J·U·B ENGINEERS, INC.

Bayview Water and Sewer District
Water System Facility Plan

Existing Conditions

February 2019

THIS PAGE WAS INTENTIONALLY LEFT BLANK

Contents

Appendices

TM No. 2 – Existing Conditions

2.1 Study Boundary

The Bayview Water and Sewer District's (District's) water service boundary comprises the general planning area of any improvements to the District's potable water system. The overall District boundary, wells, storage tank locations and other facilities are shown in **Figure 2-1.** The District boundary encompasses approximately 870 acres surrounding Scenic Bay of Lake Pend Oreille and is bounded by Farragut State Park on the south and west.

2.2 Technical Memorandum Organization

This technical memorandum is comprised of sections detailing the planning area, population demographics, water use, and regulatory issues for the District's existing water system, summarized as follows:

Section 2.3 – Service Population

The current population served by the District's water system, including number of connections and equivalent residential units (ERUs) is discussed. Two methods for projecting future connections and ERUs are presented and a growth rate is selected for use in determining future demands.

Section 2.4 – Water Use

Production data for 2015 through 2017, including Average Day, Maximum Day, Peak Hour, and Maximum Month, is presented. Consumption (demand) data collected from individual water meter readings is also summarized. Future production requirements based on projected future connections are discussed, along with fire flow recommendations. Finally, production and consumption data are compared to determine non-revenue water, the difference between water produced and water sold.

Section 2.5 – Existing Water System

The current operations, performance, and observed deficiencies of the components of the District's water system (i.e. Supply, Storage, and Distribution) are discussed to establish a baseline condition for the system. The existing water rate structure is presented and recommendations from recent IDEQ Sanitary Surveys are summarized.

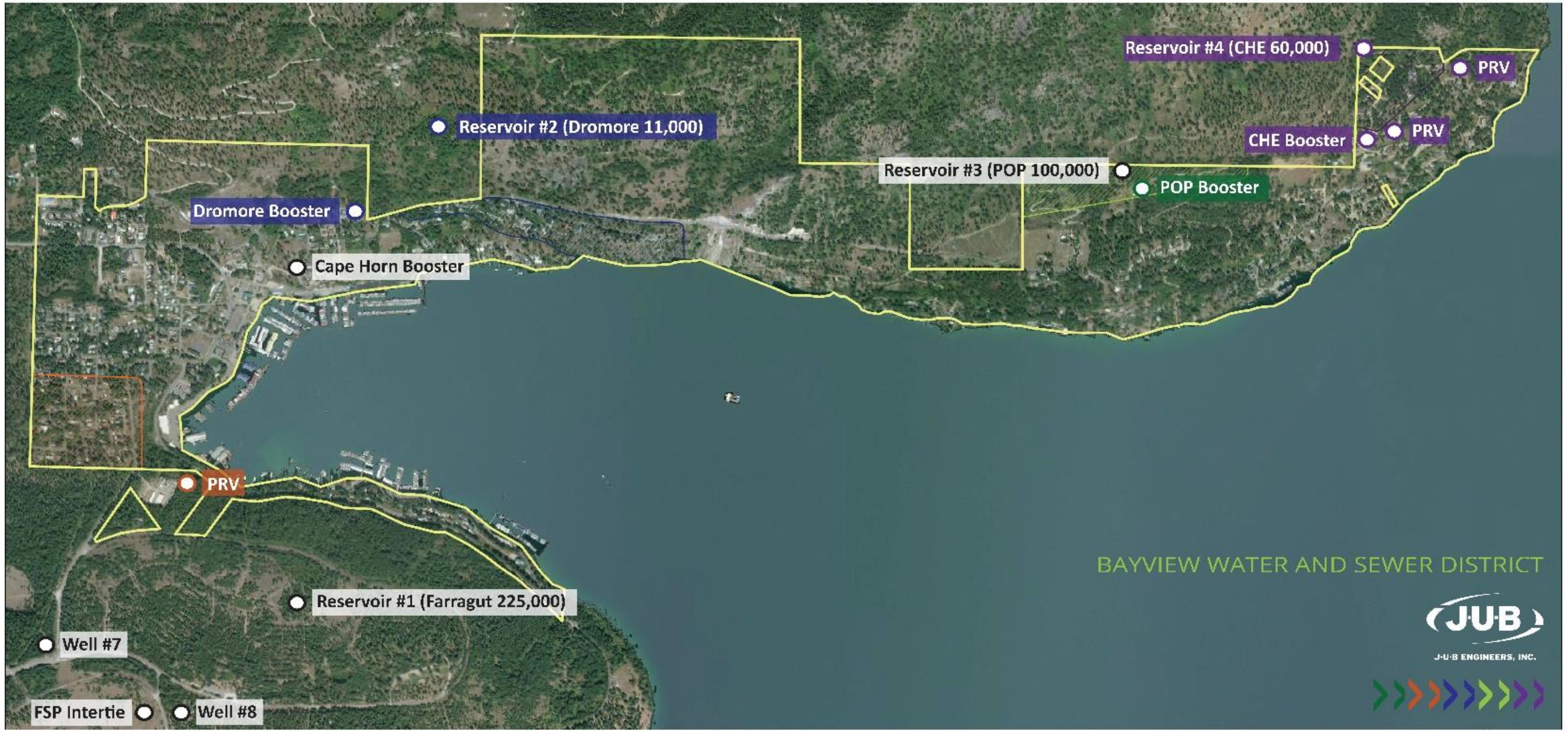
Section 2.6 – Regulatory Considerations

This section presents current regulatory items pertinent to the District's water system, as well as future regulations that may impact the District within the planning period.

Existing Environmental Conditions in the Planning Area

Note that the existing environmental conditions for the planning area for the improvements to the District's potable water system are presented and discussed separately in Technical Memorandum 5.

Figure 2-1 – District Extents and Water System Service Area



2.3 Service Population

2.3.1 Current Population Served

Population data from the 2010 Census and US Census Bureau population estimates for the nearby communities of Athol, Spirit Lake, Sandpoint, the 83803 ZIP code, as well as Kootenai and Bonner County is presented in **Table 2-1**. The table also shows percent change per year from 2010 through 2016. In general, population in all surrounding areas have increased in all referenced areas since 2010.

Table 2-1 – Existing Population Data

Entity	2010 Census[(a)]	2016 Population Estimate[(a)]	Percentage Change	Percent Change per Year from 2010 to 2016
83803 ZIP Code	744	838	12.63%	2.11%
Athol	692	863	24.71%	4.12%
Spirit Lake	1,945	2,269	16.66%	2.78%
Sandpoint	7,365	7,698	4.52%	0.75%
Kootenai County	138,494	147,716	6.66%	1.11%
Bonner County	40,877	41,389	1.25%	0.21%

(a) Per the U.S. Census Bureau

The exact population served by the District is difficult to determine as the service area is unincorporated and official population numbers are not available. Additionally, the District experiences seasonal population fluctuations as many homes in its service area are vacation and/or second homes. Therefore, population served by the District's water system was estimated using existing 2010 Census data plus residential connection information from the District assuming 1.91 people per household (the average density listed in the 2010 Census for area encompassed by the 83803 ZIP code). It should be noted that the community of Bayview and the Cape Horn Area are the only densely populated areas of the 83803 ZIP code. Using this approach, the total population served by the District's water system is estimated at **984** people (i.e., 463 active residential connections with 1.91 people per household, plus approximately 100 employees at the US Naval Detachment). Note that the US Naval Detachment is a research facility of the US Navy that conducts acoustic research in Lake Pend Oreille.

