City of Gig Harbor

Wastewater Comprehensive Plan Update

October 26, 2018

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Certificate of Engineer

City of Gig Harbor
Wastewater Comprehensive Plan Update

The material and data contained in this report were prepared under the direction and supervision of the undersigned, whose seals as professional engineers licensed to practice in the State of Washington, are affixed below.

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1. Introduction

1.1. Purpose

This Wastewater Comprehensive Plan Update has been developed to address the wastewater service issues facing the sewer collection and treatment system of the City of Gig Harbor, Washington (City). The need to assess the capacity of the existing collection and treatment system facilities and to determine an effective strategy for future growth is a critical element in the management of the City's sewer and treatment services.

The purpose of this plan is to evaluate the capacity and condition of the existing sewer system, to determine required system improvements, and provide an outline for project schedules and costs.

1.2. Background

The existing sewer system is owned, operated, and maintained by the City. The existing sewer service area covers approximately 1,800 acres and consists of approximately 213,000 lineal feet of various sizes and materials of gravity and force main pipe. The system serves areas within city limits and several developments outside of the city limits.

The original treatment facility was built by the City in 1975 and the wastewater from the City has historically been treated at the City's wastewater treatment plant (WWTP), which is located at the intersection of Harborview Drive and Austin Street. The WWTP was upgraded in 1994 to include major improvements for degritting, screening, aeration stabilization, and digester associated improvements. Additional upgrades to the WWTP were implemented in 2010-2016 and included secondary clarifiers, ultraviolet disinfection, and a new lab and administration building. Currently, the plant utilizes as activated sludge process to provide secondary treatment of municipal sewage.

1.3. Regulatory Requirement

This Wastewater Comprehensive Plan Update has been developed in accordance with Washington Administrative Code (WAC) 173-240-050, which requires all governmental agencies providing wastewater service to submit a wastewater comprehensive plan update to the Washington State Department of Ecology (Ecology) for approval. Approval by Ecology allows for the preparation of Engineering Reports/Facility Plans for specific wastewater utility infrastructure improvements.

1.4. City Policies

1.4.1. City Sewer Regulations and Planning Policies

Gig Harbor Municipal Code chapter 13.28 and the City of Gig Harbor Public Works Standards set rules and regulations for the City's sewer system, chapter 13.32 establishes rates, and chapter 13.34 sets additional rules for sewer service outside the city limits.

Sewer collection systems shall be installed in accordance with these regulations and policies. Additionally, upon wastewater basin buildout conditions, the lift stations shall be located at the topographic low point of the basin to maximize gravity service to all properties within the basin as approximated on the Wastewater Basin Map provided in Appendix B.

The siting of any wastewater facilities such as lift stations or wastewater treatment facilities will have to adhere to the City planning and zoning policies at the time of construction.

The Pierce County General Sewage Plan prohibits the extension of City sewer facilities beyond the boundaries of the UGA except in response to a public health hazard (e.g., failing septic systems). Pierce County also approves and controls the density of developments to be served by community septic systems.

The City continues to implement its policy that requires private ownership, operation, and maintenance of septic tank effluent pump (STEP) systems and grinder pump systems, and the pressure main associated with these systems.

1.4.2. Amendments to the Wastewater Comprehensive Plan

Amendments to policies or growth projection contained within this plan or amendments which adversely affect wastewater system capacity shall be processed through the City's Comprehensive Plan amendment procedures (Chapter 19.09.GHMC)

All other amendments, to be known as technical amendments, must be made through application to the City of Gig Harbor Public Works Department. Decisions on technical amendments will be made by the City Council and will, where accepted by the City Council, be adopted by resolution and be forwarded on to the appropriate state jurisdiction for additional review or approval. The requisite fee for proposed amendments to the Wastewater Comprehensive Plan must accompany the proposed application. Additionally, all costs incurred by the City will be reimbursed by the applicant proposing the amendment. These costs may include, but are not limited to, consultant fees, legal fees, and review fees required by other jurisdictions.

All proposed amendment applications must include a completed Sewer Hydraulics Report in City format.

1.4.3. On-Site Septic System Regulations

In some cases wastewater may be treated and disposed of on-site either by individual septic systems or community on-site systems. It is the intent of the City, however, to eventually provide wastewater collection services to all residents within the UGA. In the meantime, on-site septic systems should be designed to meet the Washington State Department of Health (DOH) design standards. Approval of the systems will be made either by the local health department for systems under 3,500 gallons per day, or DOH for systems less than 14,500 gallons per day but greater than 3,500 gallons per day, or Ecology for systems that are over 14,500 gallons per day in capacity. The State Board of Health statute that provides the authority for DOH to adopt rules for sewage is found in RCW 43.20.

The City desires to have individual residential on-site septic systems connect to the City's sewer system and abandon their on-site septic systems for environmental reasons. In order to assist in the facilitation of these new connections to the City sewer system, the City will work with residential property owners to educate them on the potential benefits and potential drawbacks to this change. This effort would group areas together so as to minimize expenses for each residential property owner. Funding of each group of connections could be covered by the creation of a utility local improvement district (ULID) or other mechanism so the existing wastewater operating customers are not burdened with the costs making these new connections.

1.4.4. City Sewer Agreements

The City of Gig Harbor has an agreement with Canterwood Estates to accept, convey, and treat sewage from the development's STEP system. Canterwood Estates is billed by the number of customers connected to the STEP system. Under the agreement, Canterwood Estates is responsible for construction and maintenance of its STEP system.

The City of Gig Harbor has entered into a contract with the Wollochet Harbor Sewer District to provide wastewater treatment for septic tank effluent produced in the District. The contract allows for the District to discharge an average annual flow of 16,400 gallons per day. The point of discharge is the Wagner Way lift station.

1.4.5. City Wastewater Operation and Maintenance Standards

The construction of all wastewater facilities and onsite systems within the City's corporate limits and UGA must meet the design standards as outlined in Chapter 5 of the City of Gig Harbor Public Works Standards. In addition, all wastewater facilities must meet Ecology design standards as delineated in Criteria for Sewage Works Design (latest edition).

1.5. Plan Organization and Overview

This Wastewater Comprehensive Plan Update provides an overview of the City's existing demographics and planned growth, determines estimated wastewater flows, evaluates the capacity of the system, and identifies and prioritizes necessary capital improvements within the City's existing collection and conveyance system, as well as the City's wastewater treatment plant (WWTP).

The Plan also includes preliminary engineering in adequate detail to assure technical feasibility, provides for the method of distribution of the cost and expense of the sewer system, and indicates the financial feasibility of plan implementation. The chapters in this Plan include:

Chapter 1. Introduction.

Chapter 2. Planning Criteria. Current population trends, as well as scenario developments for growth, were developed based on City planning assumptions and current City land use zoning.

Chapter 3. Wastewater Flow Projections. Historical, current, and future wastewater flow estimates were calculated for demographic sanitary flows (broken down into three total categories: households, commercial/employees, and industrial), and infiltration & inflow.

Chapter 4. Wastewater Collection System. The lift stations, forcemains, and primary gravity pipelines were evaluated to determine if capacity improvements are needed.

Chapter 5. Wastewater Treatment Plant. The WWTP chapter references specific engineering reports prepared by the City, which identify current and projected wastewater loadings and summarize plant capacity and performance, and describes needed treatment plant improvements, including related to the outfall.

Chapter 6. Water Reuse and Reclamation. The City's efforts regarding evaluation of the potential for reclaimed water to be a beneficial component of its wastewater management strategy is summarized in this chapter.

Chapter 7. Capital Improvement Program. The CIP prioritizes and schedules the City's wastewater improvement projects over the next 6 to 20 years, and provides estimated project costs.

Chapter 8. Financial Analysis. The financial evaluation developed scenarios and strategies for funding the City's wastewater utility and planned capital improvement projects.

As part of the State Environmental Policy Act (SEPA), environmental requirements for implementing this Plan are identified in the SEPA checklist contained in Appendix A. Specific environmental impacts for each project in the Capital Improvement Program will be evaluated in a separate SEPA process during implementation.

2. Demographic & Growth Projections

The configuration of the City's sewer system is influenced by several factors including development trends, political considerations, and topography. The City desires to maximize the use of gravity pipelines in the hopes of minimizing the number of lift stations required. This Wastewater Comprehensive Plan Update has established logical wastewater service areas based on topography, the drainage characteristics of the area, and corresponds with the City's growth objectives. Modifications may then be made in consideration of the influence of existing facilities, political boundaries, and growth patterns as this plan is implemented. This Plan permits sufficient flexibility to provide for existing areas of need and the future development within the City's Urban Growth Area (UGA) boundary.

2.1. Growth Management

The Growth Management Act (GMA) was enacted in 1990 to address the population growth that occurred in areas of Washington State during the 1980s. To ensure a continuation of Washington's high quality of life, officials across the state have addressed growth management within various levels of government. The basic objective of the GMA is to encourage local, county, and city governments to develop and implement a 20-year comprehensive plan that incorporates their vision of the future within the framework of the broader needs of the state.

Under the GMA, municipalities must complete city planning and coordinate these planning efforts with those of the county. The planning effort of a municipality includes the establishment of an UGA. Municipalities are to plan for the provision of providing wastewater services to areas within their established UGAs.

Under the provisions of the GMA, the City of Gig Harbor has adopted its Comprehensive Land Use Plan. Gig Harbor is currently in compliance with the GMA.

