Olympic Gravity Water System (OGWS)
Planning and Environmental White Paper
August 17, 2021

Preface

The City of Port Townsend and the Port Townsend Paper Mill have a historical partnership of supplying water to the Quimper Peninsula, City of Port Townsend, and the Port Townsend Paper Mill dating back to 1928. The City and Port Townsend Paper Company are in the process of developing a new partnership agreement that will address water supply looking forward to the next 100 years.

Like the development of the Olympic Gravity Water System in the late 1920's, the development of an agreement between the City of Port Townsend (City) and Port Townsend Paper Company (PTPC) is a significant undertaking with the stakes being high for both parties. As such, the negotiation of a mutually beneficial agreement warrants thoughtful collaboration based on the best data possible.

As a way to ensure good factual data is available for the negotiation, eight technical white papers break down information into manageable segments. In the following specific white paper categories, the City and PTPC have worked together to develop these white papers to provide information for consideration during the negotiation of the agreement.

1. Assets: Understanding each entities assets and capacities that support investment.
2. Stakeholders: The public as well as many governmental organizations may be potentially interested stakeholders.
3. Planning and Environmental Considerations: Future water supply needs, climate change and water supply availability are important factors to plan for and include in planning for the future.
4. Operations: Operational requirements, efficiencies, cost, and reliability as well as distinguishing between capital and ordinary maintenance is a major part of any public private partnership agreement.
5. Capital Investments: Capital needs are extensive and should be informed by a value engineering study for system reliability and to reduce costs.
6. Funding and Resources: In order to address operational and capital needs, a plan is necessary to fund system needs ensuring that sustainability is achieved.
7. Legal considerations impact the form of the agreement depending on negotiation outcomes. Surety and performance are two key legal discussion points.

The intent of developing these white papers is to provide a resource to inform negotiations and as background for the public and decision makers. All of the white papers will be assembled into a comprehensive technical report in support of the development of a comprehensive recommendation for the City of Port Townsend City Council and the Port Townsend Paper Mill Board of Directors.

The following white paper addresses environmental and planning considerations for the Olympic Gravity Water System looking forward for the next 20 to 40 years with the recognition that investments will be made with 100 years in mind.

Introduction

Port Townsend is located in the northern portion of the Quimper Peninsula, an area with no perennial streams and an average rainfall of less than approximately 20 inches per year. Port Townsend's water system evolved from a series of springs and wells to a mountain stream gravity fed water system in 1905. Construction of the National Paper Products Company paper mill beginning in 1927 led to the development of additional water rights on the Big and Little Quilcene Rivers, construction of two diversions, two reservoirs, and 30 miles of transmission pipeline to supply the water demand.

Approximately 10 to 14 million gallons per day (mgd) is transferred from the Quilcene watersheds to the northeast corner of the Quimper Peninsula. The gravity-operated water transmission system delivers water to most customers without pumping, minimizing energy consumption. After use, treated wastewater from the City of Port Townsend is discharged to the Straits of Juan de Fuca and treated mill effluent is discharged to Port Townsend Bay.

As with every source of water for human use, environmental impacts are an important to consider when developing a course of action for the future. The environmental considerations addressed in this white paper include the following:

1. The legal and regulatory framework defining environmental compliance requirements to comply with the laws of the United States, State, County, and City of Port Townsend.
2. Climate Change - The impacts of climate change to water supply and sea level rise.
3. Carbon footprint of the system.
4. A water supply analysis with projections for future demands.
5. A Conservation analysis examining planned conservation measures as well as conservation opportunities.
6. Water Re-use analysis examining opportunities and challenges associated with developing a water re-use system.
7. Other Environmental Considerations are shared.

The intent of this whitepaper is to document and share all of the environmental considerations considered with this agreement in pursuit of a sustainable water supply for the future. Environmental considerations such as Mill odors and emissions, which are regulated by other agencies are not addressed in this paper.

Legal and Regulatory Framework

A number of key environmental and regulatory laws provide overarching guidance and rules for the OGWS to operate within. The Clean Water Act provides the primary guidance to the Forest Service's water quality protection programs as well as wastewater discharge. The City of Port Townsend source water protection program is guided by the Safe Drinking Water Act. Regulations to implement these laws have been promulgated by the Environmental Protection Agency (EPA), and delegated to state agencies to administer. In the state of Washington, the Clean Water Act was delegated to Department of Ecology (DOE) and the Safe Drinking Water Act was delegated to Department of Health (DOH). Other laws also are also part of the City's purview to follow such as the Endangered Species Act and regulations specific to Washington State and Jefferson County. These laws and rules become pertinent

depending on the activities. As an example, construction activity requires securing a number of permits and approvals, while operations involved programmatic compliance with laws and permits.

Clean Water Act

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972. Under the CWA, EPA has implemented pollution control programs such as setting wastewater discharge standards for industry. EPA has also developed national water quality criteria recommendations for pollutants in surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters without a valid permit.

In an effort to implement the Clean Water Act, EPA advised the USFS to cooperate with state agencies and municipalities in the development of municipal watershed management plans. These plans allow the Forest Service, the affected municipalities, and state agencies responsible for public water supply standards to assess the impact of proposed management activities on the watershed resources, and to provide means for the Forest Service, municipality and state regulator to cooperatively monitor the watershed.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and requires a number of actions to protect drinking water and its sources—rivers, lakes, springs, and ground water. SDWA authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water. EPA, states, and water systems then work together to make sure that these standards are met.

Utilities are further required to implement watershed control programs in order to protect the source of their water supply from contamination. These programs are based on land ownership or written agreements to insure control of activities within the municipal watershed.

Source Water Protection Program

Source water protection is the primary way to reduce the risk of contamination or decline in production. In most circumstances source water protection requires a coordinated effort of regulatory agencies, landowners, and the public to achieve protection. Droughts, contamination, climate change, growth demands, and limited allocation of water rights all emphasize the need to be proactive about protecting source water quality and quantity to protect public health.

The state Department of Health Office of Drinking Water (ODW) has been assigned primacy for the federal drinking water program in Washington State. Planning requirements (WAC 246-290) require all Group A systems using surface water as a source of supply to develop watershed control programs.

The mountain watersheds which supply the Olympic Gravity Water System (OGWS) with high quality surface water are located on public owned land, over 95% of which is managed by the United States Forest Service (USFS) with the remainder by the National Park Service. A cooperative relationship

between the City and the Forest Service is guided by the Memorandum of Understanding, statute law, and the Forest Service's Land and Resource Management Plan (LMP).