2.3.2 Connections and ERUs

The District maintains records on its total number of connections. The District is currently moving forward with a rate study to evaluate its existing rate structure, as well as a review of their commercial connections. Currently the District considers 12 of the connections to be commercial, but a recent review of the records for this facility planning effort by the District has indicated several connections that are currently labelled residential should actually be considered and billed with the commercial connections. The District has not assigned "equivalent residential units" or ERUs to their commercial connections at this time but anticipate analyzing it in the upcoming rate study. **Table 2-2** contains connection information for the District for the past few years, including percent change.

Table 2-2 – Total Water Connections[(a)]

Date	Residential Connections		Commercial Connections	Total Connections	Annual Change	
	Bayview Area	Cape Horn Area			Connections	Percent
Sept 2014	345	149	12	506		
Sept 2015	345	150	12	507	1	0.20%
Sept 2016	348	150	12	510	3	0.59%
Sept 2017	352	156	12	520	10	1.96%
				AVERAGE	**4.67**	**0.92%**

[(a)] *Includes active and inactive accounts – best available information provided by the District's records.*

2.3.3 Future Connection Projections

Residential connections have increased at a rate of approximately one percent from 2014 through 2017 while commercial connections have remained constant. This correlates relatively well with the 1.11 percent growth observed in Kootenai County from 2010 through 2016. **Table 2-3** shows projected connections through a 30-year planning period assuming commercial use and demand remain relatively constant and a one percent growth rate for residential connections. Extending the horizon 10 years beyond the typical 20-year planning period can be instructive for long-lived infrastructure improvement planning.

Table 2-3 – Future Connections at a One Percent Growth Rate

Year	Residential Connections	Total Connections [(a)]
2017 (Existing)	463	475
2027	509	521
2037	560	572
2047	616	628

[(a)] *Assumes commercial connections remain at existing levels (i.e., 12)*

This projection (i.e., one percent growth), which results in the addition of 97 and 153 connections over the next 20 and 30 years, respectively, assumes the District water system boundaries will remain close to the current configuration and all new connections are expected to be residential. Some minor commercial expansion may occur, but future use and demand are not expected to be significantly different from current uses.

Another method for approximating the District's future connections is based on land availability and number of platted lots in the District plus all parcels large enough to be subdivided. This assumes the water system would expand to serve all areas, including existing water patrons and sewer-only lots. In addition, there are at least four small private water systems in the Bayview area (and within the current

District boundaries) that do not currently have any desire to be served by the District's infrastructure. However, future costly repairs or regulations may increase the probability that these four small systems (Schaeffer, Bayview Heights, Silver Water, and McKinley) would connect to the District's system. This could represent 60-80 potential residential connections in the Bayview Area.

A potential full build-out scenario could result in new water service to approximately 130 connections in the Cape Horn Area and potentially 200 connections in the Bayview Area. This results in a total of 330 new residential connections and represents a growth rate of around two percent annually over the next 30 years. This also correlates well with the growth seen in the 83803 ZIP code area based on US Census Bureau projections. As indicated earlier, the District boundary makes up the bulk of the 83803 ZIP code area.

Based on the historical data presented, the District selected a residential growth rate of two percent for planning purposes at a Public Workshop on April 10, 2018 after reviewing the range of potential growth over the 20-year planning period for this Facility Plan. Future commercial demand was assumed to remain similar to the current uses. A two percent growth rate results in approximately 679 connections served by the system in 2037, as shown in **Table 2-4**.

Table 2-4 – Future Connections at Selected Two Percent Growth Rate

Year	Residential Connections	Total Connections[(a)]
2017 (Existing)	463	475
2027	556	568
2037	667	679
2047	800	812

[(a)] *Assumes commercial connections remain at existing levels (i.e., 12)*

2.4 Water Use

Subsequent sections discuss the District's water production, current and future demand, fire flow, and non-revenue water.

2.4.1 Production

The District's water supply is made up of two similar groundwater wells that each have a capacity of 750 gpm (Well 7 primary, Well 8 backup). Historically, Well 7 has been the District's primary source, while Well 8 is considered the backup as it is leased from the State of Idaho.

The production from each well is measured with a flow meter located in each well house. The District's operator typically reads the flow meter once daily. Prior to 2016, some of the production data appears to be missing, inaccurate and/or affected by the 2015 wildland fire in the District. In addition, as noted in later sections, non-revenue water has been reduced from previous years due to the fixing of leaks by

the former system operators. While additional years of data are presented here for review, analysis of the production output for future projections will be primarily based on data from 2016 and 2017. **Table 2-5** summarizes the monthly production data.

Table 2-5 – Monthly Water Production Data (2014 – 2017)

Month	Total (gal)				Average Day (gpd)	Maximum Day (gpd)
	2014	2015[(a)]	2016	2017	2016 & 2017	2017
January	9,215,900	7,201,900	7,414,700	5,515,300	208,600	
February	8,784,400	6,967,000	7,634,400	4,786,800	221,900	
March	7,951,500	7,879,200	8,042,600	5,173,200	213,200	
April	7,282,300	7,703,700	8,238,400	4,471,000	211,800	
May	8,156,500	9,206,800	10,466,500	5,805,400	262,500	
June	9,421,700	13,432,000	11,655,000	7,223,500	314,700	
July	11,840,100	18,112,600[(a)]	10,154,000	10,566,100	334,200	392,900
August	10,811,000	14,075,000	10,406,400	11,418,800	352,000	477,100
September	10,010,800	9,839,600	7,026,800	6,614,300	227,400	
October	7,585,100	8,247,300	4,823,600	4,549,700	151,200	
November	6,069,300	8,221,000	4,341,800	3,910,400	137,500	
December	8,656,900	7,330,800	5,922,400	4,444,800	167,200	
Totals:	**105,785,500**	**118,216,900**	**96,126,600**	**74,479,300**	**233,500[(b)]**	

(a) *In 2015, the Cape Horn Area and portions of Bayview experienced a significant wildland fire during the month of July that destroyed several homes and structures within the District boundary.*

(b) *Average value.*

The District's production typically experiences a pronounced increase generally beginning in June due to increased irrigation demands and the seasonal influx of tourists and part-time residents. The highest production occurs in the summer (i.e., June through August), with substantial increases in July and August. Production then drops significantly from August to September with subsequent decreases to the winter months. This pattern is consistent with the highly seasonal population and irrigation demands throughout the District.

The total monthly production during the summer months of 2015 was abnormally high. This can be attributed to an early and very dry summer and to the significant wildland fires in and adjacent to the District during that year that taxed the water system.

Production in 2016 was still higher than what was seen in 2017. Both years did not experience the drought conditions of 2015 and likely represent more typical production years for the District than 2015. 2017 data is generally believed to have the lowest system leaks, but for the purposes of this analysis, 2016 and 2017 will be averaged together.

Table 2-6 summarizes daily and monthly average and maximum flows, including peaking factors. Peak hour production cannot be identified because the District does not collect hourly flow data. Therefore, a peak hour production value was estimated at 160 percent of maximum day production based on available diurnal information from nearby water systems. Although the diurnal is based on larger water systems, it is assumed to be representative of the District for planning purposes.

Through 2016 and 2017, the District's water production averaged approximately 233,500 gallons per day (gpd) with a peak daily production of 477,100 gallons recorded on August 1, 2017. Maximum monthly production was highest in June 2016, although similar production was recorded in August 2017, per **Table 2-5**.