2.2. Location

The City of Gig Harbor is located on the Gig Harbor Peninsula at the southern end of Puget Sound in Pierce County approximately five miles northwest of Tacoma, across the Narrows. Gig Harbor is bordered by Henderson Bay to the northwest, unincorporated Pierce County to the west, south and north, and Puget Sound to the east.

Gig Harbor is primarily a residential community with waterfront commercial activities. Waterfront activities include marinas for pleasure and fishing boats, commercial vessel moorage facilities, and boat repairs. Commercial activities have developed along the State Route 16 (SR16) corridor. The City has annexed several areas to the north and south, including existing subdivisions and developed commercial properties along SR16.

2.3. Study Area

The study area for this Plan consists of the City of Gig Harbor urban growth area (UGA) shown in the map included in Appendix B.

2.4. Demographic Assessment

The Demographic Forecast Allocation Model for Wastewater (DFAM-WW) was developed for the City to improve the ability to use forecasted growth in the City's UGA to support detailed planning of City wastewater utility infrastructure. The DFAM-WW serves this purpose by allocating growth to wastewater basins within the UGA, as well as providing a flexible tool for incorporating actual growth observed over time and localized changes in growth rates related to new infrastructure or other conditions. The primary input to the DFAM-WW results from the City's Buildable Lands Analysis.

The DFAM-WW was designed as a computer spreadsheet-based tool to provide a flexible and user-friendly environment for working with demographic projections within the City's UGA. Model calculations are performed through a combination of Excel based equations and Visual Basic programming (macros). A digital copy of the model has been provided to the City for use by City staff.

The DFAM-WW provides the City with a tool that can be used to update Gig Harbor's Wastewater Comprehensive Plan and adapted for other utility and/or transportation planning projects. The model permits ready modification of key inputs and assumptions that define spatial and temporal growth patterns. It can be updated with new growth projections when they become available and can address any planning period through 2050.

2.4.1. Process to Develop DFAM-WW Model

The City's Planning and Engineering staffs and consultants developed the DFAM-WW. Initially identified were the desired features of the model and discussions of available data and inputs. In order to provide basic inputs to the model, the City's pre-existing Buildable Lands Inventory (BLI) and Buildable Lands Analysis (BLA) were utilized. However, City staff noted that this pre-existing work did not extend outside City Limits. Thus, the same inventory and analysis methodology was applied to the area outside City Limits but within the UGA, and the results from this expanded BLA were then used as inputs to the DFAM-WW.

2.4.2. DFAM-WW Overview

The DFAM-WW uses existing forecasted demographic data to generate an annual estimate of wastewater generating populations in the City's UGA. This model is designed to generate annual demographic estimates by allocating existing forecasted demographic data spatially into delineated wastewater basins. It also permits adjustment of growth rates within the planning period to recognize that growth may occur more rapidly during some periods than others. "Trigger Events" (an activity or project that could influence the rate of growth) can be identified that prompt accelerated growth and development. These trigger events allow for manual adjustments to the demographic forecasts to individual wastewater basins or all wastewater basins for short-term or long-term periods.

The model allows analysis of six distinct demographic categories: population; single-family households; multifamily households; employment; school enrollment; and the prison population at the Washington Corrections Center for Women (WCCW). Each of these demographic categories represent definable components of wastewater generation.

Temporal Distribution

Figure 2-1 displays the modeling approach, using households as an example. The process begins with entry of aggregate demographic data for the entire UGA broken down by wastewater basin. The wastewater breakdown is carried through the entire model and can be re-aggregated for key outputs. The spatially distributed data is then used to develop an unadjusted annual forecast of the projected demographic data based on a straight-line allocation. Resulting unadjusted annual growth rates are determined.

In the next step, the model allows the user to adjust annual growth rates, for any wastewater basin to reflect changes in growth resulting from growth patterns and trigger events. Based on the adjusted growth rates, the model then generates an adjusted forecast of the projected demographic data for all years of interest.

The model is designed to allow single-family households, multifamily households, and employment to be broken down into sewered and unsewered categories. This feature is intended to support development of the City's wastewater plan. It accounts for both conversions of existing sites with septic systems to service by the City's sewer system and new development connected to the sewer system in the future. This element was not included for the prison or school enrollment since the prison and all schools are fully sewered.

Figure 2-1. Flow Chart Depicting Approach for Residential Analysis

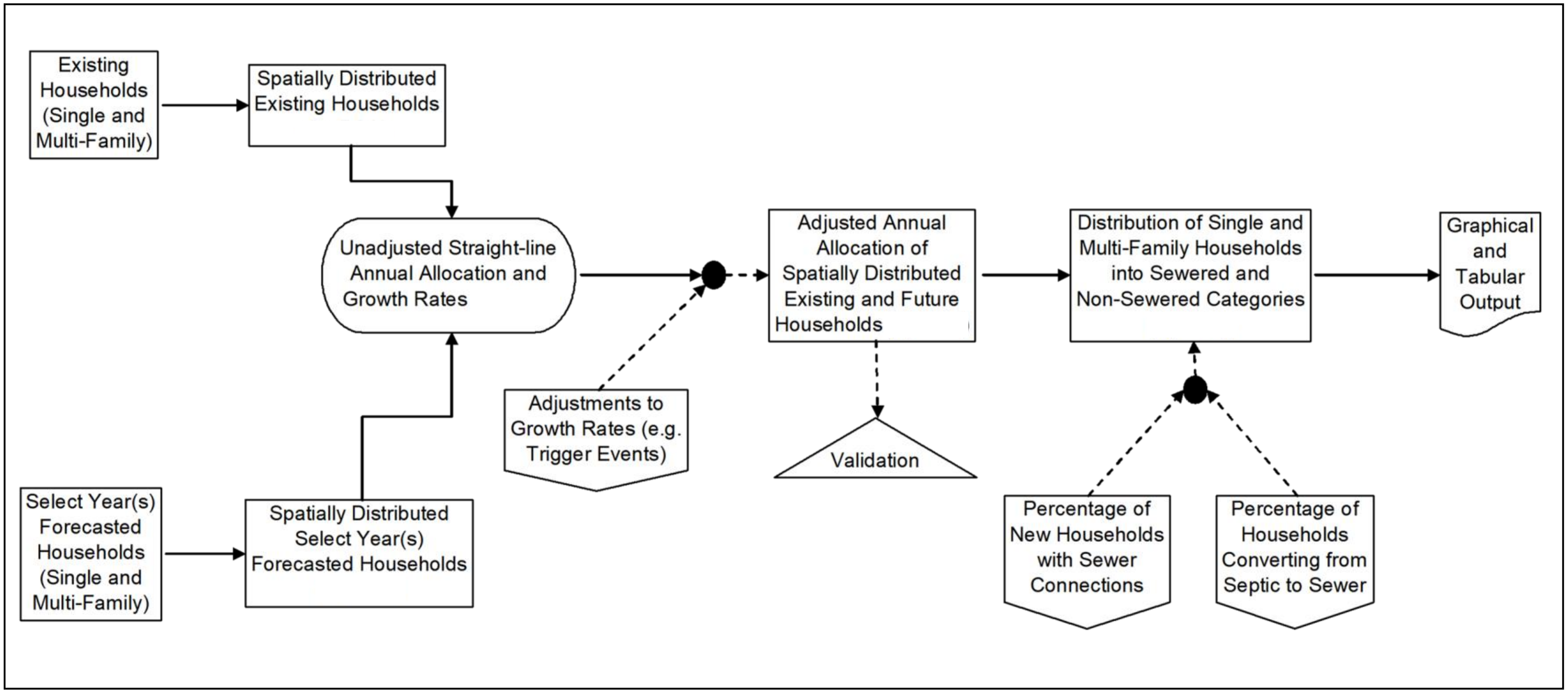
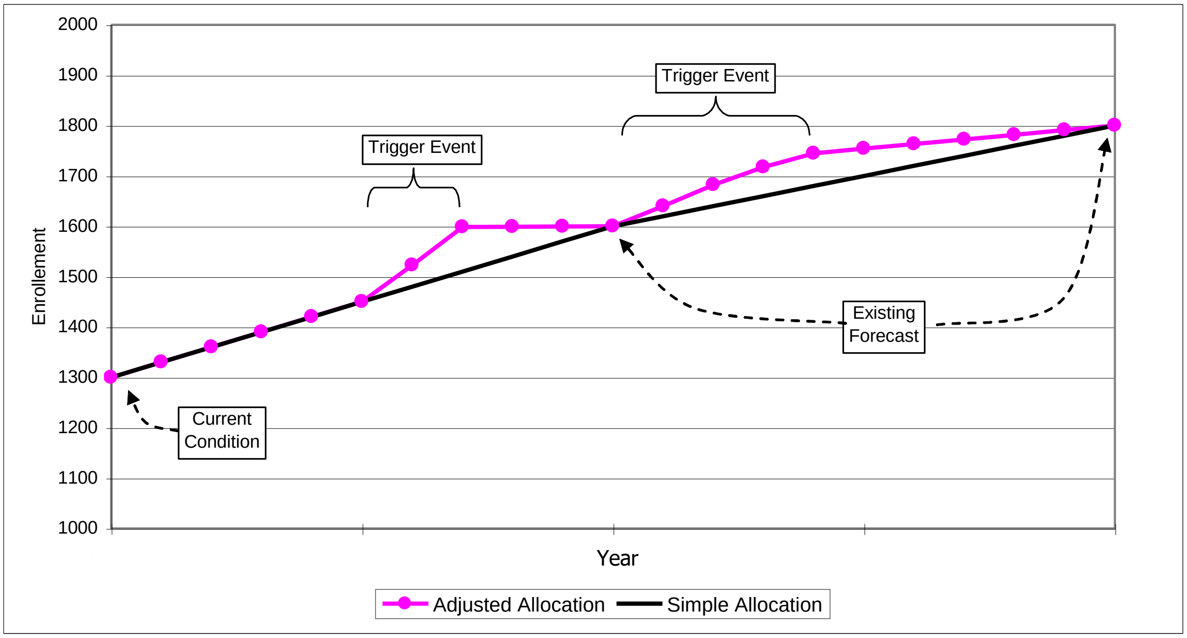


Figure 2-2 illustrates how a pre-existing forecast is input and then adjusted. An initial curve is plotted to show initial data and forecasts for two later identified milestone years. This is labeled "simple allocation." Growth rates based on this line are then modified for two trigger events. Note that the growth rates following the trigger events are reduced to ensure that the existing forecasts are not exceeded. While not shown in this example, the model is also capable of reflecting a long-term effect that lifts the growth curve for all subsequent years.