The Forest Service manages national forest lands according to a multiple use mandate which is based on achieving an acceptable balance between beneficial uses. The Olympic National Forest currently provides significant protection of water quality values within the Municipal Watershed, according to Standards and Guidelines contained in the 1990 Land and Resource Management Plan (Forest Plan). Municipal Watershed Standards and Guidelines further refine the protection afforded the watershed, and the Sensitive Areas within it. The primary goal is to provide high quality water over the long term and when conflicts exist between watershed management and other resources, the conflict should be resolved in favor of the watershed resource.

A Memorandum of Understanding (MOU) signed May 3, 1993, by City of Port Townsend and the USFS-Olympic National Forest provides watershed protection as well as a commitment to implement the Cooperative Watershed Protection Program. Supplementary agreements between the City of Port Townsend and the Olympic National Forest can be developed under the terms of the MOU to provide means for equitable sharing of responsibilities and other aspects of implementing the watershed control program. The last agreement with the Forest Service was entered into in 2009. This Special Use Permit set for minimum instream flows for the Big Quilcene River as well as outlined programmatic operations of the OGWS as it impacts Forest Service lands.

Endangered Species Act

There are a variety of threatened and endangered species residing within municipal watershed or in adjoining habitat. Section 7 of the Endangered Species Act (ESA) of 1973 (as amended), directs federal departments and agencies to ensure that actions authorized, funded, and/or conducted by them are not likely to jeopardize the continued existence of any federally proposed or listed species, or result in destruction or adverse modification of critical habitat for such species. In addition, federal agencies must consult with the National Oceanic and Atmospheric Administration (NOAA) Fisheries on all activities, or proposed activities, authorized, funded or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH), as designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996. Other ESA-listed species including the marbled murrelet and northern spotted owl require consultation with the US Fish and Wildlife Service. Section 7(a)(2) requires that Federal agencies avoid jeopardizing the continued existence of listed species. The ESA likewise requires that Federal agencies refrain from adversely modifying designated critical habitat.

National Environmental Policy Act

Section 101 of NEPA sets forth a national policy "to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." 42 U.S.C. 4331(a). Section 102 of NEPA establishes procedural requirements, applying that national policy to proposals for major Federal actions significantly affecting the quality of the human environment by requiring Federal agencies to prepare a detailed statement on: (1) the environmental impact of the proposed action; (2) any adverse effects that cannot be avoided; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of man’s environment and the maintenance and

enhancement of long-term productivity; and (5) any irreversible and irretrievable commitments of resources that would be involved in the proposed action. 42 U.S.C. 4332(2)(C).

Forest Service proposals are subject to the NEPA requirements when all of the following apply:

(1) The Forest Service has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated (see 40 CFR 1508.23);

(2) The proposed action is subject to Forest Service control and responsibility (see 40 CFR 1508.18);

(3) The proposed action would cause effects on the natural and physical environment and the relationship of people with that environment (see 40 CFR 1508.14); and

(4) The proposed action is not statutorily exempt from the requirements of section 102(2)(C) of the NEPA (42 U.S.C. 4332(2)(C)).

Tribal Consultation

Working with the tribes is an important element of being inclusive and respectful of the people and history of this place. The outreach associated with this effort is addressed in the Stakeholder and Public Engagement whitepaper. The Jamestown S'Klallam, Port Gamble S'Klallam, and Lower Elwha Klallam tribes are indigenous people to the Quilcene watershed and the Quimper Peninsula, the City of Port Townsend and along the pipeline. Tribal consultation is included as a key component of any permitting under NEPA is the requirement for Tribal Consultation. The City also consults with the Tribes outside of NEPA recognizing the importance of honoring indigenous people, heritage, and land.

State Environmental Policy Act

The State Environmental Policy Act (SEPA) process identifies and analyzes environmental impacts associated with governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilities, or adopting regulations, policies, and plans. The SEPA review process helps agency decision-makers, applicants, and the public understand how the entire proposal will affect the environment. SEPA can be used to modify or deny a proposal to avoid, reduce, or compensate for probable impacts.

The agency proposing a project is the default lead SEPA agency. However, lead agency status may be transferred if all agencies with a jurisdiction agree. Any number of agencies can agree to share lead agency status, with one agency designated as "nominal lead agency." The agencies should develop an agreement defining the duties and responsibilities of each agency, how to deal with differing opinions, etc.

A SEPA review was completed for the City's 2019 Water System Plan (WSP) update. The elements of the water supply system and current City/Mill agreement are addressed in the current WSP. It is anticipated that the new agreement will be consistent with the 2019 WSP; however, if it is not, the City will amend the 2019 WSP and associated SEPA to incorporate changes.

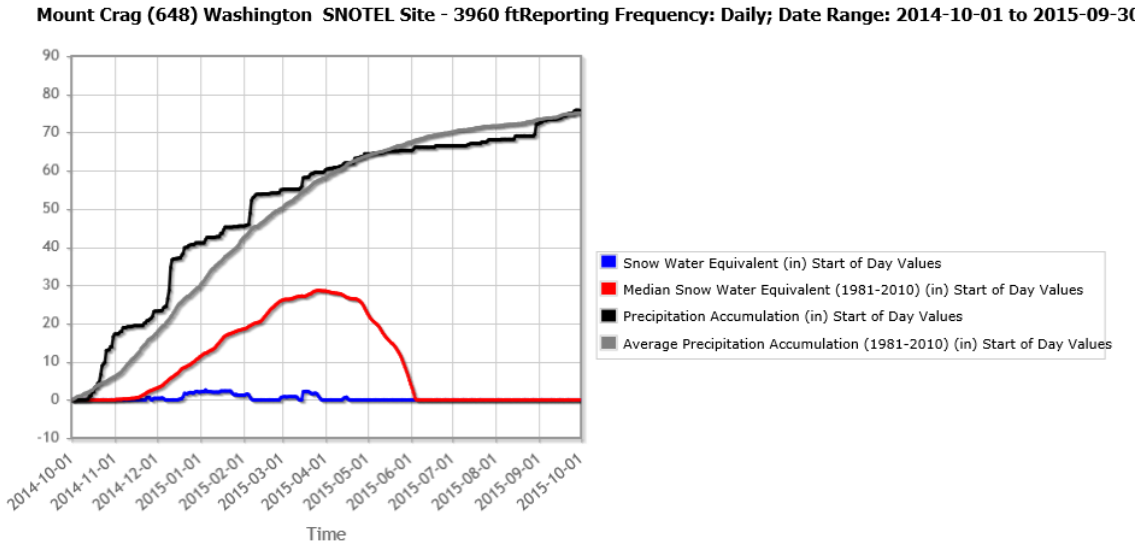
County and State Regulations

Since the majority of the OGWS system lies outside of the City limits, Jefferson and State regulations will typically apply to work on the water system.

