOPMENTS	200	20,835	32,800	50,000	
SAMOWENS CG	45	4,688	7,380	11,250	
HOPE PENINSULA RESORTS - ISLAND VIEW, BEYOND HOPE, RED FIR	81	8,438	13,284	20,250	
ACTIVATE EXISTING VACANT LOT HOOKUPS & SPECULATIVE ERU's	101	10,522	16,564	25,250	
PROJECTED 20 YR GROWTH - EBSD AREA (HOPE, EAST HOPE, PENINSULA)	150	15,626	24,600	37,500	
TOTAL EXISTING + FUTURE	1,084	112,928	177,776	271,000	
		Existing	**Future**	**Future District**	
1995 FP DESIGN CRITERIA	239	49,000	69,500	187,000	
SUMMARY					
FUTURE GROWTH RATE	1.24%	*Bonner County 1920-2015*			
EST. AVG FLOW / ERU (data)	104	*GPD / EDU (EDSB Data 2006-2016)*			
MAX MO DAILY FLOW	164	*GPD / EDU (EDSB Data 2006-2016)*			
MAX MO DAY PEAKING FACTOR	1.20	*EBSD Data 2006-2016*			

The peak hour factor was calculated based on the equation given in the "Ten States' Standards", as shown below in Equation 1 to be 3.54, resulting in a peak hour flow of up to 443 GPM that must be hydraulically accommodated by the proposed system at full buildout.

Equation 1: Peak Hour Factor

$$PHF = \frac{18 + \sqrt{\frac{Population}{1000}}}{4 + \sqrt{\frac{Population}{1000}}}$$

4.7 Wastewater Characteristics

Two separate grab samples were obtained at Lift Station #4 (the final lift station before entering the treatment plant) and analyzed to determine current plant influent characteristics. The results appear in Table 13. The constituent loading inputs are based on a battery of testing results obtained from Lift Station #4 (the final lift station before the plant) used to characterize wastewater quality to aid in the design of the updated 2017 Facility Plan currently being drafted. The recent testing at the entrance to the plant shows influent BOD loading at an average of about

130 mg/L, lower than the original design estimate of 150 mg/L, and at the low end of the range of literature values for domestic wastewater (see Table 13).

Due to anticipated expanded usage of water saving devices and low-flow appliances in future developments, wastewater is expected to be more concentrated. Higher constituent loading than historical testing values are used for the design basis as shown in Table 13.

Table 13 - EBSD Plant Influent Testing, Comparison to Literature Values, & 2017 Facility Plan Design Values

TEST	UNITS	1995 FP ASSUMED INFLUENT*	INF RESULT - 07/19/17****	INF RESULT - 08/01/17****	INF RESULT - 09/14/17****	TYPICAL DOMESTIC WW CHARAC. **	BioWin Sim. MUNICIPAL DEFAULT***	2017 FP DESIGN VALUES *****
Alkalinity ($CaCO_3$)	mg/L	-	198	-	-	-	300	200.0
BOD_5	mg/L	150	110	110	171	133 - 400	250	280.0
C-BOD_5	mg/L	-	140	-	-	-	250	-
COD	mg/L	-	551	-	286	339 - 1,016	500	552.0
Filtered COD	mg/L	-	184	-	-	-	185	220.8
TSS	mg/L	100	215	130	86	130 - 389	243	250.0
Ammonia (NH_3)	mg/L	-	35.6	-	-	20 - 41	26.4	36.0
Nitrate-N	mg/L	-	ND	-	-	-	0.0	0.2
TKN	mg/L	40	47.8	-	-	24 - 70	40.0	48.0
TP	mg/L	-	6.48	-	-	3.7 - 11	10.0	6.5
Ortho-P	mg/L	-	4.65	-	-	1.6 - 4.7	5.0	4.7
pH	S.U	-	7.16	-	-	-	7.30	7.19

**From Ruen-Yeager & Associates 1995 Facility Plan*

***From Metcalf & Eddy 5th ed. 2014.*

****Envirosim (BioWin publisher) has gathered extensive data at plants across North America to produce their default simulator input loading*

*****Influent testing from lift station #4 grab sampling*

******BOD5 Assumed value based on literature ratios and past T-O experience of COD:BOD for municipal wastewater*

Final design flows, constituent concentrations, and daily loading for average and max month conditions are shown in Table 16.

4.8 Correction of Previous Non-Compliance

The letter of intent for the FY17 grant cycle to IDEQ indicated correction of previous non-compliance would be a feature of the facility plan. The updated plan addresses the non-compliance associated with the lower storage lagoon leakage testing by proposing alternatives to long-term storage of wastewater through new reuse options possible through higher treatment levels. These alternatives could make the use of the lower storage lagoon unnecessary in the future by creating year-round reuse and/or discharge opportunities. This would avoid operations and maintenance costs associated with the 15.0 million gallon lower storage lagoon as well as potential risks to grondwater quality with continued seepage as well as seasonal odors occassionally reported near the treatment plant site.

4.9 Habitat Evaluation for Threatened or Endangered Species

The capability of the treatment alternatives is considered along with potential reuse or discharge options in the context of providing the highest level of treatment that can be achieved. This will reduce current impacts to soil quality and prevent any new degradation to surface water and soil quality by providing a higher level of treatment than could be previously achieved and consolidating all wastewater treatment operations to a single facility rather than relying on the performance of individual onsite septic systems.

5. IDENTIFICATION & SCREENING OF ALTERNATIVES

The purpose of this section is to identify the alternatives proposed for the revised facility plan and provide justification for the selected alternative. The feasibility of each alternative for the collection system, treatment system, and disposal system are investigated considering the capital and O&M costs, technological advantages, and coordination with existing system infrastructure each alternative provides.

5.1 Collection System Improvements and Additions

Alternatives for addressing current sewer collection system issues and expansion options to serve new customers are presented in this section.

5.1.1 Existing System Improvements

The existing collection system piping and manholes are in good working condition and no improvements have been identified to increase system capacity or to replace/rehabilitate deteriorating components. The system operator indicated there are no trouble areas causing blockages or excessive maintenance and there is no measurable I/I.

As described in Section 3.1.1, there are some deficiencies associated with the District's lift stations. Existing system improvements with estimated planning level costs are summarized in Table 14.

Table 14 - Existing Collection System Lift Station Improvement Planning Level Costs

Item	LS No. 1	LS No. 2	LS No. 3	LS No. 4	Total
Permanent Standby Generator	$35,000	$25,000	$35,000		$95,000
New Electrical Junction Box	$3,000	$3,000	$3,000		$9,000
Pump Controls and Panels	$20,000	$20,000	$20,000		$60,000
Security Fencing	$5,000	$5,000	$5,000		$15,000
Flow Monitoring	$10,000	$10,000	$10,000		$30,000
Total	**$73,000**	**$63,000**	**$73,000**	**$0**	$209,000
Portable Standby Pump	$12,000				

Notes:
1. Generator cost includes diesel generator, automatic transfer switch, and installation.
2. Portable standby pump includes diesel motor, fuel storage, and trailer.
3. Pump control upgrades includes all new controls, electrical components, and panels.
4. Flow monitoring consists of a magnetic flow meter installed in a vault.

Pump	Cost	Location
Hydro. S4KXP2000 20hp 460/3 9.25" imp.	$14,776.00	L.S.#1 and L.S.#3
Hydro.S4PXP750 FC 7.5hp 460/3 8.25 imp.	$9,224.00	L.S.#2
Franklin Elec. Sub. Motor 25hp 460/3 S.F.	$5,142.00	L.S.#4
L.S. #4 Replacement -pumps, rails, bases, retrofit in current wet well.	$40,000	
New Access doors and top	$3,500	
Labor estimate	$10,000	

Each of the items listed in Table 14 are not required to be completed. The intent is to provide the District with budgetary costs to make informed decisions and prioritize improvements. For example, with replacing the pump controls and panels new pump hour meters will be installed and flow monitoring can be accomplished using pump run times versus a flow meter.

5.1.2 Collection System Expansion to Un-Sewered Areas

The 1995 Wastewater Facility Plan defined the City limits of Hope and East Hope as the Phase 1 planning area and the Hope Peninsula as Phase 2. The Phase 1 recommendations were constructed to serve Hope and East Hope. There is existing infrastructure in place within Hope and East Hope for planned growth to occur and connect into the existing collection system. The collection system expansion alternatives developed in this planning document focus on serving the Hope Peninsula.

There are several existing residential and commercial development areas on the Hope Peninsula consisting of condos, resorts, homes, RV campgrounds, and a forest service campground. A portion of the area has sewer service provided by Bio-Clear and the forest service has a sewer system for the Samowen Campground. For District planning purposes, it is assumed the existing sewer systems on the Hope Peninsula will be connected into the District's system. The exact location and number of lots served by Bio-Clear, location of Bio-Clear and forest service sewer collection lines, and Bio-Clear/forest service pump station information is not available. District expansion planning assumes new sewer collection lines and pump stations will be installed. Existing infrastructure would be evaluated on a case by case basis to determine if it is suitable to be used by the District.

Collection system expansion throughout the Hope Peninsula will generally follow existing roads. Due to the topography of the area, raw sewage will be collected and conveyed to the District treatment facility using a combination of gravity conveyance and pumping. Individual lift stations will be necessary for low-lying properties below the roadways to lift sewage up to the collection lines.

Site plans showing preliminary locations for gravity collection lines, pump station locations, and force main are provided in Appendix K. The proposed expansion throughout the Hope Peninsula will connect approximately 376 ERUs including homes, resorts, and campgrounds. It is estimated that 250 active septic systems and drain fields would be abandoned. Conservative treatment capacity for an additional 200 ERU's are anticipated for full development potential on the peninsula.

Table 15 - Hope Peninsula Expansion - Estimated ERU's by Area

AREA	# LOTS	10% at 3 ERU / LOT	TOTAL ERU's	AVE DAY FLOW	MAX MO FLOW
Area 1	161	48	209	21,736	34,276
Area 2	10	3	13	1,352	2,132
Area 3	101	30	131	13,624	21,484
Totals	**272**	**81**	**353**	**36,712**	**57,892**

A preliminary cost estimate for system expansion across the entire peninsula is included in Appendix L. The number of manholes assumes an average spacing on the gravity lines of 300 feet. The cost assumes excessive rock excavation is not required. However, a detailed geotechnical analysis is recommended during design of the system to define potential rock constructability issues that could significantly impact costs. The lift station costs include submersible duplex pumps with wet well, control panels, security fencing, and on-site standby power.

5.2 Treatment System Alternatives

The following alternatives have been identified and are analyzed based on the level of treatment (class) each would achieve as well as integration with existing infrastructure and estimated capital and operations and maintenance costs.

Each alternative is considered based on the full future system design. All alternatives are for on-site treatment, as there is no option to transfer wastewater to existing WWTP's in the area. Alternatives are also assessed based on the estimated level of treatment they can achieve (e.g. Class C, B, or A), technological advantages they can provide, and complexity of operation in order to expand the future effluent reuse and/or discharge options as the facility grows.

5.2.1 Final Design Parameters

The design criteria for the alternatives are outlined in Section 4 based on flow monitoring data collected by the Ellisport Bay Sewer District (EBSD) and current and estimated future system users. The final flow and loading design parameters for the future facility appear in Table 16 below.

Table 16 – Future Design Basis: Flow, Constituent Concentrations, and Daily Loading

CONSTITUENT	VALUE	UNIT	FUTURE LOADING AVE DAY (lb/day)	FUTURE LOADING MAX MO (lb/day)
ALKALINITY	200.0	mg/L	188.5	296.7
BOD5	280.0	mg/L	263.9	415.4
COD	552.0	mg/L	520.2	818.9
FILTERED COD	220.8	mg/L	208.1	327.6
TSS	250.0	mg/L	235.6	370.9
AMMONIA (NH3)	36.0	mg/L	33.9	53.4
NITRATE-N	0.2	mg/L	0.2	0.3
TKN	48.0	mg/L	45.2	71.2
TP	6.5	mg/L	6.1	9.6
ORTHO-P	4.7	mg/L	4.4	7.0
pH	7.19	SU	-	-
DESIGN DAILY FLOW	180,000	GPD		
AVG DAILY FLOW (104/ERU)	112,928	GPD		
MAX MO DAILY FLOW (164/ERU)	177,776	GPD		

5.2.2 Alternative #1: No Action

This alternative is required for analysis in every Facility Plan. This alternative would provide no additional capacity for the treatment plant as the plant is already near its hydraulic storage limit during winter storage months and for land application over the growing season. No additional

wastewater sources are recommended to be added to the system under its current design and operation. Costs to address treatment capacity and disposal needs would be deferred to a future facility plan.

Pros: Utilize existing lagoon infrastructure, no change to current facility operation or operator classification requirements

Cons: No expansion to reuse options (continue land application only) or treatment capacity, no improvement to treated effluent quality, no expansion to incorporate Hope Peninsula users possible as the plant will soon reach its maximum treatment capability based on non-growing season storage capacity and land application hydraulic limits.

Estimated Cost: Normal annual operating and maintenance costs.

Alternative #1 has been rejected due to its failure to accommodate expansion of the district boundaries and future growth. Additionally, Alternative #1 provides no benefit of improved final effluent quality, limiting future reuse options.

5.2.3 Alternative #2: Lagoon Optimization/Expansion

Optimizing the aeration system in the current lagoons and adding additional lagoon capacity would allow the treatment and storage of additional wastewater if new users are to be added to the system. Baffle curtains could be installed in one or more of the lagoons to provide separation for anoxic and aerobic zones to improve treatment capability.

Effluent quality would likely remain the same (Class C), requiring an expansion of HMU's for land application or other reuse option as ERU's are added to the system. For example, if the flow from the Samowen campground was brought to the EBSD treatment plant, the former Samowen land application sites could possibly be added to the plant's land application area. Further expansion of the land application area would likely be required. This option would likely not improve non-point source nutrient contributions to LPO until all septic systems on the Hope Peninsula could be added to the system. At this point however, an estimated 50 MG of additional lagoon storage would be required to store treated effluent from the first two lagoons as well as the current storage lagoon, which would likely have to be converted to a treatment lagoon with as well to address aeration and HRT requirements for minimum treatment levels.

This option appears to be self-limiting prior to the anticipated 20-year plant design capacity of 1,084 ERU's, as there is no suitable land that could accommodate the construction of a suitably sized lagoon of 50 MG, which would measure about 670' wide by 670' long and 20' deep. Additionally, land application irrigation could be outpaced by treated influent to the storage lagoon depending on timing of suitability for irrigation in the land application area, resulting in a constantly building storage requirement that cannot be depleted during the limited growing season.

Additional treatment could be achieved after the existing treatment lagoons and prior to discharge to the storage lagoon to upgrade to Class B or Class A reuse water. With a Class A or B effluent, loading to existing HMU's could potentially be expanded (until a hydraulic limit is reached), with the possibility of allowing other reuse options such as campground toilet flushing, residential irrigation, school area irrigation, and/or snowmaking during the winter. This would allow the

lagoons to operate at their full capacity year-round, as storage would not be required outside of growing season.

The effluent treatment quality upgrade would require a tertiary treatment technology, such as a Submerged Attached Growth Reactor (SAGR) or sand filtration. SAGR manufacturers claim they can achieve full nitrification at water temperatures of less than one degree Celsius, which would likely be the case at the treatment facility for a portion of the non-growing season. A SAGR system would require construction of additional underground reactors near the treatment lagoons, with sizing based on specific effluent characteristics, but with a maximum BOD influent load of 25 mg/L. It is unknown whether treatment of BOD to this level can be achieved at winter lagoon temperatures, as no winter treatment lagoon temperature and/or effluent water quality testing data is available. Due to variable winter conditions and anticipated growth in future loading (lowering HRT in treatment lagoons), the SAGR system is regarded as a relatively risky and unsustainable long-term treatment option.

A continuous backwash sand filter could also be used to improve effluent quality. This option would circulate effluent through a series of filter tanks filled with sand to remove impurities to upgrade reuse class. The size and number of tanks would depend on the effluent quality fed to the filters, which could be variable considering winter conditions if a year-round reuse option is used. The sand filters would require additional operations expertise and cost, as the filter feed pumps must be maintained, and filter media must be replaced periodically.

Pros: Utilize existing infrastructure, little change to current facility operation or operator classification requirements. With tertiary treatment, high-quality effluent possible, utilize existing lagoon infrastructure (after capacity upgrades), flexible reuse options, no requirement for solids processing beyond occasional lagoon dredging.

Cons: No improvement to treated effluent quality, requires expansion of land application reuse facilities (currently near limits operationally), and additional land for future lagoon expansion. With tertiary treatment, increased operating cost, potential for increased operator classification requirement.

Estimated Cost: $3,885,066 (cost includes lagoon expansion and disinfection upgrades, additional cost for tertiary filtration, see Appendix G)

Alternative #2 has been rejected due to the land requirements associated with lagoon expansion to accommodate expansion of the district boundaries and future growth. Sufficient land does not exist near the current plant that would be able to continue utilizing existing collection system infrastructure. Additionally, the EBSD board and users have indicated they would prefer to move away from a lagoon system to a treatment alternative that can operate in a smaller footprint and provide improved final effluent quality, expanding future reuse options. Finally, the implementation cost associated with Alternative #2 is the highest amongst the identified alternatives.

5.2.4 Alternative #3: Activated Sludge SBR Plant w/ Final Filtration

SBR's offer proven technology that can achieve consistent treatment levels despite surrounding environmental conditions. New SBR tanks could be installed near current treatment operations. Each tank could operate as a discrete SBR, or, depending on final design flows, the tanks could be

partitioned with new concrete walls inside to create multiple smaller tanks for smaller batch sizes to meet current demand.

Estimated equipment requirements for two SBR's include:

- Two bolted steel tanks, 20' tall, 31' diameter, 115,000-gallon capacity;
- Transfer pumps to fill reactors;
- About 400 SCFM of air supplied by duty-standby 30 HP blowers;
- Additional sludge tank;
- Potentially tertiary treatment.

Alternatively, one of the tanks or an additional tank could be used as an anoxic pre-treatment tank with some recycle to further improve nutrient removal. A portion of one of the tanks could house a microfiltration unit or a stand-alone sand filtration technology such as Blue Water Technologies could be installed after the SBR's to treat all or a portion of final effluent to Class A standards for land application, residential irrigation, or potential discharge to LPO. Some flow could also undergo pretreatment in the existing aerated lagoons prior to transfer to the SBR's. Additional tanks would be required for storage and processing of waste sludge, which would likely be hauled for land fill disposal off site.

Pros: High-quality effluent, utilize existing lagoon infrastructure (temporarily or permanently for pretreatment), potential to utilize to some extent existing equipment at SOCG, flexible reuse options.

Cons: Frequent fluid transfer requirements, high capital cost, increased operating and maintenance cost for pump operations, increased operator oversight requirements and operator classification.

Estimated Cost: $2,074,878 (SBR's only)

$3,306,461 (SBR's with tertiary sand filter, see Appendix H)

Alternative #3 has been rejected due to high equipment and estimated operating costs. The other mechanical plant alternative option identified (MBR system) can provide more consistent and similar or better final effluent quality than the SBR system operated with tertiary filtration. Additionally, the MBR alternative can provide more flexible operation and is more easily expandable with the installation of additional treatment train units that occupy a smaller overall footprint.

5.2.5 Alternative #4: Activated Sludge MBR Plant

Installation of an MBR treatment plant would likely produce the most reliable high quality Class A effluent. The existing lagoons could continue to be used for equalization, pretreatment, and storage capacity, reducing maintenance and monitoring requirements. This would be especially useful if the first MBR train is brought on to treat only a portion of flow to Class A standards for selected reuse operations prior to the expansion of the collection system. The treatment facility could effectively be piloted while all lagoons are operational, providing a backup treatment option. As the MBR system is made fully operational, lagoons could then be sequentially decommissioned as additional ERU's are accepted to the system and more MBR trains are brought online.

Similarly to the other alternatives, loading and reuse options could be expanded with Class A effluent. An existing lagoon, portion of a lagoon, or new bolted-steel tanks could be utilized as

bioreactors, with the future possibility of adding additional tanks or baffles to produce separate anoxic and aerobic zones for enhanced treatment capabilities.

As with the SBR alternative, additional tanks would be required for storage and processing of waste sludge, which would likely be hauled for land fill disposal off site.

Estimated equipment requirements for a full scale MBR plant at the 20-year design capacity include:

- Anoxic tank – 30,000 gallon (18' deep);
- Aerobic tank – 120,000 gallon (18' deep);
- Process and membrane scour blowers;
- Transfer pumps;
- UV disinfection;
- Chemical cleaning system (sodium hypochlorite and citric acid storage and pumps);
- Process instrumention and monitoring to keep treated effluent at specifications;
- 40'x80' building to house and protect chemicals and membranes.

It is possible however in the interim to operate a smaller system that contains the above elements in a modular, skid-mounted configuration to save cost and allow the operator to become familiar with the equipment. As influent from new users is accepted to the plant, additional MBR trains could be purchased and brought online to meet capacity requirements. The modular design of a plant with multiple discrete units would also allow for flexbility in maintenance and plant operations, such as a partial shutdown during low flow periods.

Pros: High-quality effluent, utilize existing lagoon infrastructure for EQ/storage, flexible reuse options, smallest treatment footprint available. Can easily upgrade skid mounted system as plant capacity demands.

Cons: More complex operation (including requirements for CIP chemicals and monitoring equipment), capital cost, increased operator classification requirements, sludge handling.

Estimated Cost: **$3,540,855** (full-scale plant w/ 112,000-gallon EQ tank added)

$1,053,239 (early phase skid-mounted MBR unit, see Appendix I)

Alternative #4 is the alternative selected by the EBSD board. See Section 6 for a full discussion of the selected alternative and its implementation.

5.3 Effluent Discharge Alternatives/Options

A major issue of the current system design is the constraints of land application conditions that prevent unrestricted irrigation, even during certain periods of the growing season. There are days and weeks during the growing season during which meteorological and soil conditions prevent full or even partial land application under the IWR defined by the reuse permit. The class of treated water will determine the possible reuse options available (see IDAPA 58.01.17.601).

Class A water is of the highest quality, thus requiring the fewest restrictions for reuse. Currently the EBSD facility produces Class C effluent, which requires a buffer to its land application area cannot be applied to areas where human contact is likely soon after application. An upgrade in reuse water quality would likely permit reuse options such as:

- Direct use for residential landscape irrigation;
- Irrigation of parks, playgrounds, and school yards during periods of non-use (nearby Hope Elementary School land outside of school year);
- Irrigation of edible food crops;
- Fire suppression;
- Snowmaking for parks;
- Toilet flushing and irrigation at seasonal Samowen campground;
- Groundwater recharge.

In addition, options for discharge to surface waters could be explored as Class A treated water would likely be of higher quality than environmental water.

There is precedent in Idaho for reuse water discharge to multiple options which include NPDES permits to surface water. Examples include the City of Meridian, ID, which is permitted to discharge Class A reuse water to crop/turf/landscape irrigation, dust suppression, fire suppression, toilet flushing, surface water features, flushing of sanitary sewers, and to 5 Mile Creek, a tributary to the Boise River (NPDES permit XID0020192).

Another example is the City of Ketchum Sun Valley Water and Sewer District, which is permitted to reuse Class A water for land application to irrigate 130 acres of golf course and surrounding residences via in-ground sprinklers, or the Big Wood River (NPDES permit #ID0020281). Both of these surface waters have similar receiving water designations including cold water aquatic life, salmonid spawning, primary contact recreation, and domestic water supply.

5.3.1.1 Classification as "Class A"

In order to be classified as "Class A" recycled water, municipal wastewater shall be oxidized, coagulated, clarifier, and filtered, or treated by an equivalent process and adequately disinfected (IDAPA 58.01.17-601.01) according to the requirements in Table 17.

A Class A facility will have additional requirements for equipment/process redundancy and automation, as well as potentially expanded effluent constituent monitoring requirements. These requirements help to ensure there is a minimized potential for contamination to reuse destination.

In general, the higher the treatment class is the more numerous the potential reuse options are. The best plan for the treatment facility will allow flexibility in discharge options if effluent reuse water quality is compromised for any reason. This may take the form of an "off-spec" storage facility from which the water can either be recycled to the front of the treatment system or discharged to a reuse application with lower treatment requirements.

The EBSD facility already contains the infrastructure to store up to 21 million gallons of water in three existing lagoons. The flexibility provided would allow separate storage of off-spec effluent from effluent meeting the strictest reuse criteria.

Table 17: IDAPA 58.01.17 Class A Recycled Water Classification Requirements

CONSTITUENT	VALUE	UNITS / TEST	SPECIAL CONDITIONS
Disinfection	median total coliform testing over 7-day analysis period < 2.2 / 100 mL	CFU / 100 mL Total Coliforms	No single sample > 23 organisms / 100 mL 5-log activation of virus when combined with filtration
Turbidity (for membrane processes)	daily arithmetic mean < 0.2	NTU (Nephelometric Turbidity Units)	No single sample > 0.5 NTU at any time Turbidity standard to be met prior to disinfection (1) in-line continuously monitoring & recording turbidimeter req'd for each treatment train prior to disinfection. > 5 min. above instantaneous limit requires auto bypass
Nitrogen	< 10 mg/L GW recharge < 30 mg/L res irrigation (Monthly arithmetic mean)	mg/L Total Nitrogen	Limits are maximum value, and may not be applicable based on further groundwater quality study
pH	6.0 ≤ Value ≤ 9.0	S.U.	Daily grab sample or continuous monitoring
BOD5	< 5 mg/L GW recharge < 10 mg/L res. Irrigation (Monthly arithmetic mean)	mg/L	Monthly arithmetic mean determined from weekly composite sampling
Phosphorus	*no limit defined in IDAPA 58.01.17	mg/L Total Phosphorus	Limits may defined based on individual permit. At minimum, monitoring will likely be required.

Redundancy	- Treatment capability able to treat peak day flow for the season in which Class A recycled water is produced
	- Provide for (1) of the following:
	  - Another permitted disposal option
	  - Diversion to adequate lined storage capable of storing Class A recycled water during malfunction/emergency
	- Alternative back-up system must be automatically activated if turbidity or disinfection system not achieving target
	- Class A redundant monitoring equipment and automatic by-pass equipment must be provided
	- Standby power sufficient to maintain all treatment and distribution works or to meet the requirements for an alternative back-up system		

5.3.2 Evaluation of Wastewater Facilities with Respect to TMDL Implementation Plan

It is the EBSD board's intent to minimize the overall effect wastewater collection, treatment, and reuse practices have on the local environment, including the surface water quality in LPO. Specifically, the board seeks to eventually eliminate all onsite septic treatment systems from the Hope Peninsula (presumed to be major non-point source nutrient contributors to LPO near-shore waters) and enhance the treatment capability of the entire system. This will allow reuse practices that land apply water over a greater area with much lower constituent loading. The improved treatment quality will provide immediate benefit to the ground water and near shore water quality of the lake, and provide a higher level of disinfection of potentially pathogenic organisms within the treated effluent. In addition, leakage from existing lagoons to groundwater would be eradicated as lagoons are taken offline due to lowered non-growing season storage requirements.