Figure 2-2. Example of Model Application



Spatial Distribution - Wastewater Basin Delineation

The City's UGA was broken down into wastewater basins (see map in Appendix B). These wastewater basins represent the fundamental building blocks for this analysis and provide the ability to differentiate growth rates for each basin within the UGA. This in turn will support identification of needs for utility improvements based on growth and related wastewater flow projections.

The boundaries of the wastewater basins that directly feed into each of the individual lift stations were established by identifying the gravity lines that drain into each lift station by using the City-wide collection system map, and using previously developed drawings with basin boundaries shown. Furthermore, the topography of the area also helped in identifying areas with higher elevations and the borders of the collection basins. These basins were delineated to reflect anticipated differences in growth potential resulting from population and household growth, annexations, and corresponding need for utility services. Appendix B shows the wastewater basin boundaries.

Existing Wastewater Basin Descriptions

WW Basin 1. Basin 1 is served by Lift Station 1 and is generally located northeast of the City's downtown area near the north end of the harbor along Vernhardson Street. Flows from Lift Station 1 are discharged to Basin 2. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 2. Basin 2 is served by Lift Station 2A and is generally located north of the harbor in the vicinity of Peacock Hill Avenue. Flows from Lift Station 2A are discharged to Basin 3. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and there is the potential to extend gravity service north along Peacock Hill Avenue. Figure 2-3 shows the City's desired approach to extending gravity sewer piping on Peacock Hill Avenue to serve Basin 2 (and Basin 15).

WW Basin 3. Basin 3 is served by Lift Station 3A. All wastewater flows generated in the City's service area flow through Lift Station 3A, which discharges directly to the City's wastewater treatment plant. Basin 3 has the largest service area of all basins, encompassing about 25 percent of the City's UGA area. The Basin 3 area generally extends to the southeast along Stinson Avenue, to the southwest south of Rosedale Street in the vicinity of Gig Harbor High School, to the northwest to the Washington Corrections Center for Women (WCCW), and to the northeast near Borgen Boulevard. The boundaries of this existing basin include both the existing collection system and additional non-sewered areas that appear to be serviceable in the future by extending gravity pipelines connected to the existing gravity piping in this basin. Further sub-basin analysis would be needed in the northeast near Peakcock Hill Road and the northwest near Burnham Drive.

WW Basin 4. Basin 4 is served by Lift Station 4, and is generally bounded on the north by Rosedale Street, to the east by Soundview Drive, and to the south and west by State Route (SR) 16, and includes Pioneer Way along the center area of the basin. Flows from Lift Station 4 are discharged to Basin 3. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 5. Basin 5 is served by Lift Station 5. It is a relatively small basin adjacent to the waterfront off Harborview Drive, and is east and down gradient of Basin 4. Flows from Lift Station 5 are discharged to Basin 4. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 6. Basin 6 is served by Lift Station 6, and is generally located adjacent to the waterfront east of Soundview Drive and is east and down gradient of Basin 4. Flows from Lift Station 6 are discharged to Basin 4. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 7. Basin 7 is served by Lift Station 7, and is generally located east of SR 16 in the vicinity of Olympic Drive. Flows from Lift Station 7 are discharged to Basin 4. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 8. Basin 8 is served by Lift Station 8, and is generally located west of SR 16 in the vicinity of Point Fosdick Drive and 56th Street. Basin 8 also receives wastewater flows from Goodman Middle School and Harbor Heights Elementary School (located outside the City's UGA boundary), which are metered and billed by the City. It was assumed during this analysis that flows from the school would continue to discharge to the City's system in the future. Flows from Lift Station 8 are discharged to Basin 4. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 9. Basin 9 is served by Lift Station 9, and is generally located east of Olympic Drive and west of Reid Drive. Flows from Lift Station 9 are discharged to Basin 7. The boundaries of this existing basin include both the existing collection system and additional non-sewered areas that appear to be serviceable in the future by extending gravity pipelines connected to the existing gravity piping in this basin. Further sub-basin analysis would be needed in the northern portion of the basin.

WW Basin 10. Basin 10 is served by Lift Station 10, which serves the Forest Grove Apartments in the vicinity of Olympic Drive and 56th Street. Flows from Lift Station 10 are discharged to Basin 8. Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 11. Basin 11 is served by Lift Station 11, which serves the Woodland Creek subdivision off of 38th Avenue. Flows from Lift Station 11 are discharged to Basin 8. Due to topography sloping west toward the UGA boundary, Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 12. Basin 12 is served by Lift Station 12. Basin 12 has the second largest service area, encompassing about 10 percent of the City's UGA area. The Basin 12 area generally extends east and west of SR 16 and includes portions of Burnham Drive, Borgen Boulevard and Woodhill Drive. Basin 12 also receives wastewater flows from Canterwood. Flows from Basin 12 are discharged to Basin 3. The boundaries of this existing basin include both the existing collection system and additional non-sewered areas that appear to be serviceable in the future by extending gravity pipelines connected to the existing gravity piping in this basin. Further sub-basin analysis would be needed in the northeast portion of the basin near Peakcock Hill Road, and in the northwest portion of the basin near Burnham Drive.

WW Basin 13. Basin 13 is served by Lift Station 13. Basin 13 is in the northwest corner of the UGA, bounded by the waterfront to the west and SR 16 to the east, and includes Peninsula High School. Flows from Basin 13 are discharged to Basin 12. The boundaries of this existing basin include both the existing collection system and additional non-sewered areas that appear to be serviceable in the future by extending gravity pipelines connected to the existing gravity piping in this basin. Further sub-basin analysis would be needed in the southeast portion of the basin in the vicinity of Goodnough Drive.

WW Basin 14. Basin 14 is served by Lift Station 14. Basin 14 is west of SR 16 adjacent to Wollochet Drive and Wagner Way. Basin 14 also receives wastewater flows from the Wollochet Harbor Sewer District (located outside the City's UGA boundary), which is metered and billed by the City. It was assumed during this analysis that flows from the Wollochet Harbor Sewer District would continue to discharge to the City's system in the future. Flows from Basin 14 are discharged to Basin 3. The boundaries of this existing basin include both the existing collection system and additional non-sewered areas that appear to be serviceable in the future by extending gravity pipelines connected to the existing gravity piping in this basin. Further sub-basin analysis would be needed in the northern portion of the basin in the vicinity of Wagner Way.

WW Basin 16. Basin 16 is served by Lift Station 16, which serves the McCormick Ridge Condominiums between Canterwood Boulevard and SR 16. Flows from Lift Station 16 are discharged to Basin 12. Due to topography sloping west toward SR 16, Existing sewer piping generally covers the existing basin area to provide gravity collection to the existing lift station, and it does not appear that the basin boundaries can be expanded to provide additional areas by gravity.

WW Basin 21. Lift Station 21A serves Basin 21, located along Skansie Avenue (46th) near Hunt Street. Basin 21 discharges into Basin 3 and is bordered by Basin 14 to the east and Basin 3 to the north.