Climate Change

Climate change is projected to alter environmental conditions across the region. Consequences for the Port Townsend water system are expected to include variations in water supply, water quality, watershed health and potential damage to infrastructure. Cumulative effects of climate change and increased likelihood of disturbances (fire, insects, tree disease), is expected to lead to transformation in the current watershed vegetation landscape. Interaction between multiple disturbances, such as insect or disease outbreaks and wildfires, could amplify impacts within the watershed.

Statewide average spring snowpack is projected to decline 38 to 46% by mid-century and 56 to 70% by the 2080s (relative to 1970–1999) under low and moderate greenhouse gas scenarios and reductions of up to 80% (likely range from 50 to 90%) are expected under the high emissions scenario (Intergovernmental Panel on Climate Change Special Report on the Ocean and Cryosphere in a Changing Climate, 2019). Warmer winters, less snow and a greater proportion of winter precipitation falling as rain are projected to shift the timing of peak spring streamflow to earlier in the year, increasing the risk of wintertime flooding and decreasing summer stream flows. Lower flows in the late summer and early fall will necessitate increased reliance on stored water along with other conservation measures in order to meet industrial demand in particular.



2015 Precipitation and Snowpack

Drawdown of Lords Lake (2015)

The greatest risk related to climate change is a decrease in summer and fall flows in the Big and Little Quilcene rivers. In 2015, a year of low water supply was encountered due to low snowpack. This forced curtailment of a portion of the Paper Mill's operations. Lords Lake was drawn down to a point where the necessary flow rate could not be maintained. Since that time, several operational changes have bene implemented. However, with climate change, years like 2015 are expected to increase in frequency. As a result, the most effective way to address this likelihood is to increase storage capacity in order to capture water during high runoff periods and store it until needed during dry periods of the year. The Capital White Paper includes a plan to increase the storage capacity of the Lords Lake Reservoir by raising the east and north dams. This modification was explored in 2001 to increase Lords Lake Capacity by 50% and 100%. The cost of this modification is included in the Capital Improvement Plan. Further analysis is necessary to determine the sizing of any future expansion.

The OGWS infrastructure is located above areas expected to be inundated as a result of sea level rise during the next 100 years. However, an increased risk of stream flooding has the potential to damage portions of the system. Wells located within or adjacent to the City's service area may be affected by seawater intrusion with increasing sea levels. Unusable wells would probably lead to demand for City water service. The amount of groundwater currently being consumed within the local area is not known. A few large irrigation wells such as at the golf course or small farms would potentially create most of the potential demand. Maximum summertime demand from the golf course irrigation well is about 4% of total daily demand and would likely be more than all nearby affected residential wells combined.

Carbon Footprint

The gravity water delivery system avoids the expense and environmental impact of pumping water. The gravity system uses much less energy compared to systems requiring pumping. However, the dispersed location of the facilities requires daily commuting in order to operate and maintain the system. In addition, there are carbon emissions for the drinking water treatment, distribution, and wastewater treatment. Carbon emissions for the annual operation of the water transmission system

have not been calculated as of yet. Information below is based on the City of Port Townsend & Jefferson County 2011 Climate Action Plan.

City of Port Townsend - Emissions Inventory

The operational carbon footprint of the overall system is not expected to increase looking forward. The carbon impact will replacement of the pipeline will be consistent with construction activity to replace 30 inch pipeline. The positive impact of the watershed being managed by the forest service for older timber is also noted. Reduction in electric power emissions is related to the switch to Bonneville Power Administration electricity.

City of Port Townsend Water/Sewage Greenhouse Gas Emissions in tons of CO2e (Climate Action Plan 2011)

	Back cast	Base Year	Forecast			
	1990	**2005**	**2012**	**2020**	**2030**	**2050**
Assuming current practices	570	802	907	1045	1225	1876
Target	570	802	802	657	476	114

Jefferson County, Washington 2018 Inventory of Greenhouse Gas Emissions & Facility Reporting

City of Port Townsend - 2nd IPCC Assessment		2005		2018			
Inventory	**Fuel Type**	**Usage**	**CO2e MT**	**Usage**	**CO2e MT**	**% Change Usage**	**% Change CO2e**
Water & Wastewater	Electricity (kWh)	1,509,249	729	1,456,368	17	-3.5%	-98%
	Propane (gallons)	274	2	6,060	34.2	2,112%	1710%
Total			730		36.1		

Port Townsend Paper Corporation - Emissions Inventory

PTPC estimated that the 2005 mill-wide direct greenhouse gas emissions were about 153,000 carbon dioxide equivalent tons. Since then, PTPC has worked to reduce greenhouse gas (GHG) emissions by reducing the use of fossil fuels. As a result of efficiency improvements and use of renewable carbon neutral biomass, GHG emissions have been reduced by over 50%. In 2018, the Port Townsend Paper Corporation (PTPC)'s emissions generated 66,331 metric tons of CO2e, see table below. As noted in the 2018 Inventory of Greenhouse Gas Emissions for the Industrial Sector, due to the convention of considering burning of biomass biogenic in nature (EPA and DOE have stated that burning of renewable, sustainably managed biomass is considered carbon-neutral), the 106,537 tons of dry wood used as an energy source is considered to have released only 5% as much CO2e (from CH4 and N2O) as was released from all the other industrial fuels.

Inventory	Fuel Type	Usage	Units	CO2e MT	% Total
Industrial Energy PTPC	Electricity	163,321,000	kWh	1,911	3%
Industrial Energy PTPC	Propane	724,014	MMBtu	38,427	58%
Industrial Energy PTPC	Fuel Oil	2,215,290	Gallons	22,702	34%
Industrial Energy PTPC	Wood	106,537	BDT	3,292	5%
Industrial Energy PTPC Total				66,332	100%

Port Townsend Paper Corporation - Emissions Summary for 2018

Utilizing the IPCC 2nd Assessment factors for both 2005 and 2018, the PTPC emissions decreased 52% from 2005. PTPC has been working to reduce greenhouse gas emissions by reducing the use of fossil fuels and has made a variety of efficiency improvements since 2005.