A solution that allows more flexible reuse options will be required lagoons age and require additional expensive maintenance and/or are brought out of service, and as more users are added to the system and the current land application site and lagoon storage volume become inadequate to store and apply effluent at current treatment quality. As existing systems are inspected and deemed to be out of compliance per the definition in IDAPA 58.01.03.003.13, they will be added to the central collection and treatment system. Voluntary hook-ups to the system by homeowners will also be encouraged.

5.3.2.1 TMDL Implementation Plan

The TMDL was initiated based on citizens' concerns and complaints about increasing growths of algae and other nuisance aquatic plants. Acording to Tri-State Water Quality Council, increasing level of nutrients in LPO, particularly phosphorus, contributing to growth of algae and invasive aquatic plants like eurasian milfoil.

The purpose of the TMDL is to numerically identify the total allowable load that LPO can assimilate while maintaining water quality standards. The load is distributed among load allocations to nonpoint and background nutrient sources and wasteload allocations to point sources. The following are relevant points of the TMDL:

- LPO is identified in the TMDL as being phosphorus-limited for nuisance aquatic plant growth. For this reason, phosphorus is used as the guidance water quality target;
- A water quality target of 9 µg/L (0.009 mg/L) total phosphorus was used to develop the nearshore TMDL, with an action target of 12 µg/L based on individual sample concentrations;
- The overall loading capacity for the nearshore waters of LPO is 4,588 pounds of total phophorus per season (June – September);
- The TMDL addresses shoreline loading, direct runoff from the land immediately surrounding the lake, and loads from septic seepage through ground water;
- LPO is considered most vulnerable during the summer months (June-September) due to elevated water temperatures and a decrease in mixing of lake waters (critical conditions), especially in the northern section of the lake which has the highest human influence.

5.3.2.2 Current Nutrient Sources to Near Shore Waters of LPO

Potential pollution sources to near shore waters of LPO include:

- Septic drainfield system seepage through groundwater;
- Lawn fertilizer use near shoreline;
- Poorly managed construction sites near shoreline;
- Increased development and recreational use;
- Digging near shoreline without permits;
- Dumping of waste in lake;
- Herbicide treatment of invasive aquatic weeds;
- Logging;
- Grazing near lake or lake wetlands;
- Road building and maintenance;

In addition, there are several proposed projects that could impact water quality in LPO including:

- Rock Creek Mine in Montana;
- Sandpoint bywater construction along Sand Creek;
- Fluctuating water levels due to downstream hydroelectric dams

5.3.3 Disposal to Land Application

According to the recent plant capacity analysis, land application to the current HMU's is limited hydraulically rather than by nutrient loading. An improvement in treated effluent quality (such as from Class C to Class A) will likely not result in an increase in loading to the HMU's as the application rate is controlled by meteorological and soil conditions.

There are currently no loading limits placed on salt or COD by the reuse permit. Nitrogen and phosphorus currently have constituent loading limits of 87 and 20 lb./acre respectively. Monthly grab samples are required for monitoring Total Nitrogen and Total Phosphorus, and quarterly grab samples are required for monitoring Nitrite + Nitrate nitrogen. Future land application flows may approach the ceiling nutrient loading limits (especially for phosphorus) if improved effluent quality is not achieved through a new treatment plant or if expanded irrigation area is not permitted through DEQ by the EBSD.

If the Samowens campground is incorporated into the EBSD system (currently operated under reuse permit M-020-05), there is a possibility of expanding land application to their area as well. This would only add an additional 6.0 acres to the existing 41.14 acres of EBSD application area. Utilizing the Samowens land may also require expansion of EBSD irrigation piping and potentially a booster pump station as the Samowens application area is located over a ridge 1,000 – 2,000 feet away from the upper treatment lagoons and end of the existing supply piping for irrigation.

Table 18 - Sam Owens Campground Land Application Area Details

UNIT	SIZE (acres)	SERIAL #	GS IWR	N (lb./acre)	P (lb./acre)
Upper East Field	3.00	MU-020-01	IWR	63	-
Lower West Field	3.00	MU-020-02	IWR		
TOTAL:	**6.00**				
Growing Season June 1 through September 30 (122 days)					

5.3.4 Disposal to Snow-Making

The seasonal application of stored effluent through snowmaking could alleviate some of the storage capacity required over winter and reduce the cost of maintaining additional lagoons. Snowmaking technology for reuse application is currently practiced around the world, and locally at Schweitzer Mountain Resort. Resort or winter park snowmaking must be Class A quality. If the reuse water remains treated to Class C, the possibility of applying in a buffered area could be explored.

Concerns over this technology include the requirement for specific meteorological conditions for the system to operate, as well as the buildup of snow that will result in longer snow melt periods in the spring that may raise local groundwater levels and keep growing season land application areas unsuitable for reuse irrigation. Additionally, the runoff quality of snow made from reuse water is not well understood. Depending on the duration and timing of snow melt, reuse water of less than Class A quality could contribute additional nutrient load to near shore waters if inadequate soil retention time does not occur upon melting.

While an additional level of treatment may be achieved through land application with this method, nutrient contributions to LPO may be more direct than with typical land application, especially during runoff season. It is unclear if IDEQ would require application through snow with hydraulic and nutrient loading restrictions similar to liquid application, or whether this method would provide a reduction in overall non-point source loading over septic tank drain fields. Other concerns include the propagation of snow fog clouds under windy conditions, and whether this dispersal could cause odor and/or nutrient deposition issues elsewhere in the area.

5.3.5 Discharge to Lake Pend Oreille

The possibility of applying for a future IPDES permit (once Idaho DEQ primacy is initiated in July 2018) has been explored through several meetings with IDEQ staff from the state office in Boise and the Coeur d'Alene regional office. A future study exploring the specific path forward required for an IPDES permit application is planned. The study will analyze existing water quality monitoring efforts and TMDL evaluations, as well as attempt to quantify the net benefits to LPO water quality that would be associated with the transfer of existing and future septic systems to a new central wastewater treatment system treating to strict quality standards. Past DEQ meetings discussing the potential permit and the IPDES permitting path forward are discussed further in Sections 5.3.5.1 – 5.3.5.4.

It is assumed that any point discharge to LPO would require at a minimum a Total Phosphorus (TP) level below the near shore TMDL limit of 9 µg/L (0.009 mg/L), and possibly as low as 7.3 µg/L (0.0073 mg/L) per the Montana and Idaho Border Nutrient Load Memorandum of Agreement. Additional data on Lake Pend Oreille Clark Fork influent water quality is available through Clark Fork Coalition at https://clarkfork.org/.

5.3.5.1 DEQ Interaction to Date

Several meetings have been conducted with IDEQ regarding future IPDES permitting. These meetings seek to define the requirements that would be included by permit reviewers for submittal for a permit under the new IPDES system. Such requirements may include nutrient/dispersion modeling of the proposed outfall showing interaction of deep and near-shore waters, modeling of the proposed diffuser design, and a demonstration of net benefit to LPO waters compared to existing conditions.

In the most recent meeting on November 6th, 2017, several potential requirements were brought up by IDEQ staff for consideration of a future application. These requirements may include:

- Diffusion/dispersion modeling of the proposed outfall with respect to diffuser design and location and depth within the lake to rule out possibility of mixing of discharged water with near shore lake water;
    - May require nutrient/temperature dispersion modeling based on discharge location, diffuser design, and prevailing currents;
- Demonstration of the net nutrient benefit to the lake overall in terms of total phosphorus (TP):
    - If a near–shore discharge is considered, conversion of non-point source phosphorus contributions to a single point source at the minimum treatment standard or lower based on near-shore TMDL;
        - Show net benefit in TMDL balance of removing septic systems (i.e. overall more systems discharging to point source, but superior treatment results in fewer nutrients actually entering the near shore system);
    - If a deep-water discharge (> 52.5 feet) is considered, demonstration of net lower overall amount of TP released to lake, and benefit of dispersal in deep water outside of littoral zone where nutrient can contribute to nuisance plant and algae growth;
        - No current allocation (TMDL) for deep water;
    - Consideration of Montana-Idaho agreement for total nutrient loads, which are adjusted year-to-year based on flows;

- Consideration of seasonal mixing/turnover of lake water;
- Consideration of allowing for capping a total yearly quantity of discharge (hydraulic and nutrient based) and/or seasonal restriction or ban on discharge (i.e. during growing season).

The preliminary proposal would consist of a pipeline from the EBSD treatment facility along Peninsula Road following the same alignment as the proposed collection system about 6,200 feet towards Owens Bay. The pipeline would then extend about 5,280 feet along the bottom of LPO to deep water at minimum in excess of 52.5-foot definition of near-shore. The discharge to deep water would prevent eutrophication and nuisance aquatic plant growth as no light penetrates to this depth to facilitate photosynthesis. The discharge design would include a diffuser to broaden the application area and prevent the possibility of local buildup of discharge water. The estimated cost for construction of the effluent pipeline is about $400,000.

Future meetings with DEQ will continue to discuss the most effective way to present an improved nutrient balance incorporating the enhanced treatment of all peninsula systems and abandonment of septic systems near the lake shore. Future analysis would also take into account the technical and economic viability of producing 7.3 µg/L TP discharge. This analysis would require consideration of both near-shore and deep-water portions of the lake as well as adherence to border nutrient agreements.

5.3.5.2 Net Benefits Associated with Proposed System

Enhanced levels of treatment including superior removal of nutrients would directly benefit nearshore water quality through decreasing nutrient loads to the lake via septic seepage through groundwater. The impact of the above plan with respect to phosphorus loading to LPO will be further investigated in ongoing future IPDES permitting discussions with IDEQ. These discussions will include a numerical analysis of the effect of upgrading land application effluent quality as well as removing septic systems and in the future decommissioning one or more storage lagoons.

If a yearly limit cannot be achieved for an IPDES discharge permit to LPO, a non-growing season permit would still be beneficial as it would prevent the need to store treated effluent throughout the non-growing season, reducing the pond storage capacity requirements for the facility.

Net benefits to removing near shore septic systems and providing an enhanced level of Class A level treatment include:

- Removal of septic tanks from entirety of Hope peninsula;
- Reducing risk of current and future lagoon leakage to lake via groundwater;
  - Less storage requirements, would only utilize upper lakes for off-spec effluent which would be recycled to the front of the treatment system;
- Treatment to higher quality level than background influent from Clark Fork and background LPO testing levels;
- Land application would be of higher quality Class A reuse water
  - Would contain much lower nutrient concentrations
  - Could be land applied over a wider area defined by lower buffer requirements to increase soil retention time before ground water is encountered;
- Only discharging during non-growing season, avoiding timing of high nutrient loading in case any mixing of deep water with near shore water is possible.

5.3.5.3 Existing LPO Area NPDES Permits

Currently greater than 90% of nitrogen and phosphorus load entering LPO do so as influent from the Clark Fork River from Montana (Larson 2016). No point sources discharging directly to LPO are currently permitted, however the Kootenai-Ponderay Sewer District is permitted to discharge to the Boyer Slough, which flows into Kootenai Bay of Lake Pend Oreille. Non-point sources of nutrients include runoff from lawns and developments, storm water, and underground septic systems near the lake shore, as well as small streams.

The Pend Oreille River, the outlet of LPO, has several permitted surface water discharges under the current NPDES program including:

- City of Sandpoint (NPDES permit number ID-002084-2);
- Kootenai-Ponderay Sewer District (ID-002122-9);
- City of Dover (ID-002769-3)

The permits contain limits for pH, flow, BOD, TSS, chlorine residual, and bacteria, but are monitor only for nutrients including nitrogen and phosphorus.

5.3.5.4 Existing Water Quality Monitoring Data

IDEQ published a 5-year review for the nearshore TMDL for LPO in June 2015, and DEQ staff presented results of TMDL monitoring studies at a conference in 2016 (Larson 2016). These publications contain detailed water quality monitoring data from multiple study locations around the lake.

Additional water quality monitoring data for the years 2012 – 2015 is available from the Lake Pend Oreille Waterkeeper Alliance for 15 locations around the shore of the lake and in the Pend Oreille River outlet (see Reference 10).

5.3.6 Reduction of Groundwater Impacts

Residential developments on the Hope peninsula obtain their drinking water from groundwater wells. At seasonal high groundwater (during spring snowmelt), depth to groundwater at the facility is approximately 6 feet. The depth to ground water at other peninsula areas is unknown. Any permit applications to expand existing land application areas (including to existing Samowen Campground reuse irrigation sites) would require an investigation into potential impacts to groundwater considering the higher level of treatment and potential elimination of onsite septic systems within the peninsula. This includes the Hope Elementary school groundwater well, which is currently being monitored monthly for nitrates (See Section 3.5.2).

5.4 Final Screening of Alternatives

5.4.1 Collection System

The proposed collection system development includes:

- Phased expansion of collection system on Hope Peninsula, as LID allows;
  - By priority area to remove existing septic systems from service.
- Incremental improvements to existing lift stations as funding allows;
  - Prioritize standby power installation and improvement of efficiency and controls of existing pumps.

5.4.2 Treatment System

The selected alternative for the treatment facility is a modular design, single train MBR unit to be operated with the existing upper treatment lagoons as backup for off-spec discharge. This option will facilitate the most consistent and reliable treatment technology to produce Class A effluent for reuse and/or discharge. The MBR offers the advantage of a modular installation that can be easily upgraded with additional modular units as capacity demands with the expansion of the collection system along the Hope Peninsula. This will also allow the deferral of some capital equipment and installation costs until capacity is actually required.

Class A effluent is considered essential to address the need for expanded effluent disposal in the future. A system that consistently meets Class A requirements will allow for the most flexible multiple reuse options as capacity overwhelms the current storage lagoon and limited growing season land application area. Additionally, it will offer the best possible reduction in nutrient loading to LPO by eliminating onsite septic systems and treating wastewater to the highest possible quality.

A single MBR train unit will be designed for a capacity that will cover current ERU allocation, speculative ERU allocation, a portion of hope peninsula septic transfers, and growth in the existing EBSD service area for initial of operations. Each MBR train can also be installed with excess capacity for additional membrane modules to be added for incremental capacity flexibility between the purchases of full trains.

Future expanded operations would involve the installation of a second MBR train to allow expansion of service to the entire Hope Peninsula as the collection system is incrementally developed. The second MBR train will allow treatment redundancy as well as additional capacity.

5.4.3 Effluent Disposal/Reuse

Due to concerns that snow-making may result in a rapid influx of stored nutrients to the near shore waters of LPO immediately at the onset of spring thaw, and the relatively specific conditions required to operate snow making equipment effectively, this option has been tabled for the present analysis.

The permitting of additional land application in the immediate area of the EBSD treatment plant on the peninsula is unlikely due to the steep, rocky condition of the land, and the general lack of IWR for native forest land due to the prevailing climatic conditions. It is possible that incorporation of the Samowens wastewater to the facility could make that facility's existing land application are available for future permitting, however the facility generally has the same issues with hydraulic loading as the EBSD irrigation area. Additionally, the growing season only application ability constrains the amount of users that can be added to the system with the current treated effluent storage capability, which is also unlikely to expand due to space constraints.

Neither expanded Class C land application nor snow-making offer potential improvement to nutrient loading to LPO. Nutrient contirubtion will likely still be felt by the lake depending on climatic and soil conditions that control the speed and direction of groundwater movement and timing of snow melt.

For the above reasons, a year-round suitable discharge that is independent of meteorological and soil conditions is the best long-term solution for treated effluent disposal. Upgrading to Class A treatement quality is absolutely required to achieve this.

5.5 Evaluation of Sustainable Infrastructure

Efforts included in planning for the expansion of the collection and treatment system include:

- Management-based efforts:
  - Develop capital budget that is funded and supported by a capital improvement plan;
- Technology-based efforts:
  - Wastewater reuse when other alternatives have been considered in the facility planning process;
  - Class A reclaimed water distribution system ("purple pipe");
  - Variable frequency drive (VFD) pumps;
  - Supervisory control and data acquisition (SCADA) system installation;
  - The use of tertiary filtration that reduces ultraviolet disinfection power requirements will also be evaluated.

The above technologies are included in cost estimates for the proposed alternatives and collections system expansions. Construction of facilities not including the above efforts has not been considered. The ranking of each item in terms of relative cost and ease of implementation is indicated below. A detailed cost-benefit analysis for each item will accompany detailed design of the system when a cost for each alternative and its deviation from "base" pricing can be determined by consideration of manufacturer proposals and targeted alternative implementation strategies on the peninsula.

1. The use of VFD's for pumps and installation of a SCADA system for monitoring and control will be integral to the design of the MBR treatment system, and required by the manufacturer for standard automation to skid-mounted treatment equipment components. The use of VFD's and monitoring will improve the systems overall efficiency due to constant automatic system monitoring requiring no continuous operator intervention and automatic speed control and starting/stopping of pumps only when their use is necessary.
2. Management of the capital budget for design and eventual operation of the MBR treatment system will be supported by a capital improvement plan through the EBSD board. This effort will include funding details that consider potential LID's (see Section 7) and cost covreage based on both new installation and improvements to existing collection system infrastructure as well as improvements to the treatment facility.
3. The preferred method of treated effluent discharge will be reuse in some manner. The existing reuse irrigation area is hydraulically and seasonally limited for land application. The addition of a Class A reclaimed water distribution system ("purple pipe") will enable the use of treated water in areas across the peninsula, decreasing demand from public and private potable water systems and decreasing irrigation level on the land application area which could contribute to excessive runoff. Purple pipe reuse may start with limited availability, for example at the Sam Owens Campground, with eventual extension to other areas of the peninsula based on cost and potential demand for reuse quality water.
4. Tertiary filtration technology will be evaluated once further information regarding final discharge total phosphorus levels for a surface water discharge has been discussed with DEQ. Tertiary filtration will also be considered to further improve water clarity to reduce power requirements for UV disinfection after the MBR system.

6. RECOMMENDED ALTERNATIVE & IMPLEMENTATION

6.1 Construction Planning

The upgrades to the EBSD facility will be completed in phases over the next approximately 20 years to the full build out capacity as the Hope Peninsula is connected to the collection system and new residential development in the Hope and East Hope City areas is brought on to the system. The treatment system will be developed in so that multiple collection system upgrade phases can be accommodated within larger, modular capacity upgrades to the MBR system.

The detailed timing and magnitude of expansion phasing can be modified as the project develops to accommodate areas of the most need for collection system expansion based on funding available and the speed of new development. The MBR technology is flexible in adapting to this modular approach, in that multiple redundant or active MBR trains can be further expanded by adding or removing individual cassettes within each train to alter treatment capacity as required.

Current MBR technology is available from multiple vendors in the form of package systems pre-engineered to accommodate specific hydraulic flow and constituent loading. The package systems may be trailer or skid-mounted or consist of larger bioreactor tanks installed above or below ground. All collection system and non-modular treatment components will be designed to handle 40-year capacity requirements at initial construction. In this way, all modular components of the treatment system, including membranes and associated equipment, can be added sequentially according the final phased implementation plan developed by the district.

6.2 Proposed Collection System

Per IDAPA standards, all collection pipes must be at least 8 inches in diameter and sloped to provide sufficient scour velocity. The collection piping will be installed underneath the drinking water distribution system wherever they intersect, based on IDAPA spacing.

The collection system will convey the wastewater to a single lift station (lift station #4), which will feed the upper lagoons. The lift station is currently operating and consists of one active and one redundant pump in a wet well.

6.3 Proposed Treatment System

The proposed treatment system consists of primary sedimentation, flow equalization, and scum removal in existing lagoons, influent pumping and screening, biological treatment with nutrient removal, membrane separation, and UV disinfection. Each of these unit processes and other design considerations are discussed in the following sections.

6.3.1 Unit Processes

6.3.1.1 Influent Pumping

Submersible pump influent lift stations will collect wastewater from the gravity collection system and pump it to Lift Station #4, the final lift station before the treatment system. The lift stations will include one duty pump with one redundant standby pump. Costs for upgrades to existing plant lift stations are summarized in Table 14. These upgrades are not considered mandatory for expansion of the treatment; however the upgrades would improve the existing collection systems in the Hope and East Hope City areas.

A total of 10 new lift stations would be required to accommodate expansion on the Hope peninsula in three identified areas indicated in the collection system figure in Appendix K. The lift stations will be designed to accommodate fluctuations in raw influent flow while maintaining pump cycle times in approximately a 30-minute window to prevent septic conditions occurring within wet wells. Lift stations will be covered to minimize odors. Each lift station will include one duty pump and one standby/redundant pumps as well as controls and backup power equivalent to the operation of the existing EBSD collection system lift stations.

6.3.1.2 Screening

Secondary treatment involving MBR technology requires robust influent screening to prevent the buildup of inorganics on the membranes and to prevent membrane fouling. For this project, 2mm screening will be used. The screens (one duty, one standby) will be located next to the treatment plant. Screens can easily handle low flows at the beginning of the project. Influent screening is required for membrane manufacturer warranty compliance.

6.3.1.3 Flow Equalization

Existing upper lagoons offer up to 6.0 million gallons of equalization and sedimentation capacity prior to feed to the MBR system.

6.3.1.4 Biological Treatment with Nutrient Removal

The center of the wastewater treatment system is the single train (two-train in full build-out) biological treatment component. The MBR treatment strategy employs high concentrations of microbes maintained in a relatively small footprint to maximize treatment efficiency. The biological portion of the treatment system will be designed to treat the maximum month flow of 180,000 GPD at BOD and TKN concentrations outlined in Table 16. The biological portion of the treatment train will consist of a bolted steel bioreactor tank – with both anoxic and aerobic zones – and two MBR tanks. The anoxic tank will receive a recycle flow from the membrane tank of approximately 5 times the plant flow to remove total nitrogen and to maintain mixed liquor concentration in the bioreactor tank. Process pumps (permeate pumps, recycle pumps) will be mounted on a skid for modular convenience. Blowers will feed oxygen to the system via a fine bubble diffuser grid.

The mixed liquor concentration in the bioreactor tank will range from 8,000-10,000 mg/L at full build-out. Approximately 24% of the overall tankage volume will be thoroughly mixed under anoxic conditions to remove nitrate. The remaining 76% will be aerated to maintain dissolved oxygen concentration and support oxygen uptake by the biology.

The biological treatment system can be operated in pseudo-batch mode as needed during initial phases of development when there is low flow. Such startup operation has historically been performed for similar developments. An additional chemical phosphorus removal unit process can be added in the future if discharge and reuse permitting make it necessary to meet permit limits.

6.3.1.5 Membrane Separation

Hollow fiber membranes will be used for solids separation. This will allow the biology to be retained in the process tankage while clean effluent is permeated through the membranes. Permeate pumps (rotary lobe) will be used to pull clean water through the membranes, while centrifugal RAS pumps will recycle mixed liquor from the membrane tanks to the bioreactor tank.

The membranes can be periodically back-pulsed to inhibit fouling. A back-pulse tank will be supplied to hold clean permeate to be used during the back-pulse cycle. During back-pulse, the rotary lobe permeate pumps will pump in reverse of the normal direction, forcing clean liquid outward through the hollow fiber membranes, purging them of accumulated solids.

A periodic cleaning cycle is also required. Chemical metering skids will supply sodium hydroxide and citric acid during cleaning cycles to remove organic fouling from the membrane surface. Low flows at the beginning of the project are allowable through the membranes. Typically, there is only a maximum flux limitation on membranes.

6.3.1.6 UV Disinfection

Class A reuse water requires consistent and reliable disinfection. A UV disinfection system will be used to neutralize any coliform or otherwise pathogenic biology in the effluent. UV is a reliable and commonly used technology for disinfection and is especially useful in this application because of the low solids levels in the filtered effluent. UV technology can achieve up to 5-log inactivation of viruses. The proper UV dose necessary to achieve this log inactivation will be determined during the preliminary engineering phase. Performance data to verify such inactivation will be collected from the UV system supplier during the submittal process. Initially a single UV system will be provided. As long as the current land application system remains active, chlorine disinfection will function as the backup disinfection redundancy. When it is necessary to install a second train, an additional single UV system will be provided with the second train, with redundancy preserved using a future third UV system at the point when a new reuse option is permitted that requires UV system redundancy.

The UV system will be supplied with an uninterruptable power supply. This will prevent the system from going down when power is lost before the backup generator is able to activate.

6.3.1.7 Waste Activated Sludge

Sludge production will arise from oxidation of organic material, and some small amounts of sludge will be produced through the oxidation of inorganic nitrogen. At Phase 1 conditions (90,000 GPD, 1/2 design flow with a single MBR train) approximately 160 lbs. /day of sludge will be produced and wasted. At the full build-out condition, approximately 350 lbs. /day of sludge will be produced and wasted. At 10,000 mg/L of WAS TSS, this will correspond to approximately 1,800 GPD of waste sludge in Phase 1 and 3,800 GPD at full build out.

The sludge will already be at high concentration (~1%) because of the MBR configuration and will be disposed of directly to the upper lagoons. The net effect of the additional sludge wasted to the 6.0-million-gallon capacity upper lagoons will be accounted for in the monitoring and scheduling of lagoon dredging, at which time the sludge may be dewatered and landfilled. Alternatively, if the lower lagoon is decommissioned when the upper lagoons require dredging, land application of the dredge solids will be considered to infill the lower storage lagoon and stabilize the solids. Economics will be the main consideration regarding future solids handling options.

Low flows during the initial phases of development produce less waste sludge. Since sludge wasting does not (and typically is not) continuous throughout a 24-hour day, the low waste sludge rate can easily be accommodated with a sludge pump designed for full system capacity. The discharge will be located away from the inlets and outlets of the upper lagoons to prevent short circuiting of the solids back to the MBR system before they have had time to properly settle.

6.3.2 Effluent Quality

The proposed MBR system will produce high quality effluent suitable for Class A reuse water. The predicted effluent quality parameters for the MBR system are shown in Table 19. The MBR system will be designed to incorporate treatment for all parameters outlined in the IPDES and reuse permit applications, which may include total dissolved solids, pH, phosphorus, temperature, and any other constituents required to maintain compliance with the Ground Water Quality Rule and normal surface water protection discharge rules.