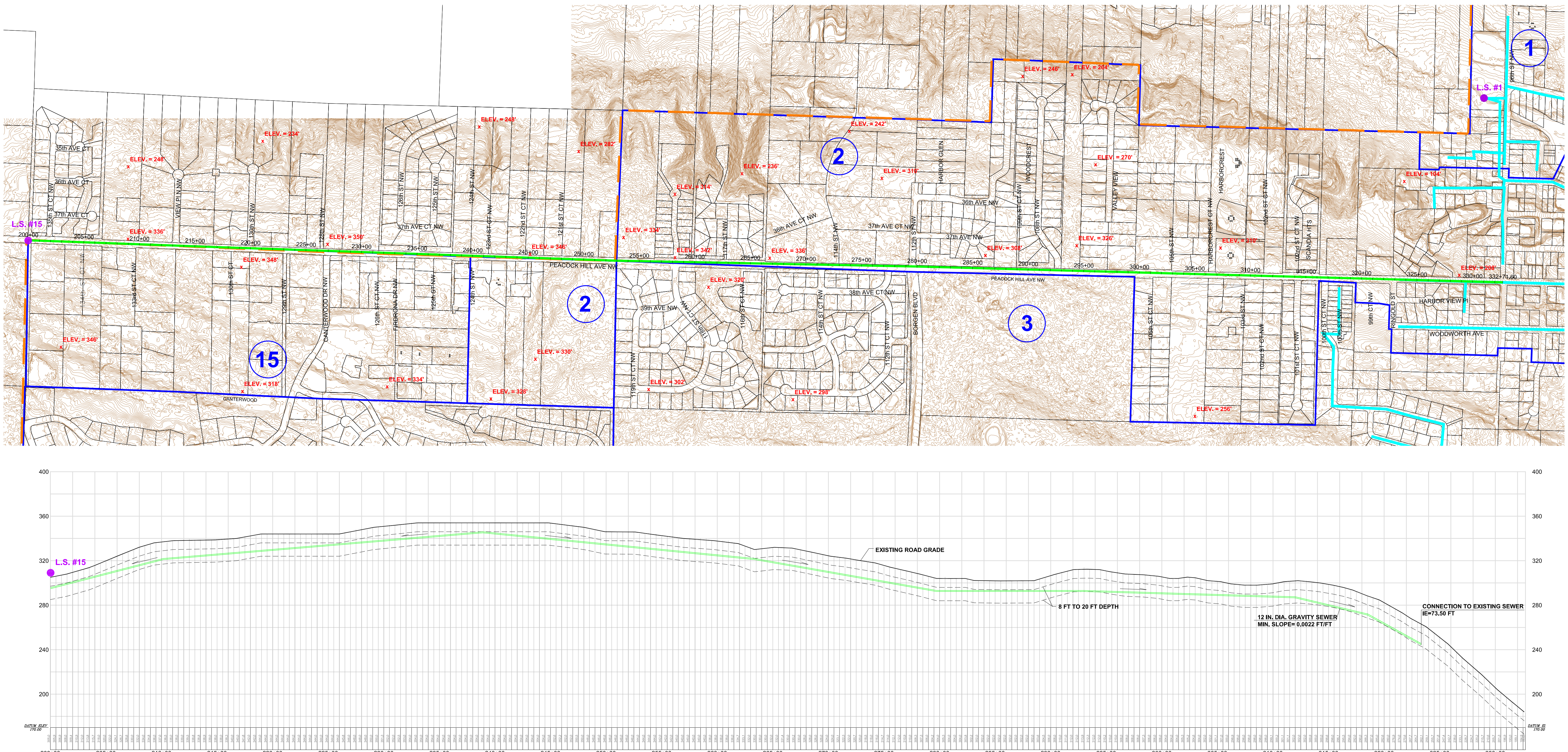
WW Basin Canterwood and Rush. The Canterwood basin is served by Septic Tank Effluent Pump (STEP) systems owned and operated by the Canterwood STEP Association and the Rush Division 12 STEP Association. This basin serves the Canterwood housing development surrounding the Canterwood Golf and Country Club located within the City's UGA boundary. Total flow from the Canterwood STEP Association is metered and billed by the City. Similarly, total flow from the Rush Division 12 STEP Association is metered and billed by the City. It was assumed during this analysis that flows from both STEP Associations would continue to discharge to the City's system in the future. Canterwood and Rush basin flows are discharged to Basin 12.

As expected, the City's current sewer system map indicates there are no City wastewater facilities in the Canterwood basin. However, the City's wastewater billing database indicates that several parcels in the Canterwood basin are billed individually for sewer service.

LEGEND

- WASTEWATER BASIN BOUNDARY
- CURRENT MODEL PIPE NETWORK
- PROPOSED SEWER ALIGNMENT
- UGA BOUNDARY
- CONTOURS
- PARCEL
- EXISTING LIFT STATION
- FUTURE LIFT STATION LOCATION

Figure 2-3
CITY OF GIG HARBOR
WASTEWATER BASINS 1, 2, & 15



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Future Wastewater Basin Descriptions

The "future" wastewater basin boundaries were delineated following a similar approach to delineating the existing basin boundaries. The future boundaries were first delineated based on topography and then refined by correlating the basin boundaries to parcel boundaries. The future basins encompass the areas between the existing basin boundaries and the City's UGA boundary. Future basins are defined as areas having the following characteristics:

- Currently non-sewered areas where sewer collection/conveyance piping and lift stations do not currently exist.
- Areas where topography indicates that gravity pipelines could provide sewer collection service to one or more low elevation locations within the basin, resulting in the need for one or more lift stations within the basin with corresponding forcemain piping to convey flows from the future basin to connect to the existing collection system.

The future basins are numbered 15 and 17 through 20. The City requested that future basins be identified with a sequential numerical value which would extend the existing basin numbering format. The boundaries of the future basins include non-sewered areas where topography indicates that gravity pipelines could provide sewer collection service to one low elevation location within the basin, resulting in the need for one lift station within the basin with corresponding forcemain piping to convey flows from the future basin to connect to the existing collection system. The general location, issues, constraints, and challenges associated with each of the future wastewater basins are described in this section.

Future WW Basin 15. Future Basin 15 will be served by Lift Station 15A. Future basin 15 is in the northeast corner of the UGA, bounded by Basin Canterwood to the west and Basin 2 to the south. Flows from Basin 15 will be discharged to Basin 2. Due to the natural topography within the basin, the City has determined that further development within the basin may require grinder pumps to discharge wastewater into the collection system. Figure 2-3 shows the City's desired approach to extending gravity sewer piping on Peacock Hill Avenue to serve Basin 15 (and Basin 2).

Future WW Basin 17. Future Basin 17 is served by Lift Station 17A. Basin 17 is located south of the Washington Corrections Center for Women (WCCW) on Bujacich Dr, bounded by Basin 18 to the south and Basin 3 to the east. Lift Station 17A will discharge into Basin 3.

Future WW Basin 18. Future Basin 18 will be served by Lift Station 18A and is generally located at the south end of 56th Ave Ct and will discharge into Basin 3.

Future WW Basin 19. Lift Station 19A will serve Future Basin 19. Basin 19 will be located near Crescent Valley Dr along Goodman Dr. Lift Station 19A will discharge into Basin 1 and is boarded by Future Basin 20 to the south. Due to the natural topography of the basin, the City has determined that future sewer extensions along properties bordering Gig Harbor may require grinder pumps to discharge wastewater into the system. Figure 2-4 shows the City's desired approach for gravity sewer piping to serve Basin 19 (and Basin 20).

Future WW Basin 20. Future Basin 20 will be served by Lift Station 20A, which will flow into Future Basin 19. Lift Station 20A is located along the south end of Goodman Dr. Due to the natural topography of the basin, the City has determined that future sewer extensions along properties boarding Gig Harbor may require grinder pumps to discharge wastewater into the system. Figure 2-4 shows the City's desired approach for gravity sewer piping to serve Basin 20 (and Basin 19).

Components of Demographic Forecast Allocation Model for Wastewater

As noted above, six demographic categories are built into the DFAM-WW. These are:

- Population
- Single-family households;
- Multifamily households;
- Employment;
- School enrollment; and
- Offender population at the Washington Corrections Center for Women (WCCW).

This section describes these categories more fully. Table 2-1, Table 2-2, and Table 2-3 summarize demographic inputs from the BLA and other sources, used in DFAM-WW. Table 2-4 presents additional information relating to sewered and unsewered areas.

Population

Population was calculated based on the number of single-family and multifamily households, using a figure of 2.19 persons per household. The population data was used as an indicator of forecasted growth; however, the other demographic category data was utilized to develop flow projections.

Single-family and Multifamily Households

Future wastewater generation from the domestic population will be impacted by two factors: growth in single and multi-family households; and conversion of households from septic systems to the sewer system.

The DFAM-WW is designed to (1) allocate existing households and projected growth annually and by wastewater basin, and (2) categorize allocated households by their connection to the sewer system.