PORT TOWNSEND PAPER CORPORATION – COMPARISON OF 2018 TO 2005

PTPC	2005		2018			
Fuel Type	Usage	CO2e MT	Usage	CO2e MT	% Change Usage	% Change CO2e
Electricity (KWh)	141,600,000	6,249	163,321,000	1,911	15%	-69%
Propane (Gallons)	161,978	912	724,014	38,425	347%	4113%
Fuel Oil (Gallons)	11,410,000	116,905	2,215,290	22,706	-81%	-81%
Wood (BDT)	428,575	13,012	106,537	3,234	-75%	-75%
Totals		137,078		66,276		-52%

The Port Townsend Paper Company has an operational incentive to reduce energy consumption to reduce input costs. In addition, the PTPC has increased it use of recycled cardboard significantly. It is anticipated that as the Mill is upgraded the amount of carbon footprint impact per ton of product produced will continue to decline.

Water supply

The City has a water right for the continuous diversion of 30 cubic feet per second (cfs) from the Big Quilcene River. There is no Washington State mandated minimum instream flow requirement associated with the water right, however, there is a 27 cfs minimum instream flow requirement conditioned by the US Forest Service Special Use Permit of 2009. The Little Quilcene River water right is for 9.56 cfs, with a minimum instream flow requirement of 6 cfs. Both the Little and Big Quilcene rivers diversion facilities are located within the Olympic National Forest.

Projected alterations of streamflow magnitude and timing within the municipal watershed have the potential to disrupt the water supply. Hydrologic impacts due to shifting from a mixed rain/snow-dominant to rain-dominate condition are expected to result in less snow and more rain, increased winter flows, and reduced late-summer flows. Earlier spring snowmelt and peak flows means that more water will run off when the City's reservoirs are already full. With the loss of snowpack water storage and lower summer stream flows, there will be an increased dependence upon water stored in Lords Lake and City Lake. Mitigation for a reduced water supply could include implementation of conservation/efficiency measures or expansion of storage capacity to capture the winter and spring runoff.

While municipal water demand could readily be satisfied for the foreseeable future by existing lake reservoir capacity, industrial demand will drive future storage requirements. As an alternative to surface water the City could develop a groundwater or reverse osmosis water supply. Ground water recharge within Port Townsend area would be insufficient for current industrial demand and likely for municipal demand as well. Reverse osmosis costs would rule out that option for supplying the Mill. Options for water supply are addressed in the Assets White Paper.

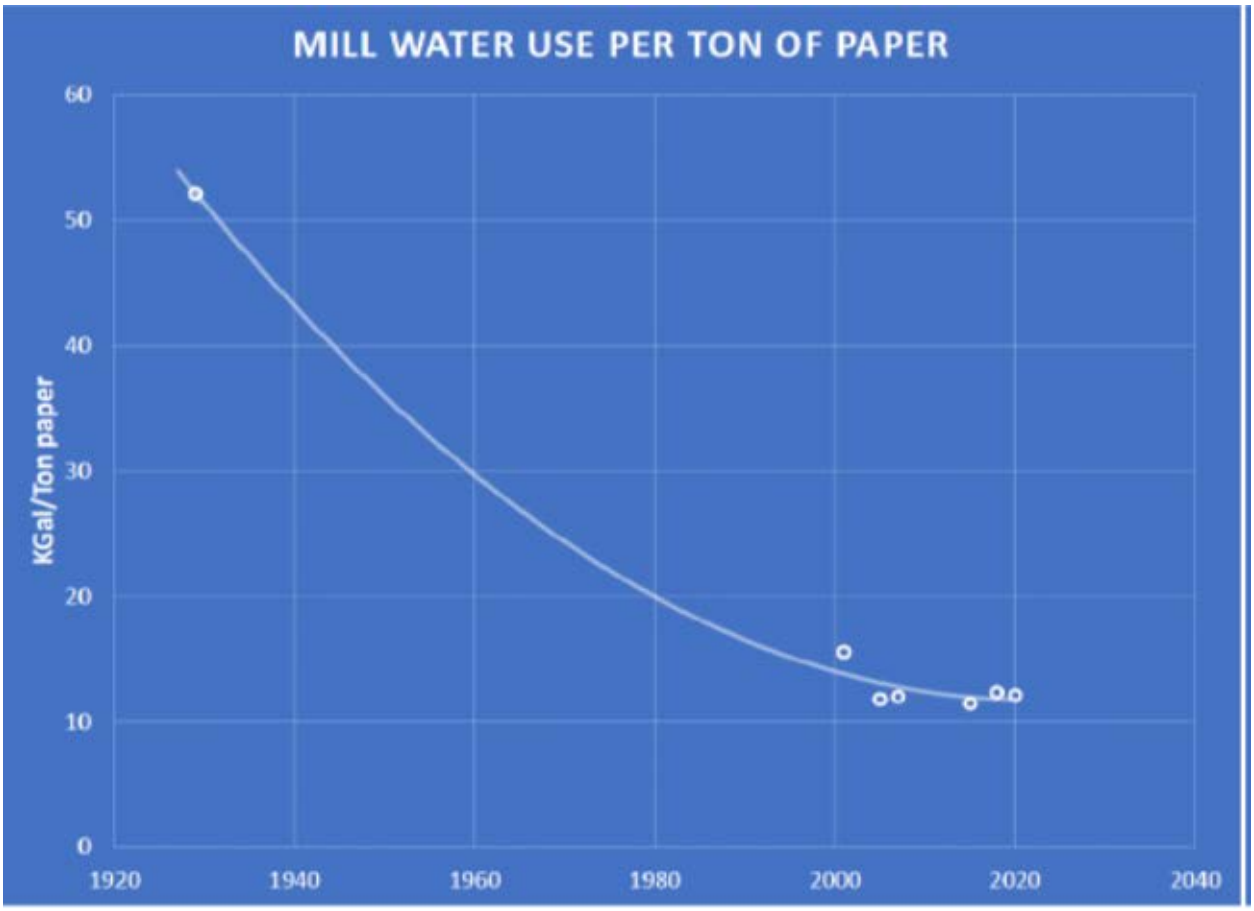
Water consumption

Consumption by the City averages around 1 million gallons per day (mgd), varying from a low of 700,000 gallons per day in the winter to a high of over 2 mgd in the summer. Municipal water production is measured by the flow meters at the Water Treatment Facility. City consumption is tracked by monthly customer meter readings. The current 3-year rolling average for unaccounted water is 7.7%. Estimated future population and demand for the City's 10, and 20-year planning horizons are presented in the table below using 1.12% annual compounded growth for the City and 0.62% for the service area outside the city limits.