Table 2-6 – Daily Average, Monthly Average, and Maximum Production [a]

Parameter	Production	Per Connection[b]
Average Day Production		
Annual [c]	233,500 gpd (162 gpm)	492 gpd
Summer [d]	333,600 gpd (232 gpm)	702 gpd
Maximum Day Production [e]	477,100 gpd (331 gpm)	1,004 gpd
Peaking Factor [e]	2.04	-
Peak Hour Production [f]	763,400 gpd (530 gpm)	1,607 gpd
Peaking Factor [g]	3.27	-
Average Month Production (gallons per month)	7,108,600	15,000
Maximum Month Production [h] (gallons per month)	11,655,000	24,500
Peaking Factor [i]	1.64	-

[a] *Based on District-provided water production data for 2016 and 2017.*

[b] *Based on 475 active connections per Section 2.3.*

[c] *Based on production data averaged over 2016 and 2017.*

[d] *Based on 2016-2017 production data for June, July, and August.*

[e] *Maximum day production was recorded on August 1, 2017. Peaking factor is based on maximum day production divided by the annual average day production.*

[f] *Estimated at 160 percent of maximum day production.*

[g] *Based on peak hour production divided by annual average day production.*

[h] *Maximum month production was June 2016 (11,655,000 gal).*

[i] *Based on maximum month production divided by annual average month production for 2016 and 2017.*

2.4.2 Current User Demand/Consumption

Water system user demand (i.e., consumption) is based on individual water meter readings collected by the District. Meters are typically read monthly from April through September. Demand for winter months is calculated using the difference between the last meter reading in the fall and the first meter reading in the spring and averaging this value over the time period it represents. Water system user demand for 2015 through 2017 is summarized in **Table 2-7**.

Table 2-7 – Yearly Demand (Consumption) Data [(a)]

Year	Total (gal)	Average Month (gal)	Maximum Month (gal)	Max Month Peaking Factor
2015	42,618,305	3,551,525	9,881,668	2.78
2016	35,311,263	2,942,605	7,301,132	2.48
2017[(b)]	34,785,672	3,162,334	8,332,670	2.64
Average:	**37,571,747**	**3,218,821**	**8,505,157**	**2.63**

(a) *Based on District-provided water meter readings.*

(b) *Consumption data for 2017 is only available through September due to the District's water meter reading schedule. Consumption for these months in 2017 have been estimated using very similar historical values during 2015 and 2016 for the same time period. In addition, the months of August and September 2017 were combined and the meters read at one time at the end of September.*

Average water demand based on meter readings from 2015 through 2017 is approximately 37.57 million gallons per year. This equates to demand per connection (475 active connections) of approximately 79,100 gallons per year or 217 gpd. This demand seems somewhat low but is likely a result of the District's seasonal population (i.e., many homes in the District are not occupied year-round) and the lower per household population of 1.91 than is seen in the surrounding counties (approximately 2.5 people per household).

What is most notable about this meter data is that it greatly differs from the production data presented in **Section 2.4.1**. Further discussion of this discrepancy will be provided in **Section 2.4.4**.

2.4.3 Future Production Requirements

Future production based on existing production data (**Section 2.4.1**) and future connection projections (**Section 2.3.3**) is summarized in **Table 2-8**.

Table 2-8 – Future Production Required

Year	Total Connections	Required Production (gpd)		
		Average Day [(a)]	Maximum Day [(b)]	Peak Hour [(c)]
2017 (Existing)	475	233,500 (162 gpm)	476,300 (331 gpm)	763,400 (530 gpm)
2027	568	279,500 (194 gpm)	570,200 (396 gpm)	914,000 (635 gpm)
2037	679	**334,100 (232 gpm)**	**681,600 (473 gpm)**	**1,092,500 (759 gpm)**
2047	812	399,500 (277 gpm)	815,000 (566 gpm)	1,306,400 (907 gpm)

[(a)] *Based on production of 492 gallons per day per connection.*

[(b)] *Based on a peaking factor of 2.04 (see **Table 2-6**).*

[(c)] *Based on a peaking factor of 3.27 (see **Table 2-6**).*

The average day and maximum day demands for the 20-year planning period are **334,100 gpd** and **681,600 gpd**, respectively. The data for the 10-year period beyond the planning horizon is provided for informational purposes.

It should be noted that the following section of this analysis (**Section 2.4.4**) will detail the large amount of non-revenue water that is currently being experienced by the District's water system. Reducing the portion of this non-revenue water that is attributed to system leaks will greatly reduce the projected future production and storage needs of the District.

2.4.4 Non-Revenue Water

Non-revenue water is the difference between water produced and water sold. Non-revenue water is typically the result of leaks in the system, inaccurate water meters, or unauthorized use. The typical goal for most water systems is to have less than 10 percent non-revenue water, with five percent or less considered to be ideal. Non-revenue water for the District based on 2015-2017 data is summarized in **Table 2-9**, with the data from 2016 and 2017 focused on for analysis.

Table 2-9 – Non-Revenue Water (2015[(a)] - 2017)

Year	Production (gal)	Consumption (gal)	Difference (gal) – Non-Revenue Water	Percent of Production (%)
2015 [(a)]	*118,216,900*	*42,618,305*	*75,598,595*	*64.0*
2016	96,126,600	35,311,263	60,815,337	63.3
2017	74,479,300	34,785,672	39,693,628	53.3
		2016-2017 Average:	**50,254,483**	**58.3**

[(a)] *Production data for 2015 is provided for reference only. 2016 and 2017 are the years that are further analyzed and averaged.*

While the data for 2015 is presented here for reference purposes, that year in general is considered atypical due to the significant wildland fire that began in the Cape Horn Area and burned into the

Bayview Area of the District. As indicated in previous sections, this fire burned several houses and other structures within the District during this event. In addition, there was a subsequent wildland fire in the neighboring area that may have also contributed to the non-revenue water during this year as the hydrants were used frequently during the summer of 2015. In 2015, the area also experienced very dry climatic conditions leading to above normal production and consumption as compared to 2016 and 2017.

Non-revenue water for the District averages 58.3 percent for 2016 and 2017. This means the District lost over one-half of its production between its sources and the point of use. This is significantly higher than the typical target of 10 percent. Averaged over 2016 and 2017, this represents approximately 50.2 million gallons lost each year. Later sections of this report will go into more detail regarding this significant system deficiency.

2.4.5 Fire Flow

Fire flow capacity is the ability of the water supply system to deliver flow for firefighting purposes, in addition to the maximum day demand, while maintaining a residual system pressure of no less than 20 pounds per square inch (psi). Fire protection is provided to District patrons by the Timberlake Fire District. Fire flow provisions for municipal-type water systems are listed in Idaho Fire Code, which is based on the International Fire Code, and National Fire Protection Association (NFPA) Standards. The provisions of these codes and standards are not mandatory unless specifically adopted by the District via ordinance. The extent of the system's fire flow capacity will affect fire insurance ratings for District residents as well as the safety and security for the future.

The minimum fire flow volume and duration for one- and two-family dwellings less than 3,600 square feet is 1,000 gpm for one hour, per Idaho Fire Code (60,000 gallons total if derived from stored water).

The minimum fire flow and duration for buildings other than one- and two- family dwellings are based on building area and construction type as defined by the International Building Code. A reduction in flow of up to 75 percent is allowed if buildings are equipped with an independent fire suppression system (e.g., sprinklers), but flow may not be less than 1,500 gpm for the prescribed duration as listed in Idaho Fire Code.