Table 19 - MBR Effluent Quality

Parameter	Units	Effluent
BOD	mg/L	≤5.0
TSS	mg/L	≤5.0
Turbidity	NTU	≤0.2
Nitrate*	mg/L	≤6.0
Total Phosphorus*	mg/L	≤0.0073

**The required nitrate and phosphorus levels for effluent disposal will depend on the most restrictive disposal option permitted. For purposes of this facility plan, a nitrate level of ≤6 mg/L is achievable without external carbon addition. If the reuse permit application determines that higher nitrate removal is required, external carbon addition will be included in the preliminary engineering stage. If the reuse permit determines higher phosphorus removal is required, chemical removal will be included in the preliminary engineering stage.*

6.3.3 Provisions for Growth

The treatment trains are sized for the full incorporation of existing users and future growth in the Hope and East Hope City areas as well as the Hope peninsula existing residents and future developments. This means that the tankage, piping, pumps, and all other equipment will be able to accommodate the full build-out conditions considering 1,084 total ERU's discharging to the system and peak hydraulic flows.

6.3.4 Phasing Plan

The only modular portion of the single train MBR design is the number of membrane cassettes installed in the membrane tanks. During the preliminary phases of development, a certain number of membrane cassettes will be installed in the membrane tanks, with spare space available. As more users are added to the system or the EBSD district boundary is expanded, additional membrane trains will be installed to meet the hydraulic load requirements while maintaining proper flux rate on the membranes. The additional train(s) will allow similar future capacity by providing additional membrane cassette space that can be filled immediately or as required.

6.3.5 Redundancy

This Class A treatment system will be designed to meet all requirements for redundancy listed in IDAPA 58.01.17 Section 611 and IDAPA 58.01.16 Section 455.

The influent lift station currently operates as a duplex pump system. A single pump accommodates the entire flow, while a second pump is installed in the lift station as a redundant spare. To maximize life of the pumps, the two will likely be cycled periodically. This approach is n+1 redundancy for the influent lift station pumps. As additional users join the system, the pumps can be replaced with larger units or a third pump can be added to retain redundancy.

The upper storage lagoons will also act as primary sedimentation vessels, allowing heavy grit and solids to settle out over an extended HRT prior to feed to the MBR tanks. Influent screening will likely still be required prior to transfer to the bioprocess tanks. The additional screening will extend the life of the membranes by protecting them from large particles.

To enhance the overall reliability of the Class A system, a liberal amount of equalization volume will be designed at the front end of the treatment trains. This can be accomplished utilizing existing upper treatment lagoons as storage. A single lagoon can be taken offline with EQ flow bypassing to the other upper lagoon if required. As expansion phases continue, the two lagoons should be more than adequate to provide equalization storage (up to 6.0 million gallons).

Influent equalization (the upper treatment lagoons) include sufficient volume to store influent wastewater while the bioprocess tank is drained for maintenance, increasing the reliability of the entire Class A treatment system. The only equipment inside the bioprocess tank itself which would require maintenance is the fine bubble diffuser grid. In municipal wastewater systems these grids typically operate for decades without requiring major maintenance. If fouling becomes more of an issue than expected, diffuser manufacturers also have methods for clean-in-place (CIP) of the diffuser grids, which means that the bioprocess tank will not need to be taken out of service. Nonetheless, to ensure overall reliability of the system and to provide a way of taking the bioprocess tank out of service, a liberal amount of EQ storage will be provided (see preceding paragraph). A 24-hour period is sufficient to drain the bioprocess tank (~4hr), and to enter the tank and perform maintenance on the PVC pipe header or the diffuser discs. Upon completion of the maintenance, stored activated sludge (from the sludge holding tank) can be pumped back into the tank up to the desired MLSS concentration, and influent wastewater can then be introduced again to the bioprocess tank. The bioprocess tank will therefore be reliable in its operation to produce Class A effluent.

Sufficient redundancy will also be built into the biological MBR treatment system. The MBR technology is inherently robust, being able to withstand fluctuation in flow and load without upsetting. In initial phases, the MBR train can be temporarily removed for service and influent can be allowed to accumulate in one of the upper ponds until the train can be brought back online.

In later phases, one of the two MBR trains can be taken off line for a period of time (two days to thirty days depending on actual diurnal loading) without permanently fouling the membranes or adversely affecting effluent quality. During outage of one of the treatment trains, the train remaining on line will may experience higher loaded but will be capable of handling the full hydraulic and organic load during that time. Fully redundant process pumping is included with each train. This design approach for the MBR trains constitutes n-1 redundancy.

The UV disinfection system will include two UV units in a duty/standby configuration. In this configuration, one of the UV units will be able to disinfect the entire plant flow at any given time. If

that UV unit goes down for any reason, the standby unit will be turned on. This configuration constitutes n+1 redundancy for the UV system.

Sludge storage in the upper lagoons will not have a continuous input, since solids can be accumulated in the biological treatment system for several days at a time if needed. The 6.0 MG of storage space will be sufficient to storage all sludge wasted from the system through the full build-out. Under normal operation, the waste sludge will be pumped equally to both lagoons. If one of the upper lagoons requires maintenance or repair, the other lagoon will serve as the sludge wasting point. Solids storage in the upper lagoons is therefore reliable in its operation for Class A effluent performance.

All other components of the IDAPA redundancy rules for Class A systems not explicitly discussed above are understood, and all redundancy requirements will be thoroughly abided by in the final design of the system as presented in the PER.

The PFD for the proposed alternative (see Appendix A) shows the redundancy built in to the system to satisfy Class A requirements, including:

- Back-up process feed pumps;
- Back-up aeration blowers;
- Back-up permeate pumps;
- Lined bypass pond for off-spec effluent;
- Return pump for off-spec effluent;
- Multiple reuse options for each season.

6.3.6 Off-Spec Effluent Detection and Diversion

IDAPA redundancy rules require either an alternate form of effluent disposal or a lined effluent storage pond in case the effluent ceases to meet Class A requirements. This regulation is met by retaining existing functioning treatment and storage lagoons operational. This will allow off-spec effluent to be sequestered for return to the head of the MBR plant or to be held until it can be discharged to a lower reuse class option such as land application in the current Class C area.

6.3.7 Standby Power

Standby power will be provided in the form of an engine/generator set to ensure electrical generation in the event of a power grid outage. This system will be designed to meet IDAPA requirements.

Generator requirements for lift stations are as follows (assuming diesel fuel for all):

- Lift station #1 and #3 each have 20 HP/15 kW pumps
  - 15 kW generator with conduit, ATS, and installation estimated $20,000 each
- Lift station #2 has 7.5 HP/5.6 kW pumps
  - 5.6 kW generator with conduit, ATS, and installation estimated $15,000
- Lift station #4 has 50 HP/37.3 kW pumps
  - 40 kW generator with conduit, ATS, and installation estimated $60,000

There is an existing 80 kW Kohler diesel generator onsite at the main operations building near the lower storage lagoon. An additional trailer-mounted 60 kW diesel generator is located onsite to power lift stations #1, #2, and #3.

Table 20 - Lift Station Generator Requirements & Estimated Costs

LS 1 and 3 each have 20 HP pumps	20 HP = 15 kW	
LS 2 has 7.5 HP pumps	7.5 HP = 5.6 kW	
LS 4 has 50 HP pumps	50 HP = 37.3 kW	
15 kW with generator, conduit, ATS, and installation estimate:	$20,000.00	ea.
5.6 kW with generator, conduit, ATS, and installation estimate:	$15,000.00	ea.
**Assume diesel fuel for all generators.*		

Generator requirements for the treatment plant include an estimated 140 kW diesel unit with ATS during Phase 1. In addition, the UV disinfection units will be supplied with an uninterruptable power supply to prevent lapses in operation during power transfers.

6.3.8 Operation

The proposed MBR system will be a Class III wastewater treatment system based on the IDEQ classification worksheet attached in Appendix C. Operation requirements (man-hours) will increase over the course of the expansion of the service area.

EBSD currently employs a single full-time Class I operator. An additional full or part-time maintenance person may be required in the future for maintenance and inspection of the expanded collection and treatment system. The salary for a small-town Class III operator with experience is expected to be $50,000-$60,000 per year.

Table 21: Operator Requirements

Operator	Hourly Rate ($/hr.)	Current Phase (Hr. /wk.)	Add Peninsula (hr. /wk.)	Future (hr. /wk.)
Class III Licensed	$25-$30	40	40	40
Labor I	$15	0	20	40
Labor II	$15	0	0	20

During initial operation, which corresponds to approximately the current loading experienced by the plant, the MBR system will be operated in batch mode since not enough hydraulic or organic load exists to maintain continuous activity, and there may be only a seasonal discharge need for Class A effluent prior to full reuse/discharge permitting of the system. During the batch mode process, it is assumed that operation requirements will be intermittent. Similarly, as flow and load ramp up during addition of new users to the system, intermittent operation will be also required. It is assumed for the sake of OPEX cost estimation that more frequent operator time is required. Once a majority of Hope Peninsula users are added to the system, it is assumed that a full-time operator and potentially a new part-time maintenance worker will be required to maintain the system.

An operation and maintenance cost estimate for the SBR and MBR alternatives appears in Appendix J.

6.4 Proposed Disposal System

6.4.1 Effluent Disposal

In the short term, the EBSD treatment facility will continue to store and discharge effluent to the existing land application site. As the facility upgrades to the proposed MBR treatment system, additional reuse options utilizing Class A effluent will be explored for permitting to the system, as storage in the lagoons will be inadequate to hold all treated effluent produced during the non-growing season. At this point, a reuse option that allows the flexibility of year-round discharge options must be permitted. In addition to providing for year-round discharge, reuse options should also allow for disposal of effluent that meets Class C requirements (but not Class A) in the current method via land application with sufficient buffers and restricted access/use.

The current ranking of options for reuse/discharge expansion include (in order of priority):

1. Discharge of Class A effluent to LPO under a new IPDES permit
2. "Purple Pipe" reuse for Samowens campground toilets and irrigation, as well as residential irrigation and fire suppression requirements within the district
3. "Purple Pipe" reuse for irrigation of nearby Hope Elementary School grounds during the summer (when school is not in session)
4. Expansion of existing Class C land application sites on the peninsula to include former Samowens application site (6.0 acres).
5. Expansion of land application to new Class A sites on the peninsula opened due to higher treatment to Class A requirements.
6. Diversion of non-Class A effluent back to the front of the plan with storage in existing lagoons until it can be retreated by the system.

Requirements for Class A effluent are listed in the Table 22.

A detailed design and proposal including a nutrient balance study considering the impacts to near shore waters of LPO by decommissioning existing onsite septic systems and adding peninsula users to the EBSD system and corresponding hydrogeological study will be conducted during the preliminary engineering phase for exploring an IPDES discharge to the lake. The intent is that a PER for the upgraded wastewater treatment system and a permit application for the IPDES discharge permit will complement each other, giving detailed design information regarding effluent quality and discharge requirements for the system based on continued IDEQ collaboration. The design phosphorus limit will be especially key and will be established during the IPDES permit application process in conjunction with IDEQ review.

It is planned that application permits for an IPDES permit, Class A reuse activities, and expanded land application will be submitted during the design process.

Table 22: Treatment Requirements of Municipal Recycled Water

Effluent Classification Table						
Classification		**Class A**	**Class B**	**Class C**	**Class D**	**Class E**
Oxidized		Yes	Yes	Yes	Yes	No
Clarified		Yes	Yes	No	No	No
Filtered		Yes	Yes	No	No	No
Disinfected		Yes	Yes	Yes	Yes	No
Total Coliform (organisms/ 100 mL)	Median results for last x-days for which analysis have been completed	2.2 7-day median	2.2 7-day median	23 5-day median	230 3-day median	No Limit
	Maximum in any sample	23	23	230	2300	No Limit
	Monitoring frequency	Daily or as determined	Daily or as determined	Once weekly or as determined	Once monthly or as determined	
Disinfection Requirements Contact Time		Contact time of 450 mg-min L with 90 min of modal time Or Disinfection to 5-log inactivation of virus	Total chlorine not less than 1 mg/L after 30 min contact time at peak flow Or Alternate process comparable to this			

6.4.2 Solids Disposal

The activated sludge MBR system will produce waste solids to control the MLSS concentration in the reactor. Under Phase 1 conditions (90,000 GPD, 1/2 design flow with a single MBR train) approximately 160 lbs. /day of sludge will be produced and wasted. At the full build-out condition, approximately 350 lbs. /day of sludge will be produced and wasted. At 10,000 mg/L of WAS TSS, this will correspond to approximately 1,800 GPD of waste sludge in Phase 1 and 3,800 GPD at full build out.

The sludge will already be at high concentration (~1%) because of the MBR configuration and will be disposed of directly to the upper lagoons. The net effect of the additional sludge wasted to the 6.0-million-gallon capacity upper lagoons will be accounted for in the monitoring and scheduling of lagoon dredging, at which time the sludge may be dewatered and landfilled. Alternatively, if the lower lagoon is decommissioned when the upper lagoons require dredging, land application of the dredge solids will be considered to infill the lower storage lagoon and stabilize the solids. Economics will be the main consideration regarding future solids handling options. The necessity of dewatering equipment prior to land application will be assessed at that time.

6.5 Drinking Water Impacts

Presently there is no drinking water infrastructure on site. Most residences in the area receive their drinking water from domestic wells on their property. All new infrastructure will be designed using the IDAPA rules for spacing between drinking water and sewer pipes. All irrigation and buffer

restrictions for Class A effluent will be followed. The irrigation and buffer restrictions as currently planned for are shown in the following table.

Table 23: Irrigation and Buffer Restrictions for Recycled Water

Recycled Water Uses	Class A	Class B	Class C	Class D	Class E
Uses relating to Irrigation and buffers					
Buffers required	No	Yes	Yes	Yes	Yes
Fodder, fiber crops	Yes	Yes	Yes	Yes	Yes
Commercial timber, firewood	Yes	Yes	Yes	Yes	Yes
Processed food crops or "food crops that must undergo commercial pathogen-destroying processing before being consumed by humans"	Yes	Yes	Yes	Yes	No
Ornamental nursery stock, or Christmas trees	Yes	Yes	Yes	Yes	No
Sod and seed crops not intended for human ingestion	Yes	Yes	Yes	Yes	No
Pasture for animals not producing milk for human consumption	Yes	Yes	Yes	Yes	No
Pasture for animals producing milk for human consumption	Yes	Yes	Yes	No	No
Orchards and vineyards irrigation during the fruiting season, if no fruit harvested for raw use comes in contact with the irrigation water or ground, or will only contact the inedible portion of raw food crops	Yes	Yes	Yes	No	No
Highway medians and roadside vegetation irrigation on sides	Yes	Yes	Yes	No	No
Cemetery irrigation	Yes	Yes	Yes	No	No
Parks, playgrounds, and school yards during periods of non-use	Yes	Yes	No	No	No
Parks, playgrounds, and school yards during periods of use	Yes	No	No	No	No
Golf courses	Yes	Yes	No	No	No
Food crops, including all edible food crops	Yes	Yes	No	No	No
Residential landscape	Yes	No	No	No	No

While Table 23 does not include buffer requirements, it is understood that IDAPA 58.01.16 Section 603.01.d mentions that drinking fountains, picnic tables, food establishments, and other public eating facilities shall be placed out of any spray irrigation area if the irrigation system is using Class A recycled water. Additionally, it is understood that DEQ guidance suggests a 50-foot buffer for water supply wells or springs and a 500 foot buffer for drinking water reservoirs. These buffers will be accommodated in the final site layout and be explicitly shown in the contract drawings to ensure compliance with new application areas.

6.6 Power Redundancy

Standby power will be provided in the form of an engine/generator set to ensure electrical generation in the event of a power grid outage. This system will be designed to meet IDAPA requirements. The estimated generator size required for a single MBR train and associated equipment is about 160 kW.

7. FUNDING AND FACILITY PLAN ADOPTION

Funding for the collection system expansion and treatment plant upgrades will be handled separately to establish a system that provides fair and equal benefit and cost burden to existing district members in the Hope and East Hope areas and proposed new district members on the Hope Peninsula.

7.1 Funding Sources and Current Funding Outlook

To keep user rates affordable and comparable to similar rural communities, District expansion will need to be financed by low-interest loans and grants. Multiple state and federal agencies have financing programs to assist rural communities with infrastructure expansion although the diversity of the economic profile within the planning area makes equitable cost-benefit distribution unique.

State and federal funding programs require that every wastewater connection receive equitable benefit regardless of economic status. While the peninsula users will directly benefit from the collection expansion, all users will benefit from the expansion of the treatment and disposal system. Equitable distribution of debt from the expansion should consider the collection system expansion separate from treatment and disposal improvements. This can be achieved by implementing a Local Improvement District (LID) on the peninsula area that is directly benefiting from the collection system expansion. The treatment portion of the project costs could then be distributed evenly across all users. With this scenario, the project would be split in to two distinct components; collection and treatment. Each would have a separate funding package funded by one or more of the following sources.

7.1.1 USDA Rural Development

The Community Facilities program is designed to help local governments in rural areas of the state to provide essential facilities and services. The District has an existing loan with USDA Rural Development. Funding available through this program includes guaranteed loans, direct loans and grant funds. Grant funds, which do not require repayment, require a median household income of $49,561 or less. An income survey would be required to determine grant eligibility of the District.

Loan funds may be used to construct, enlarge, or improve community facilities for health care, public safety and public services. This can include costs to acquire land needed for a facility, pay necessary professional fees, and purchase equipment required for its operation. Refinancing existing debts may be considered an eligible direct loan purpose if the debt being refinanced is a secondary part of the loan, is associated with the project facility and if the applicant's creditors are unwilling to extend or modify terms for the new loan to be feasible.

Loan repayment terms may not exceed the applicant's authority (under state law or organizational structure), the useful life of the facility or a maximum 40 years. The interest rate will likely be in the 3% range and is updated quarterly based on the prime rate.

7.1.2 Idaho DEQ Clean Water Loan Fund

DEQ's Clean Water Loan Fund provides below-market-rate interest loans to help repair or build new wastewater facilities. Loans of up to 100 percent of project costs may be awarded for project design and/or construction.

For fiscal year 2018 (July 1, 2017-June 30, 2018), the interest rate for loans ranges from 1.75% to 2.75%. These loans must be fully repaid within 20 to 30 years of project completion. However, 30-

year loan terms are only available if users pay more than 1.5 percent of median household income for wastewater services.

7.1.3 Idaho Department of Commerce Block Grant

The Idaho Community Development Block Grant program (CDBG) assists Idaho cities and counties with the development of needed public infrastructure. The program is administered by Idaho Department of Commerce, Division of Economic Development, with funds received annually from the U.S. Department of Housing and Urban Development.

CDBG grant funds, which do not require repayment, are used to construct projects that benefit low and moderate-income persons, help prevent or eliminate slum and blight conditions, or solve catastrophic health and safety threats in local areas. To qualify, an income survey will be required to determine if at least 51% of residents are low- to moderate income. Special service providers, such as sewer districts, must also be sponsored by the county to receive funds.

Applications are due annually the Friday before Thanksgiving and a State certified Block Grant Administrator must be procured for administration of the funds.

7.1.4 Local Improvement District (LID)

A LID is a specific geographic boundary encompassing a neighborhood or business district and formed by a group of property owners working together to bring about needed capital improvements within that boundary. A LID provides a funding mechanism to property owners for the design and construction of desired improvements that solely benefit that area.

The LID process requires a petition to be signed by at least 60 percent of the resident owners, or 2/3 of the owners of property subject to assessment, authorizing the District to charge the petitioners fees to cover expenses. After initiation, the District adopts a resolution giving notice of its intention to create the LID, to make improvements, and to levy assessments.

The LID would likely be financed by USDA Rural Development or Idaho DEQ in the form of a low-interest loan. Both of these agencies are familiar with projects that utilize LIDs, although each scenario is unique, and the District should consult directly with a Loan Specialist from the USDA Rural Development and Idaho DEQ offices in Coeur d'Alene.

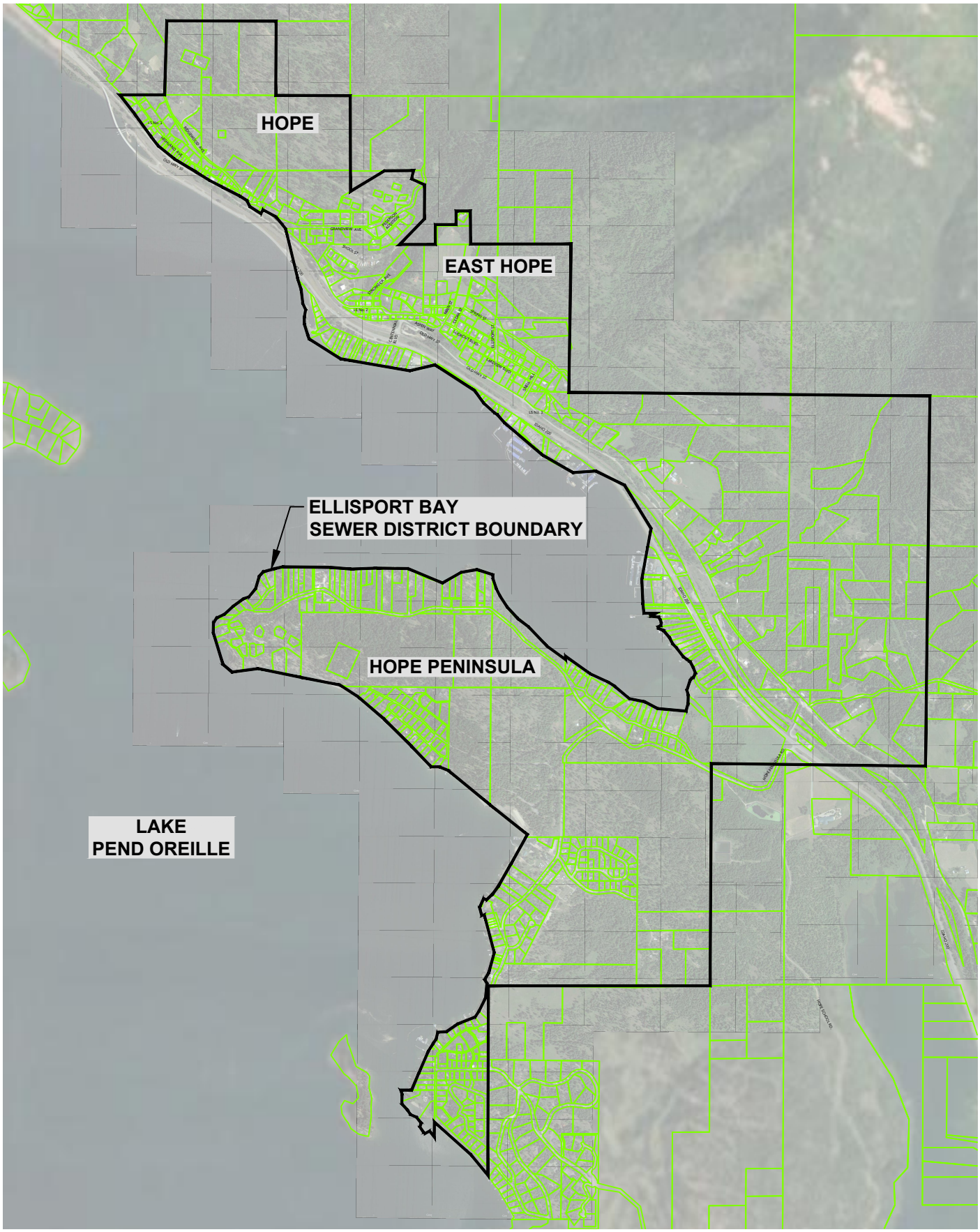
8. REFERENCES

1. Ruen-Yeager & Associates, Inc. Facility Plan - Ellisport Bay Sewer District Including the Hope Peninsula. December, 1995.
2. Idaho Department of Environmental Quality. "Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater." September 2007.
3. EBSD Flow Monitoring and Irrigation Data provided by Dex Vogel via email. May 2, 2017.
4. Larson, Kristin, and Robert Steed, Idaho Department of Environmental Quality. "TMDL Nutrient Targets for Nearshore Waters of Lake Pend Oreille, ID – An Evaluation using Long-Term Trophic and Periphyton Productivity Monitoring Data. INational Water Quality Monitoring Conference. May 2016.
5. US EPA. Current NPDES Permits in Idaho. Available at: https://yosemite.epa.gov/r10/water.nsf/npdes+permits/current+id1319
6. Idaho Department of Environmental Water Quality. Current Permits Issued by IDEQ. Available at: http://www.deq.idaho.gov/permitting/issued-permits/?page=5&records=25&type=Wastewater%20Reuse&sort=nameAscending
7. Tetra Tech, Inc. "Total Maximum Daily Load (TMDL) for Nutrients for the Nearshore Waters of Pend Oreille Lake, Idaho." Submitted by Idaho Department of Environmental Quality. April 2002.
8. Idaho Department of Environmental Quality. "Nutrient TMDL for the Nearshore Waters of Lake Pend Oreille, Idaho – TMDL Five-Year Review." June 2015.
9. Idaho Department of Environmental Quality. "M-152-04 Ellisport Bay Sewer Board, Staff Analysis Supporting Reuse Permit Issuance." June 18th, 2016.
10. Lake Pend Oreille Water Keepers. LPO water quality monitoring data – 2012-2015. Available at: http://www.lakependoreillewaterkeeper.org/water-quality-monitoring-program.html#.WQISbRPythE
11. Robinson 2004. Ellisport Bay Water and Sewer District, Silvicultural Plan, December 21, 2004. Permit LA-000152-02.
12. Montana and Idaho Border Nutrient Load Memorandum of Agreement. Available at: http://www.deq.idaho.gov/media/468512-water_data_reports_surface_water_water_bodies_pend_oreille_lake_nutrient_moa.pdf

9. APPENDICES

A. Preliminary Drawings
B. Ellisport Bay Sewer District Facility Map (IDEQ Reuse Permit LA-000152-03)
C. Proposed Future Wastewater Treatment System Classification Worksheet
D. Proposed Future Wastewater Collection System Classification Worksheet
E. Capacity Analysis of Existing Treatment Plant Based on Current Active O&M ERU's
F. EBSD Groundwater Well #5320 Drilling Log
G. Lagoon Enhancements Treatment Alternative Cost Estimate
H. SBR Treatment Alternative Cost Estimate
I. MBR Treatment Alternative Cost Estimate
J. Operations and Maintenance Cost Estimates – MBR and SBR Alternatives
K. Collection System Expansion Figure
L. Collection System Expansion Cost Estimate
M. US Fish & Wildlife Service IPaC Trust Resource Report
N. EBSD Area Flood Insurance Rate Maps (FIRM's)
O. USFWS National Wetlands Inventory Map
P. NRCS Soils Map
Q. Bonner County Land Use Zoning Map
R. Zip Code Area Map and Population – US Census Bureau Data