Population and Demand	2016	2026	2036
Population	10,478	11,673	13,006
Average Daily Demand	0.928	1.01	1.13
Maximum Daily Demand	1.877	2.12	2.38
Peak Hourly Demand	2.215	2.51	2.80

Mill average daily water use is 10-12 million gallons of untreated water but may swing from less than 7 mgd to more than 14 mgd throughout the day depending on processes operating. For the period of June 2019 through May 2020, the PTPC used an average of 10.79 million gallons per day or 12,122 Acre-ft over the year. For the same period, the City used 1.01 million gallons per day or 1,136 Acre-ft of the year.

Prior to the startup of the City's water filtration plant, the Mill received treated water that was chlorinated at City Lake for both process and potable requirements. Disinfection was eliminated at City Lake with the new treatment facility. The change in water treatment caused the mill to spend $420,000 to connect to the City's distribution system. The Mill's potable water consumption, averaging 3,750 gpd, is metered and paid for as a commercial account. Water for the Mill's paper and pulp making process is untreated, supplied from the transmission line by the Port Townsend city limits. The Mill has since added supplemental chlorine to their process water to prevent biological growth in the process systems. PTPC planning projections are for zero growth going forward. While water use has remained relatively flat over the past 20 years, the amount of paper produced with that water has increased as illustrated below. Through technology, the Mill anticipates continued increase in production for the same water use.



Historical Production of Paper per 1,000 Gallons of Water Used

Projecting forward City and Mill consumption, the estimated maximum flow and average flows/volumes are provided in the following table:

Maximum Daily Demand (MGD)			
	Current	2030	2040
City	2.12	2.38	2.66
Mill	14	14	14
Average Daily Demand (MGD)			
City	1.01	1.13	1.27
Mill	11	11	11

These flows and resulting volume estimates are considerably less than the system was originally designed to deliver. With the exception of some pressure delivery limitations to the Water Treatment Facility (described in the Operations and Capital white papers), the system could deliver substantial greater volumes of water subject to the water supply in the watershed.

Wholesale Water Sales Potential

A consideration for the future of the public on the Quimper Peninsula is the wholesale delivery of water to other service providers. Given the high cost of Capital and the exceptional quality of the water, this option is explored here as a strategy to increase the customer base, offsetting the cost per customer for water system operations. However, additional sales may be limited by water availability during the dry months. If the Jefferson County PUD, the Port Townsend Paper Company, and the City of Port Townsend, desire to expand the water system use, significant research would be necessary to validate and formalize the following analysis. As a matter of determining whether or the not to provide for this option in the future, the following number illustrate what the demand would look like if the Tri-Area was served by the OGWS. As of 2018, the Quimper water system had 3462 connections and other nearby private systems including Port Ludlow and Cape George another 2200 connections. An expanded service area could also result in larger communities subsidizing the smaller dispersed service areas.

Projected Water Demand (mgd)	2020	2030	2040
City of Port Townsend Water System			
Equivalent Res. Units (ERUs)	8,290	9,276	10,379
Average Daily Demand (ADD)	1.01	1.13	1.27
Max. Daily Demand (MDD)	2.12	2.38	2.66
PUD Quimper Water System			
ERUs	5,588	6,807	7,884
ADD	0.887	1.080	1.251
MDD	1.987	2.421	2.804
Total Projected Demand			
ERUs	13,878	16,083	18,263
ADD	1.898	2.212	2.517
MDD	4.111	4.797	5.463

As illustrated in the above table, the water use for potable use would nearly double from that of the City of Port Townsend projected use. With the Port Townsend Paper Mill in operation, expanding water use to the Quimper Peninsula Tri-Area would at least require upsizing of the 24 inch pipe section at City Lake as well as increasing the capacity of the Lords Lake.

Cost of water (Wholesale)

The delivery points for water is the terminus of the OGWS at the intersection of Mill Road and S 8th Street. The cost of water at the delivery points for the Mill and the City is the cost of operations and maintenance as well as capital investment in the OGWS infrastructure. There is a minimal permit cost for operating the water system facilities on the National Forest is negligible and there is no charge for at the source. Refer to Operations and Capital white papers for additional information on the cost of operations and capital. These costs will be incorporated into a financial analysis to establish a per million gallon cost for water at the delivery points. If the Tri-area were to purchase wholesale water at the point of delivery (Four Corners), the value of the water would be determined consistent with the costs to the City and Port Townsend Paper Company.

Source Water Quality

Water quality from the Quilcene Rivers is exceptional and, until 2017, was one of the few permitted unfiltered surface water supplies. There are no contributions of point source pollution within the municipal watershed. Naturally occurring nonpoint source pollution in the National Forest watershed from erosion of steep slopes, streambanks and road surfaces are the primary contributors to suspended sediment. Elevated turbidity is typically the result of heavy rain or rain on snow, which are generally short-term duration events. A moderate amount of recreational use of the watershed has the potential to introduce pathogens directly into water or into the animal community.

Fish bearing streams

While the diversions are upstream of natural anadromous fish barriers, the reivers provide water supply to the lower sections of both rivers which both have habitat for a variety of salmonids including ESA threatened listed Hood Canal summer-run chum and steelhead. For the 2009 Special Use Permits renewal, Environmental and Biological Assessments were developed in cooperation with the US Forest Service, National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS). NMFS concluded that reissuing the City's Permits would not jeopardize, or adversely modify or destroy designated critical habitats for the Hood Canal summer-run chum salmon. USFS Special Use Permits include requirements to maintain minimum instream flows to protect the fisheries as described above.

Conservation (Excluding Water-Recycling)

Both the City and Port Townsend Paper implement conservation measures. The Mills conservation measures have resulted in greater productivity for the equivalent water used. The City has Water Use Efficiency (WUE) Goals adopted during the most recent public forum. They include the following demand and supply side goals:

Demand Side Goal

- Reduce city-wide per capita daily consumption 3 percent below the 2013-2017 average over a 6-year period.