While the US Naval Detachment facility is connected to the District's system, they provide and maintain all their own mains and fire hydrants within the boundary of their facility (generally inside the fenced area).

According to telephone conversations with the current Timberlake Fire Chief (Bill Steele), the existing larger residential and commercial buildings in the Bayview area of the District were approved by prior Fire Chiefs with the available fire flow at that time.

Based on the fire flow data that has been compiled and previous Fire District policies, Chief Steele indicated that there is always room for improvement but that there were generally no glaring inadequacies based on existing conditions for residential areas, with the exception of the inadequate and very small tank (11,000 gallons) in the Dromore area. With that said, Chief Steele also indicated that

the Fire District would prefer to see the following target fire flows and duration be addressed in future water system improvements:

- Residential Areas (single family homes up to 3,600 SF): 1,000 gpm for one hour
- Larger Residential/Commercial Areas: 1,500 gpm for two hours

Any future large residential or commercial construction would need to be evaluated by Timberlake Fire based on building construction materials, building area, location, and available fire flow, etc.

During the construction project that extended water service out to the Cape Horn Area in 2002, the Fire District indicated that a flow of 500 gpm for two hours (60,000 gallons) was the requested goal since it was considered a rural area with inadequate water supply. One of the areas that was deemed acceptable at that time was the far end of the Cape Horn that had a total of 60,000 gallons of existing storage serving approximately 15 households.

These discussions and telephone calls with Chief Steele are summarized in an e-mail dated September 14, 2018 and included in **Appendix 2-D**.

Fire flow testing data provided by Timberlake Fire indicates between 431 gpm and 2,507 gpm is available, at various pressures, depending on hydrant location in the system. The available hydrant testing data performed by Timberlake is summarized in **Table 2-10** with the hydrant testing reports included in **Appendix 2-D**. These hydrants were flow tested between 2010 and 2015 (not every location is tested each year). Review of this hydrant data showed some interesting issues that should be specifically pointed out:

- The low-flowing hydrants along Hudson Bay Road (746-750) do not appear to have been tested since 2010.
- Hydrants within the Naval Detachment are not considered part of the District's infrastructure. However, Timberlake Fire does perform flow tests on the Navy's hydrants (1,276 – 2597 gpm range).

Table 2-10 – Fire Hydrant Testing Summary

Hydrant Number	Location	Static Range[(a)]	Residual Range[(a)]	Average Flow[(a)(b)]
702	16010 E 5th St & N Spruce Ave	85-95	30-50	1248
703	16262 E 1st St & N Fir Ave	80-90	20-30	821
705	34082 E 4th St & N Fir Ave	50-60	15-20	615
706	16025 E 5th St & N Pine Ave	50-60	17-20	661
707	E 5th St & N Spruce Ave	60-70	20-22	666
708	17974 E Highway 54	100-110	45-58	1179
709	33955 N Moonbeam Ct & E Highway 54	85-125	25-30	736
712	E Bannock Dr & Cape Horn Dr	75-80	48-56	1651
713	17375 E North Shore Ln & E Arapaho Rd	50-58	10-18	447
714	17724 E North Shore Ln	70-80	20-25	612
715	E North Shore Ln	70-79	25-30	797(*)
716	34325 N Limekiln Rd	60-80	25-40	980
717	17105 Cape Horn Dr	30-50	0-20	431
718	N Limekiln Rd/Bitterend Marina	70-83	28-48	1127
719	N Limekiln Rd/Scenic Bay Marina	92-100	54-70	1697
720	N Limekiln Rd & E Pier Rd	78-92	40-52	1403
721	N Cottonwood Ct & Cape Horn Dr	55-60	20-25	664
722	34317 W Main Ave & N Bardill St	58-70	22-28	822
723	16205 N Cherokee Rd & E Perimeter Rd	50-55	14-18	631
724	W Main Ave & E 5th St	90-98	52-80	1879
726	16415 E 4th St & N Pend Oreille Dr	65-75	20-50	907
727	E Hudson Bay Rd & N Stubs St	80-88	50-60	1638
728	E Hudson Bay Rd & N Stubs St	80-90	60-62	1855
729	17035 E Hudson Bay Rd	72-76	38-42	1213
730	17451 E Hudson Bay Rd	75-85	25-36	1014
731	17245 E Hudson Bay Rd	60-80	25-30	856
732	E Hudson Bay Rd /End of the Rd	58-70	15-20	704
737	Cape Horn Dr & N Raven Pl	80-90	37-65	1674
738	N Raven Pl/Bottom of Hill	120-135	58-95	1939
739	34155 N Pend Oreille Dr & N Pine Ave	125-136	65-90	1736
740	20104 Cape Horn Dr & N Terrace Dr	80-90	60-72	2117
741	20572 Cape Horn Dr	125-130	55-110	2507
742	20400 Cape Horn Dr & E Lower Cape Horn Rd	100-124	70-90	2248
743	34396 Cape Horn Dr	90-100	60-70	1694
744	34216 N Flattery Rd	115-128	70-90	1929
745	18982 E Slide Bay Rd	115-125	62-65	1593(*)
746	E Hudson Bay Rd	60	20	581

Hydrant Number	Location	Static Range[(a)]	Residual Range[(a)]	Average Flow[(a)(b)]
747	18284 E Hudson Bay Rd	65	18	519
748	E Hudson Bay Rd	60	20	531
749	E Hudson Bay Rd	100	20	531
750	E Hudson Bay Rd	100	40	876
751	E Waller Rd	42-70	12-24	539
752	E Waller Rd	40-55	10-50	820[(*)]
753	W Main Ave	85-88	30-64	1800
754	E 5th St	82	30-55	1523
755	N Terrace Dr	60-68	40-50	1364
756	Cape Horn Dr/Cape Horn Circle	85	55	1611
757	E 5th St & E Highway 54	87-90	47-50	1418
758	E Highway 54	90	70	1475[(*)]
759	E Slide Bay Rd & N Jeepster Rd	130	80	1724
760	E Duwamish Dr & Cape Horn Dr	40	18	504
800	Cape Horn Dr & Grandview Ln	95-100	50-58	1435
801	Cape Horn Dr & Glacier Loop	90-102	40-58	1297
802	457 Cape Horn Dr	80-90	48-60	1513
803	842 Glacier Loop/At the Y	92-115	6-80	1494
804	422 Glacier Loop	34-95	9-60	603
805	635 Glacier Loop	85-100	30-60	1280

[(a)] *This data comes from tests taken between 2010 and 2015. Not every location has a test from each year.*

[(b)] *At 20 PSI.*

(*) Contained erroneous zeros in the data. Hand calculated to re-average without erroneous data.

Review of the fire flow data presented above indicates that there are several residential areas of the District that do not appear to meet the 1,000 gpm fire flow target. The areas of specifically low fire flow appear to be sections of Hudson Bay Road, areas around 5th Street and Pine/Fir, upper areas of Dromore, and near the Post Office. On the other hand, fire flows along Main Street and all throughout the Cape Horn Area appear to be adequate.

2.5 Existing Water System

Subsequent sections discuss the physical components of the District's existing water system. The existing maps of the water system that are in the District's files are included **Appendix 2-A**.

As part of this water system planning effort, a web-based GIS of the water system (based on the available maps) was developed. Currently, the web-based GIS map is only available to District board members and staff, however, a hard copy map of the District GIS mapping is presented at the beginning of **Appendix 2-A**.

A copy of the latest sanitary survey conducted in April 2014 by the Idaho Department of Environmental Quality (IDEQ) is included in **Appendix 2-B**.