Appendix A:
Preliminary Drawings



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Mountain WATERWORKS

ENGINEERING AND ENVIRONMENTAL SOLUTIONS
1161 W. RIVER ST. SUITE 130
BOISE, IDAHO 83702
208.780.3990

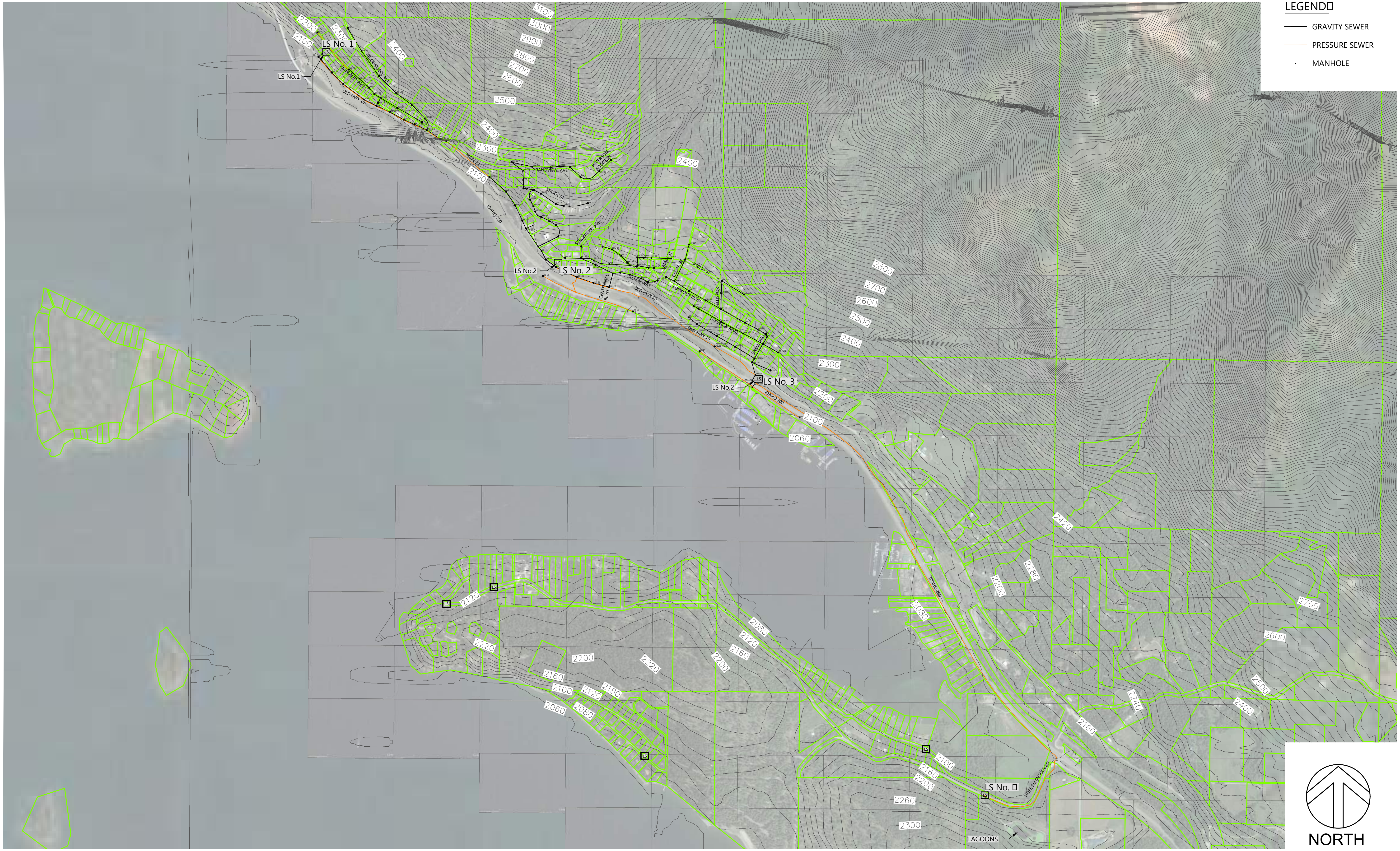
IDAHO OFFICES
BOISE · LEWISTON · Coeur D'Alene

ELLISPORT BAY SEWER DISTRICT

DISTRICT BOUNDARY

PROJECT NO.: 180.0020.01

SHEET NO. FIGURE 1



PROJECT	180.0020.01
DATE	6/14/2017
FIGURE NO.	

FIG. 1

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

Mountain WATERWORKS

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ELLIS PORT BAY SEWER DISTRICT
HOPE, IDAHO

COLLECTION SYSTEM FIGURE

LEGEND:

- EXISTING MANHOLE
- EXISTING GRAVITY SEWER
- EXISTING PRESSURE SEWER
- PROPOSED GRAVITY SEWER
- PROPOSED PRESSURE SEWER
- DISTRICT BOUNDARY
- EXISTING LIFT STATION
- PROPOSED LIFT STATION

AREA 1

AREA 2

AREA 3

LS No. 1

LS No. 2

LS No. 3

LS No. 4

NORTH

Path: S:\Projects\MAP\Planner_1800\0020 Ellisport Bay\CREF\Ellisport Bay_Hope MH Base NEW1.dwg File Name: Ellisport Bay_Hope MH Base NEW1.dwg Plot Date: 12/15/2017 8:42 AM Dude

PROJECT	180.0020.01
DATE	8/19/2018
FIGURE NO.	FIG. 1A

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

T-O ENGINEERS

Mountain WATERWORKS

ENGINEERING AND ENVIRONMENTAL SOLUTIONS
1161 W. RIVER ST. SUITE 130
BOISE, IDAHO 83702
208.780.3990

IDAHO OFFICES
BOISE ·LEWISTON · COEUR D'ALENE

ELLISPORT BAY SEWER DISTRICT

HOPE, IDAHO

COLLECTION SYSTEM FIGURE

LEGEND

- EXISTING MANHOLE
- EXISTING LIFT STATION
- EXISTING GRAVITY SEWER
- EXISTING PRESSURE SEWER
- PROPOSED GRAVITY SEWER
- PROPOSED PRESSURE SEWER
- PROPOSED LIFT STATION

LS No.1
LS No. 1
LS No.2
LS No. 2
LS No.3
LS No. 3
RIDGEWOOD AVE.
HIGHLAND AVE.
OLD HWY 10
MAIN ST.
GRANDVIEW AVE.
PEDERSON ADDITION
SHOOL ST.
IDAHO 200
STRONG CR. AVE.
CENTENNIAL BLVD
ASPEN WAY
CEDAR ST.
SPRING ST
LOOKOUT BLVD.
ELLISPORT ST.
LAKEVIEW BLVD.
SWELL HILL

NORTH

PROJECT	180.0020.01
DATE	6/14/2017
FIGURE NO.	FIG. 2

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

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BOISE, IDAHO 83702
208.780.3990
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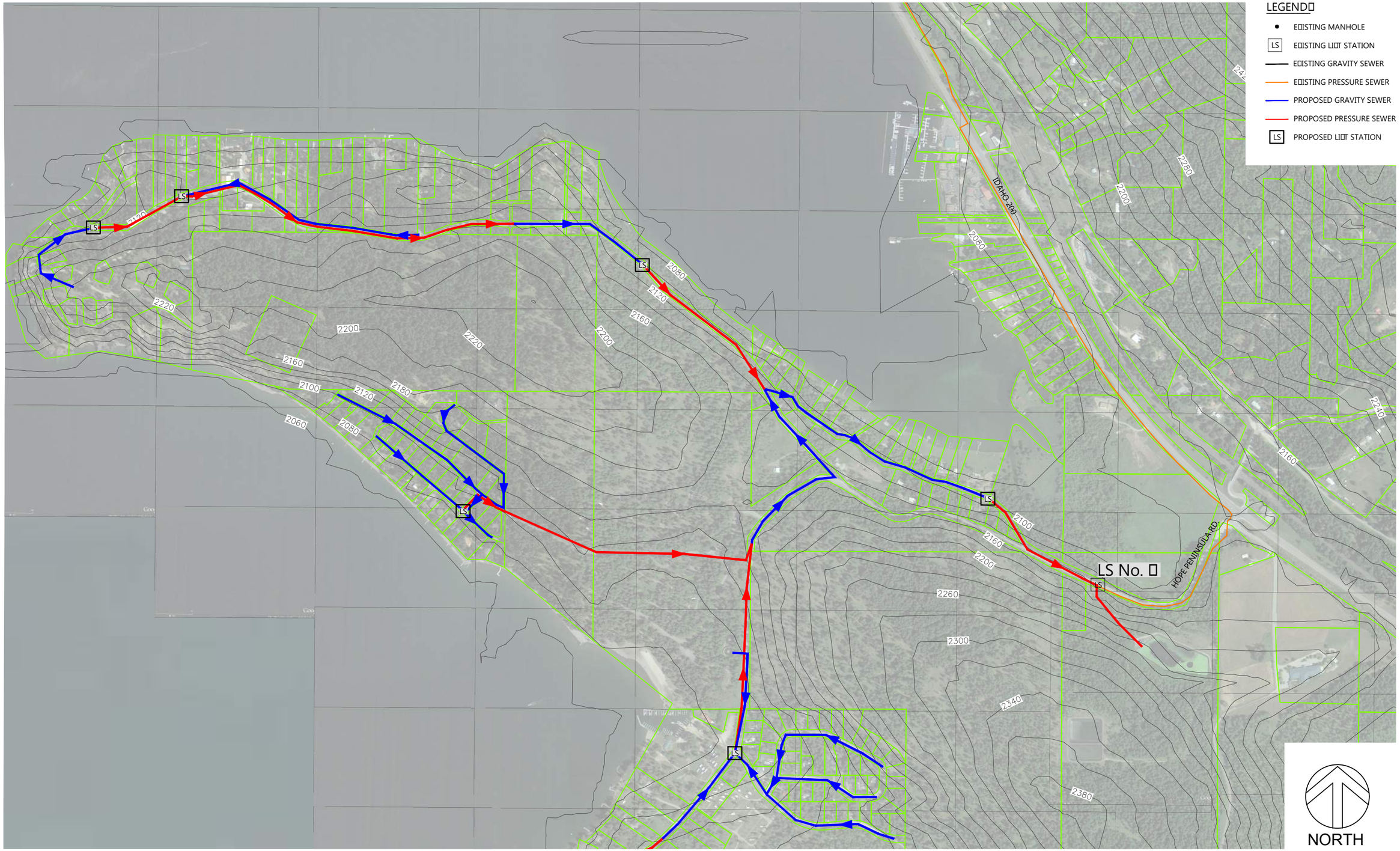
BOISE · LEWISTON · COEUR D'ALENE

ELLIS PORT BAY SEWER DISTRICT
HOPE, IDAHO

COLLECTION SYSTEM FIGURE



PROJECT	180.0020.01
DATE	6/14/2017
FIGURE NO.	FIG. 3

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

Mountain WATERWORKS

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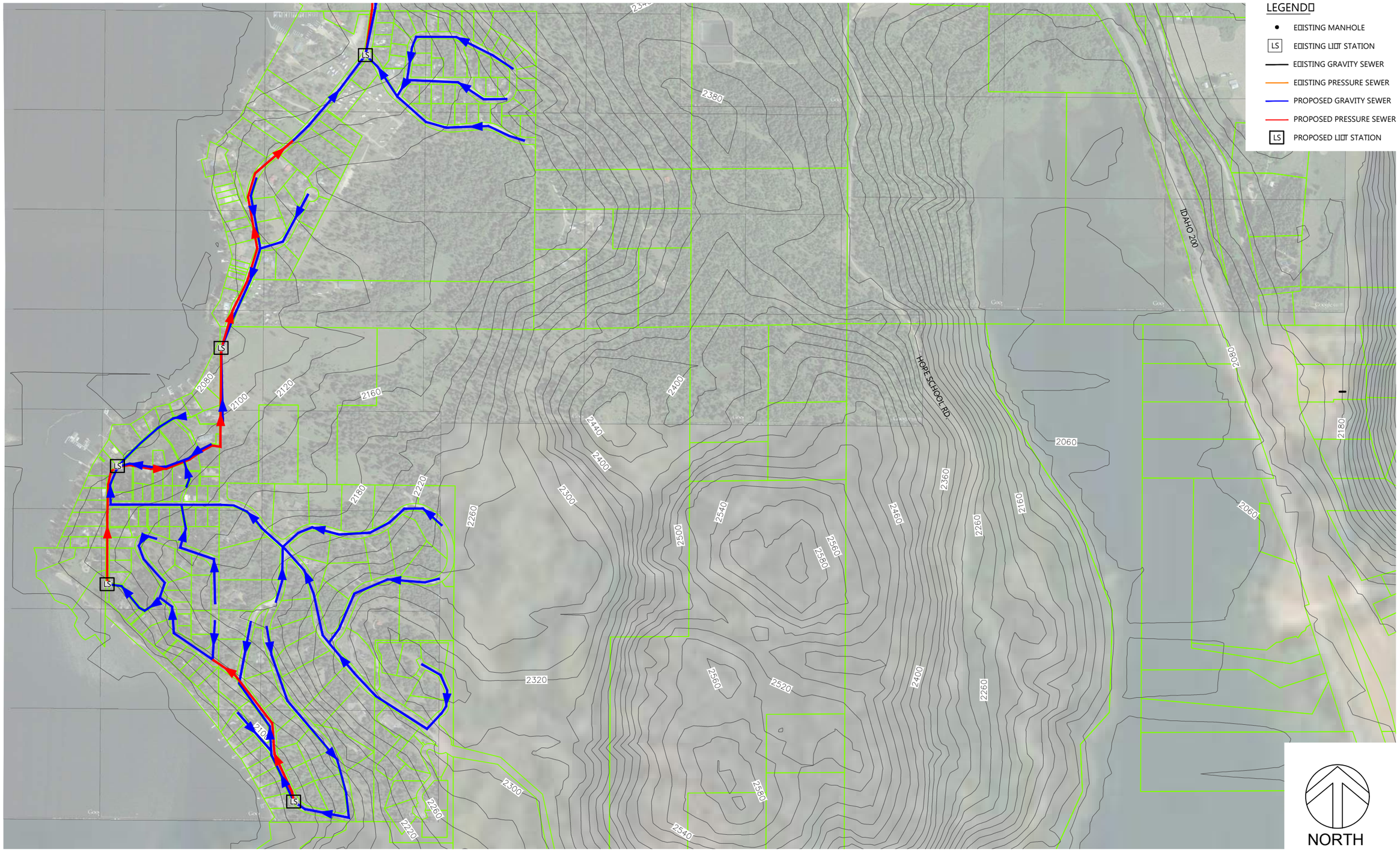
ELLIS PORT BAY SEWER DISTRICT

HOPE, IDAHO

COLLECTION SYSTEM FIGURE



PROJECT	180.0020.01
DATE	7/18/2017
FIGURE NO.	FIG. 4

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

Mountain WATERWORKS

ENGINEERING AND ENVIRONMENTAL SOLUTIONS
1161 W. RIVER ST. SUITE 130
BOISE, IDAHO 83702
208.780.3990

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ELLIS PORT BAY SEWER DISTRICT

HOPE, IDAHO

COLLECTION SYSTEM FIGURE

CITY OF HOPE GRAVITY COLLECTION SYSTEM

HOPE LIFT STATION #1

CITY OF EAST HOPE GRAVITY COLLECTION SYSTEM

EAST HOPE LIFT STATION #2

LIFT STATION #4

HOLIDAY SHORES RESORT GRAVITY COLLECTION SYSTEM

RESORT LIFT STATION #3

TREATMENT LAGOON #1

2.5 MG

ADS AERATORS (2)

TREATMENT LAGOON #2

3.5 MG

ADS AERATORS (2)

FACULTATIVE LAGOON (LOWER STORAGE LAGOON)

15.0 MG

ADS AERATORS (2)

SEASONAL IRRIGATION FLOW (MAY-OCTOBER)

CHLORINE DOSING PUMP

CHLORINE DAY TANK 500 GAL

IRRIGATION PUMP STATION (VERTICAL TURBINE PUMPS)

41.14 ACRES TOTAL

HMU#1 MU-152-01 8.32 ACRES

HMU#2 MU-152-02 8.17 ACRES

HMU#3 MU-152-03 8.30 ACRES

HMU#4 MU-152-04 8.17 ACRES

HMU#5 MU-152-05 8.18 ACRES

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	JB
DRAWN:	RK
CHECKED:	JB
APPROVED:	CH
PROJECT DATE:	DEC 2017
PROJECT NO.:	170084
SCALE:	NTS

ELLISPORT BAY SEWER DISTRICT
FACILITY PLAN

ALTERNATIVE C-1 NO ACTION-EXISTING CONDITIONS

DRAWING NUMBER

G1.0

REV A

PRELIMINARY NOT FOR CONSTRUCTION

SAVE TIME: 12/22/2017 8:36:31 AM
PLOT TIME: 12/22/2017 8:05 AM
USER NAME: TIM TOOLAN
XREF FILES: ###
FILE NAME: G:\10456 ELLISPORT BAY FACILITY PLAN\02 DWG\SHEETS\GENERAL SHEETS\G1.0 ALTERNATIVE C-1 NO ACTION EXISTING CONDITIONS.DWG

*ADD ADDITIONAL AERATORS AND BLOWERS TO TREATMENT LAGOONS AS ADDITIONAL ERU'S CONNECT TO SYSTEM UNTIL LAND APPLICATION LIMITATIONS REACHED.

CITY OF HOPE GRAVITY COLLECTION SYSTEM

HOPE LIFT STATION #1

CITY OF EAST HOPE GRAVITY COLLECTION SYSTEM

EAST HOPE LIFT STATION #2

LIFT STATION #4

HOLIDAY SHORES RESORT GRAVITY COLLECTION SYSTEM

RESORT LIFT STATION #3

AERATED LAGOON #1

2.5 MG

ADS AERATORS (2)

AERATED LAGOON #2

3.5 MG

ADS AERATORS (2)

ADS AERATORS

15 MG

FACULTATIVE LAGOON (LOWER STORAGE LAGOON)

SEASONAL IRRIGATION FLOW (MAY-OCTOBER)

SAGR/ BLUE WATER FILTER

CHLORINE DOSING PUMP

CHLORINE DAY TANK 500 GAL

IRRIGATION PUMP STATION (VERTICAL TURBINE PUMPS)

41.14 ACRES TOTAL

HMU#1 MU-152-01 8.32 ACRES

HMU#2 MU-152-02 8.17 ACRES

HMU#3 MU-152-03 8.30 ACRES

HMU#4 MU-152-04 8.17 ACRES

HMU#5 MU-152-05 8.18 ACRES

PRELIMINARY NOT FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	WR
DRAWN:	PE
CHECKED:	RB
APPROVED:	JB
PROJECT DATE:	DEC 2017
PROJECT NO.:	170084
SCALE:	NTS

ELLISPORT BAY SEWER DISTRICT
FACILITY PLAN

ALTERNATIVE LAGOON ENHANCEMENTS

DRAWING NUMBER

G1.1

REV A

SAVE TIME: 12/22/2017 8:36:25 AM
PLOT TIME: 12/22/2017 8:36:25 AM
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XREF FILES: ###
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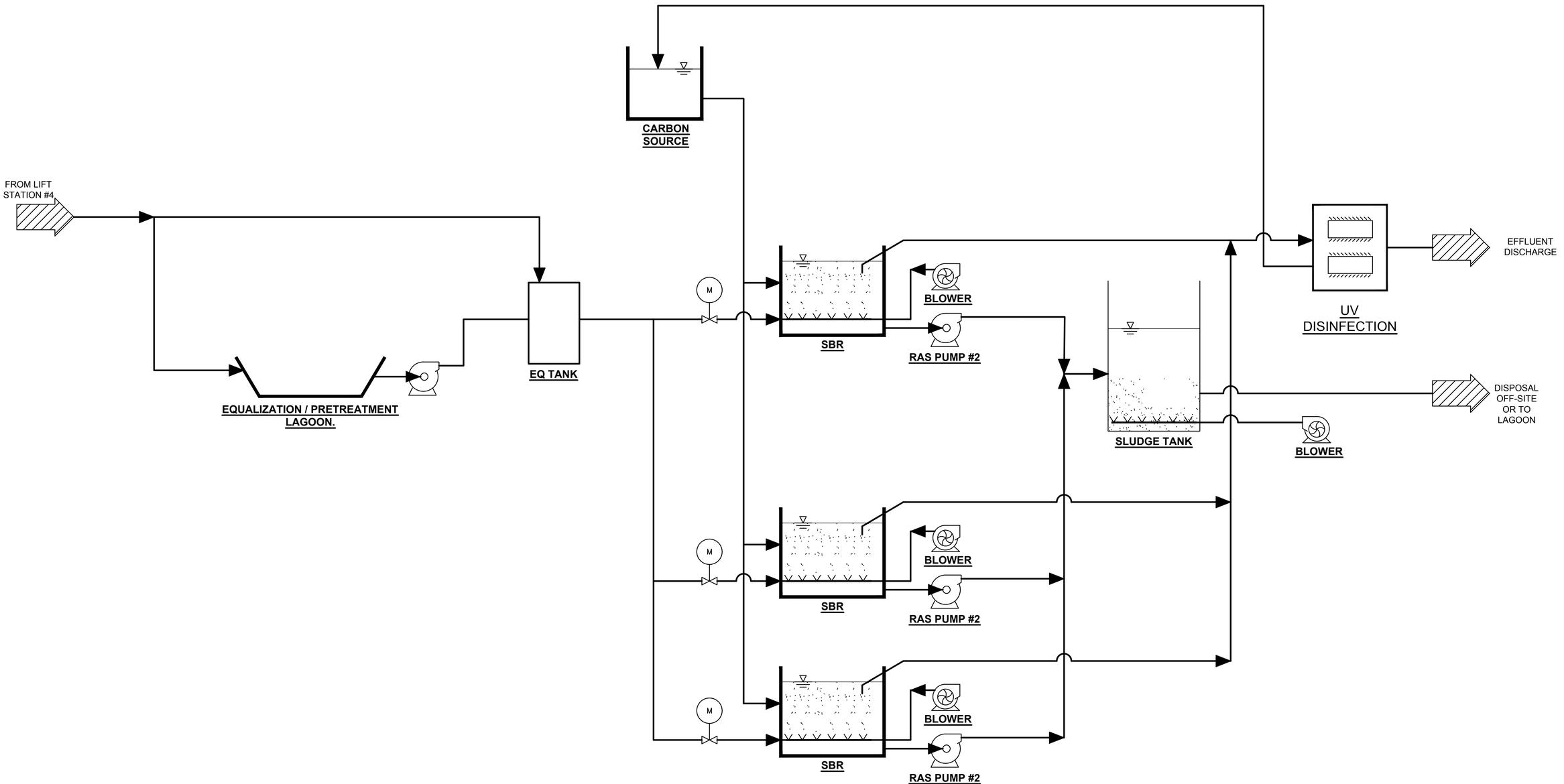

NOTE:
THERE ARE 2 ACTIVE AND 1 BACKUP MSBR IN THE FIRST 100 HOMES. THERE WILL BE 1 STANDBY UNIT FOR ALL PHASES.