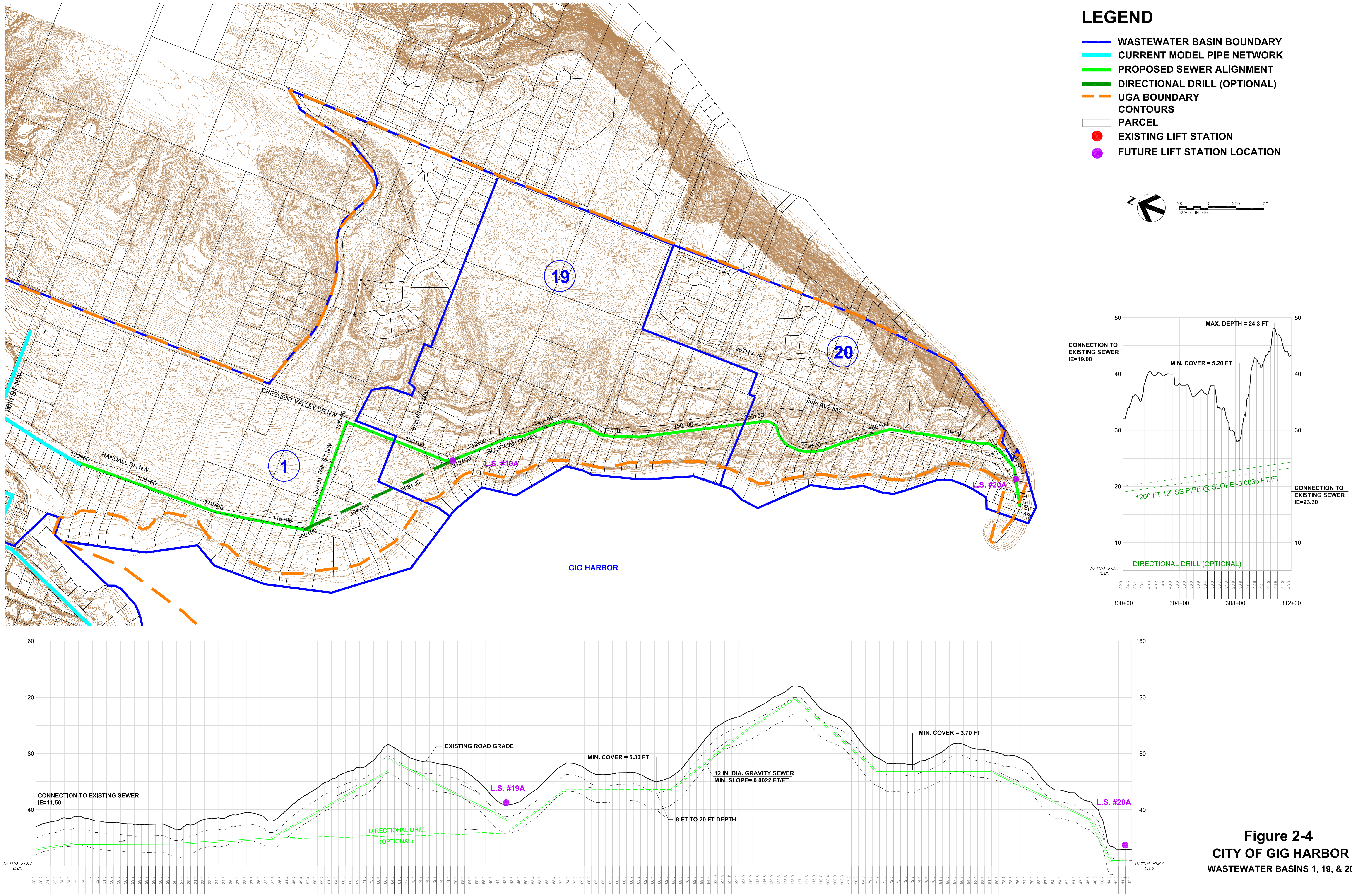

Figure 2-4
CITY OF GIG HARBOR
WASTEWATER BASINS 1, 19, & 20

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Employment

Future wastewater generation from the commercial sector will be impacted by the amount, type and location of growth. Therefore the DFAM-WW is designed to allocate existing and projected commercial growth, expressed as employment, annually by wastewater basin. The employment demographic is represented by the number of employees anticipated to be located within the service area.

School Population

Eight schools generate wastewater that enters the City's wastewater conveyance and treatment system. The schools, located in the Peninsula School District #401, are identified in Table 2-2. The DFAM-WW allocates the projected school population over a 20-year period and allows for temporal adjustments to this growth (i.e. trigger events and wastewater basin specific growth rates). The DFAM-WW shows that all schools are growing at the same rate and no new schools are built within the UGA. This information should be revisited with the school district and if necessary updated to reflect district expectations.

Prison Population

The City of Gig Harbor provides wastewater services to the State's Washington Corrections Center for Women (WCCW). The WCCW is located within the City's UGA, but outside City Limits. As shown in Table 2-3, the WCCW capacity is 738 female inmates (www.doc.wa.gov). The DFAM-WW is designed to allocate the projected WCCW inmate population over a 20-year period. Like other data in the DFAM-WW, prison data can be updated periodically, as the Washington State Department of Corrections prepares new forecasts of the offender population.

Sewered and Unsewered Areas

The model provides a breakdown of sewered and unsewered parcels. In developing the model, the City's wastewater utility billing database was used to identify sewered parcels.

Adjustments to Demographic Forecasts

The DFAM-WW is initially run using existing demographic forecasts for the City of Gig Harbor and its UGA. For example, data on current and forecasted single-family households is entered for years 2017, 2037 and 2050 (buildout) respectively. For all years between these dates, the model initially estimates population using straight-line interpolation between the data entered. This information is then converted to an annual growth rate for every year. This represents the annual change each year from 2017 to 2050, expressed as a percentage. (Note: for planning purposes, the City selected the year 2050 to correlate with buildout conditions). The annual growth rate is produced for each wastewater basin and for all six demographic categories discussed above.

Following the initial straight-line growth allocation between forecasted data points, the model permits planners to manually adjust growth rates. This can be done in any one wastewater basin, or in all of the wastewater basins, for short-term or longer-term periods. This can be used to account for “trigger events” that have a pronounced effect on growth conditions or simply to allow planners to use actual growth trends to modify long-term forecasts. Both of these conditions are discussed below.

Trigger Events

Trigger events are discrete events that have a significant impact on size and timing of growth rates and/or the location of growth. Within the DFAM-WW trigger events are classified, based on the potential size of the area impacted, as either “Area Specific” or “Region Wide.” Impacts from Area Specific trigger events are identified with one or more specific wastewater basins. Impacts from Region Wide trigger events impact the entire UGA. The trigger events included within the DFAM-WW are identified and described in Table 2-5.

It is important to note that trigger events may cause increases or decreases in growth and vary in the size and timing of the change. Therefore each trigger event should be evaluated individually. In addition, the DFAM-WW allows for modification to trigger events, in response to observations of actual growth patterns that emerge in the coming years.

Wastewater Basin Growth Rates

In addition to specific events that trigger short-term changes in growth rates, actual growth rates may simply differ from forecasted growth rates. This may occur throughout the UGA or locally within one or more wastewater basins. The DFAM-WW allows the user to modify growth rates to individual wastewater basins.

For example, if actual growth rates over a five year period are substantially higher than forecast, the DFAM-WW can be modified accordingly. This may require an adjustment to growth rates within that time period, modification of the base forecast at specified planning horizons, or both.

Table 2-1. Dataset for Use in DFAM-WW

WWB ID # (1)	Households						Employment		
	Current (2017) Estimate (2)		Total Future Capacity (3)				Current Estimate (2)	Total Future Capacity (3)	
			2037		Buildout				
	SF	MF	SF	MF	SF	MF		2037	Buildout
WWB-1	113	45	197	88	233	103	219	96	107
WWB-2	494	215	641	278	718	315	1,279	323	364
WWB-3	957	847	1,572	926	1,688	1,003	8,059	12,829	14,215
WWB-4	465	698	438	527	461	553	3,495	3,522	3,935
WWB-5	15	11	17	11	17	11	120	46	57
WWB-6	109	22	133	32	147	36	--	16	20
WWB-7	226	128	270	189	304	211	803	819	877
WWB-8	209	333	181	370	189	383	4,836	3,954	4,958
WWB-9	195	83	223	103	245	113	--	30	38
WWB-10	156	131	175	156	183	163	207	309	339
WWB-11	149	12	227	17	258	19	138	312	358
WWB-12	470	2	771	28	824	30	4,565	7,256	7,724
WWB-13	129	37	217	56	252	66	3,076	3,920	4,520
WWB-14	47	33	114	55	126	63	1,228	1,664	1,985
WWB-15	58	92	73	168	91	205	--	48	60
WWB-16	--	50	--	65	--	65	--	--	--
WWB-17	--	--	--	--	--	--	233	4,263	4,930
WWB-18	149	13	309	22	356	26	--	52	64
WWB-19	50	9	88	15	101	18	--	13	16
WWB-20	87	1	97	2	107	2	--	9	11
WWB-21	161	42	260	75	298	89	308	731	836
WWB-Canterwood	620	--	784	--	941	--	--	138	173
WWB-Rush	70	--	71	--	71	--	--	--	--

SF = Single Family; MF = Multifamily

1. ”WWB” stands for Wastewater Basin.
2. Current refers to the current estimated number of households or employees, irrespective of the BLI classification parcels are assigned to.
3. Total Future Capacity refers to the total estimated number of households or employees that is projected by 2037 or buildout. This is the sum of developed and future additional capacity.

Table 2-2. Gig Harbor UGA School Population

Wastewater Basin	Schools	Student Enrollment (1)			
		2017	2020	2025	2030
WWB-3	Discovery Elementary	518	553	609	651
WWB-8	Harbor Heights Elementary	565	642	707	755
WWB-13	Purdy Elementary	569	686	756	807
WWB-3	Gig Harbor High School	1,627	1,980	2,187	2,344
WWB-3	Henderson Bay High School	109	140	155	166
WWB-13	Peninsula High School	1,410	1,636	1,807	1,936
WWB-8	Goodman Middle School	572	590	652	698
WWB-3	Harbor Ridge Middle School	600	704	777	833
	TOTAL	**5,970**	**6,931**	**7,649**	**8,191**

1. Enrollment from Peninsula School District No. 401 posted on https://psd401.net/district-profile/ for FTE in June 2017.

Table 2-3. Current and Projected Prison Population

Area Code	Description	Inmates	
		2017	Buildout
WWB-3	Wastewater Basin 3	738	996

Source: Washington State Department of Corrections, (http://www.doc.wa.gov/corrections/incarceration/prisons/wccw.htm) September 2017.