2.5.1 Supply

2.5.1.1 Current Operations

The District has two wells - a main and backup groundwater source. Both of these well are nearly identical as they were constructed in the early 1940s as part of the former Farragut Naval Base. Both of these wells draw water from the Rathdrum Prairie Aquifer and are located south of the District boundary as shown on **Figure 2-1**.

While each of these wells were originally constructed for the Naval facility, the District acquired these wells in slightly different ways. Well 7 was acquired by the District in the late 1970s by the US Navy, along with the transmission line and Farragut Tank. Well 7 is controlled by the District under a 50-year lease that is due to expire in November 2027. Discussions with the local Navy personnel has indicated that they anticipate the lease would be extended as they have no desire to utilize the well other than receiving potable water from the District. They did caution that it could be a lengthy process and the District may want to start that process at least a year early to ensure that they can extend the lease without a lapse.

Well 8 was later acquired sometime in the 1990s through a permit/lease with the State of Idaho, who had acquired the remainder of the original land and Farragut Naval infrastructure in the 1950s from the Federal government. Well 8 is controlled by the District under a 10-year permit that requires renewal in December 2024.

It should be noted that the District does not chlorinate these well sources on full-time basis, but it does have liquid chlorination facilities that are occasionally utilized on an as-needed basis.

Each of the District's well sources have a licensed water right from the Idaho Department of Water Resources (IDWR). After reviewing each water right, it is recommended that the District convert its water right on Well 7 to a municipal water right designation instead of a right with separate irrigation, commercial, domestic, and fire protection diversion rates and annual volume caps. The designation for Well 8 has already been changed to municipal.

The benefit of changing to a municipal designation allows the District to tie the place of use to it official boundary (and any future boundary changes). In addition, it also allows for a much greater flexibility to serve the various needs and demands of the District as they may change over the years. **Table 2-11** summarizes the District's water right information for each source. Water right and other well information for the well sources is included in **Appendix 2-E**.

Table 2-11 – District Water Rights

Parameter	Well 7	Well 8
IDWR ID Number	95-9880	95-9880
IDWR Type	Water Right	Water Right
Priority Date	07/17/1981	08/27/1998
Beneficial Use		
Irrigation	Yes	N/A
Commercial	Yes	N/A
Domestic	Yes	N/A
Fire Protection	Yes	Yes
Municipal	N/A	Yes
Use Dates		
Irrigation	3/15 – 11/15	N/A
Commercial	1/01 – 12/31	
Domestic	1/01 – 12/31	N/A
Fire Protection	1/01 – 12/31	1/01 – 12/31
Municipal	N/A	1/01 – 12/31
Diversion Rate		
Irrigation	1.67 cfs (749 gpm) [(a)]	N/A
Commercial	0.5 cfs (224 gpm) [(a)]	N/A
Domestic	0.54 cfs (242 gpm) [(a)]	N/A
Fire Protection	1.67 cfs (749 gpm) [(a)]	1.7 cfs (763 gpm) [(a)]
Municipal	N/A	1.7 cfs (763 gpm) [(a)]
Annual Volume Cap		
Irrigation	504 AFA (164.2 MG) [(b)]	N/A
Commercial	103.7 AFA (33.8 MG) [(b)]	N/A
Domestic	229.2 AFA (74.7 MG) [(b)]	N/A
Fire Protection	N/A	N/A
Municipal	N/A	731.4 AFA (238.3 MG) [(b)]

[(a)] *Cubic Feet per Second (equivalent to 448.8 gpm)*

[(b)] *Acre-Feet Annually (equivalent to 325,829 gallons per year)*

Well 7

Based on record information, Well 7 appears to have been drilled with "extra heavy wall oil well casing" that has a 18.625-inch outside diameter and a 17.75-inch inside diameter (0.875-inch wall thickness). It was originally constructed in the early 1940's and is approximately 330-feet deep (record elevation of 2270.5). The as-built information reports that the bottom 67 feet of the casing was perforated. The static water level (SWL) in 1943 was reported as 223-feet below ground surface (BGS) with the top of the bowls of the pump around 270-feet BGS. The surrounding formation below the SWL is a mixture of sands and gravels of various sizes.

The 125-hp motor is believed to have been re-built within the last 10 years and is reported to function very reliably. In conjunction with 8-inch column piping and pump, this vertical turbine system has an operator-observed capacity of 750 gpm. There is a backup generator at this well site, however it only functions in manual mode as there is not an automatic transfer switch.

Well 8

Well 8 is believed to have been constructed around the same time as Well 7. While it appears to have been constructed in a very similar manner, there are no known record drawings or information for this well that have been found to date. As with Well 7, the motor on Well 8 is also believed to have been rebuilt recently. The main difference is that this site does not have a source of backup power.

Well Source Summary and Analysis

Well and pump information for both sites are summarized in **Table 2-12**.

Table 2-12 – Well and Pump Summary

Well	Pump Type	Horsepower (HP)	Estimated Capacity (gpm)	Well Information		
				Well Depth	Original SWL	Pump Depth
Well 7 (primary)	Vertical Turbine	125	750	330 feet	223 bgs	270 bgs
Well 8 (backup)	Vertical Turbine	125	750	unknown	unknown	unknown

Historically, Well 7 has been utilized as the primary source used by the District to meet their demands. From 2015 through 2017, Well 8 accounted for less than one percent of the total production of the District. Well 7 responds to all "calls-to-run" while Well 8 is only activated if there is a low tank situation or an emergency when Well 7 is out of service. The District is currently considering utilizing these wells in an alternating lead-lag control, rather than having Well 7 always be the lead.

These wells are located about 1,900-feet from each other and at approximately the same ground level elevation. Groundwater that is produced by both of these wells is measured at each of the well houses using a newer 4-inch propeller-style flow meter, then is pumped through a transmission line to the Farragut Tank. The shared 10-inch portion of the transmission line is capable of adequately handling the combined flow of both of these wells.

Since these wells have similar capacities, the production capacity with the largest unit out of service (i.e., firm capacity) is 750 gpm. Therefore, the firm capacity of the District's supply is about 40 percent greater than the estimated existing peak hour demand of 530 gpm shown in **Table 2-6**.

The District's supply system also has ample ability to provide for the peak hour demand (or the maximum day demand plus equalization storage) under normal operation conditions with any source out of service per the redundancy requirements of the Idaho Administrative Procedures Act (IDAPA) 58.01.08.501.17.

Emergency Interconnection with Farragut State Park

Although technically not a supply for the District, the intertie with Farragut State Park (FSP) is mentioned here as an emergency source. Portions of the District and FSP systems were at one time part of the same water system that served the Farragut Naval installation in the 1940s. Until about 2000, these systems were only separated by a single gate valve. With cooperation between the District and FSP, the District installed a valve vault with an electrically actuated solenoid (normally closed) valve to be able to remotely open this interconnection from inside the wellhouse at Well 8. There is also a hand-operated gate valve inside of this vault to more effectively maintain the separation of the two water systems.

This interconnection can be utilized by the District (in coordination with FSP) in the event of an emergency to supply the District's water system on a temporary basis. However, according to FSP personnel, the District's wells cannot serve the FSP water system back through this interconnection as the pumps do not appear to have adequate head to fill FSP's tanks.

2.5.1.2 Observed Deficiencies

- Well 7 (primary) does not have an automatic transfer switch to engage the existing generator during an emergency (manual operation only).
- Well 8 (backup) does not have a dedicated backup/standby power source (generator).
- Controls system (SCADA) that dictates when pumps are called to run needs updating for reliability and remote review.