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	JB
DRAWN:	RK
CHECKED:	RB
APPROVED:	JB
PROJECT DATE:	DEC 2017
PROJECT NO.:	170084
SCALE:	NTS

ELLISPORT BAY SEWER DISTRICT
FACILITY PLAN

ALTERNATIVE SBR SYSTEM

DRAWING NUMBER
G1.2
REV A

PRELIMINARY NOT FOR CONSTRUCTION

SAVE TIME: 12/8/2017 11:04:32 AM
PLOT TIME: 12/12/2017 9:05 AM
USER NAME: TIM DOUGLAS
XREF FILES: ####
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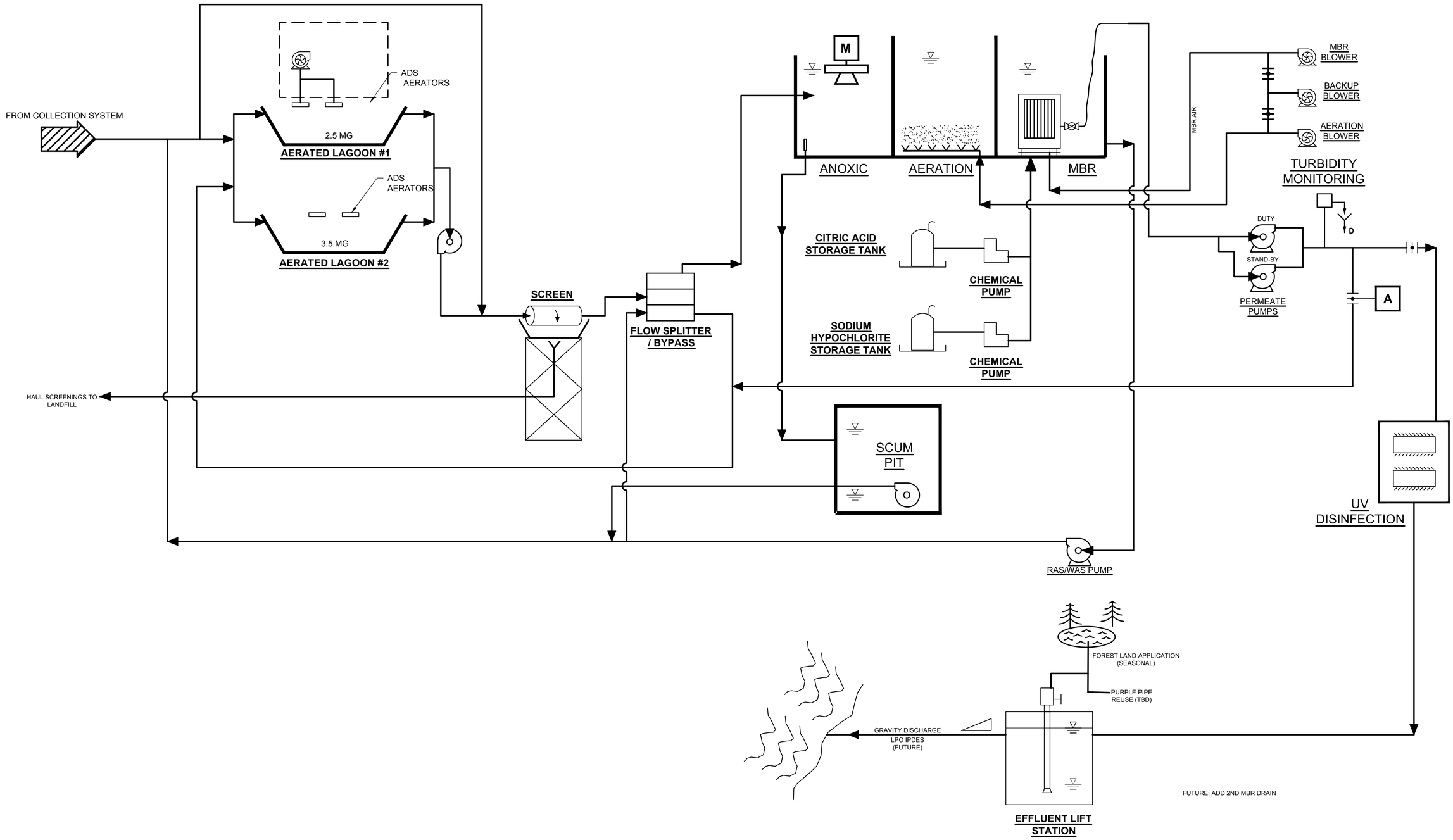


REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	WR
DRAWN:	PE
CHECKED:	RB
APPROVED:	JB
PROJECT DATE:	DEC 2017
PROJECT NO.:	170084
SCALE:	NTS

ELLISPORT BAY SEWER DISTRICT
FACILITY PLAN

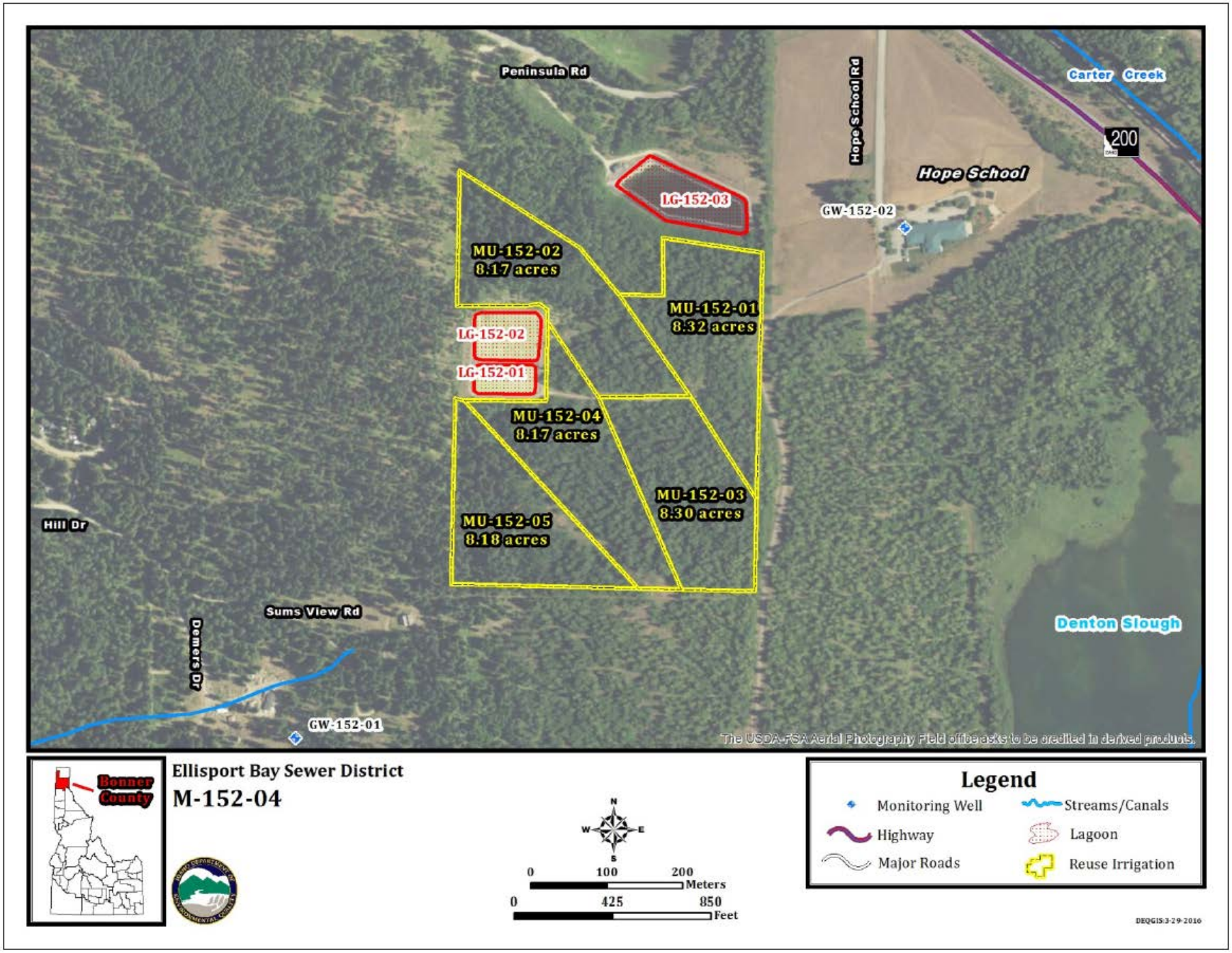
ALTERNATIVE MBR

DRAWING NUMBER
G1.3
REV A

PRELIMINARY NOT FOR CONSTRUCTION

SAVE TIME: 12/22/2017 8:48:54 AM
PLOT TIME: 12/22/2017 9:05 AM
USER NAME:TIM DOUGLAS
XREF FILES: ####
FILE NAME: Q:\10458 ELLISPORT BAY FACILITY PLAN\02 DWG\SHEETS\GENERAL SHEETS\G1.3 ALTERNATIVE MBR.DWG

Appendix B:
Ellisport Bay Sewer District Existing Facility Map


Peninsula Rd
Hope School Rd
Carter Creek
200
Hope School
LG-152-03
GW-152-02
MU-152-02
8.17 acres
MU-152-01
8.32 acres
LG-152-02
LG-152-01
MU-152-04
8.17 acres
MU-152-03
8.30 acres
MU-152-05
8.18 acres
Hill Dr
Sums View Rd
Demers Dr
GW-152-01
Denton Slough
The USDA-FSA Aerial Photography Field office asks to be credited in derived products.
Bonner County
Ellisport Bay Sewer District
M-152-04
N
W
E
S
0 100 200
Meters
0 425 850
Feet
Legend
Monitoring Well
Streams/Canals
Highway
Lagoon
Major Roads
Reuse Irrigation
DEQGIS:3-29-2016

Appendix C:
Proposed Future Wastewater Treatment System Classification Worksheet

IDAHO PUBLIC WASTEWATER TREATMENT PLANT CLASSIFICATION WORKSHEET

OFFICE USE DO NOT WRITE HERE

System Class _____

Upgrade ___ STD 5 Yr ___

Approved by _____

Date_____

Name of System: Ellisport Bay Sewer District- MBR

Legal Owner of Treatment System Ellisport Bay Sewer District

System Address: P.O. Box 455

City: Hope **State:** ID **Zip Code:** 83836

Contact Person: Trecy Carpenter **Title:** Chair

Business Phone Number: (208) 264-0112 **Email** ebsd.colleen@frontier.com

Treatment System - Design Flow/Actual Flow 0.11 /
(MGD) (MGD)

Treatment Plant Classification Worksheet is (Check one):

☐ **Initial System Rating** ☒ **System Upgrade** ☐ **Standard 5 Year Rating**

Date of last system classification rating (if applicable) _____

☐ **Attach a flow schematic or hydraulic flow diagram of the treatment facility to this treatment plant classification worksheet when submitting to DEQ.**

Instructions:

Use this rating form for all types of public wastewater treatment plants, facilities, or systems[D-16] that treat domestic and/or industrial wastewater including, but not limited to traditional biological and mechanical treatment processes, large soil absorption systems, community drainfields, and wastewater lagoon systems. Fill out ONE form for the wastewater treatment facility including all sequential, parallel or multiple treatment processes for both effluent and solids that provide treatment of all wastewater introduced into the system.

How to Assign Points:

Evaluate each item listed in the table below and place the specified point value next to each item selected. *Each unit process should have points assigned only once* .Add the total number of points selected to determine the class of the treatment system. Definitions describing all configurations, names, and/or reasons why rating points are or are not assigned to a particular item are provided for those items with a small D-number behind the item, i.e. D-1. Check the definition if unsure whether a particular treatment plant process qualifies for the point value shown.

Treatment facilities will be classified as VSWW, Class I, Class II, Class III or Class IV with IV being the largest and most complex. *Mail the completed, signed form to the Department of Environmental Quality 1410 N. Hilton, Boise, ID 83706 Attention: Adam Bussan. Keep a photocopy of the original form for your files.*

Item	Points	Your System
System Size (2 to 20 points)		
Number of Connections (for information only)	(not scored)	
Maximum population served, peak day (1 point minimum to 10 point maximum)	1 point/10,000 or part	1

Item	Points	Your System
Design flow (average/day) or peak months (average/day) Whichever is larger (1 point min to 10 point max)	1 point/MGD or part	1
Variation in Raw Waste (0 to 6 points) [1]		
Variations do not exceed those normally or typically expected	0 points	
Recurring deviations/excessive variations of 100% to 200% in strength/flow	2 points	2
Recurring deviations/excessive variations of more than 200% in strength/flow	4 points	
Raw wastes subject to toxic waste discharges	6 points	
Impact of septage of truck-hauled waste (0 to 4 points)	0-4 points	
Preliminary Treatment Process		
Plant pumping of main flow	3 points	3
Screening, comminution	3 points	3
Grit removal	3 points	
Equalization	1 point	1
Primary Treatment Process		
Primary clarifiers	5 points	
Imhoff tanks, septic tanks, or similar (combined sedimentation/digestion)[D-8]	5 points	
Secondary Treatment Process		
Fixed-film reactor[D-7]	10 points	
Activated sludge[D-1]	15 points	
Stabilization ponds or lagoon without aeration	5 points	
Stabilization ponds or lagoon with aeration	8 points	8
Membrane Biological Reactor (MBR) – Basic MBR which combines activated sludge (minus secondary clarification) and membrane filtration.[D-17]	15 points	15
Tertiary Treatment Process		
Polishing ponds for advanced waste treatment	2 points	
Chemical/physical advanced waste treatment w/o secondary[D-5]	15 points	
Chemical/physical advanced waste treatment following secondary[D-4]	10 points	
Biological or chemical/biological advanced waste treatment[D-2]	12 points	12
Nitrification by designed extended aeration only	2 points	
Ion exchange for advanced waste treatment	10 points	
Reverse osmosis, electrodialysis and other membrane filtration techniques for advanced waste treatment	15 points	
Advanced waste treatment chemical recovery, carbon regeneration	4 points	
Media filtration (removal of solids by sand or other media) [D-13]	5 points	
Additional Treatment Processes		
Chemical additions (2 points each for a max of 6 points)[D-3]	0-6 points	
Dissolved air floatation (for other than sludge thickening)	8 points	
Intermittent sand filter	2 points	
Recirculating intermittent sand filter	3 points	
Microscreens	5 points	
Generation of oxygen	5 points	
Solids Handling		
Solids stabilization (used to reduce pathogens, volatile organic chemicals &		

Item	Points	Your System
odors include lime or similar treatment and thermal conditioning)[D-15]	5 points	
Gravity thickening	2 points	
Mechanical dewatering of solids[D-11]	8 points	
Anaerobic digestion of solids	10 points	
Aerobic digestion of solids	6 points	
Evaporative sludge drying	2 points	
Solids reduction (including incineration, wet oxidation)	12 points	
On-site landfill for solids	2 points	
Solids composting[D-14]	10 points	
Land application of biosolids by contractor [D-9]	2 points	
Land application of biosolids by facility operator in responsible charge	10 points	
Disinfection (0 to 10 points maximum)		
No disinfection	0 points	
Chlorination (including chlorine dioxide or chloramines) or ultraviolet irradiation	5 points	5
Ozonation	10 points	
Effluent Discharge (0 to 10 points maximum)		
No discharge	0 points	
Discharge to surface water receiving stream[D-6]	0 points	
Mechanical post aeration[D-12]	2 points	
Land treatment with surface disposal or land treatment with subsurface disposal [D-10]	4 points	
Direct recycle and reuse	6 points	
Instrumentation (0 to 6 point maximum)		
SCADA or similar instrumentation systems to provide data with no process operation	0 points	
SCADA or similar instrumentation systems to provide data with limited process operation	2 points	
SCADA or similar instrumentation systems to provide data with moderate process operation	4 points	
SCADA or similar instrumentation systems to provide data with extensive or total process operation	6 points	6
Laboratory Control (0 to 15 point maximum) [2]		
Bacteriological/Biological Laboratory Control (0 to 5 point maximum)		
Lab work done outside the treatment plant	0 points	0
Membrane filter procedures	3 points	
Use of fermentation tubes or any dilution method; fecal coliform determination	5 points	
Chemical/Physical Laboratory Control (0 to 10 point maximum)		
Lab work done outside the treatment plant	0 points	
Push-button or visual (colorimetric) methods for simple tests such as pH, settleable solids	3 points	
Additional procedures such as DO, COD, BOD, gas analysis, titrations, solids, volatile content	5 points	
More advanced determinations such as specific constituents; nutrients, total		

Item	Points	Your System
oils, phenols	7 points	
Highly sophisticated instrumentation such as atomic absorption, gas chromatography	10 points	
TOTAL POINTS FOR YOUR SYSTEM		

System Classification Key			
*VSWWS***		*Class II*	*31 to 55 points*
Class I	*30 points or less*	*Class III*	*56 to 75 points*
Class IV	76 points or greater		
YOUR SYSTEM CLASSIFICATION		**VSWWS, I, II, III, IV (Circle one)**	

Footnote [1] The key concept is frequency and/or intensity of deviation or excessive variation from normal or typical fluctuations; such deviation can be in terms of strength, toxicity, shock loads, I/I, with points from 0-6.

Footnote [2] The key concept is to credit laboratory analyses done on-site by plant personnel under the direction of the operator in direct responsible charge with points from 0-15.

**The Very Small Wastewater System Classification is applicable to a system comprised of one of the following wastewater treatment processes: aerated lagoon (s); non-aerated lagoon(s); primary treatment; or LSAS.

_____/_____

Signature of Legal Owner or Owner's Representative Date

Wastewater Treatment Definitions

D-1. **Activated Sludge** - Wastewater treatment by aeration of suspended organisms followed by secondary clarification, including extended aeration, oxidation ditches, Intermittent Cycle Extended Aeration system (ICEAS), and other similar processes. A sequencing batch reactor with the purpose of providing this form of treatment would be rated under this category.

D-2. **Biological or chemical/biological advanced waste treatment** - The advanced treatment of wastewater for nutrient removal including nitrification, denitrification, or phosphorus removal utilizing biological or chemical processes or a combination. If the facility is designed to nitrify based solely on detention time in an extended aeration system, only the points for nitrification by designed extended aeration should be given.

D-3. **Chemical addition** - The addition of a chemical to wastewater at an application point for the purposes of adjusting pH or alkalinity, improving solids removal, dechlorinating, removing odors, providing nutrients, or otherwise enhancing treatment, excluding chlorination for disinfection of effluent and the addition of enzymes or any process included in the Tertiary Chemical/Physical Processes. The capability to add a chemical at different application points for the same purpose should be rated as one application; the capability to add a chemical(s) to dual units should be rated as one application; and the capability to add a chemical at different application points for different purposes should be rated as separate applications.

D-4. **Chemical/physical advanced treatment following secondary** - The use of chemical or physical advanced treatment processes following (or in conjunction with) a secondary treatment process. This would include processes such as carbon adsorption, air stripping, chemical coagulation, and precipitation, etc.

D-5. **Chemical/physical advanced treatment without secondary** - The use of chemical or physical advanced treatment processes without the use of a secondary treatment process. This would include processes such as carbon adsorption, air stripping, chemical coagulation, precipitation, etc.

D-6. **Discharge to Receiving Water** - Treatment processes present at the facility are designed to achieve NPDES permit limitations that have already factored in the sensitivity of the receiving stream. Consequently, no additional points are assigned to rate the receiving stream separately from the facility treatment processes.

D-7. **Fixed-film reactor** - Biofiltration by trickling filters or rotating biological contactors followed by secondary clarification.

D-8. **Imhoff tanks (or similar)** - Imhoff tanks, septic tanks, spirogester, clarigester, or other single unit for combined sedimentation and digestion.

D-9. **Land application of biosolids by contractor** - The land application or beneficial reuse of biosolids by a contractor outside of the control of the operator in direct responsible charge of the wastewater treatment facility.

D-10. **Land treatment and disposal (surface or subsurface)** - The ultimate treatment and disposal of the effluent onto the surface of the ground by rapid infiltration or rotary distributor or by spray irrigation. Subsurface treatment and disposal would be accomplished by infiltration gallery, injection, or gravity or pressurized drain field.

D-11. **Mechanical dewatering** - The removal of water from sludge by any of the following processes and including the addition of polymers in any of the following: vacuum filtration; frame, belt, or plate filter presses; centrifuge; or dissolved air floatation.

D-12. **Mechanical post-aeration** - The introduction of air into the effluent by mechanical means such as diffused or mechanical aeration. Cascade aeration would not be assigned points.

D-13. **Media Filtration** - The advanced treatment of wastewater for removal of solids by sand or other media or mixed media filtration.

D-14. **Solids composting** - The biological decomposition process producing carbon dioxide, water, and heat. Typical methods are windrow, forced air-static pile, and mechanical.

D--15. **Solids stabilization** - The processes to oxidize or reduce the organic matter in the sludge to a more stable form. These processes reduce pathogens or reduce the volatile organic chemicals and thereby reduce the potential for odor. These processes would include lime (or similar) treatment and thermal conditioning. Other stabilization processes such as aerobic or anaerobic digestion and composting are listed individually.

D-16 **Wastewater Treatment Facility**. Any physical facility or land area for the purpose of collecting, treating, neutralizing or stabilizing pollutants including treatment plants, the necessary intercepting, outfall and outlet sewers, pumping stations integral to such plants or sewers, equipment and furnishing thereof and their appurtenances. A treatment facility may also be known as a treatment system, waste treatment system, waste treatment facility, or waste treatment plant (IDAPA 58.01.16.010).

D-17 **Membrane Biological Reactor (MBR) Point Factoring -** The points assigned to the basic MBR unit does not include points for any additional treatment processes such as phosphorus removal, nitrification, denitrification, land application, rapid infiltration basins, lagoons, etc. Points must be assigned separately to each additional treatment process beyond the basic MBR unit. Additional treatment processes may vary on a case-by-case basis.

Appendix D:
Proposed Future Wastewater Collection System Classification Worksheet

IDAHO PUBLIC WASTEWATER COLLECTION SYSTEM CLASSIFICATION WORKSHEET

OFFICE USE ONLY
DON'T WRITE HERE

System Class _____

Approved by: _____

Date: _____

Name of System: Ellisport Bay Sewer District

Legal Owner of Treatment System: Ellisport Bay Sewer District
System Address: P.O. Box 455
City: Hope **State:** ID **Zip Code:** 83836

Contact Person: Trecy Carpenter **Title:** Chair

Business Phone Number: (208) 264-0112 **Email:** ebsd.colleen@frontier.com

Collection System Classification Worksheet is (check one):

☐ **Initial System Rating** ☒ **System Upgrade** ☐ **Standard 5 yr Rating**

Date of last system classification rating (if applicable) _____

Collection System - Design Flow /Actual Flow 113,000 GPD /_____

Item	Points	Your System
System Size (Minimum 3 points)		
Miles of Line	1 point/10 miles or part	1
Number of Connections = _____ (Use Connection Equivalencies)	1 point /250 or part	4
Number of Manholes	1 point/150 or part	2
Lift Stations	1 point/each	14
Miles of Force Mains	1 point/mile or part	6
Odor Abatement		
Chemical Feed System	2 points	
Air Entrainment System	2 points	
Bio-filter System	2 points	
Maintenance Management System		
Manual Maintenance Management System	3 points	3
Manual Mapping System	3 points	
Computerized Maintenance Management System	5 points	
Computerized Mapping System	5 points	
Alarm or SCADA System for Lift Stations	5 points	5
TOTAL POINTS FOR YOUR SYSTEM		35

System Classification Key	
VSWWS** Class I 0-30 points	
Class II 31-55 points Class III 56-75 points Class IV 76 or greater points	
YOUR SYSTEM CLASSIFICATION	**VSWWS, I, II, III, IV (Circle one)**

**The Very Small Wastewater System Classification is applicable to a system that serves 500 connections with a system size of six points or less.

_____/_____
Signature of Legal Owner or Owner's Representative Date

Mail form to: Department of Environmental Quality, 1410 N. Hilton, Boise, Idaho 83706, Attn: Adam Bussan

Appendix E:
Capacity Analysis of Existing Treatment Plant Based on Current Active O&M ERU's

APPENDIX E - Unit Capacity Analysis Under Existing Plant Conditions

T-O ENGINEERS

ELLISPORT BAY SEWER DISTRICT - CURRENT & PROJECTED CAPACITY ANALYSIS

Proj #: 170087.50
Date: 10/30/2015
By: JSB
Description: *Current Plant Conditions*

TO USE CAPACITY ANALYSIS:
INPUT
Calculated Value Based on INPUT
No other cells require manipulation

No. of ERU's

# ERU's Existing:	**257**	*as of 10/19/2017*
# ERU's to Add:	**26**	*INPUT for analysis*
Total ERU's to Analyze:	**283**	

Flow to Plant

Average Daily Flow (GPD):	**29,483**	*2006 - 2016 data*
Max Month Daily Flow (GPD):	**53,204**	*2006 - 2016 data*

Flow to Land App / Lower Storage Lagoon

Ratio Yearly Irrigation flow to plant influent:	**1.10**	*2006-2016 data ave*
Yearly Flow to Irrigation - Ave Day Basis:	**11,837,400**	gal/yr
Yearly Flow to Irrigation - Max Mo Day Basis:	**21,361,406**	gal/yr
Growing Season:	**184.0**	days
Lower Storage Lagoon Fill at end of Prev. GS:	**10%**	
Lower Storage Lagoon Fill at beg GS (Ave Day):	**7,370,053**	
Lower Storage Lagoon Fill at beg GS (Max Mo):	**12,092,916**	

Constituent	Units	1995 FP Plant Design & Capacity***	2017 FP Design Values	Per ERU Basis Ave Day* (lbs/day)	Per ERU Basis Max Mo Day** (lbs/day)	2017 Influent Sampling Results*****	Per ERU Basis Ave Day* (lbs/day)	Per ERU Basis Max Mo Day** (lbs/day)	Land App Eff Monitor (mg/L)
			2017 FP Design Values			*2017 Testing Values*			*2006-2016*
Flow	GPD	49,000 / 69,500	-	**104**	**188**	26,775 / 48,450	**104**	**188**	-
Alkalinity (as $CaCO_3$)	mg/L	-	200.0	0.1739	0.3138	198.00	0.1721	0.3106	-
BOD_5	mg/L	150.0	280.0	0.2434	0.4393	130.33	0.1133	0.2045	-
COD	mg/L	-	552.0	0.4799	0.8660	418.50	0.3638	0.6566	-
TSS	mg/L	100.0	250.0	0.2173	0.3922	143.67	0.1249	0.2254	-
Ammonia (NH_3)	mg/L	-	36.0	0.0313	0.0565	35.60	0.0310	0.0559	-
Total N	mg/L	-	48.2	0.0419	0.0756	47.80	0.0416	0.0750	9.00
Nitrate-N	mg/L	-	0.2	0.0002	0.0003	0.05	0.0000	0.0001	-
TKN	mg/L	40.0	48.0	0.0417	0.0753	47.80	0.0416	0.0750	-
Total P	mg/L	-	6.5	0.0057	0.0102	6.48	0.0056	0.0102	4.00
Ortho-P	mg/L	-	4.7	0.0041	0.0074	4.65	0.0040	0.0073	-
pH	S.U	-	7.2	-	-	7.16	-	-	-

NOTES:
- *Average day flow per ERU is based on ave monthly flow data from period 2006-2016
- **Average daily max mo flow per ERU is based on the maximum month flow over the period of record (Dec 2007)
- ***49,000 GPD existing Hope & East Hope (1995), 69,500 Future (2015)
- ****Assume no sludge buildup in bottom of treatment lagoons affecting volume for treatment
- *****Average of multiple samples where applicable Land app testing results 8.40 TN, 3.8 TP