Supply Side Goal

- Maintain the 3-year rolling average water distribution system leakage below 6.5 percent.

At the end of the 10-year planning period (2026), if met, the demand water use efficiency goal would account for an average city-wide savings of 52,243 gpd. At the end of the 20-year planning period (2036), the goal would account for an average savings of 53,546 gpd and if achieved, the net water savings over the 20-year planning period will be in excess of 347 million gallons.

Conservation Response Measures

The Port Townsend City Council passed Ordinance 3132 Exhibit A Drought Contingency Response Plan on August 3, 2015. The updated drought response plan is divided into three stages. Each stage has its own level of activity and triggering condition. Action timing may be adjusted earlier than specified if the Lords Lake reservoir drawdown occurs sooner or is more rapid than predicted.

Construction of the City's water treatment plant has alleviated most reservoir turbidity concerns, which would allow the Mill to potentially draw more water from Lords Lake and City Lake. The extent to which

the mill would be permitted to draw City Lake down would depend on the time of the year and ability of the City to meet expected demand. Aggressive water recycling is built into the mill process, allowing each gallon to be used up to 7 times before the effluent is treated. During low water supply periods cooling towers are used to further reuse process cooling water.

Irrigation Water Consumption

Irrigation in northwest Washington occurs primarily between May and September. In order to determine the impact of irrigation consumption on the water system the peak average daily demand is converted to an Equivalent Residential Unit (ERU), a unit of measure for system capacity in units of single-family residences, which was calculated as 122 gallons per ERU. Dividing the July peak average daily demand by 122 equates to 1256 ERUs. Water system sources, treatment, storage, and delivery systems must be sized to serve the demand or offset by utilizing another source of water.

Commercial and Residential Irrigation Consumption (gallons)									
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**	**Average Daily Demand**	**ERU**
Jan	101,000	44,000	15,000	65,000	109,000	65,000	66,500	2,145	18
Feb	89,000	54,000	92,000	29,000	116,000	44,000	70,667	2,524	21
Mar	210,000	119,000	97,000	88,000	215,000	121,000	141,667	4,570	37
Apr	452,000	516,000	288,000	122,000	459,000	1,088,000	487,500	16,250	133
May	1,993,000	1,981,000	982,000	1,779,000	2,029,000	1,296,000	1,676,667	54,086	443
Jun	3,936,000	1,806,000	2,533,000	2,944,000	3,193,000	1,086,000	2,583,000	86,100	706
Jul	3,248,000	2,535,000	3,529,000	3,284,000	3,522,000	1,794,000	2,985,333	96,301	789
Aug	2,170,000	2,269,000	3,444,000	3,376,000	3,348,000	2,693,000	2,883,333	93,011	762
Sep	1,130,000	1,745,000	1,925,000	1,200,000	928,000	1,672,000	1,433,333	47,778	392
Oct	661,000	157,000	408,000	420,000	278,000	341,000	377,500	12,177	100
Nov	138,000	43,000	191,000	159,000	163,000	N/A	138,800	4,627	38
Dec	54,000	48,000	152,000	122,000	127,000	N/A	100,600	3,245	27
Total	14,182,000	11,317,000	13,656,000	13,588,000	4,487,000	10,200,000	12,905,000		
Golf Course Irrigation Consumption (gallons)									
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**	**Average Daily Demand**	**ERU**
Jan	14,000	-	-	-	-	-	2,333	75	1
Feb	-	-	-	-	-	-	-	-	-
Mar	14,000	155,000	-	8,000	323,000	341,000	140,167	4,522	37
Apr	341,000	1,217,000	18,000	612,000	336,000	865,000	564,833	18,828	154
May	1,805,000	988,000	1,717,000	1,638,000	1,266,000	898,000	1,385,333	44,688	366
Jun	2,808,000	1,916,000	2,671,000	1,653,000	1,268,000	696,000	1,835,333	61,178	501
Jul	1,165,000	2,478,000	2,417,000	1,949,000	1,474,000	1,725,000	1,868,000	60,258	494
Aug	801,000	1,604,000	2,617,000	1,454,000	1,411,000	1,058,000	1,490,833	48,091	394
Sep	527,000	476,000	1,282,000	406,000	925,000	1,143,000	793,167	26,439	217
Oct	91,000	258,000	316,000	403,000	758,000	590,000	402,667	12,989	106
Nov	80,000	37,000	9,000	31,000	-	N/A	31,400	1,047	9

Dec	-	-	-	-	-	N/A	-	-	-
Total	7,646,000	9,129,000	11,047,000	8,154,000	7,761,000	7,316,000	8,508,833		

The current system limiting factor is the Water Treatment Facility's designed 2.95 mgd (2,049 gpm) capacity, which limits the system to 12,052 ERUs, or an additional 4,448 ERUs over the existing demand. A booster pump to transfer water from the low zone to high zone eliminates the apparent high zone limiting factor. Thus, irrigation represents a potential deferment of the treatment plant expansion if an alternate water source such as the golf course well or wastewater reuse is developed.

Water System Limiting Factors	System Capacity ERUs	Existing Demand ERUs	Available ERUs
Installed Source Capacity	20,325	7,604	12,721
Treatment Capacity	12,052	7,604	4,448
Instantaneous Water Rights	20,324	7,604	12,720
Annual Water Rights	209,28	7,604	20,167
Storage Capacity (High Zone)	2,275	1,141	1,134
Storage Capacity (Low Zone)	17,991	6,463	11,528

Water Re-Use (Mill and City)

Water re-use provides the opportunity to reduce demands on the system by utilizing wastewater that is currently being discharged to Puget Sound. The greatest advantage of water-reuse is generally realized when multiple values are achieved. For example, the both the Mill and the City have National Pollutant Discharge Permits for their treated effluent. Those permits have discharge requirements that become more stringent over time. As an example, the City is facing nutrient removal requirements for the municipal wastewater treatment plant thereby making water re-use as one of many potential options for addressing new requirements. Additionally, water-reuse is valuable to the OGWS as a way to off-set Maximum Day Demands and Maximum Month Demands from a flow standpoint and to maintain higher streamflows. From a volume standpoint, water re-use may assist in offsetting storage requirements for the system to account for the impacts of Climate Change.