2.5.2 Storage

2.5.2.1 Current Operations

The storage component of the District's water system is comprised of 4 tanks. Refer to the system map shown in **Figure 2-1** for their locations**.**

Reservoir 1 – Farragut Tank

The District's primary storage is a 225,000-gallon concrete storage tank, originally constructed in the early 1940s. It is located southeast of the District's boundary in a portion of what is now Farragut State Park. Although it appears to be a standpipe, the tank actually has an elevated floor that is about 2/3 of the way up the 101-feet of height with an internal overflow (record drawings indicate a max water surface of 2430.0, working surface of 2415). Currently the tank appears to be operated with a maximum water depth of around 20-feet, based on a temporary pressure sensing probe placed in the tank for several weeks in March 2018. The base of the tank is at an approximate elevation of 2,330-feet and has a diameter of 38-feet. The original roof was replaced with a welded steel roof in the late 1980s and it has a screened vent and a single 2-foot square access hatch. Access to the tank lot is from a gated road within Farragut State Park. The road is generally well-maintained and can be plowed for year-round access.

This tank is controlled by the District under the same 50-year lease as Well 7 that is due to expire in November 2027. Discussions with the local Navy personnel has indicated that they anticipate the lease would be extended as they have no desire to utilize the well/tank/piping facilities and are content to continue receiving potable water from the District. They did caution that it could be a lengthy process and the District may want to start that process at least a year early to ensure that they can extend the lease without a lapse.

In November 2017, the District had this tank cleaned and inspected via remote operated vehicles (ROV) and an underwater drone. This inspection revealed widespread and significant areas of failure in the coating on the walls, floor, and interior supports.

This tank was also reviewed by a structural engineer in December 2017 to determine any deficiencies and to establish an approximate remaining life of the aging structure. In summary, the report noted numerous cracks that were leaking (and most likely causing further damage to the reinforcing steel), potential safety concerns with the doors and access ways, and a likely remaining functional life of about 25 years (with rehabilitation). The main concern with this tank is that due to its age and the way it was likely designed and constructed, it does not meet current building code requirements for earthquake resistance. If it were to experience the anticipated design-level earthquake as defined by the current

building code, the tank could likely crack sufficiently to make it no longer functional or even fail completely. The full report can be found in **Appendix 2-F.**

This tank serves as the main source of storage for all the District. The wells feed this tank directly and all other storage facilities within the District are fed out of this tank by booster pump stations in the distribution systems. Therefore, for the purpose of this report, this tank will be analyzed as the main source of finished water storage for the District. Other storage facilities of the District are also described below.

Reservoir 2 – Dromore Tank

This tank is a small welded-steel tank that was installed sometime in the late 1970s or early 1980s as the Dromore area on the north side of Bayview was developed. It has a reported capacity of 11,000 gallons (11-feet diameter, 18-feet height) at a record base elevation of 2386. It serves about 20 homes in the northeast portion of Bayview and is fed by a small duplex 3-hp booster station. Controls are believed to be floats in the tank that call on the pumps to run in an alternating lead/lag configuration.

This tank is greatly undersized for any fire suppression capabilities – a point that was very evident during the fire of July 2015 that burned very close to the homes in the Dromore area. It also has an above-grade discharge pipe that is covered with insulation and susceptible to freezing. The exterior does not appear to have been painted or maintained in the last decade or perhaps longer. There are also several taste complaints in this area with reports of black flakes frequently in the water.

Reservoir 3 – Pend Oreille Pines Tank

This 100,000-gallon at-grade welded steel tank was installed in 2002 with the project that extended the District's water service to the Cape Horn area. It has a base elevation of 2393.5 and has a 30-foot diameter and a height of 20-feet. It is fed by the main Cape Horn Booster, which is a duplex 40 hp system (each pump at approximately 350 gpm).

A radio telemetry system monitors the transducer in this tank and calls on the duplex booster to pump in an alternating lead/lag fashion.

This tank supplies water to the majority of the residents of the Cape Horn area.

There are no reported or observed deficiencies for this storage facility.

Reservoir 4 – Cape Horn Estates Tanks

There are two identical 30,000-gallon at-grade welded steel tanks that are side-by side at this location (total storage of 60,000-gallons). They were originally installed in the early 1970s with the development of the Cape Horn Estates subdivision. During the 2002 construction project that extended the District's water service to the Cape Horn area, these tanks were refurbished and the interiors were re-coated. The base elevation is 2531.5.

These tanks serve less than 20 homes on the very NE corner of the District. In the event of an emergency or other event that would drain the Pend Oreille Pines Tank, pressure-reducing valves (PRV's) would allow water from these tanks to drain into the lower pressure zone that serves the majority of the Cape Horn area. These tanks are fed by the small Cape Horn Estates simplex 5-hp (50 gpm) booster and controlled by the level in the tanks (via a buried wire and transducer in the tanks. Note that historically the District has maintained a replacement pump in the District inventory for this booster (it is unknown if a replacement is currently in the District's inventory).

There are no reported or observed major deficiencies for this storage facility. However, there appears to be some minor flaking of exterior paint near the top of these tanks that should be addressed as a maintenance project.

System Storage Analysis

Components of finished water storage, as defined by IDAPA 58.01.08.003.16, for the District are summarized below.

1. Dead Storage – Storage that is either not available for use in the system or can provide only substandard flows and pressures.
    - All of the District's storage is available for use in the system to provide adequate flows and pressures. Therefore, the District does not need to account for any Dead Storage.
2. Effective Storage – All storage other than dead storage, including operational, equalization, fire suppression, and standby.
3. Operational Storage – Storage that supplies water when, under normal operating conditions, the sources are off. This component is the larger of 1) the volume required to prevent excess pump cycling and to ensure that the equalization, fire suppression, and standby storage components are full and ready for use when needed or 2) the volume needed to compensate for the sensitivity of the water level sensors.
    - The "dead-band" volume between the level sensors in the main storage tank should be accounted for since this volume is required for the District to fully supply the Equalization Storage, Fire Suppression Storage, and Standby Storage components. The level sensors in the District's control system allow the level in the main tank to drop approximately 1.5-feet, which represents a volume of approximately 12,800 gallons.

4. Equalization Storage – Storage required to compensate for the difference between a water system's maximum firm supply capacity and peak hour demand.
    - Peak hour demand is estimated at 160 percent of maximum day production based on available diurnal information from nearby systems (reference **Section 2.4.1**). The District's firm supply capacity (i.e., capacity with the largest pump out of service) is 750 gpm. Since the estimated existing peak hour demand is 530 gpm (**Table 2-6**), there is no need for equalization storage. Future equalization storage, based on 20-year future demand presented in **Section 2.4.3**, is approximately 9 gpm (difference between 759 gpm demand and 750 gpm supply) or approximately 590 gallons for the small period of time where the future demand exceeds the firm capacity.
5. Fire Suppression Storage – Storage needed to support fire flow in systems that provide it.
    - The following list summarizes fire flow storage recommendations based on fire flow and duration information presented in **Section 2.4.4**.
        i. 60,000 gallons (500 gpm for two hours) – previously approved for the Cape Horn Estates area.
        ii. 60,000 gallons (1,000 gpm for one hour) – target for residential areas of the District.
        iii. 180,000 gallons (1,500 gpm for two hours) – target for commercial areas of Bayview
6. Standby Storage – Storage that provides a measure of reliability should sources fail or when unusual conditions impose higher than anticipated demands. Normally used for emergency operation to provide water for eight hours of operation at average day demand, if standby power is not provided.
    - The District does provide standby power for its primary supply source (Well 7), however, it is not automatically engaged with a transfer switch (manual only). Therefore, the required existing Standby Storage is approximately 77,800 gallons. Future standby storage (without automatic back-up power), based on 20-year future demand presented in **Section 2.3.3**, is approximately 111,400 gallons.