No.	COMPONENT	DESCRIPTION	ANALYSIS	INSTALLED CAPACITY	UNITS	NOTES (capacity basis)	Based on Average Day Flow						Based on Max Mo Flow					
							AVE DAY TOTAL ERU LIMIT	CURRENT GPM over day / # starts hr	% OF FULL CAPACITY	REMAINING CAP. - GPM	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	CURRENT GPM over day / # starts hr	% OF FULL CAPACITY	REMAINING CAP. - GPM	REMAINING ERU's	NOTES
1.	**Lift Station #4**	LS pumps - duplex 50 HP vertical flooded suction pumps in wetwell/drywell config																
		Full pumping capacity of single pump at design head 195 ft TDH	Flow	**350**	GPM	assume pumping 100% of time, GPM distr over day	4,838	21	**6.00%**	329	4,548		2,681	37	**10.57%**	313	2,397	
		Pump starts per hour	Flow	**7.0**	starts / hr	based on rec dwg pump switch set points	2,419	1.54	**21.98%**	5.5	2,136	max # starts 7.0 / hr	1,340	2.64	**37.69%**	4.4	1,057	
2.	**Upper Lagoons - Treatment******	Upper Aerated Lagoon SA 0.75 acres & 2.5 MG, Upper Storage Lagoon SA 1.00 acres & 3.5 MG	**6,000,000**	gal (total)	1.75	acres (total surface area)	AVE DAY TOTAL ERU LIMIT	HRT (d) / Load lbs/ac/d / SCFM Req'd (aerator & blower)	% CAPACITY	REM. CAP. (days / SCFM / GPM)	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	HRT (d) / Load lbs/ac/d / SCFM Req'd (aerator & blower)	% CAPACITY	REM. CAP. (days / SCFM / GPM)	REMAINING ERU's	NOTES
		Holding volume - HRT required for winter treatment, 100% treatment in upper treatment lagoons	HRT	**24**	days (minimum)	based on max mo winter conditions	2,376	204	**11.91%**	179	2,093		1,317	113	**21.49%**	89	1,034	
		Overall BOD loading	Loading - BOD	**35**	lbs / acre / day	10SS recommend 15-35 lb/acre/day	536	18.3	**52.35%**	17	253		296	33.1	**94.48%**	2	13	
		Upper aerated lagoons, aerator treatment capacity	Loading - BOD	**32.4**	O_2 SCFM	4 ADS aerators, 2 each upper lagoon	283	32.4	**99.85%**	0.0	0	See tab "2 - Lagoon" for calculation details	157	58.3	**179.85%**	-25.9	-126	
		Blower/Compressor capacity (connected aerators)	Loading - BOD	**40.0**	SCFM	1 Busch MM 1144 BP installed	350	32.4	**80.88%**	8	67	Add unit aerator or compressors as needed	194	58.3	**145.68%**	-18	-89	
		Gravity Transfer pipe - gravity flow to upper storage lagoon	Flow	**805**	GPM	at 805 GPM, 1' of available head is exhausted	11,127	20	**2.54%**	785	10,844		6,100	37	**4.59%**	768	5,817	
		Transfer pipe - gravity flow to lower storage lagoon. Keep flow velocity in 4" pipe < 10 FPS	Flow	**372**	GPM	at 350 GPM, velocity in 4" pipe is 9.2 FPS	5,143	20	**5.50%**	352	4,860		2,850	37	**9.93%**	335	2,567	
3.	**Lagoon #3 - Lower Storage Lagoon; Polishing**	SA 2.20 acres					AVE DAY TOTAL ERU LIMIT	NGS STORAGE REQ (gal / NGS)	% CAPACITY	REMAINING CAP. - GAL	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	NGS STORAGE REQ (gal / NGS)	% CAPACITY	REMAINING CAP. - GAL	REMAINING ERU's	NOTES
		Holding Volume Over Non-growing Season - Lower Polishing Lagoon Only	Storage	**15,000,000**	gal	Assume hold over volume entered above	650	7,370,053	**49.13%**	7,629,947	367		360	12,092,916	**80.62%**	2,907,084	77	
4.	**Disinfection System**						AVE DAY TOTAL ERU LIMIT	ACTUAL CT (min) / Cl dose GPH / gal hypochl	% CAPACITY	REMAINING CAP. - GPM	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	ACTUAL CT (min) / Cl dose GPH / gal hypochl	% CAPACITY	REM. CAP. - GPM / GAL	REMAINING ERU's	NOTES
		Chlorine Contact Time - Pipe Capacity/Length at 400 GPM prior to hitting first irrigation zone supply	Flow	**15.0**	min	10 SS - 15 min CT upheld until flow of 900 GPM	5,655	33.96	**44.44%**	500	5,372	*limited by max pumping hrs / pump capacity	3,133	33.96	**44.44%**	500	2,850	*limited by max pumping hrs / pump capacity
		Chemical feed pumps - single Neptune diaphr pump dosed 3/8" tubing and saddle tap to 6" irrig pump disch	Dose Rate	**7.0**	GPH	typically set stroke at 30-40%	4,402	0.450	**6.43%**	6.5	4,119	dose rate depends on irrig pump rate, use 400 GPM		0.450	**6.43%**	6.5	-283	dose rate depends on irrig pump rate, use 400 GPM
		Chemical storage - Currently Use about 4 55-gal drums per GS, unloaded at once into 500-gal tank	Storage Req	**500.0**	gal	Existing storage % chem req based on # ERU's	637	222	**44.39%**	278	354		353	401	**80.11%**	99	70	
5.	**Reuse / Irrigation Lift Station**	design 400 GPM @ 350' TDH					AVE DAY TOTAL ERU LIMIT	PUMP Hrs Req'd	% CAPACITY	CAP. - Pump Hrs	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	PUMP Hrs Req'd	% CAPACITY	CAP. - Pump Hrs	REMAINING ERU's	NOTES
		Yearly inflow balance with GS land app maximum hydraulic loading rate for Irrig pump operating hrs	Irrig Pump	**972.33**	Op hrs / GS	Assume min. fill lower storage lagoon beg. GS	589	555.7	**57.15%**	417	306		322	952.6	**97.97%**	20	39	
6.	**Land Application Site**						AVE DAY TOTAL ERU LIMIT	YEARLY FLOW (GPY or lbs/YR)	% CAPACITY	REMAINING FLOW CAP.	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	YEARLY FLOW (GPY or lbs/YR)	% CAPACITY	REMAINING FLOW CAP.	REMAINING ERU's	NOTES
		41.14 total acres natural forest land application site, Growing Season May 1 - October 31	Hydraulic Loading	**23,335,832**	gal / yr	hydraulic loading to entire site per year	614	11,837,400	**50.73%**	11,498,432	275		340	21,361,406	**91.54%**	1,974,426	26	
		Nutrient Loading - Nitrogen	Loading - N	**3,579**	lbs / yr	87.0 lb/acre per growing season, over entire site	1,253	889	**24.84%**	2,690	856		694	1604	**44.82%**	1,975	348	
		Nutrient Loading - Phosphorus	Loading - P	**823**	lbs / yr	20.0 lb/acre per growing season, over entire site	648	395	**48.02%**	428	306		359	713	**86.66%**	110	44	
7.	**Power Supply to Site**	**No Existing Limitation Considering Current Equipment**					AVE DAY TOTAL ERU LIMIT	Voltage / Amps Req'd	% CAPACITY	REMAINING FLOW CAP.	REMAINING ERU's	NOTES	MAX MO TOTAL ERU LIMIT	Voltage / Amps Req'd	% CAPACITY	REMAINING FLOW CAP.	REMAINING ERU's	NOTES
		Sum of power requirement for all components. Insert existing capacity by area	Power			existing capacity												

Appendix F:
EBSD Groundwater Well #5320 Drilling Log

Form 238-7
11/97

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

RECEIVED
NOV 20 1998
IDWR/North

78173

Office Use Only
Inspected by _____
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 5320
DRILLING PERMIT NO. 96-98-N-267
Other IDWR No. _____

2. OWNER:
Name Ellisport Bay Sewer District
Address P.O. Box 455
City Hope State ID Zip 83836

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

POSTED

N / W / E / S

Twp. 56 North ☒ or South ☐
Rge. 1 East ☒ or West ☐
Sec. 12, NE 1/4 (10 acres) SW 1/4 (40 acres) NE 1/4 (160 acres)
Gov't Lot ____ County Bonner
Lat: : : Long: : :
Address of Well Site Samowen Road
City Hope
(Give at least name of road + Distance to Road or Landmark)

Lt. _____ Blk. _____ Sub. Name _____

POSTED

4. USE:
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other _____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other _____

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other _____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
CS Granular	0'	18'	500lbs.	Overdrill

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 28'
Was drive shoe seal tested? ☐ Y ☒ N How? _____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
6"	+2'	28'	.250	C.S.	☒	☐	☒	☐
4"	10'	150'	160 PSI	PVC	☐	☒	☐	☐
					☐	☐	☐	☐

Length of Headpipe _____ Length of Tailpipe _____

9. PERFORATIONS/SCREENS
Perforations Method Hand Drill
Screens Screen Type _____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
140'	150'	--	15	5/8"	PVC	☐	☒
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
80 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: _____

56N 1E 12

11. WELL TESTS:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
Est. ¼-½	N.D.	148'	1 hr.

Water Temp. Cold Bottom hole temp. N.D.
Water Quality test or comments: _____
Depth first Water Encounter 75'

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
10"	0'	18'	Large cobbles, sand&gravel		X
6"	18'	28'	Large cobbles, sand&gravel		X
6"	28'	150'	Extremely broken shale	X	
			Water encountered at 75', no more after that. Engineer stopped drilling at 150'.		

Completed Depth 150' (Measurable)
Date: Started 10/05/98 Completed 10/08/98

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Tacoma Pump & Drilling Firm No. 423
Firm Official _____ Date 10/08/98
and
Driller or Operator _____ Date _____
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Appendix G:
Lagoon Enhancements Alternative Cost Estimate

Opinion of Probable Construction Cost

T-O ENGINEERS

Lagoon Improvements

MARK-UPS:	Percentage
MOBILIZATION	2%
OVERTIME ALLOWANCE	0%
ELECTRICAL/INSTRUMENTATION	3.0%
MECHANICAL	0.0%
ROCK EXCAVATION ALLOWANCE	0%
ALLOWANCE	10%
CONTINGENCY	10%
CONTR. INSURANCE / PROFIT	10%
ENGINEERING DESIGN	7%
CONSTRUCTION MGMT	4%

PROJECT : Sanitary Treatment System
FACILITY : Ellisport Bay Sewer
Ellisport Bay, Idaho
DATE: 11/15/2017
By: C. Hipwell

LEVEL: Budget Level (+30%,-20%)

NO.	DESCRIPTION	QTY	Unit	Unit Cost	Installation	TOTAL	Comment
1.	Aeration Upgrade	13	ea	$6,200.00	25%	$100,750	Air Diffusioin Systems. 52 diffusers.
2.	Winter Storage Lagoon Liner	448,900	sf	$2.75	0%	$1,234,475	50 MG, 670 ft x 670 ft x 20 ft deep 3:1 slope
3.	Excavation/Placement	250,000	yd	$4.00	0%	$1,000,000	
4.	Repair Existing Liner	67,335	sf	$2.75	0%	$185,171	Replace 1/2 of liner
5.	Chlorine Upgrade Building	200	sf	$125.00	0%	$25,000	
6.	Chlorine HVAC	1	ls	$15,000.00	25%	$18,750	ventilation of chlorine system
A	**SUBTOTAL**					**$2,564,146**	
B	*MOBIL./DEMOBIL.*	(% of A)				$51,283	
C	*OVERTIME ALLOWANCE*	(% of A)				$0	
D	*ELECTRICAL/INSTRUMENTATION*	(% of A)				$76,924	
E	*MECHANICAL*	(% of A)				$0	
G	**SUBTOTAL**					**$2,692,354**	
H	*ALLOWANCE*	(% of G)				$269,235	
I	*CONTINGENCY*	(% of G)				$269,235	
J	*CONTR. PROFIT*	(% of G)				$269,235	
K	**SUBTOTAL**					**$3,500,060**	
L	*ENGINEERING DESIGN*	(% of K)				$245,004	
M	*CONSTRUCTION MGMT*	(% of K)				$140,002	
	SUBTOTAL					**$3,885,066**	
	TOTAL ESTIMATED COST					**$3,885,066**	

Appendix H:
SBR Treatment Alternative Cost Estimate

Opinion of Probable Construction Cost

T-O ENGINEERS

Sequencing Batch Reactor with Effluent Filtration

MARK-UPS:	Percentage
MOBILIZATION	2%
OVERTIME ALLOWANCE	0%
ELECTRICAL/INSTRUMENTATION	13.0%
MECHANICAL	15.0%
ROCK EXCAVATION ALLOWANCE	0%
ALLOWANCE	10%
CONTINGENCY	10%
CONTR. INSURANCE / PROFIT	10%
ENGINEERING DESIGN	7%
CONSTRUCTION MGMT	4%

PROJECT : Sanitary Treatment System
FACILITY : Ellisport Bay Sewer
Ellisport Bay, Idaho
DATE: 11/15/2017
By: C. Hipwell

LEVEL: Budget Level (+30%,-20%)

NO.	DESCRIPTION	QTY	Unit	Unit Cost	Installation	TOTAL	Comment
1.	SBR Package Equipment	1	LS	$375,000.00	25%	$468,750	scalled of sbr burley
2.	SBR Tank No. 1	115,000	gal	$0.67	0%	$77,050	
3.	SBR Tank No. 2	115,000	gal	$0.67	0%	$77,050	
4.	Sludge Tank	40,000	gal	$0.85	0%	$34,000	
5.	Earthwork	1,500	cy	$8.00	0%	$12,000	
6.	Grinder	1	ea	$35,000.00	25%	$43,750	
7.	UV System	2	ea	$75,000.00	25%	$187,500	
8.	Equipment Building	1,500	sf	$125.00	0%	$187,500	
9.	Yard Piping	1	ls	$50,000.00	0%	$50,000	
10.	Effluent Filtration	2	ea	$125,000.00	25%	$312,500	
11.	Effluent Filtration, 2nd stage	2	ea	$125,000.00	25%	$312,500	
A	**SUBTOTAL**					**$1,762,600**	
B	*MOBIL./DEMOBIL.*	(% of A)				$35,252	
C	*OVERTIME ALLOWANCE*	(% of A)				$0	
D	*ELECTRICAL/INSTRUMENTATION*	(% of A)				$229,138	
E	*MECHANICAL*	(% of A)				$264,390	
G	**SUBTOTAL**					**$2,291,380**	
H	*ALLOWANCE*	(% of G)				$229,138	
I	*CONTINGENCY*	(% of G)				$229,138	
J	*CONTR. PROFIT*	(% of G)				$229,138	
K	**SUBTOTAL**					**$2,978,794**	
L	*ENGINEERING DESIGN*	(% of K)				$208,516	
M	*CONSTRUCTION MGMT*	(% of K)				$119,152	
	SUBTOTAL					**$3,306,461**	
	TOTAL ESTIMATED COST					**$3,306,461**	

Appendix I:
MBR Treatment Alternative Cost Estimate

Opinion of Probable Construction Cost

T-O ENGINEERS

Membrane Bioreactor

MARK-UPS:	Percentage
MOBILIZATION	2%
OVERTIME ALLOWANCE	0%
ELECTRICAL/INSTRUMENTATION	13.0%
MECHANICAL	15.0%
ROCK EXCAVATION ALLOWANCE	0%
ALLOWANCE	10%
CONTINGENCY	10%
CONTR. INSURANCE / PROFIT	10%
ENGINEERING DESIGN	7%
CONSTRUCTION MGMT	4%

PROJECT : Sanitary Treatment System
FACILITY : Ellisport Bay Sewer
Ellisport Bay, Idaho
DATE: 11/15/2017
By: C. Hipwell

LEVEL: Budget Level (+30%,-20%)

NO.	DESCRIPTION	QTY	Unit	Unit Cost	Installation	TOTAL	Comment
1.	MBR Package Equipment	1	LS	$895,000.00	25%	$1,118,750	Quote for Class A Equipment
2.	MBR Tank No. 1		gal		0%	$0	Included
3.	MBR Tank No. 2		gal		0%	$0	Included
4.	Process Tank	115,000	gal		0%		Included
5.	Sludge Tank	40,000	gal	$0.85	0%	$34,000	
6.	Earthwork	1,500	cy	$8.00	0%	$12,000	
7.	Influent Screens	2	ea	$90,000.00	25%	$225,000	
8.	UV System	2	ea	$0.00	0%	$0	Included
9.	Equipment Building	3,000	sf	$125.00	0%	$375,000	
10.	Yard Piping	1	ls	$50,000.00	0%	$50,000	
11.	Equalization Tank	112,000	gal	$0.65	0%	$72,800	
A	**SUBTOTAL**					**$1,887,550**	
B	*MOBIL./DEMOBIL.*	(% of A)				$37,751	
C	*OVERTIME ALLOWANCE*	(% of A)				$0	
D	*ELECTRICAL/INSTRUMENTATION*	(% of A)				$245,382	
E	*MECHANICAL*	(% of A)				$283,133	
G	**SUBTOTAL**					**$2,453,815**	
H	*ALLOWANCE*	(% of G)				$245,382	
I	*CONTINGENCY*	(% of G)				$245,382	
J	*CONTR. PROFIT*	(% of G)				$245,382	
K	**SUBTOTAL**					**$3,189,960**	
L	*ENGINEERING DESIGN*	(% of K)				$223,297	
M	*CONSTRUCTION MGMT*	(% of K)				$127,598	
	SUBTOTAL					**$3,540,855**	
	TOTAL ESTIMATED COST					**$3,540,855**	

Appendix J:
Operations and Maintenance Cost Estimate – MBR and SBR Alternatives

Operations and Maintenance Cost Estimates - MBR and SBR Alternatives

			Power		Maintenance		Consumables	
No.	**Item**		**MBR**	**SBR + Filtration**	**MBR**	**SBR + Filtration**	**MBR**	**SBR + Filtration**
1	Process Blower	30 HP	$ 5,913.00		$ 750.00		$ 1,000.00	
2	MBR Blower	30 HP	$ 11,826.00		$ 750.00		$ 1,000.00	
3	Air Compressor	5 HP	$ 164.25	$ 164.25	$ 500.00	$ 500.00	$ 500.00	$ 500.00
4	Air Compressor	20 HP		$ 7,884.00		$ 2,500.00		
5	Jet Aeration Pump	30 HP		$ 11,826.00		$ 750.00		
6	Jet Aeration Blower	10 HP		$ 3,942.00		$ 750.00		
7	Permeate Pump	5 HP	$ 1,971.00		$ 1,000.00			
8	Chemical Pumps				$ 1,000.00			
9	Membranes						$ 5,000.00	
10	Sand							$ 500.00
11	Cleaning Chemicals						$ 5,000.00	$ 1,000.00
	Totals		$ 19,874.25	$ 23,816.25	$ 4,000.00	$ 4,500.00	$ 12,500.00	$ 2,000.00

MBR Total	$ 36,374.25
SBR Total	$ 30,316.25

Annual O&M based on a flow of 111,082 gallons per day

Appendix K:
Collection System Expansion Figure

LEGEND:

- EXISTING MANHOLE
- EXISTING GRAVITY SEWER
- EXISTING PRESSURE SEWER
- PROPOSED GRAVITY SEWER
- PROPOSED PRESSURE SEWER
- DISTRICT BOUNDARY
- EXISTING LIFT STATION
- PROPOSED LIFT STATION

AREA 1

AREA 2

AREA 3

LS No. 1

LS No. 2

LS No. 3

LS No. 4

NORTH

Path: S:\Projects\MAP\Planner_1800\0020 Ellisport Bay\CREF\Ellisport Bay_Hope MH Base NEW1.dwg File Name: Ellisport Bay_Hope MH Base NEW1.dwg Plot Date: 12/15/2017 8:42 AM Dude

PROJECT	180.0020.01
DATE	8/19/2018
FIGURE NO.	FIG. 1A

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

T-O ENGINEERS

Mountain WATERWORKS

ENGINEERING AND ENVIRONMENTAL SOLUTIONS
1161 W. RIVER ST. SUITE 130
BOISE, IDAHO 83702
208.780.3990

IDAHO OFFICES
BOISE ·LEWISTON · COEUR D'ALENE

ELLISPORT BAY SEWER DISTRICT

HOPE, IDAHO

COLLECTION SYSTEM FIGURE

Appendix L:
Collection System Expansion Cost Estimate

APPENDIX L: Collection System Expansion Cost Estimate
Updated 11/15/17 per District Board comments

Total System Estimates				
Item	**Units**	**Value**	**Unit Cost**	**Total**
Gravity Lines	lf	30,168	$70	$2,111,760
Pressure Lines	lf	15,600	$60	$936,000
Manholes	ea	100	$4,000	$400,000
Lift Stations	ea	10	$200,000	$2,000,000
Total				**$5,447,760**
→ *$18,159.20 each for 300 connections* $76				
Area 1				
Item	**Units**	**Value**	**Unit Cost**	**Total**
Gravity Lines	lf	8,800	$70	$616,000
Pressure Lines	lf	6,400	$60	$384,000
Manholes	ea	29	$4,000	$116,000
Lift Stations	ea	5	$200,000	$1,000,000
Area 1 Subtotal				**$2,116,000**
Contingency and Engineering (30%)				**$634,800**
Area 1 Total				**$2,750,800**
Area 2				
Item	**Units**	**Value**	**Unit Cost**	**Total**
Gravity Lines	lf	6,300	$70	$441,000
Pressure Lines	lf	2,700	$60	$162,000
Manholes	ea	21	$4,000	$84,000
Lift Stations	ea	1	$200,000	$200,000
Area 2 Subtotal				**$887,000**
Contingency and Engineering (30%)				**$266,100**
Area 2 Total				**$1,153,100**
Area 3				
Item	**Units**	**Value**	**Unit Cost**	**Total**
Gravity Lines	lf	15,068	$70	$1,054,760
Pressure Lines	lf	6,500	$60	$390,000
Manholes	ea	50	$4,000	$200,000
Lift Stations	ea	4	$200,000	$800,000
Area 3 Subtotal				**$2,444,760**
Contingency and Engineering (30%)				**$733,428**
Area 3 Total				**$3,178,188**
			EXPANSION TOTAL:	**$7,082,088**

Appendix M:
US Fish & Wildlife Service IPaC Trust Resource Report

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as trust resources) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Bonner County, Idaho

Local office

Idaho Fish And Wildlife Office

(208) 378-5243
(208) 378-5262

1387 South Vinnell Way, Suite 368
Boise, ID 83709-1657

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Canada Lynx Lynx canadensis There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Grizzly Bear Ursus arctos horribilis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7642	Threatened
North American Wolverine Gulo gulo luscus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Fishes

NAME	STATUS
Bull Trout Salvelinus confluentus There is a **final** critical habitat designated for this species. Your location overlaps the designated critical habitat. https://ecos.fws.gov/ecp/species/8212	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Bull Trout Salvelinus confluentus https://ecos.fws.gov/ecp/species/8212#crithab	Final designated

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service[3]. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The migratory birds species listed below are species of particular conservation concern (e.g. Birds of Conservation Concern) that may be potentially affected by activities in this location. It is not a list of every bird species you may find in this location, nor a guarantee that all of the bird species on this list will be found on or near this location. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To view available data on other bird species that may occur in your project area, please visit the AKN Histogram Tools and Other Bird Data Resources. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

NAME	SEASON(S)
Bald Eagle Haliaeetus leucocephalus https://ecos.fws.gov/ecp/species/1626	Year-round
Black Swift Cypseloides niger https://ecos.fws.gov/ecp/species/8878	Breeding
Calliope Hummingbird Stellula calliope https://ecos.fws.gov/ecp/species/9526	Breeding
Cassin's Finch Carpodacus cassinii https://ecos.fws.gov/ecp/species/9462	Year-round
Flammulated Owl Otus flammeolus https://ecos.fws.gov/ecp/species/7728	Breeding

Fox Sparrow Passerella iliaca	Breeding
Lewis's Woodpecker Melanerpes lewis https://ecos.fws.gov/ecp/species/9408	Breeding
Olive-sided Flycatcher Contopus cooperi https://ecos.fws.gov/ecp/species/3914	Breeding
Peregrine Falcon Falco peregrinus https://ecos.fws.gov/ecp/species/8831	Breeding
Rufous Hummingbird selasphorus rufus https://ecos.fws.gov/ecp/species/8002	Breeding
Short-eared Owl Asio flammeus https://ecos.fws.gov/ecp/species/9295	Year-round
Swainson's Hawk Buteo swainsoni https://ecos.fws.gov/ecp/species/1098	Breeding
Western Grebe aechmophorus occidentalis https://ecos.fws.gov/ecp/species/6743	Breeding
White Headed Woodpecker Picoides albolarvatus https://ecos.fws.gov/ecp/species/9411	Year-round
Willow Flycatcher Empidonax traillii https://ecos.fws.gov/ecp/species/3482	Breeding

What does IPaC use to generate the list of migratory bird species potentially occurring in my specified location?

Landbirds:

Migratory birds that are displayed on the IPaC species list are based on ranges in the latest edition of the National Geographic Guide, Birds of North America (6th Edition, 2011 by Jon L. Dunn, and Jonathan Alderfer). Although these ranges are coarse in nature, a number of U.S. Fish and Wildlife Service migratory bird biologists agree that these maps are some of the best range maps to date. These ranges were clipped to a specific Bird Conservation Region (BCR) or USFWS Region/Regions, if it was indicated in the 2008 list of Birds of Conservation Concern (BCC) that a species was a BCC species only in a particular Region/Regions. Additional modifications have been made to some ranges based on more local or refined range information and/or information provided by U.S. Fish and Wildlife Service biologists with species expertise. All migratory birds that show in areas on land in IPaC are those that appear in the 2008 Birds of Conservation Concern report.

Atlantic Seabirds:

Ranges in IPaC for birds off the Atlantic coast are derived from species distribution models developed by the National Oceanic and Atmospheric Association (NOAA) National Centers for Coastal Ocean Science (NCCOS) using the best available seabird survey data for the offshore Atlantic Coastal region to date. NOAANCCOS assisted USFWS in developing seasonal species ranges from their models for specific use in IPaC. Some of these birds are not BCC species but were of interest for inclusion because they may occur in high abundance off the coast at different times throughout the year, which potentially makes them more susceptible to certain types of development and activities taking place in that area. For more refined details about the abundance and richness of bird species within your project area off the Atlantic Coast, see the Northeast Ocean Data Portal. The Portal also offers data and information about other types of taxa that may be helpful in your project review.

About the NOAANCCOS models: the models were developed as part of the NOAANCCOS project: Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf. The models resulting from this project are being used in a number of decision-support/mapping products in order to help guide decision-making on activities off the Atlantic Coast with the goal of reducing impacts to migratory birds. One such product is the Northeast Ocean Data Portal, which can be used to explore details about the relative occurrence and abundance of bird species in a particular area off the Atlantic Coast.

All migratory bird range maps within IPaC are continuously being updated as new and better information becomes available.

Can I get additional information about the levels of occurrence in my project area of specific birds or groups of birds listed in IPaC?

Landbirds:

The Avian Knowledge Network (AKN) provides a tool currently called the "Histogram Tool", which draws from the data within the AKN (latest,survey, point count, citizen science datasets) to create a view of relative abundance of species within a particular location over the course of the year. The results of the tool depict the frequency of detection of a species in survey events, averaged between multiple datasets within AKN in a particular week of the year. You may access the histogram tools through the Migratory Bird Programs AKN Histogram Tools webpage.

The tool is currently available for 4 regions (California, Northeast U.S., Southeast U.S. and Midwest), which encompasses the following 32 states: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North, Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin.

In the near future, there are plans to expand this tool nationwide within the AKN, and allow the graphs produced to appear with the list of trust resources generated by IPaC, providing you with an additional level of detail about the level of occurrence of the species of particular concern potentially occurring in your project area throughout the course of the year.

Atlantic Seabirds:

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAANCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird

Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Facilities

Wildlife refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

PFO1C

PSS1C

FRESHWATER POND

PAB4Hx

LAKE

L1UBH

A full description for each wetland code can be found at the National Wetlands Inventory website: https://ecos.fws.gov/ipac/wetlands/decoder

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix N:
EBSD Area Flood Insurance Rate Maps (FIRM's)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by the State of Idaho. This information was compiled from the U.S. Geological Survey (2007), University of Idaho (2007), BureauofLandManagement(2005), BonnerCountyGISDepartment(2007),NGS(2007), and USDA-FSA (2004) at a scale of 1:24,000.