Table 2-4. Current Percent Sewered by Demographic

Area Code (1)	Percent Sewered of Current Demographic		
	Employment	SFR	MFR
WWB-1	100.0%	30.1%	17.7%
WWB-2	11.8%	39.1%	14.0%
WWB-3	78.6%	76.1%	75.1%
WWB-4	76.7%	95.7%	78.6%
WWB-5	62.2%	100.0%	45.5%
WWB-6	0.0%	81.7%	18.1%
WWB-7	84.4%	4.4%	21.9%
WWB-8	66.9%	0.5%	62.8%
WWB-9	0.0%	29.7%	0.0%
WWB-10	38.4%	0.0%	82.7%
WWB-11	0.0%	18.1%	0.0%
WWB-12	63.9%	83.0%	0.0%
WWB-13	73.6%	1.6%	8.0%
WWB-14	24.4%	4.3%	0.0%
WWB-15	0.0%	0.0%	0.0%
WWB-16	0.0%	0.0%	0.0%
WWB-17	0.0%	0.0%	0.0%
WWB-18	0.0%	0.0%	0.0%
WWB-19	0.0%	0.0%	0.0%
WWB-20	0.0%	0.0%	0.0%
WWB-21	0.0%	28.0%	0.0%
WWB-Canterwood	0.0%	0.0%	0.0%
WWB-Rush	0.0%	0.0%	0.0%

1. ”WWB” stands for Wastewater Basin.
2. Current refers to the current estimated number of employees, irrespective of the BLI classification parcels are assigned to.

Table 2-5. Trigger Events Potentially Impacting Growth Rates in Gig Harbor's UGA

Event	Completion Date	Location	Description	Area of Impact
Region Wide Impacts				
New Tacoma Narrows Bridge and Upgrade to Existing Narrows Bridge	Completed	South of Gig Harbor next to existing Narrows Bridge	Daily 85,000 to 90,000 vehicles use the corridor today and use is estimated to increase to 120,000 vehicles/day in 2020(WSDOT 2005).	Impacts Large Portion of Kitsap Peninsula, including the entire Gig Harbor UGA
Area Specific				
Franciscan Health Systems St. Anthony Hospital.	Completed	Near Canterwood Boulevard and Burnham Drive in North Gig Harbor	New Hospital.	To Be Determined by City Planning Staff
Costco	Completed	Gig Harbor North Area (Site Plan Review - 10910 Harbor Hill Dr.)	Will construct necessary infrastructure required for additional residential development. The residential development will follow by a couple of years.	To Be Determined by City Planning Staff
YMCA	Completed	Gig Harbor North Area	Will construct necessary infrastructure required for additional residential development. The residential development will follow by a couple of years.	To Be Determined by City Planning Staff
WSDOT Projects – Interchange Reconstruction	In Progress of identifying	Wollochet interchange on SR-16	May dramatically influence the residential development on the west side of SR-16	To Be Determined by City Planning Staff
WSDOT Projects – Crossing	In Progress of identifying	New over crossing of SR-16 at Hunt Street	May dramatically influence the residential development on the west side of SR-16.	To Be Determined by City Planning Staff
Washington Corrections Center for Women - Health Care Facility Expansion	To Be Determined	Washington Corrections Center for Women	The Existing 9,900 square foot clinic/infirmary will be replaced with a new two-story 16,415 square foot facility.	To Be Determined by City Planning Staff
Uptown multi-care property	Complete	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff
12-Plex Theater	Complete	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff
Proposed Park and Ride	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff	To Be Determined by City Planning Staff

2.4.3. Structure and Operation of Model

The instructions for running the DFAM-WW are included in the Excel file containing the model.

Step 1. User inputs geographic area data.

Step 2. User inputs the current and projected demographic data from existing sources for the entire Gig Harbor UGA by geographic area (unadjusted forecast). Data are only entered for select years for which data are available. Data may be directly typed into Step 1 worksheet or the Step 1 worksheet can be linked to one of the input worksheets.

Step 3. Model interpolates/extrapolates unadjusted annual allocation of the projected demographic data from Step 2, based on a straight-line trend.

Step 4. Model calculates unadjusted growth rates (percent growth) in each year based on Step 3 results. Note that in instances where a growth rate cannot be estimated because the prior year is a zero, the term “Initial” is inserted by the model.

Step 5. User inputs Trigger Event data to be incorporated into the modified forecast.

Step 6. Model calculates modified forecast using Step 2 and Step 5 inputs. This worksheet only contains select years forecast and trigger event modified forecast.

Step 7. Model calculates the modified annual straight-line allocation using Step 6 results.

Step 8. Model calculates the growth rates for the modified annual allocation from Step 7. This is a key output of the model.

Step 9. User inputs the select years current and projected percent sewered for each demographic (e.g., user enters in the percent of single family households that are sewered within a specific geographic area).

Step 10. Model calculates annual percent sewered using Step 9 inputs.

Step 11. Model calculates sewered demographics using results from Step 7 and Step 10.

Step 12. Model calculates non-sewered demographics using results from Step 7 and Step 10.

Step 13. User input and model calculation of annual unit wastewater generated per demographic (e.g., wastewater per single family household in gallons per day).

Step 14. Model calculates Annual Dry Weather Flow using Step 11 and Step 13 results.

Step 15. User inputs peaking factor. Model calculates Sanitary Peak Flow using Step 14 results and peaking factor.

Step 16. User input and model calculation of annual Inflow and Infiltration for the entire UGA.

Step 17. Model calculates each geographic areas share of the UGA inflow and infiltration (i.e., the spatial distribution of inflow and infiltration within the UGA). The model uses the sum of population, employment, school enrollment, and inmates to calculate the share.

Step 18. Model calculates Maximum Day Inflow and Infiltration using Step 16 and Step 17 results.

Step 19. Model calculates Peak Hour Inflow and Infiltration using Step 16 and Step 17 results.

Step 20. User input and model calculation of wastewater contributed by areas outside of the UGA (Other Contributors to Wastewater Flow).

Step 21. Model calculates Maximum Day Flow by summing Average Dry Weather flow for each demographic (Step 14), Maximum Day I&I (Step 18), and Other Contributors (Step 20). User can select between using ADWF based on population or based on households.

Step 22. Model calculates Peak Day Flow by summing Sanitary Peak Flow for each demographic (Step 15), Peak Hour I&I (Step 19), and Other Contributors (Step 20). User can select between using SPF based on population or based on households.

Table 2-6 depicts the main menu contained in the DFAM-WW. The steps listed above are shown in the far right column of this table.

Table 2-6. DFAM WW Main Menu

Gig Harbor Demographic Forecast Allocation Model - Wastewater (DFAM-WW) Main Menu				
Components		**User Input**	**Macros (Click Button to Run)**	**Worksheets (Click Link to go to sheet)**
--	Instructions	n/a	Run ALL Steps	Instructions
	Note: Linked Cells on each worksheet generate pop-up graphs displaying the data series.			-
External Inputs				-
--	External Data: Inputs on demographic forecasts and number of sewer connections from BLA.	**Data & Conversion Factors**	n/a	Inputs 1
--	External Data: Inputs on percent of households sewered.	**Data & Percent Sewered Assumptions**	n/a	Inputs 2
Demographic Forecast				-
(1)	Geographic Areas	**Codes, Descriptions, & Map**	Display / Hide Selected Rows	STEP 1
(2)	Forecasted Demographics	**Forecasted Demographics**	n/a	STEP 2
(3)	Straight-line Allocations	*Computed by Model*	Allocate Demographics	STEP 3
(4)	Growth Rates of Straight-line Allocation	*Computed by Model*	n/a	STEP 4
(5)	Trigger Events	**User Identified Increases**	Check: Overlapping Events	STEP 5
(6)	Modified Demographic Forecast: Manual and Trigger Event	**Trigger Events/Modified Growth Rates**	Setup Modifications	STEP 6
(7)	Modified Straight-line Allocations	*Computed by Model*	Modified Allocation	STEP 7
(8)	Growth Rates for Modified Straight-line Allocations	*Computed by Model*	n/a	STEP 8
Wastewater Flow Estimation				-
(9)	Forecast of Percent Sewered (%)	**Forecast of Future Percent Sewered**	n/a	STEP 9
(10)	Straight-line Forecast of Percent Sewered (%)	*Computed by Model*	Allocate Percent Sewered	STEP 10
(11)	Straight-line Forecast of Sewered Demographics	*Computed by Model*	n/a	STEP 11 (Sewered)
(12)	Straight-line Forecast of Non-Sewered Demographics	*Computed by Model*	n/a	STEP 12 (Non-Sewered)
(13)	Unit Wastewater Flow Generated Per Demographic	**Forecast of Unit Wastewater Flow**	Calculate Unit Wastewater	STEP 13
(14)	Wastewater Annual Dry Weather Flow	*Computed by Model*	n/a	STEP 14 (ADWF)

Table 2-6. DFAM WW Main Menu

Gig Harbor Demographic Forecast Allocation Model - Wastewater (DFAM-WW) Main Menu				
Components		**User Input**	**Macros (Click Button to Run)**	**Worksheets (Click Link to go to sheet)**
(15)	Sanitary Peak Flow	**Peaking Factor**	n/a	STEP 15 (SPF)
(16)	Temporal Inflow and Infiltration Distribution	**Inflow and Infiltration for the Entire UGA by Year**	Calculate Updated Interpolatation	STEP 16 (I&I Dist)
(17)	Spatial Inflow and Infiltration Distribution	*Computed by Model*	n/a	STEP 17 (%SewPop)
(18)	Maximum Day Inflow and Infiltration	*Computed by Model*	n/a	STEP 18 (Max I&I)
(19)	Peak Hour Inflow and Infiltration	*Computed by Model*	n/a	STEP 19 (Peak I&I)
(20)	Other Contributors to Wastewater Flow	**Flow**	Calculate Updated Interpolatation	STEP 20
(21)	Maximum Day Flow	**Select Demographic Option**	n/a	STEP 21 (MDF)
(22)	Peak Hour Flow	**Select Demographic Option**	n/a	STEP 22 (PHF)

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3. Wastewater Flow Projections

This chapter summarizes the historical wastewater flow analysis and the use of the DFAM-WW, refined for wastewater flow estimates, to estimate existing and projected wastewater flows in the City's system. A review and analysis of historical wastewater flows and rainfall data provided by the City was performed and completed. DFAM-WW, as explained in Chapter 2, was refined for wastewater flow estimates. Additionally, this chapter also includes a strategy to address infiltration & inflow (I&I).