The current and future storage required per IDAPA is the sum of the "Dead-Band," Equalization, and Standby Storage, 90,600 gallons and 124,800 gallons, respectively. The total amount of storage the District provides will depend on the desired amount of desired Fire Suppression Storage as well as the reliable production capacity. Having a source of automatic backup power at the District's sources could reduce both the existing and future projected required storage volumes. A summary of existing storage information is presented in **Table 2-13**, while future storage information is summarized in **Table 2-14**. Both tables assume existing production capacity.

Table 2-13 – Existing Storage Summary

Fire Flow and Duration	Fire Suppression Storage (gal)	"Dead-Band" Storage (gal)	Equalization Storage (gal)	Standby Storage (gal)	Total Required Storage (gal)
1,000 gpm for 1 Hour	60,000	12,800	0	77,800	150,600
1,500 gpm for 2 Hours	180,000	12,800	0	77,800	270,600

Table 2-14 – Future (2037) Storage Summary

Fire Flow and Duration	Fire Suppression Storage (gal)	"Dead-Band" Storage (gal)	Equalization Storage (gal)	Standby Storage (gal)	Total Required Storage (gal)
1,000 gpm for 1 Hour	60,000	12,800	600	111,400	184,800
1,500 gpm for 2 Hours	180,000	12,800	600	111,400	304,800

2.5.2.2 Observed Deficiencies

- Farragut Tank has visible leaks and notable deterioration (spalling) of the interior and exterior coating system.
- Access stairs, ladders, railings, etc. for Farragut or Dromore tanks do not meet current Occupational Safety and Health Administration (OSHA) standards.
- Farragut Reservoir has an estimated remaining functional life of 25 years (with rehabilitation of coating system), however the concern is that structure does not meet current building code requirements for earthquake resistance and could likely crack sufficiently to make it no longer functional or even fail completely if it were to experience the anticipated design-level earthquake as defined by the current building code.
- Dromore Tank is in need of cleaning and re-painting and is greatly undersized at 11,000 gallons.
- The control system (SCADA) should be upgraded to include reliability during power outages, provide more data to the District office, as well as remote access by the system operators.
- Finished water storage volume at both Farragut and Dromore tanks is not adequate to meet current or desired future storage requirements plus desired fire suppression storage goals (based on the target of 1,500 gpm for two hours for commercial areas).

2.5.3 Transmission and Distribution

2.5.3.1 Current Operations

Refer to **Appendix 2-A** for a hard-copy map of the District's web-based GIS map.

Transmission
With the main storage facility and both wells located in Farragut State Park, the District has a substantial amount of transmission line that connect the wells to the tank and the tank to the distribution system. The transmission line is comprised of:

- 720 LF of 12-inch cast iron (connecting Well 7 to shared transmission line to tank)
- 1,600 LF of 8-inch PVC (connecting Well 8 to shared transmission line to tank)
- 3,200 LF of 10-inch cast iron (shared transmission line to tank)
- 1,000 LF of 8-inch cast iron (connecting shared transmission line to distribution system)

Note that the 50-year lease (expiring in November 2027) associated with the Farragut Tank and Well 7 also applies to all of the transmission lines, except the 8" PVC portion of line from Well 8 to the shared transmission line. That portion is controlled by the District under a continuing 10-year lease/permit from the State of Idaho that will expire in December 2026.

Distribution
The distribution system is comprised mainly of 6-inch diameter polyvinyl chloride (PVC) pipelines, with some portions of 2-inch, 4-inch, and 8-inch diameter PVC or polyethylene pipelines. The distribution system does have some sections of 8-inch cast iron (near Navy facility) and some 5-steel line in the Cape Horn Estates portion of the District. The composition of the existing distribution system piping is summarized in **Table 2-15**. The District's service area is generally fairly well looped, however, there are a number of areas where the "dead end" lines are reduced to 2-inch lines to serve the remaining 2-4 connections.

Table 2-15 – Summary of Existing Distribution System Piping Network

Pipe Material	Length (ft) by Pipe Size						Total Length (ft)
	2 in	4 in	5 in	6 in	8 in	Unknown	
PVC	5,100	16,100	---	36,000	7,300	---	64,500
Steel	---	---	4,200	---	---	---	4,200
Polyethylene	---	---	---	---	5,300	---	5,300
Cast/Ductile Iron	---	---	---	---	1,500	---	1,500
Subtotals:	**5,100**	**16,100**	**4,200**	**36,000**	**14,100**	**0**	**75,500**

The District's distribution system is classified as a Class I system according to the Idaho Department of Environmental Quality (IDEQ) Public Water System classification hierarchy. The current contract

operator is licensed by IBOL as a Class II Operator for Water Distribution and Water Treatment, which exceeds IDEQ's requirements for the District.

Pressure Zone Analysis
The District's water distribution system has three pressure zones in the Bayview area and two major pressure zones in the Cape Horn area. In addition, there is a small booster pump station at the main tank in the Cape Horn area that supplies water for the few existing homes that are above the tank. As part of the water system modelling analysis, the focus was placed on the available pressures and flows at the end points of the distribution system by evaluating elevation and friction losses in the system. A summary of the calculations made is included in **Appendix 2-C**.

Gravity Pressure Zone – Bayview Zone 1
The gravity pressure zone (Bayview Zone 1) is located in the southwest residential portion of the Bayview area and is served directly from the main tank (Farragut). It is located south of the mid-block of 4th Street and 3rd Street and west of Highway 54. This area currently serves about 40 connections and is mainly comprised of 6-inch and 4-inch mains, with some small sections of 2-inch lines serving 2-4 connections. The length of the 2-inch lines are generally less than 200-feet. The pressures in this zone reportedly range from about 70 psi to about 100 psi.

Bayview Zone 2
The majority of the rest of Bayview is served by the lower pressure zone (Bayview Zone 2). It is separated from the gravity zone by two PRVs. The PRVs reportedly reduce the pressure by around 60 psi, so most of the lower zone has a resultant pressure range of 45 psi to 90 psi. This zone is made up of a some 8-inch, with the majority of it being comprised of 6-inch and 4-inch mains. As with the upper gravity zone, there are some portions of 2-inch lines that feed small sections of the District's residential type connections (generally less than 300-feet in length). There are a few areas of the north side of this

Dromore Area – Bayview Zone 3
The Dromore area (Bayview Zone 3) is served by a small duplex 3-hp booster that pumps from the lower Bayview pressure zone and into the Dromore tank on the north side of Bayview. It provides service to about 20 existing homes. This Dromore portion of the District's distribution system is not connected back to the lower zone via any PRVs. It is made up of 6-inch, 4-inch and 2 or 3-inch lines. Pressures range from about 25 psi to around 70 psi.

As mentioned before, the Cape Horn area has two major pressure zones.