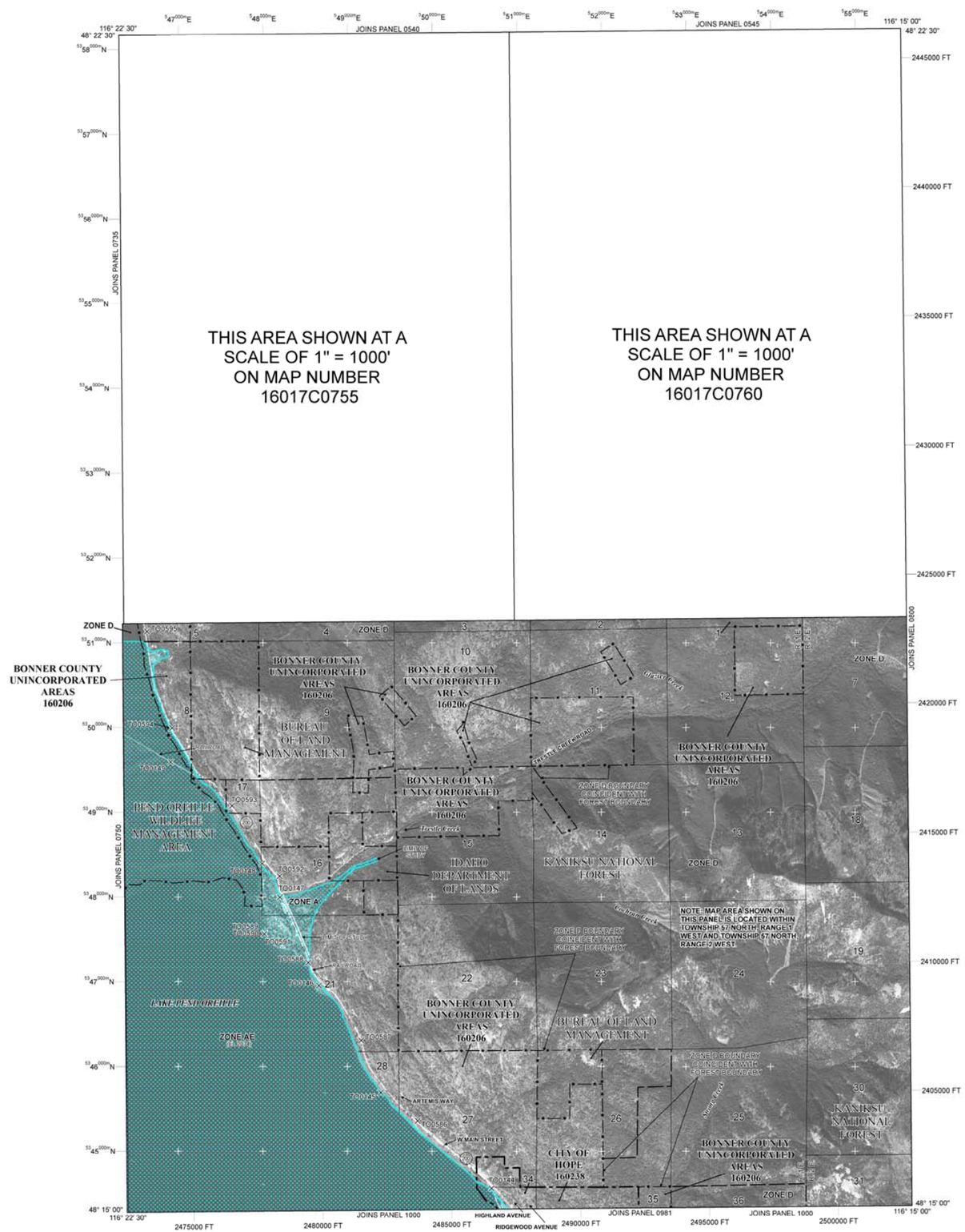
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Idaho State Plane West Zone (FIPS Zone 1103), Transverse Mercator projection
4889000m N	1000-meter Universal Transverse Mercator grid values, zone 11N
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

NOVEMBER 18, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0775E

FIRM

FLOOD INSURANCE RATE MAP

BONNER COUNTY, IDAHO AND INCORPORATED AREAS

PANEL 775 OF 1475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BONNER COUNTY	160206	0775	E
HOPE, CITY OF	160238	0775	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
16017C0775E
EFFECTIVE DATE
NOVEMBER 18, 2009

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by the State of Idaho. This information was compiled from the U.S. Geological Survey (2007), University of Idaho (2007), BureauofLandManagement(2005), BonnerCountyGISDepartment(2007), NGS(2007), and USDA-FSA (2004) at a scale of 1:24,000.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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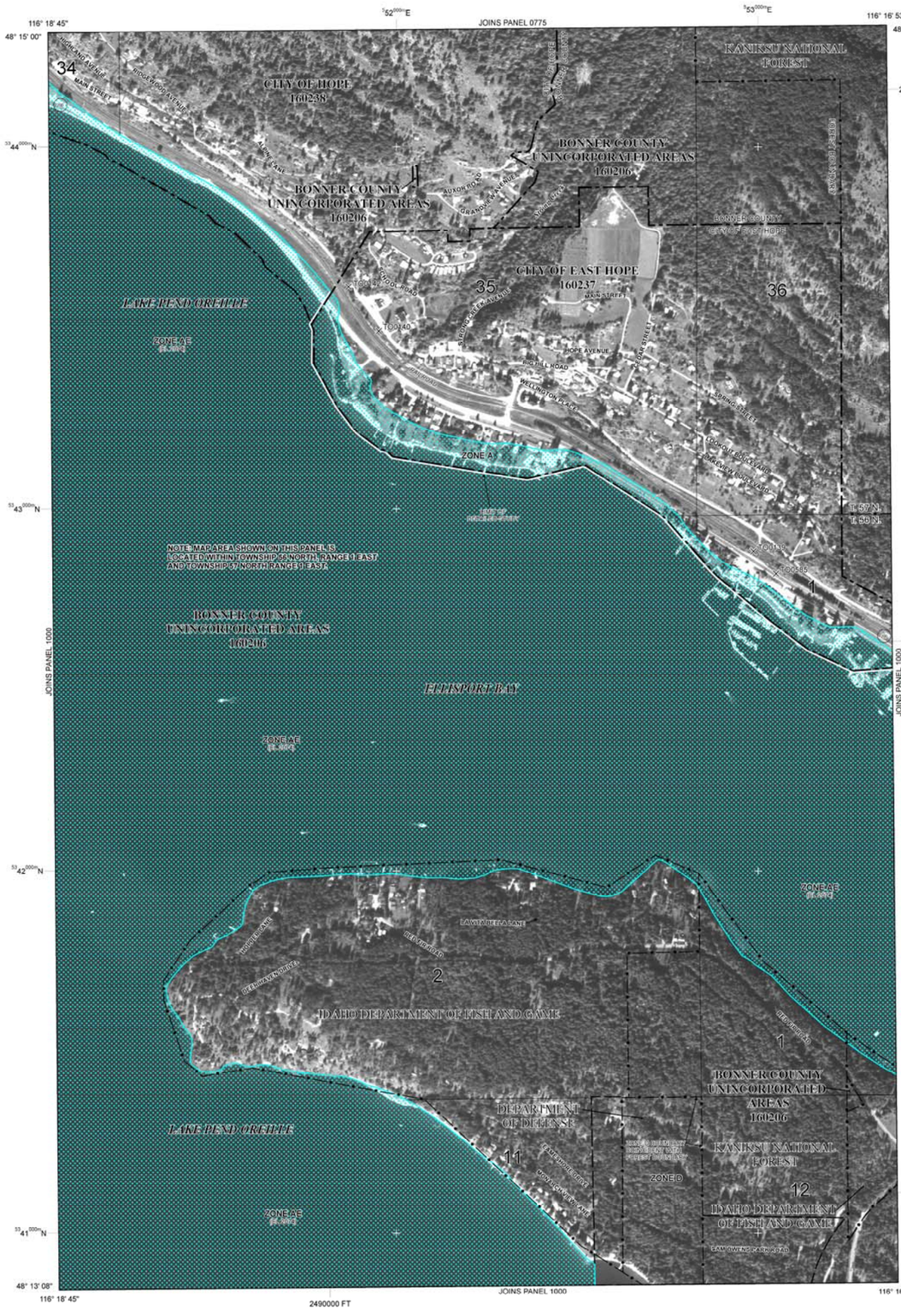
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Idaho State Plane West Zone (FIPS Zone 1103), Transverse Mercator projection
4889000m N	1000-meter Universal Transverse Mercator grid values, zone 11N
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

NOVEMBER 18, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0981E

FIRM

FLOOD INSURANCE RATE MAP

BONNER COUNTY, IDAHO AND INCORPORATED AREAS

PANEL 981 OF 1475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BONNER COUNTY	160206	0981	E
EAST HOPE, CITY OF	160237	0981	E
HOPE, CITY OF	160238	0981	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
16017C0981E
EFFECTIVE DATE
NOVEMBER 18, 2009

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by the State of Idaho. This information was compiled from the U.S. Geological Survey (2007), University of Idaho (2007), BureauofLandManagement(2005), BonnerCountyGISDepartment(2007), NGS(2007), and USDA-FSA (2004) at a scale of 1:24,000.

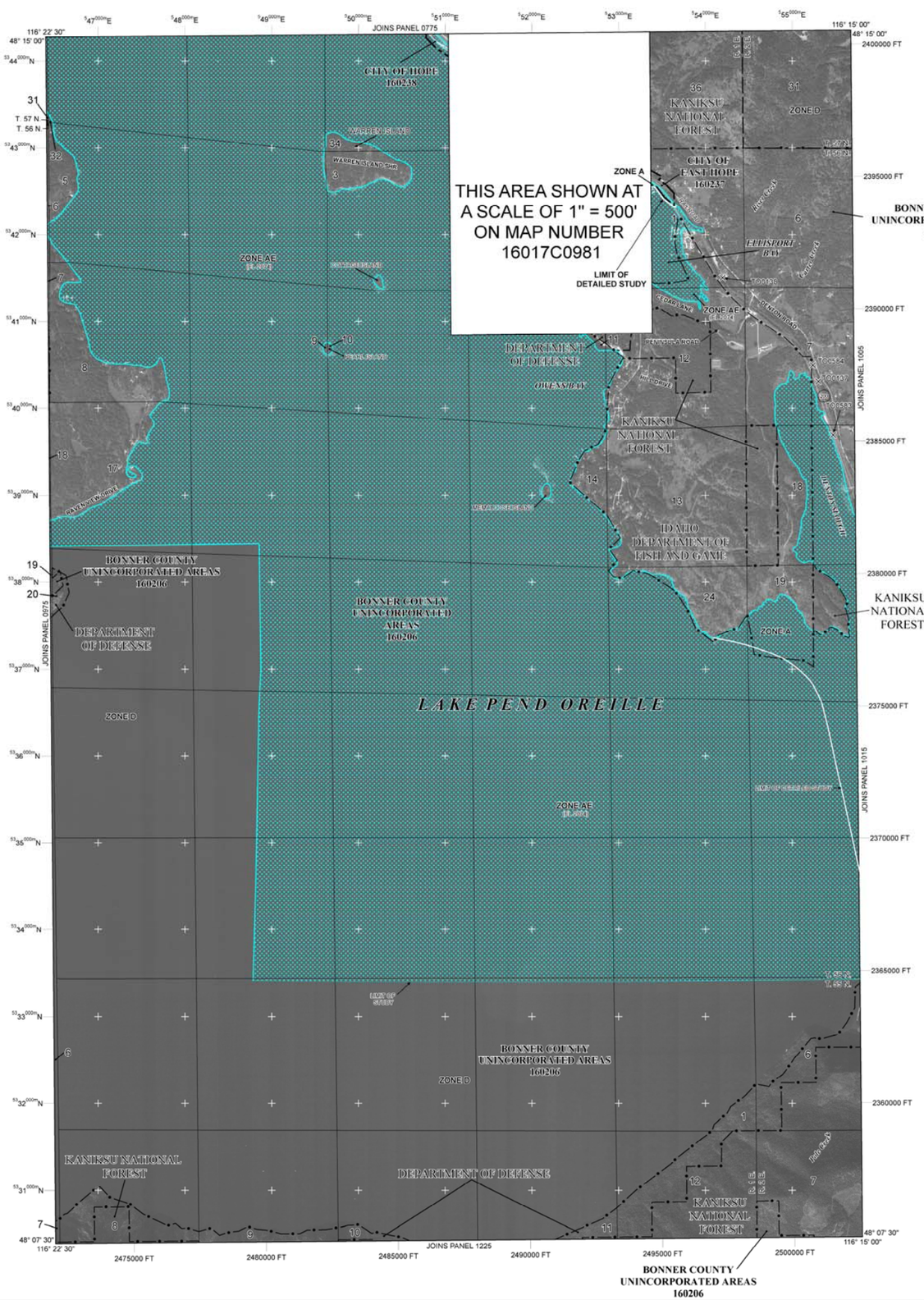
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
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OTHER FLOOD AREAS

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OTHER AREAS

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 3100000 FT — 5000-foot ticks: Idaho State Plane West Zone (FIPS Zone 1103), Transverse Mercator projection
- 4889000 N — 1000-meter Universal Transverse Mercator grid values, zone 11N
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

NOVEMBER 18, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1000E

FIRM

FLOOD INSURANCE RATE MAP

BONNER COUNTY, IDAHO AND INCORPORATED AREAS

PANEL 1000 OF 1475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BONNER COUNTY	160206	1000	E
EAST HOPE, CITY OF	160237	1000	E
HOPE, CITY OF	160238	1000	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
16017C1000E
EFFECTIVE DATE
NOVEMBER 18, 2009

Federal Emergency Management Agency

Appendix O:
USFWS National Wetlands Inventory Map

U.S. Fish and Wildlife Service

National Wetlands Inventory

Ellisport Bay Sewer District

July 28, 2017

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Appendix P:
NRCS Soils Map

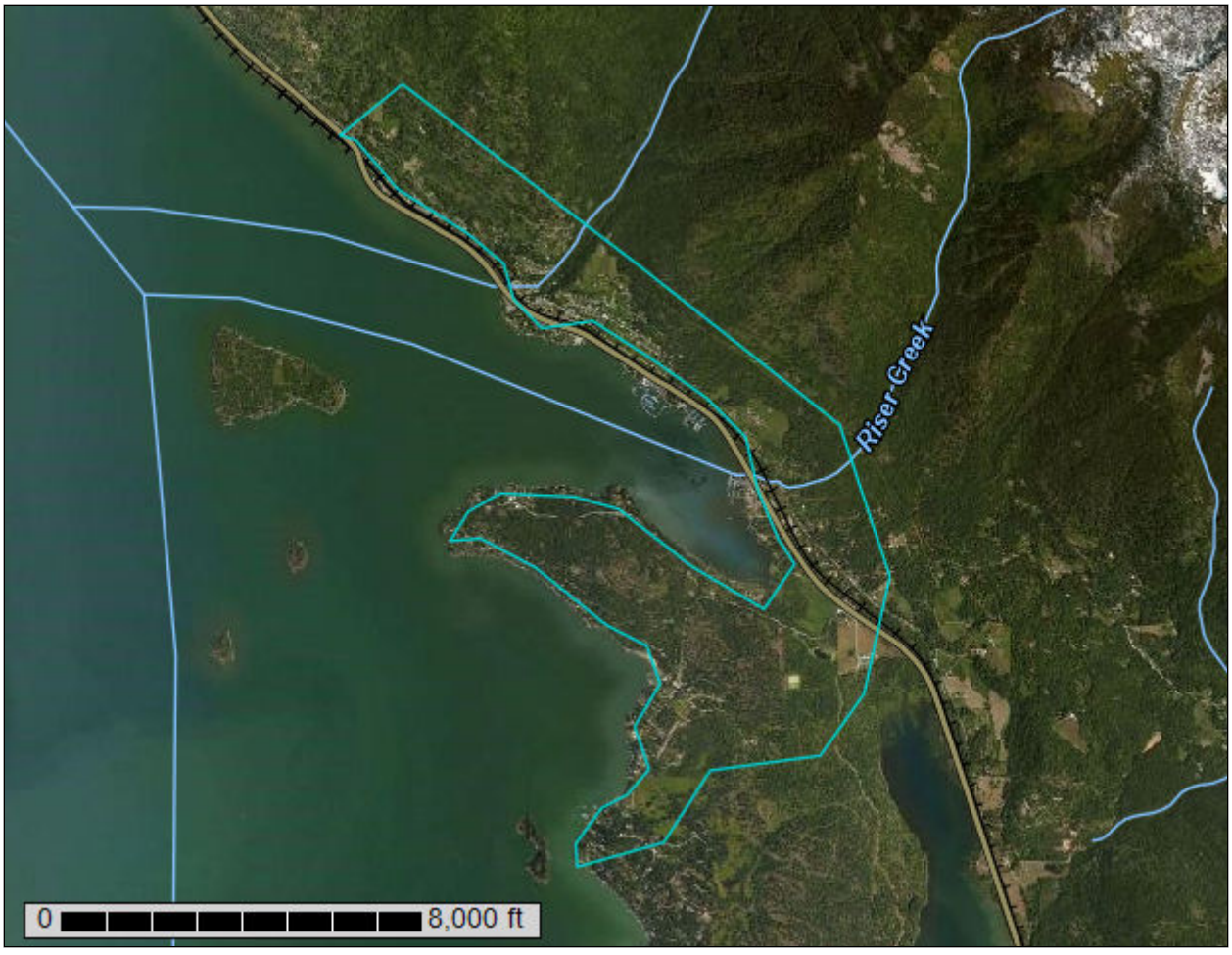
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Bonner County Area, Idaho, Parts of Bonner and Boundary Counties



July 28, 2017

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

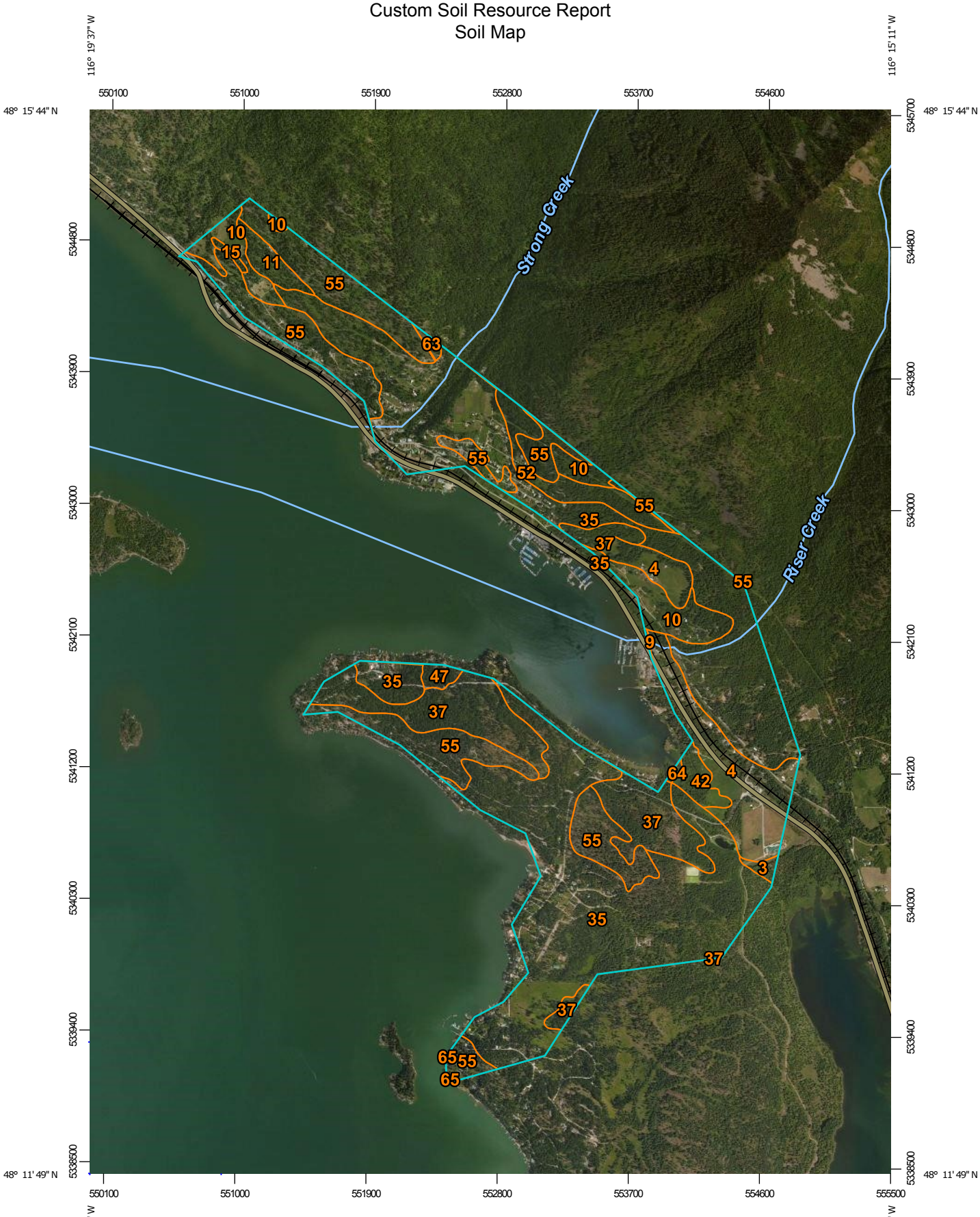
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:35,400 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bonner County Area, Idaho, Parts of Bonner and Boundary Counties
Survey Area Data: Version 11, Sep 8, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 11, 2011—Jul 24, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Bonner County Area, Idaho, Parts of Bonner and Boundary Counties (ID604)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Bonner gravelly silt loam, 30 to 65 percent slopes	5.6	0.3%
4	Bonner silt loam, cool, 0 to 4 percent slopes	148.9	8.4%
9	Colburn very fine sandy loam, 0 to 4 percent slopes	0.6	0.0%
10	Dufort silt loam, 5 to 45 percent slopes	92.5	5.2%
11	Dufort-Rock outcrop complex, 5 to 45 percent slopes	21.4	1.2%
15	Hoodoo silt loam, 0 to 1 percent slopes	3.3	0.2%
35	Pend Oreille silt loam, 5 to 45 percent slopes	908.9	51.5%
37	Pend Oreille-Rock outcrop complex, 5 to 45 percent slopes	193.2	11.0%
42	Pywell-Hoodoo complex, 0 to 1 percent slopes	19.5	1.1%
47	Sagle silt loam, 5 to 30 percent slopes	8.9	0.5%
52	Treble gravelly sandy loam, 20 to 55 percent slopes	48.3	2.7%
55	Treble-Rock outcrop association, 20 to 65 percent slopes	305.8	17.3%
63	Vay-Ardtoo association, 35 to 65 percent slopes	3.6	0.2%
64	Wrencoe silty clay, 0 to 2 percent slopes	2.1	0.1%
65	Water	0.5	0.0%
Totals for Area of Interest		**1,763.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the

landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present

or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Bonner County Area, Idaho, Parts of Bonner and Boundary Counties

3—Bonner gravelly silt loam, 30 to 65 percent slopes

Map Unit Setting

National map unit symbol: 5460
Elevation: 2,000 to 3,000 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Bonner and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bonner

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and loess over outwash derived from granite and/or schist and/or gneiss

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: gravelly ashy silt loam
Bw - 6 to 22 inches: gravelly silt loam
2BC - 22 to 30 inches: gravelly loam
3C - 30 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Other vegetative classification: grand fir/twinflower (CN590)
Hydric soil rating: No

4—Bonner silt loam, cool, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 546c
Elevation: 2,000 to 4,200 feet
Mean annual precipitation: 25 to 45 inches
Mean annual air temperature: 41 to 46 degrees F
Frost-free period: 60 to 120 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bonner, cool, and similar soils: 80 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bonner, Cool

Setting

Landform: Outwash terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and loess over outwash derived from granite and/or schist and/or gneiss

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: ashy silt loam
Bw - 6 to 22 inches: gravelly silt loam
2BC - 22 to 30 inches: gravelly loam
3C - 30 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Other vegetative classification: western hemlock/queencup beadlily (CN570)
Hydric soil rating: No

Minor Components

Capehorn

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: western redcedar/ladyfern (CN540)
Hydric soil rating: Yes

9—Colburn very fine sandy loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 547c
Elevation: 2,000 to 4,200 feet
Mean annual precipitation: 25 to 45 inches
Mean annual air temperature: 41 to 46 degrees F
Frost-free period: 60 to 120 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Colburn and similar soils: 70 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colburn

Setting

Landform: Alluvial fans, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A - 0 to 3 inches: very fine sandy loam
Bwc - 3 to 20 inches: very fine sandy loam
2Btg - 20 to 29 inches: very fine sandy loam
2Cg - 29 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Minor Components

Pywell
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Capehorn
Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: western redcedar/ladyfern (CN540)
Hydric soil rating: Yes

Hoodoo
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

10—Dufort silt loam, 5 to 45 percent slopes

Map Unit Setting
National map unit symbol: 545b
Elevation: 2,100 to 3,600 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 90 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition
Dufort and similar soils: 75 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dufort

Setting
Landform: Hills, mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and/or loess over till derived from granite and/or gneiss and/or schist

Typical profile
A - 0 to 13 inches: ashy silt loam
Bt - 13 to 24 inches: gravelly silt loam

2C - 24 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 5 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: grand fir/ninebark (CN506)
Hydric soil rating: No

11—Dufort-Rock outcrop complex, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 545c
Elevation: 2,100 to 3,600 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 90 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition

Dufort and similar soils: 45 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dufort

Setting

Landform: Hills, mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and/or loess over till derived from granite and/or gneiss and/or schist

Typical profile

A - 0 to 13 inches: ashy silt loam
Bt - 13 to 24 inches: gravelly silt loam
2C - 24 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 5 to 45 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: grand fir/ninebark (CN506)
Hydric soil rating: No

Description of Rock Outcrop

Typical profile
R - 0 to 60 inches: bedrock

Properties and qualities
Slope: 5 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

15—Hoodoo silt loam, 0 to 1 percent slopes

Map Unit Setting
National map unit symbol: 545h
Elevation: 2,000 to 4,200 feet
Mean annual precipitation: 25 to 45 inches
Mean annual air temperature: 41 to 46 degrees F
Frost-free period: 60 to 120 days
Farmland classification: Prime farmland if drained

Map Unit Composition
Hoodoo and similar soils: 70 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoodoo

Setting
Landform: Flood plains, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium

Typical profile

A - 0 to 15 inches: ashy silt loam
Cg1 - 15 to 52 inches: silt loam
2Cg2 - 52 to 60 inches: very cobbly silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 40 to 60 inches to abrupt textural change
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Pywell

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Capehorn

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: western redcedar/ladyfern (CN540)
Hydric soil rating: Yes

Wrencoe

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Hoodoo, peat substratum

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

35—Pend Oreille silt loam, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 5466
Elevation: 2,000 to 3,600 feet

Mean annual precipitation: 25 to 38 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 70 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition

Pend oreille and similar soils: 70 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pend Oreille

Setting

Landform: Mountains
Landform position (two-dimensional): Footslope, backslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and/or loess over till derived from granite and/or metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 6 inches: ashy silt loam
Bw - 6 to 19 inches: gravelly loam
2Bt - 19 to 43 inches: gravelly sandy loam
2C - 43 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 5 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: western hemlock/queencup beadlily (CN570)
Hydric soil rating: No