The components of wastewater flow evaluated include: Annual Average Flow (AAF), Maximum Day Flow (MDF), Maximum Month Flow (MMF), Peak Hour Flow (PHF), Average Dry Weather Flow (ADWF), Maximum Dry Weather Flow (MDWF) and Average Wet Weather Flow (AWWF). These flow components encompass different time frames (annual, monthly, daily, and hourly) but are all reduced to consistent terms expressed in million gallons per day (mgd). The flow components are defined as follows:

- Annual Average Flow (AAF) is the total flow over a one year period divided by 365 days. This flow factor is typically used to compare with other calculated flow factors to assess the level of peak flow and I&I in the system.
- Maximum Day Flow (MDF) is the maximum flow during one 24-hour period (midnight to midnight) during the year. This flow factor is typically used to size lift stations and unit WWTP processes that rely on short-term hydraulic detention times for proper performance such as chlorine contact tanks and equalization basins.
- Maximum Month Flow (MMF) is the average daily flow during the maximum calendar month. This flow factor is typically used to design unit WWTP processes and used as a critical flow in determining effluent limits for toxic substances on the basis of chronic toxicity for a surface water discharge.
- Peak Hour Flow (PHF) is defined as the peak sustained flow rate occurring during a one-hour period. This flow factor is typically used to design collection and interceptor sewers, lift stations, piping, flow meters, and certain physical WWTP processes such as grit chambers and sedimentation tanks, whose performance can be affected by sudden high hydraulic inputs.
- Average Dry Weather Flow (ADWF) is the average daily flow during periods without rainfall. This flow factor is used to assess the flow generated from households, employment, and industrial customers (without I&I). The households, employees, and industrial components are also called demographic or sanitary flows.
- Maximum Dry Weather Flow (MDWF) is the maximum daily flow during periods without rainfall. This flow factor is also referred to as the maximum demographic or sanitary flow.
- Average Wet Weather Flow (AWWF) is the average daily flow during rainfall periods. This flow factor is used to assess the level of I&I in the system.
- Infiltration & Inflow (I&I) is the contribution to wastewater flows from extraneous groundwater or stormwater entering the collection system. Infiltration is characterized by leaky pipes and manholes allowing groundwater to infiltrate the collection system. Inflow is the

direct connection of stormwater to the wastewater collection system through sources such as manhole cleanout lids, roof downspouts, and catchbasins.

The historical and projected AAF, MDF, MMF, PHF, ADWF, MDWF, and AWWF for the City are presented in this Chapter.

3.1. Historical Wastewater Flows

Recorded data provided by the City includes the peak day and average monthly rainfall, and WWTP influent flow between June 2014 and May 2017. The MDF recorded at the WWTP was 2.18 MGD, and the MMF was 1.43 MGD. These data are illustrated in Table 3-1 and Table 3-2.

The instantaneous flow data at the WWTP influent are displayed on a digital readout. The maximum instantaneous flow that can be recorded is 3,000 GPM or 4 MGD. The City has the digital capability to track instantaneous flow (no limit) and utilize the "historian" program (put into service at the end of the 2016 upgrade) to track history of flows. City staff has observed a maximum instantaneous flow of 2,236 GPM (3.22 MGD) on the digital readout. The City estimates that this instantaneous flow continued for at least one hour during the December 2007 storm. Therefore, the observed 3.22 MGD is used as the historical PHF.

Table 3-1. City of Gig Harbor Wastewater Treatment Plant Avg. Flows (June 1, 2014 to May 31, 2017)

	2014	2015	2016	2017
Month	**Flows**	**Flows**	**Flows**	**Flows**
Jan		0.9200	1.2991	1.1490
Feb		0.9597	1.3406	1.3250
Mar		0.9217	1.3193	1.4300
Apr		0.8553	1.0221	1.2340
May		0.8572	0.9567	1.1360
June	0.8661	0.8478	0.9900	
July	0.8237	0.8316	0.9543	
Aug	0.8283	0.8321	0.9592	
Sept	0.8570	0.8538	0.9800	
Oct	0.8915	0.8870	1.3300	
Nov	0.9374	1.0413	1.2610	
Dec	0.9815	1.3275	1.2366	

Table 3-2. City of Gig Harbor Wastewater Treatment 24-hr Peak Flow for Month/ Rainfall on that Day (June 1, 2014 to May 31, 2017)

Month	2014			2015			2016			2017		
	Date	Peak Flow	Rainfall	Date	Peak Flow	Rainfall	Date	Peak Flow	Rainfall	Date	Peak Flow	Rainfall
Jan				1/19/2015	1.077	0.000	1/21/2016	1.8750	1.2500	1/18/2017	1.7130	0.7900
Feb				2/7/2015	1.2375	0.5300	2/13/2016	1.5600	0.7700	2/9/2017	1.9875	0.8700
Mar				3/15/2015	1.2945	1.3300	3/9/2016	1.7250	1.5300	3/15/2017	1.7775	0.4000
Apr				4/10/2015	0.9360	0.6100	4/12/2016	1.1160	0.5600	4/12/2017	1.4895	0.8800
May				5/13/2015	0.9285	0.1800	5/18/2016	1.0080	0.0500	5/18/2017	1.655	0.000
June	6/30/2014	0.9285	0.000	6/30/2015	0.939	0.000	6/30/2016	1.074	0.000			
July	7/1/2014	0.9150	0.000	7/1/2015	0.897	0.000	7/1/2016	1.032	0.000			
Aug	8/12/2014	0.9225	1.320	8/29/2015	0.9810	2.0900	8/14/2016	1.0275	0.000			
Sept	9/8/2014	1.0485	0.050	9/9/2015	1.08	0.000	9/21/2016	1.026	0.000			
Oct	10/22/2014	1.1475	1.330	10/31/2015	1.2330	1.2500	10/20/2016	1.4580	0.6100			
Nov	11/28/2014	1.3365	1.290	11/17/2015	1.6180	0.9300	11/15/2016	1.6680	0.1500			
Dec	12/20/2014	1.2015	0.920	12/8/2015	2.1750	2.3300	12/8/2016	1.5975	0.2900			

The City does not have a true dry season since it receives rainfall throughout the year. Previously, the historical data provided by the City were organized so that the daily WWTP flows could be correlated for days with zero rainfall and for days with measurable rainfall, instead of organizing by traditional wet weather (October to April) and dry weather (May to September) seasons. This is discussed in Section 3.2.

3.1.1. Historical Lift Station and WWTP Flow Calculations

All lift stations are installed with constant speed pumps, with the exception of Lift Stations 3A, 4B, 12, and 21A, which have pumps with variable frequency drives (VFDs). To calculate the flows for each lift station, the installed pump capacity for each lift station was multiplied by the corresponding daily run time data provided by the City. This effort should provide appropriate results for the lift stations with constant speed pumps. However, the lift stations with VFDs likely do not operate at full pump capacity throughout the daily run time documented, so calculated flows estimated using this technique are likely to be higher than actual conditions. This discrepancy applies primarily to Lift Stations 4B, 12, and 21A. Since Lift Station 3A conveys all flows collected in the system and discharges directly to the WWTP, the flow data from Lift Station 3A can be correlated (or replaced) by the flows documented for the WWTP influent.

3.1.2. Historical Flow Data for Selected Wastewater Customers

Previously, the City collected historical billing data (for the years 2004 through 2006) for analysis of the following customers:

- Wollochet Harbor Sewer District
- Canterwood STEP Association and Rush Division 12 STEP Association
- Goodman Middle School and Harbor Heights Elementary School

These billing data were used to estimate historical wastewater flows from these customers. The calculation results of historical flows for these customers are presented in Table 3-3.