Cape Horn Area – Cape Zone 1
The main pressure zone in Cape Horn area serves the majority of the residents (Cape Zone 1). It is fed by a duplex 40-hp booster built in 2002 that has standby power (each pump at 350 gpm). The booster feeds the Pend Oreille Pines Tank (100,000 gallons). The vast majority of this section of the District has 8-inch and 6-inch PVC mains that were installed in 2002 to provide service and fire flow to the connections and fire hydrants. There are portions of 5-inch steel (in Cape Horn Estates area) and some smaller 4-inch and 2-inch lines that serve a small number of residential connections. Pressures in this zone range from 45 psi to 120 psi. Connections near the lake require individual PRVs on the service lines due to the higher pressures (120 psi). There is a small duplex 3-hp booster pump station (variable speed motors,

27 gpm each pump) that serves the few homes that are above this tank. This small booster station also has standby power.

Upper Cape Horn Estates – Cape Zone 2
The upper portion of the far northeast end of the District is served by a small pressure zone (Cape Zone 2) for less than 20 lots (approximately 13 homes currently). The pipes are existing 6-inch from the original 1973 construction of the Cape Horn Estates subdivision. The pressures range from about 50 psi to 70 psi. This zone is fed by a small simplex 5-hp booster (50 gpm) from the main Cape Horn pressure zone to the Cape Horn Estates tanks (60,000 gallons). This booster station has standby power available. This zone is separated from the lower Cape Horn zone by two PRVs. Normally, these PRVs should be closed, but would open in the event of an emergency that would drain the main Pend Oreille Pines Tank.

2.5.3.2 Further Review of Non-Revenue Water

During the analysis of production and consumption data for the District, it quickly became evident that there was a continuing pattern of consistently large discrepancies between the data sets. To further understand this large amount of non-revenue water, potential sources were identified:

- Many of the meters in the Bayview area are about 40 years old and past their useful life. As meters age, their accuracy is impacted and the registered volume is reduced (read less than actual use).
- The US Navy Detachment facility is a large connection that is not metered (has at least two 6-inch or 8-inch connections).
- There have historically been significant leaks in the aging transmission lines in the Farragut area.

To further identify a potential source of the non-revenue water, a level probe was placed in the main tank in March 2018 for about two weeks. During portions of this time, the pumps were shut off some of the evenings and the system was supplied only by the tank until the morning hours. The goal was to see if there was a steady state decrease in the level of the tank that would be indicative of leak. Time periods where there should be essentially no use/demand on the system were closely studied (eg., midnight to 4 am).

This data did indeed show a steady and consistent reduction of the level of the tank during these periods of at least 40 gpm (almost 60,000 gallons per day). This kind of steady decline would be indicative of leak within the system. After multiple discussions with Navy personnel, it was understood that they were most likely not the source of steady usage. While their use is still unknown due to a lack of meters, their onsite water distribution system is probably not the source of a leak, as it has been completely replaced over the last decade.

With that information, the aging transmission mains from the original 1940s construction were the main suspected location of system leaks due to the following reasons:

- J-U-B has occasionally assisted the District over the past 20 years or so with small projects to repair leaks in this line multiple times.

- The contractor that was used to repair most if not all these joints was consulted and indicated that this area has always been a problem area for the District.
- American Leak Detection assisted the District in 2016 and indicated a number of potential leaks in this area. It is unknown if any of these leaks were addressed by the prior system operators.
- Idaho Rural Water assisted the District in December 2017 with some leak detection in this area. While the results were not definite due to depth of pipe, distance between valves, etc., their preliminary testing indicated that this area did appear to have some more potential leaks.

2.5.3.3 Observed Transmission and Distribution Deficiencies

- A significant amount of non-revenue water indicates the high likelihood of significant leaks in the system, believed to be in the transmission line for the Farragut area (refer to **Section 2.5.3.2** for more detail). A substantial reduction of the significant amount of non-revenue water (2016-2017 data) should be a high priority of the District.
- The hydraulic analysis and review of the existing elevation of portions of the District shows that certain points in the system cannot meet maximum day demand at the required pressure residual of 40 psi (Post Office area, Dromore area).
- The fire hydrant testing results indicate the system cannot provide the desired fire flow of 1,000 gpm in most of the residential areas of Bayview.
- Most of the water meters in the Bayview area are 40 years old and are well past their useful life (generally 20 years). The District reports an increasing number of failing meters that are needing to be replaced.
- There are a number of sections of 2-inch line that may be a bottleneck during periods of high demand, even though they only serve a small number of residential connections each.
- Some fire hydrants have not been fire flow tested since 2010.

2.5.4 Current Water Rates

The current water rate structure was adopted by the District in 2016. The District charges a flat fee for a monthly allotment of 5,000 gallons. Subsequent use is charged at a uniform rate per thousand gallons used. **Table 2-16** summarized the District's rate structure.

Table 2-16 – Water Rate Structure

Base Monthly Rate	Overage Charge
$24/5,000 gallons	$1.75/1,000 gallons

The District also charges a one-time hookup fee when new connections are made to the system. Commercial accounts (i.e., restaurants and marinas) are currently charged the same monthly fee based as residential connections. **Table 2-17** summarizes the additional charges associated with the District's water system.

Table 2-17 – Additional Water System Charges

Item	Charge
Multi-family Service	$24/month x No of units
Late Fee(s)	10% of total owed to District
Hydrant connection	$50 + $3/1000 gal
Connection Fees	
Residential	$2,700
Commercial	$3,000
Capitalization Fees	
Bayview Area	$2,080
Cape Horn Area	$9,975

2.6 Regulatory Considerations

2.6.1 Current Drinking Water Regulations

All Public Water Systems (PWSs) are subject to the rules contained in the Environmental Protection Agency's (EPA's) *Code of Federal Regulations* (CFR). Through primacy, some states are given the authority to regulate drinking water systems under the CFR. IDEQ is given primacy by EPA, meaning that IDEQ has been given authority by the EPA to enforce the regulations contained in the CFR. While IDEQ is the primacy agency, the EPA still has the authority to implement and enforce Federal drinking water rules.

The District is generally in compliance with current regulations, as it has no known violations related to the water system. The District's system has maintained its "approved" status with just a minor deficiency noted during the last Sanitary Survey conducted by IDEQ in April 2014. The noted deficiency has already been addressed by the District, but will continue to be something that must be part of ongoing system maintenance:

Deficiencies and Requirements:

- It is required that any dead-end distribution mains must be flushed every six months.

Other follow-up items and recommendations by IDEQ are provided in the cover letter of the Sanitary Survey included in **Appendix 2-B.**

2.6.2 Cross-Connection Control

The District currently has a cross-connection control resolution (Resolution 03-3) that addresses the District's policy on protecting the water system from connections that could backflow or back-siphon contaminants or pollutants into their system.

A copy of this resolution is provided in **Appendix 2-G**.

2.6.3 Water Quality Reporting

As required, the District annually tests their drinking water for certain contaminates. The water quality report for 2017 is posted on the District's website and indicates that they have no violations, except for a monitoring violation. This monitoring violation occurred as result of the unfamiliarity of the new operator taking a sample from an area that he believed was part of the Cape Horn Area but was not.

A copy of this 2017 Water Quality Report is available in **Appendix 2-H**.

Appendices (reference attached disk)

Appendix 2-A – System Maps
Appendix 2-B – IDEQ Sanitary Survey
Appendix 2-C – Hydraulic Calculations
Appendix 2-D – Fire Hydrant Testing Reports
Appendix 2-E – Groundwater Water Right Information
Appendix 2-F – Initial Structural Assessment – Farragut Reservoir
Appendix 2-G – Cross-Connection Control Resolution
Appendix 2-H – 2017 Water Quality Report

THIS PAGE WAS INTENTIONALLY LEFT BLANK