Minor Components

Hoodoo

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

37—Pend Oreille-Rock outcrop complex, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 5468
Elevation: 2,000 to 3,600 feet
Mean annual precipitation: 25 to 38 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 70 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition

Pend oreille and similar soils: 45 percent
Rock outcrop: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pend Oreille

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Footslope, backslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and/or loess over till derived from granite and/or metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 6 inches: ashy silt loam
Bw - 6 to 19 inches: gravelly loam
2Bt - 19 to 43 inches: gravelly sandy loam
2C - 43 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 5 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: western hemlock/queencup beadlily (CN570)
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 5 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Minor Components

Hoodoo

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

42—Pywell-Hoodoo complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 546g
Elevation: 2,000 to 4,200 feet
Mean annual precipitation: 25 to 45 inches
Mean annual air temperature: 41 to 46 degrees F
Frost-free period: 60 to 120 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Pywell and similar soils: 40 percent
Hoodoo and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pywell

Setting

Landform: Depressions, flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Herbaceous and/or woody organic material

Typical profile

Oa1 - 0 to 15 inches: muck
Oa2 - 15 to 42 inches: muck
Oe - 42 to 60 inches: mucky peat

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 48 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very high (about 26.9 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C
Hydric soil rating: Yes

Description of Hoodoo

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium

Typical profile

A - 0 to 15 inches: ashy silt loam
Cg1 - 15 to 52 inches: silt loam
2Cg2 - 52 to 60 inches: very cobbly silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 40 to 60 inches to abrupt textural change
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Capehorn

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: western redcedar/ladyfern (CN540)
Hydric soil rating: Yes

Wrencoe

Percent of map unit: 5 percent

Landform: Flood plains
Hydric soil rating: Yes

47—Sagle silt loam, 5 to 30 percent slopes

Map Unit Setting

National map unit symbol: 546m
Elevation: 2,000 to 3,000 feet
Mean annual precipitation: 25 to 38 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Sagle and similar soils: 70 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagle

Setting

Landform: Hillslopes
Landform position (two-dimensional): Toeslope, footslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and loess over till derived from granite and/or metamorphic rock

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 16 inches: silt loam
Bt - 16 to 22 inches: gravelly silt loam
Btg - 22 to 61 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: grand fir/twinflower (CN590)

Hydric soil rating: No

Minor Components

Hoodoo

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

52—Treble gravelly sandy loam, 20 to 55 percent slopes

Map Unit Setting

National map unit symbol: 546t
Elevation: 1,800 to 3,600 feet
Mean annual precipitation: 24 to 35 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 90 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Treble and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Treble

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope, footslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Volcanic ash and loess over till derived from granite and/or gneiss and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: gravelly sandy loam
Bw1 - 3 to 8 inches: gravelly sandy loam
Bw2 - 8 to 28 inches: very gravelly coarse sandy loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 20 to 55 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Other vegetative classification: Douglas-fir/ninebark (CN260)
Hydric soil rating: No

55—Treble-Rock outcrop association, 20 to 65 percent slopes

Map Unit Setting

National map unit symbol: 546x
Elevation: 1,800 to 3,600 feet
Mean annual precipitation: 24 to 35 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 90 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Treble and similar soils: 45 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Treble

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Volcanic ash and loess over till derived from granite and/or gneiss and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: gravelly sandy loam
Bw1 - 3 to 8 inches: gravelly sandy loam
Bw2 - 8 to 28 inches: very gravelly coarse sandy loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 20 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Other vegetative classification: Douglas-fir/ninebark (CN260)
Hydric soil rating: No

Description of Rock Outcrop

Typical profile
R - 0 to 60 inches: bedrock

Properties and qualities
Slope: 20 to 65 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

63—Vay-Ardtoo association, 35 to 65 percent slopes

Map Unit Setting
National map unit symbol: 5476
Elevation: 2,300 to 5,200 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 60 to 110 days
Farmland classification: Not prime farmland

Map Unit Composition
Vay and similar soils: 40 percent
Ardtoo and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vay

Setting
Landform: Mountains
Landform position (two-dimensional): Backslope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Volcanic ash over residuum weathered from granite and/or gneiss and/or schist

Typical profile
Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 7 inches: gravelly medial silt loam
Bw1 - 7 to 17 inches: gravelly silt loam
Bw2 - 17 to 26 inches: very gravelly loam
2BC - 26 to 43 inches: extremely gravelly coarse sandy loam
2Cr - 43 to 53 inches: bedrock

Properties and qualities

Slope: 35 to 65 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: B
Other vegetative classification: western hemlock/queencup beadlily (CN570)
Hydric soil rating: No

Description of Ardtoo

Setting

Landform: Mountains
Parent material: Volcanic ash and loess over residuum weathered from granite and/or gneiss and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: gravelly sandy loam
Bw - 5 to 16 inches: gravelly sandy loam
2Bt - 16 to 49 inches: very gravelly coarse sandy loam
2Cr - 49 to 59 inches: bedrock

Properties and qualities

Slope: 35 to 65 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Other vegetative classification: grand fir/ninebark (CN506)
Hydric soil rating: No

64—Wrencoe silty clay, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5477
Elevation: 2,000 to 3,000 feet
Mean annual precipitation: 25 to 38 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 80 to 120 days
Farmland classification: Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Wrencoe and similar soils: 80 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wrencoe

Setting

Landform: Flood plains, stream terraces
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Lacustrine deposits

Typical profile

A - 0 to 10 inches: silty clay
Btg1 - 10 to 50 inches: silty clay
Btg2 - 50 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Pywell

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Hoodoo

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

65—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Soil Information for All Uses

Suitabilities and Limitations for Use

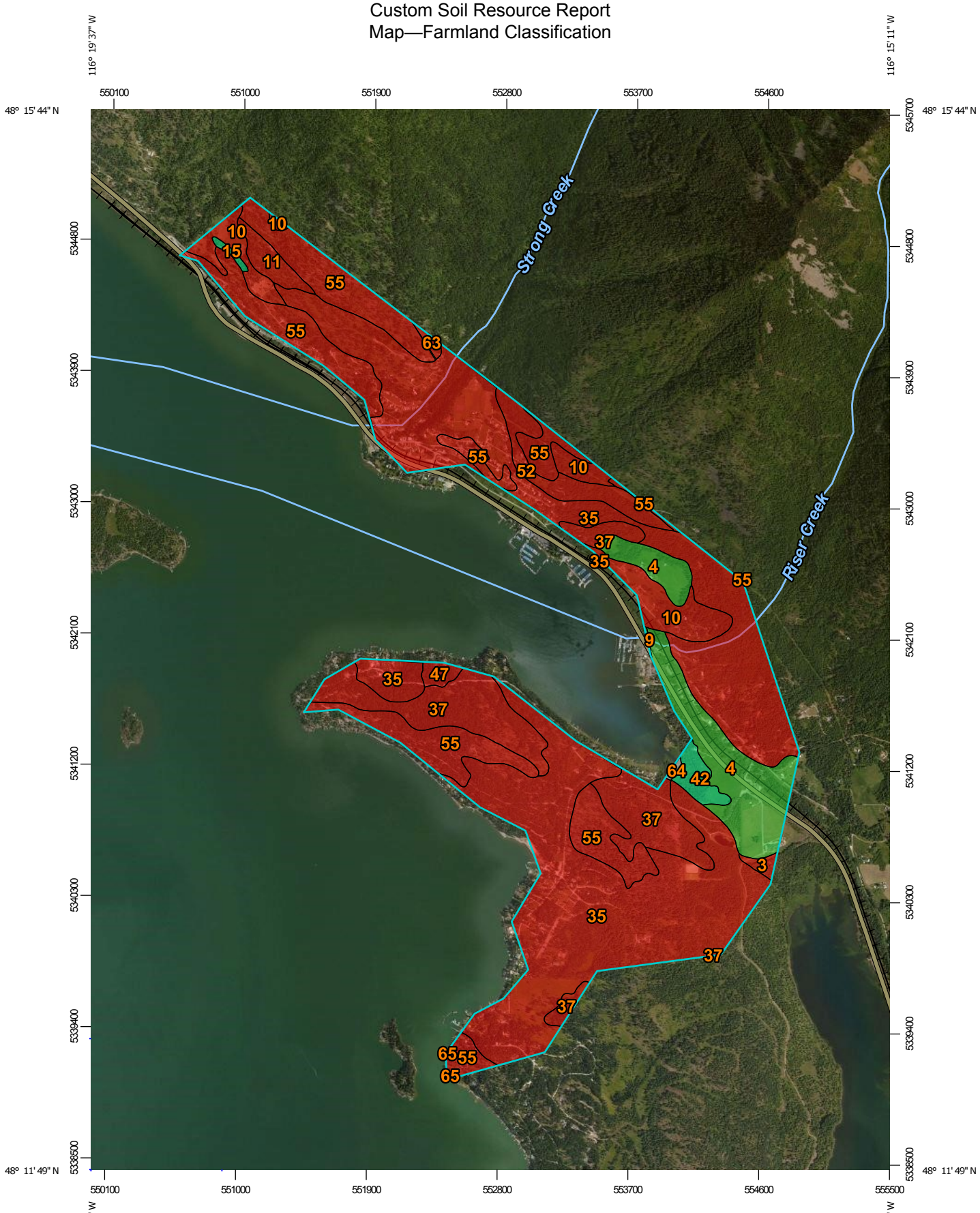
The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.



Map Scale: 1:35,400 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation


Rails


Interstate Highways


US Routes

Major Roads

Local Roads

Background


Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bonner County Area, Idaho, Parts of Bonner and Boundary Counties
Survey Area Data: Version 11, Sep 8, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 11, 2011—Jul 24, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification

Farmland Classification— Summary by Map Unit — Bonner County Area, Idaho, Parts of Bonner and Boundary Counties (ID604)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
3	Bonner gravelly silt loam, 30 to 65 percent slopes	Not prime farmland	5.6	0.3%
4	Bonner silt loam, cool, 0 to 4 percent slopes	All areas are prime farmland	148.9	8.4%
9	Colburn very fine sandy loam, 0 to 4 percent slopes	All areas are prime farmland	0.6	0.0%
10	Dufort silt loam, 5 to 45 percent slopes	Not prime farmland	92.5	5.2%
11	Dufort-Rock outcrop complex, 5 to 45 percent slopes	Not prime farmland	21.4	1.2%
15	Hoodoo silt loam, 0 to 1 percent slopes	Prime farmland if drained	3.3	0.2%
35	Pend Oreille silt loam, 5 to 45 percent slopes	Not prime farmland	908.9	51.5%
37	Pend Oreille-Rock outcrop complex, 5 to 45 percent slopes	Not prime farmland	193.2	11.0%
42	Pywell-Hoodoo complex, 0 to 1 percent slopes	Prime farmland if drained	19.5	1.1%
47	Sagle silt loam, 5 to 30 percent slopes	Not prime farmland	8.9	0.5%
52	Treble gravelly sandy loam, 20 to 55 percent slopes	Not prime farmland	48.3	2.7%
55	Treble-Rock outcrop association, 20 to 65 percent slopes	Not prime farmland	305.8	17.3%
63	Vay-Ardtoo association, 35 to 65 percent slopes	Not prime farmland	3.6	0.2%
64	Wrencoe silty clay, 0 to 2 percent slopes	Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season	2.1	0.1%
65	Water	Not prime farmland	0.5	0.0%
Totals for Area of Interest			**1,763.3**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

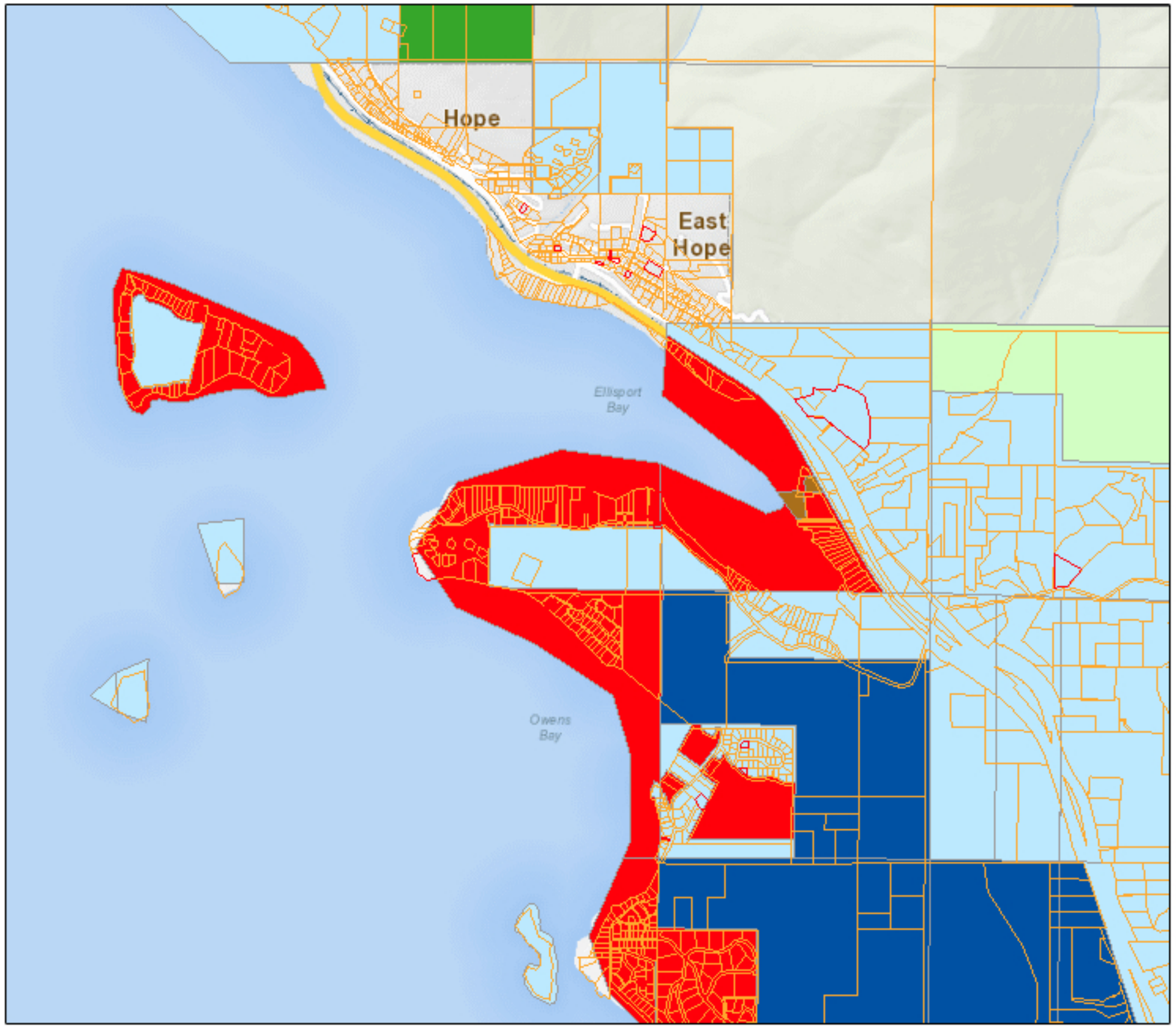
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix Q:
Bonner County Land Use Zoning Map

Bonner County Zoning Map

Ellisport Bay Sewer District



http://maps.bonnercounty.us/apps/public/ (accessed 7/31/17)

Legend

Parcels

2018 Parcels

Tax Roll Parcels

Zoning

Current Zoning

- ALPINE VILLAGE (AV)
- RECREATION (REC)
- SUBURBAN (S)
- COMMERCIAL (C)
- RURAL SERVICE CENTER (RSC)
- INDUSTRIAL (I)
- RURAL 5 (R-5)
- RURAL 10 (R-10)
- AGRICULTURAL/FORESTRY 10 (A/F-10)
- AGRICULTURAL/FORESTRY 20 (A/F-20)
- FOREST 40 (F)

Appendix R:
Zip Code Area Map and Population – US Census Bureau Data

QT-P3

Race and Hispanic or Latino Origin: 2010

2010 Census Summary File 1

NOTE: For information on confidentiality protection, nonsampling error, and definitions, see http://www.census.gov/prod/cen2010/doc/sf1.pdf.

Geography: ZCTA5 83836

Subject	Number	Percent
RACE		
Total population	1,033	100.0
One race	1,026	99.3
White	996	96.4
Black or African American	0	0.0
American Indian and Alaska Native	6	0.6
American Indian, specified [1]	6	0.6
Alaska Native, specified [1]	0	0.0
Both American Indian and Alaska Native, specified [1]	0	0.0
American Indian or Alaska Native, not specified	0	0.0
Asian	3	0.3
Native Hawaiian and Other Pacific Islander	20	1.9
Some Other Race	1	0.1
Two or More Races	7	0.7
Two races with Some Other Race	1	0.1
Two races without Some Other Race	5	0.5
Three or more races with Some Other Race	0	0.0
Three or more races without Some Other Race	1	0.1
HISPANIC OR LATINO		
Total population	1,033	100.0
Hispanic or Latino (of any race)	15	1.5
Mexican	4	0.4
Puerto Rican	0	0.0
Cuban	0	0.0
Other Hispanic or Latino [2]	11	1.1
Not Hispanic or Latino	1,018	98.5
RACE AND HISPANIC OR LATINO		
Total population	1,033	100.0
One race	1,026	99.3
Hispanic or Latino	14	1.4
Not Hispanic or Latino	1,012	98.0
Two or More Races	7	0.7
Hispanic or Latino	1	0.1
Not Hispanic or Latino	6	0.6

X Not applicable.
[1] "American Indian, specified" includes people who provided a specific American Indian tribe, such as Navajo or Blackfeet. "Alaska Native, specified" includes people who provided a specific Alaska Native group, such as Inupiat or Yup'ik.
[2] This category is comprised of people whose origins are from the Dominican Republic, Spain, and Spanish-speaking Central or South American countries. It also includes general origin responses such as "Latino" or "Hispanic."
Source: U.S. Census Bureau, 2010 Census.

DP-1

Profile of General Population and Housing Characteristics: 2010

2010 Demographic Profile Data

NOTE: For more information on confidentiality protection, nonsampling error, and definitions, see http://www.census.gov/prod/cen2010/doc/dpsf.pdf.

Geography: ZCTA5 83836

Subject	Number	Percent
SEX AND AGE		
Total population	1,033	100.0
Under 5 years	28	2.7
5 to 9 years	58	5.6
10 to 14 years	44	4.3
15 to 19 years	47	4.5
20 to 24 years	20	1.9
25 to 29 years	32	3.1
30 to 34 years	29	2.8
35 to 39 years	40	3.9
40 to 44 years	48	4.6
45 to 49 years	58	5.6
50 to 54 years	97	9.4
55 to 59 years	123	11.9
60 to 64 years	149	14.4
65 to 69 years	91	8.8
70 to 74 years	74	7.2
75 to 79 years	40	3.9
80 to 84 years	31	3.0
85 years and over	24	2.3
Median age (years)	55.8	(X)
16 years and over	894	86.5
18 years and over	871	84.3
21 years and over	854	82.7
62 years and over	360	34.8
65 years and over	260	25.2
Male population	510	49.4
Under 5 years	13	1.3
5 to 9 years	35	3.4
10 to 14 years	25	2.4
15 to 19 years	22	2.1
20 to 24 years	11	1.1
25 to 29 years	18	1.7
30 to 34 years	18	1.7
35 to 39 years	17	1.6
40 to 44 years	15	1.5
45 to 49 years	34	3.3
50 to 54 years	40	3.9
55 to 59 years	60	5.8
60 to 64 years	74	7.2

Subject	Number	Percent
65 to 69 years	46	4.5
70 to 74 years	38	3.7
75 to 79 years	21	2.0
80 to 84 years	12	1.2
85 years and over	11	1.1
Median age (years)	55.5	(X)
16 years and over	432	41.8
18 years and over	421	40.8
21 years and over	415	40.2
62 years and over	180	17.4
65 years and over	128	12.4
Female population	523	50.6
Under 5 years	15	1.5
5 to 9 years	23	2.2
10 to 14 years	19	1.8
15 to 19 years	25	2.4
20 to 24 years	9	0.9
25 to 29 years	14	1.4
30 to 34 years	11	1.1
35 to 39 years	23	2.2
40 to 44 years	33	3.2
45 to 49 years	24	2.3
50 to 54 years	57	5.5
55 to 59 years	63	6.1
60 to 64 years	75	7.3
65 to 69 years	45	4.4
70 to 74 years	36	3.5
75 to 79 years	19	1.8
80 to 84 years	19	1.8
85 years and over	13	1.3
Median age (years)	56.1	(X)
16 years and over	462	44.7
18 years and over	450	43.6
21 years and over	439	42.5
62 years and over	180	17.4
65 years and over	132	12.8
RACE		
Total population	1,033	100.0
One Race	1,026	99.3
White	996	96.4
Black or African American	0	0.0
American Indian and Alaska Native	6	0.6
Asian	3	0.3
Asian Indian	0	0.0
Chinese	0	0.0
Filipino	1	0.1
Japanese	2	0.2
Korean	0	0.0
Vietnamese	0	0.0
Other Asian [1]	0	0.0
Native Hawaiian and Other Pacific Islander	20	1.9
Native Hawaiian	2	0.2
Guamanian or Chamorro	3	0.3
Samoan	0	0.0

Subject	Number	Percent
Other Pacific Islander [2]	15	1.5
Some Other Race	1	0.1
Two or More Races	7	0.7
White; American Indian and Alaska Native [3]	1	0.1
White; Asian [3]	2	0.2
White; Black or African American [3]	2	0.2
White; Some Other Race [3]	1	0.1
Race alone or in combination with one or more other races: [4]		
White	1,003	97.1
Black or African American	2	0.2
American Indian and Alaska Native	7	0.7
Asian	6	0.6
Native Hawaiian and Other Pacific Islander	21	2.0
Some Other Race	2	0.2
HISPANIC OR LATINO		
Total population	1,033	100.0
Hispanic or Latino (of any race)	15	1.5
Mexican	4	0.4
Puerto Rican	0	0.0
Cuban	0	0.0
Other Hispanic or Latino [5]	11	1.1
Not Hispanic or Latino	1,018	98.5
HISPANIC OR LATINO AND RACE		
Total population	1,033	100.0
Hispanic or Latino	15	1.5
White alone	13	1.3
Black or African American alone	0	0.0
American Indian and Alaska Native alone	0	0.0
Asian alone	0	0.0
Native Hawaiian and Other Pacific Islander alone	0	0.0
Some Other Race alone	1	0.1
Two or More Races	1	0.1
Not Hispanic or Latino	1,018	98.5
White alone	983	95.2
Black or African American alone	0	0.0
American Indian and Alaska Native alone	6	0.6
Asian alone	3	0.3
Native Hawaiian and Other Pacific Islander alone	20	1.9
Some Other Race alone	0	0.0
Two or More Races	6	0.6
RELATIONSHIP		
Total population	1,033	100.0
In households	1,033	100.0
Householder	485	47.0
Spouse [6]	291	28.2
Child	182	17.6
Own child under 18 years	147	14.2
Other relatives	27	2.6
Under 18 years	12	1.2
65 years and over	2	0.2
Nonrelatives	48	4.6
Under 18 years	3	0.3
65 years and over	5	0.5
Unmarried partner	27	2.6
In group quarters	0	0.0

Subject	Number	Percent
Institutionalized population	0	0.0
Male	0	0.0
Female	0	0.0
Noninstitutionalized population	0	0.0
Male	0	0.0
Female	0	0.0
HOUSEHOLDS BY TYPE		
Total households	485	100.0
Family households (families) [7]	330	68.0
With own children under 18 years	77	15.9
Husband-wife family	291	60.0
With own children under 18 years	57	11.8
Male householder, no wife present	14	2.9
With own children under 18 years	8	1.6
Female householder, no husband present	25	5.2
With own children under 18 years	12	2.5
Nonfamily households [7]	155	32.0
Householder living alone	135	27.8
Male	57	11.8
65 years and over	16	3.3
Female	78	16.1
65 years and over	39	8.0
Households with individuals under 18 years	86	17.7
Households with individuals 65 years and over	182	37.5
Average household size	2.13	(X)
Average family size [7]	2.52	(X)
HOUSING OCCUPANCY		
Total housing units	916	100.0
Occupied housing units	485	52.9
Vacant housing units	431	47.1
For rent	9	1.0
Rented, not occupied	0	0.0
For sale only	25	2.7
Sold, not occupied	4	0.4
For seasonal, recreational, or occasional use	369	40.3
All other vacants	24	2.6
Homeowner vacancy rate (percent) [8]	5.9	(X)
Rental vacancy rate (percent) [9]	9.4	(X)
HOUSING TENURE		
Occupied housing units	485	100.0
Owner-occupied housing units	398	82.1
Population in owner-occupied housing units	796	(X)
Average household size of owner-occupied units	2.00	(X)
Renter-occupied housing units	87	17.9
Population in renter-occupied housing units	237	(X)
Average household size of renter-occupied units	2.72	(X)

X Not applicable.

[1] Other Asian alone, or two or more Asian categories.

[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.

[3] One of the four most commonly reported multiple-race combinations nationwide in Census 2000.

[4] In combination with one or more of the other races listed. The six numbers may add to more than the total population, and the six

percentages may add to more than 100 percent because individuals may report more than one race.

[5] This category is composed of people whose origins are from the Dominican Republic, Spain, and Spanish-speaking Central or South American countries. It also includes general origin responses such as "Latino" or "Hispanic."
[6] "Spouse" represents spouse of the householder. It does not reflect all spouses in a household. Responses of "same-sex spouse" were edited during processing to "unmarried partner."
[7] "Family households" consist of a householder and one or more other people related to the householder by birth, marriage, or adoption. They do not include same-sex married couples even if the marriage was performed in a state issuing marriage certificates for same-sex couples. Same-sex couple households are included in the family households category if there is at least one additional person related to the householder by birth or adoption. Same-sex couple households with no relatives of the householder present are tabulated in nonfamily households. "Nonfamily households" consist of people living alone and households which do not have any members related to the householder.

[8] The homeowner vacancy rate is the proportion of the homeowner inventory that is vacant "for sale." It is computed by dividing the total number of vacant units "for sale only" by the sum of owner-occupied units, vacant units that are "for sale only," and vacant units that have been sold but not yet occupied; and then multiplying by 100.
[9] The rental vacancy rate is the proportion of the rental inventory that is vacant "for rent." It is computed by dividing the total number of vacant units "for rent" by the sum of the renter-occupied units, vacant units that are "for rent," and vacant units that have been rented but not yet occupied; and then multiplying by 100.
Source: U.S. Census Bureau, 2010 Census.