There are several potential re-use options are available based on current water re-use regulations. The feasibility from a cost standpoint of water re-use is highly depended on the reclamation standards required for each type of use and whether or not filtration is required governed by the Department of Health and Department of Ecology (RCW Chapter 90.46). The following uses with treatment requirements are permitted under WAC 173-219-390.

Table 3: Use-Based Performance Standards

Beneficial Use	Reclaimed Water Class Requirements	Additional Requirements
Indoor Use		
(1) Commercial or industrial facilities, buildings, apartments, condominiums, hotels, and	Class A	Residents must not have access to the plumbing system for repairs or modifications. Where

motels (toilet/urinal flushing or laundry).		the residents have access to the plumbing system for repairs or modifications, no use of reclaimed water is permitted.
Commercial, Industrial, and Institutional Uses[1]		
(2) Commercial, industrial, and institutional uses (including public water features) with public contact.	Class A	
(3) Commercial, industrial, and institutional uses with environmental contact.	Class B	Must minimize adverse impacts to the environment and dependent beneficial uses.
(4) Commercial, industrial, and institutional uses with restricted access.	Class B	• Contact limited to qualified personnel. • Little potential for health impacts.
Land Application or Irrigation[1]		
(5) Landscape irrigation with direct or indirect public access.	Class A	
(6) Landscape irrigation with restricted access and contact.	Class B	Contact limited to qualified personnel or used at times of no, or very limited public access.
(7) Irrigation of food crops (unless otherwise specified).	Class A	
(8) Frost protection of orchard crops.	Class B	• Must not apply within 15 days of harvest. • 50-foot setback from public access.
(9) Irrigation of nonfood crops.	Class B	50-foot setback from public access.
(10) Irrigation of orchards or vineyards.	Class B	• 50-foot setback from public access. • Class B irrigation water must not come in contact with the fruit within 15 days of harvest.
(11) Irrigation of process food crops.	Class B	50-foot setback from public access.
(12) Irrigation of trees, fodder, fiber, or seed crops in pastures not accessed by milking animals.	Class B	50-foot setback from public access.
(13) Irrigation of trees, fodder, fiber, or seed crops in pastures accessed by milking animals.	Class A	
Release to Wetlands		
(14) Category I wetlands.	No reclaimed water use	

(15) Category II wetlands with special characteristics.	No reclaimed water use	On a case-by-case basis, Class A reclaimed water may be used, if it can be demonstrated that no existing significant wetlands functions will be decreased and a net environmental benefit can be demonstrated as required in WAC 173-219-210 (2)(h)(vi).
(16) Category II wetlands without special characteristics.2	Class A	Unless it can be demonstrated that no existing significant wetlands functions will be decreased, and overall net environmental benefits will result from the release of reclaimed water must not exceed on average annual basis: • 20 mg/L BOD, 20 mg/L TSS, 3 mg/L TKN, and 1 mg/L phosphorous. • Annual hydraulic load ≤2 cm/day.
(17) Category III or IV wetlands.2	Class A	Unless it can be demonstrated that no existing significant wetlands functions will be decreased, and overall net environmental benefits will result from the release of reclaimed water must not exceed on average annual basis: • 20 mg/L BOD, 20 mg/L TSS, 3 mg/L N TKN, and 1 mg/L phosphorous. • Annual hydraulic load ≤3 cm/day.
(18) Constructed treatment or beneficial use wetlands with public access.	Class A	Reclaimed water that does not meet the class A or B reclaimed water standards may be beneficially used for discharge into constructed treatment wetlands where the department of ecology, in consultation with the department of health, has specifically authorized such use at such lower standards, as provided for in RCW 90.46.090(2).

(19) Constructed treatment or beneficial use wetlands with no public access.	Class A or B	Reclaimed water that does not meet the class A or B reclaimed water standards may be beneficially used for discharge into constructed treatment wetlands where the department of ecology, in consultation with the department of health, has specifically authorized such use at such lower standards, as provided for in RCW 90.46.090(2).
Surface Water Augmentation		
(20) Surface water augmentation (including direct via impoundments, rivers, reservoirs, or lakes and indirect via groundwater or bank infiltration).	Class A or B	Criteria established on a case-by-case basis to protect existing beneficial uses (recreational, environmental, or other). Must meet applicable requirements of: • Chapter 173-201A WAC (surface water standards). • WAC 246-290-310 (drinking water maximum contaminant levels).
Groundwater Recharge		
(21) Indirect groundwater recharge (surface percolation, subsurface percolation, or vadose wells).	Class A or B	Criteria established on a case-by-case basis. Must meet applicable requirements of: • Chapter 173-200 WAC (groundwater standards). F • Chapter 173-218 WAC when using a UIC well (underground injection control program). • WAC 246-290-310 (drinking water maximum contaminant levels in finished reclaimed water or at alternative point of compliance). • Minimum physical setback of 200 feet, and sanitary control area requirements, whichever is greater, around water supply wells as outlined in WAC 246-290-135.
(22) Direct groundwater recharge (aquifer recharge).	Class A	Criteria established on a case-by-case basis.

		Must meet applicable requirements of: • Chapter 173-200 WAC (groundwater standards). • Chapter 173-218 WAC (UIC program). • WAC 246-290-310 (drinking water maximum contaminant levels in finished reclaimed water product or at alternative point of compliance). • Minimum physical setback of 200 feet, and sanitary control zone area requirements, whichever is greater, around water supply wells as outlined in WAC 246-290-135.
(23) Recovery of reclaimed water stored in an aquifer (aquifer recovery).	Class A	The effects of recovering stored reclaimed water from an aquifer must be demonstrated using the criteria presented in the engineering report. They must not negatively impact groundwater quality, the surrounding environment, or water rights holders.
Direct Potable Reuse		
(24) Direct potable reuse.	Class A+	Class A+ treatment criteria will be established on a case-by-case basis by health. Direct potable reuse is not a beneficial use of reclaimed water unless and until the group A potable water purveyor or reclaimed water generator has applied for and received a waiver from the state board of health under WAC 246-290-060(4).

1. Class A reclaimed water may be used with no additional requirements.
2. For depressional wetlands, maximum increase of 10 cm above the natural average monthly water level.

An average of 286 million gallons of municipal wastewater is treated annually. Analysis of the re-use at the Mill 10 years ago determined it would be prohibitively expensive and require extensive changes to the Mill water system. It is estimated 74 million gallons of reclaimed water could potentially be utilized, mostly for irrigation purposes within the city. However, the majority of the property considered for reclaimed water is not currently irrigated, thus, a more realistic total for water use would be on the order of 10-12 MG/year. Water re-use for irrigation could offset summer peaking demands for the City by approximately 0.5 MGD with an adequate distribution system to access the School District, Fort

Worden, Golf Course, Port, Farms, and City Parks. Also, given climate change, irrigation demands are expected to increase.

In 2017 the total net present value cost for the water reclamation system (additional treatment, storage, pumping and distribution piping) was $16,887,000. Assuming reclaimed water use totals 12 MG/year, the total value per gallon treated over a 20-year period equates to approximately $0.04 per gallon. The current monthly service charge for water based on the summer irrigation rate is $0.0062 per gallon. Reuse of treated wastewater does not appear to be economically feasible at this time, particularly that demand for reclaimed water is low and would be seasonally operated.

As technology improves cost efficiency of wastewater re-use and public acceptance and regulations change, it is anticipated that the City will explore application of water re-use in the next 50 years.

Wastewater Treatment

Despite the high quality of treatment produced by the City's Wastewater Treatment Plant (WWTP), considerable modifications would need to be made to make the water meet re-use standards. For the purpose of this whitepaper, the current discharge information for the WWTP is provided. Port Townsend's WWTP is designed for a maximum monthly flow of 2.05 mgd and an average annual daily flow of 1.44 mgd. Current maximum monthly and average annual flows are 0.872 mgd and 0.786 mgd respectively, however flows have reached 4 mgd for short periods of time during exceptionally heavy rainstorms.

Treatment effectiveness has exceeded the following criteria:

- BOD designed Influent Loading Max. Month: 3754 lbs./day – Currently operating at 2718 lbs/day or about 72% of maximum loading. Treatment plants are required to develop upgrade plans at 85% of capacity.

	Permit Effluent Discharge Limit		Discharged to Straits
BOD	30 mg/l Ave. Month	45 mg/l Ave. weekly	4.7 mg/l
T.S.S.	30 mg/l Ave. Month	45 mg/l Ave. weekly	2.9 mg/l

- T.S.S. designed Influent Loading Max. Month: 4568 lbs./day – Current loading is 2686 lbs/day.

Excessive levels of nutrients from human sources, such as nitrogen and carbon, are negatively impacting water quality in Puget Sound. High nutrient loading, of which wastewater is a significant factor, provides fertilizer for algae and aquatic plants. Decomposition of algae and plants consumes oxygen that marine animals need to survive.

Due to low average influent wastewater volume, treatment by the Port Townsend wastewater plant provides partial nitrogen removal prior to discharge to the Straits of Juan de Fuca. While contributing to the overall Puget Sound loading, high tidal exchange within the Straits dilutes the effluent more readily than in the shallower bays and inlets.

In 2019, the DOE discussed options for controlling nutrient pollution from treatment plants. After receiving public input on a preliminary determination, the DOE decided to move forward with a Nutrients General Permit because it was determined to be the best tool for reducing excess nutrients

from treatment plants that discharge directly to Puget Sound. The exact permit conditions are still to be determined. The City will be issued a new NPDES individual permit after the General Permit has been issued requiring the City to comply with new nutrient standards. The full impact of these requirements on the city wastewater system is yet to be determined.

Water reuse is also considered in the Assets white paper briefly under the consideration of water supply alternatives. The conclusion concerning water re-use is that it only addresses a portion of the water demands and the current economics does not make it a viable solution during this current planning period.

Other Environmental Considerations

City of Port Townsend Environmental Sustainability

Steps the City has taken toward developing environmental sustainability include:

- Golf course well
    - The City filed a water-right application for an irrigation well at the Port Townsend Golf Course with the Washington State Department of Ecology on June 3, 2002. A well was drilled and the water right G2-30059 permit approved in 2019 for the maximum instantaneous allocation of 150 gallons per minute and a maximum annual withdrawal of 51 acre-feet to irrigate 35 acres of the City-owned golf course.
    - The well will allow the City to irrigate the golf course with groundwater rather than surface-water from the Big and Little Quilcene Rivers. Use of groundwater sourced from a basin that drains directly to the marine environment will reduce demand from the rivers when surface-water is limited. The well would also be used as an emergency water supply if the municipal water system's single source of supply is inoperative or if a significant portion of the municipal distribution system is damaged.
- Leak monitoring and repair
    - The current 3-year rolling average water distribution system leakage is 7.7%. The City of Port Townsend's ongoing supply side WUE measures include ensuring that all accounts are metered, repairing broken meters, and identifying and repairing leaks. An ongoing acoustic leak detection program surveys several miles of pipeline per year.
- Xeriscape LS
    - When possible, the City practices xeriscaping of public spaces and parks to reduce the need for continued irrigation.
- Excess water use rate charges promote conservation
    - Port Townsend's utility billing adds an incremental charge for each 1,000 gallons of water consumption. In addition, the wastewater charge, which is based on water consumption, increases if use is 3,000 gallons or more.
- Plumbing Codes
    - The federal government enacted national standards in the U.S. Energy Policy Act of 1992 (EPAct 1992). This comprehensive legislation set minimum efficiency standards for all toilets, showers, urinals, and faucets manufactured in the United States after 1994.

Port Townsend Paper Corporation Environmental Sustainability

Steps the PTPC has taken toward developing environmental sustainability include:

- Significant greenhouse gas reductions.
- Increased recycling of waste paper, currently 800 tons of cardboard per day.
- Increased water reuse during shortages through use of rental cooling towers.
- Fiber all sourced through Sustainable Forestry Initiative (SFI) & Forest Stewardship Council (FSC) certified suppliers programs, which provide third-party certification that wood and pulp suppliers support and practice responsible forest management principles.

References

1. Cooperative Watershed Protection Program, April 1, 1994
2. Memorandum of Understanding Between the City of Port Townsend and U.S. Department of Agriculture Forest Service Olympic Nation Forest, May 3, 1993
3. 2009 Special Use Permit with the US Forest Service
4. Climate Action Plan - Port Townsend/Jefferson County, Washington November 14, 2011
5. Jefferson County Washington 2018 Inventory of Greenhouse Gas Emissions
6. City of Port Townsend 2018 ENERGY USE DATA-WATER WASTEWATER AND STORMWATER.xlsx
7. Shifting Snowlines and Shorelines: The Intergovernmental Panel on Climate Change's Special Report on the Ocean and Cryosphere and Implications for Washington State (2020)