Table 3-3. Selected Wastewater Customer Historical Flow Estimates

Customer	Annual Average Flow (AAF)
Wollochet Harbor Sewer District	11,000 gallons per day
Canterwood STEP Association	40,000 gallons per day
Rush Division 12 STEP Association	5,000 gallons per day
Goodman Middle School	14,000 gallons per day
Harbor Heights Elementary School	8,000 gallons per day

Calculation of flows from these customers was required in order to estimate current and future flows using DFAM-WW, since DFAM-WW does not account for currently non-sewered parcels (parcels not billed individually by the City for sewer service) and for demographics located outside the City's UGA boundary. The Canterwood STEP Association and the Rush Division 12 STEP Association are currently non-sewered individual accounts, but are billed in aggregate by the City. The Wollochet Harbor Sewer District and the two schools are located outside the City's UGA boundary.

3.2. Collection System Infiltration and Inflow (I&I)

The historical wastewater flow analysis indicates the significance of infiltration resulting from consecutive days of rainfall as the primary source of infiltration and inflow (I&I) in the collection system. This section focuses on evaluating individual wastewater basins within the collection system to identify and prioritize areas where infiltration may be most prevalent, to determine a strategy for I&I corrective activities. Basin-level I&I evaluations included previous I&I studies and observations, lift station flow and rainfall correlation, and estimated basin I&I flows. Two I&I reduction alternatives are presented, followed by the City's strategy to address I&I.

In order to estimate the rainfall's effects of wastewater flow, the historical data were sorted and ranked by maximum daily rainfall and maximum daily flow. The days with the most rainfall do not directly correlate to the highest witnessed WWTP flows. On selected days, 4.99 and 6.76 inches of rainfall produced approximately 2 MGD, while on another day 6 inches of rainfall produced only 0.814 MGD. This analysis indicates that daily rainfall does not directly affect daily WWTP flows (i.e., inflow from catchbasins or roof downspouts). The next step was to investigate the correlation of the number of days and amount of rainfall leading up to maximum rainfall events and wastewater flows. This was done through the following steps:

1. Grouping consecutive rainfall days
2. Counting back the number of days before a maximum daily rainfall where there was zero rainfall
3. Calculating the total amount of rainfall that had fallen within those consecutive measurable rainfall days.

As a result, several consecutive days of rainfall appears to correlate with increased WWTP flows, indicating a trend that is historically related to interflow. To verify this observation, the data were sorted by descending consecutive number of days since zero rain to observe the correlation of previous days of rainfall to observed wastewater flows. The results indicate that approximately five to six days of rain totaling 4 to 12 inches resulted in 1.3 to 2.0 MGD in WWTP flows. Approximately two days of consecutive rain totaling 2 to 4 inches resulted in approximately 1.0 to 1.1 MGD in WWTP flows.

Note that one day with 6 inches of rainfall (January 6, 2004) with no prior rainfall had limited effect on the WWTP flows. However, according to the historical rainfall and influent data, two days of consecutive rain on January 6 – 7, 2004 (6.7 inches total), had produced a maximum of 1.026 MGD at the WWTP.

3.2.1. Equivalent I&I Factor

The Rational Method was used to calculate the equivalent drainage area that impacts the WWTP flows. This method provides an equivalent I&I factor correlating rainfall and measured treatment plant flows. The total preceding rainfall, daily rainfall, and WWTP influent values are estimates from the historical data provided by the City.

$$\text{Rational Method}: Q = ciA \rightarrow cA = \frac{Q}{i}$$

$$Q = \text{Inflow} \left(\frac{ac - in}{day}\right)$$

$$i = \text{Daily Rainfall (inches)}$$

$$cA = \text{Runoff Factor x Area = Equivalent I\&I Factor (acres)}$$

Inflow, Q, was calculated by subtracting the ADWF from the WWTP Influent values. An equivalent I&I factor of 8 acres is utilized with precipitation data to calculate the I&I portion of total wastewater flows.

3.2.2. I&I Reduction Alternatives

A general alternative to reduce I&I in the City's collection system is to consider repairing and replacing existing collection system components. The challenge of repairing and replacing existing collection system components is identifying the location and cost-effective measures to implement the projects. Most I&I reduction projects requiring repair or replacement of existing facilities is expensive. Even more challenging is implementing I&I reduction projects where repair or replacement of the facilities are located on wastewater customers' private property.

Pipe segments may be difficult to repair or replace on private property and high flows from Gig Harbor have been observed by the City during some rain events. Focusing on remedies of known defects within the public right-of-way will be the starting point for the City to monitor the cost-effectiveness of I&I reduction.

3.2.3. I&I Reduction Strategy

The various I&I analyses presented above indicate varying priority basins. The City plans to begin addressing some of the known defects and monitor the results. The following lists the City's strategy and priorities for addressing I&I in the collection system:

1. Focus first on addressing known defects identified by observation or increased lift station run times. Addressing defects in the public right-of-way will likely be easier to implement first before addressing defects on private property.
2. Record daily rainfall data and lift station flow run time to further evaluate wet weather flows. Conduct detailed I&I evaluation on priority basins when appropriate data justifies.

3.3. Current and Future Wastewater Flow-Generating Demographics

Wastewater flows in the City under current and future conditions were estimated using the Demographic Forecast Allocation Model – Wastewater (DFAM-WW). Description of the wastewater flow estimates is provided in this section.

The DFAM-WW used the demographic data and applied average wastewater unit flow rates to estimate the Average Dry Weather Flow (ADWF) and Sanitary Peak Flow (SPF) for each basin. The I&I factors were used as the basis and applied to calculate the MDF, MMF, and PHF for each wastewater basin.

3.3.1. Sewered and Non-Sewered Parcels

Sewered and non-sewered parcel estimates used in the DFAM-WW were reassigned to wastewater basins within the DFAM-WW. Existing sewered parcels are based on the City's billing database and the location of sewered parcels is presented in Appendix B. The demographic estimates prepared for the DFAM-WW were based on the Buildable Lands Inventory (BLI) and Buildable Lands Analysis (BLA) completed for the City. The BLI and BLA analyzed each parcel in the City's UGA to identify undeveloped, developed, and redevelopable parcels which were correlated to each of the demographic components (single family, multi-family, etc.).

DFAM-WW has been developed with the capability to distribute demographics for each wastewater basin into sewered and non-sewered categories. The DFAM-WW estimates sewered and unsewered demographics by multiplying demographics for each wastewater basin by an estimate of the percent sewered within the wastewater basin. Estimates of percent sewered are applied to the years 2017, 2037, and 2050, by wastewater basin, for single family and multi-family households, and employment. The 2017 percent of demographics sewered for each wastewater basin is estimated based on tax parcel information extracted from the BLA correlated to the City's wastewater utility billing database. Estimates of future percent sewered included in the DFAM-WW are rough estimates that can be further scrutinized by City staff in the future as growth develops. Estimates of the future percent sewered accounts for two components: (1) how quickly do currently unsewered, developed parcels connect to the public sewer system, and (2) the assumption is applied regarding whether new development is sewered at the time of development or a future time. The DFAM-WW currently applies the following assumptions:

- Year 2037 (20-year planning horizon): Fifty percent of unsewered, developed parcels from 2017 are sewered in 2037. Ninety percent of demographics associated with new development are sewered.
- Year 2050 (year of buildout identified by the City): One hundred percent of unsewered, developed parcels from 2017 are sewered in 2050. One hundred percent of demographics associated with new development are sewered.

- The DFAM-WW currently estimates the annual percentages by using a straight-line linear trend between data points requested by the City (2017, 2037 and 2050).

DFAM-WW has the capability to modify the estimated future percentage of sewered parcels within each wastewater basin to allow for further refinement and correlation of future wastewater flows with growth and development trends to be identified by the City.

The sewered and non-sewered demographic projections using DFAM-WW are presented in Table 3-4.

Table 3-4. Sewered and Non Sewered Demographic Estimates using DFAM-WW

	Single Family Households		Multifamily Households		Employment		Prison	School
Year	Sewered	Non-Sewered	Sewered	Non-Sewered	Sewered	Non-Sewered	Inmates(1)	Enrollment(2)
2017	2,035	2,889	1,580	1,225	18,929	9,635	738	5,970
2037	5,674	1,184	2,446	739	30,859	9,492	894	8,949
Build-Out	7,608	0	3,466	0	45,517	0	996	10,356

1. The Washington Corrections Center for Women (WCCW) is currently sewered.
2. Existing schools are sewered. Current methodology assumes equal distribution of school enrollment growth across existing schools, and that new schools would be connected to the sewer system upon construction.

3.3.2. DFAM-WW Correlation with Historical Flows

Basin specific comparisons of historical/observed wastewater flows to current flow estimates from the DFAM-WW as an effort to determine a level of calibration is not feasible due to the fact that the majority of the City's wastewater collection system consists of lift stations pumping in series. The flows in most lift stations include cumulative flows from the upstream lift station(s). However, the appropriate comparison of historical/observed wastewater flows with DFAM-WW projected flows apply to the total flows at the WWTP.

3.3.3. DFAM-WW Results and Conclusion

Table 3-5 and Table 3-6 present output from the forecasting model for the entire Gig Harbor UGA. Table 3-5 displays total values for the six demographic categories contained in the model. Table 3-6 presents three demographic categories for which data are broken down further into sewered and unsewered categories. For the sake of brevity, only milestone years are shown. The actual model generates results for each year through 2050. The model can generate similar tables for any individual wastewater basin.

Figure 3-1 displays the growth in demographic categories in a graphic format. This graph is contained within the model and can be generated either for the UGA as a whole or for individual wastewater basins.

It is anticipated the City will utilize the model for utility planning services and will update it as needed to ensure input data and forecasts remain current.

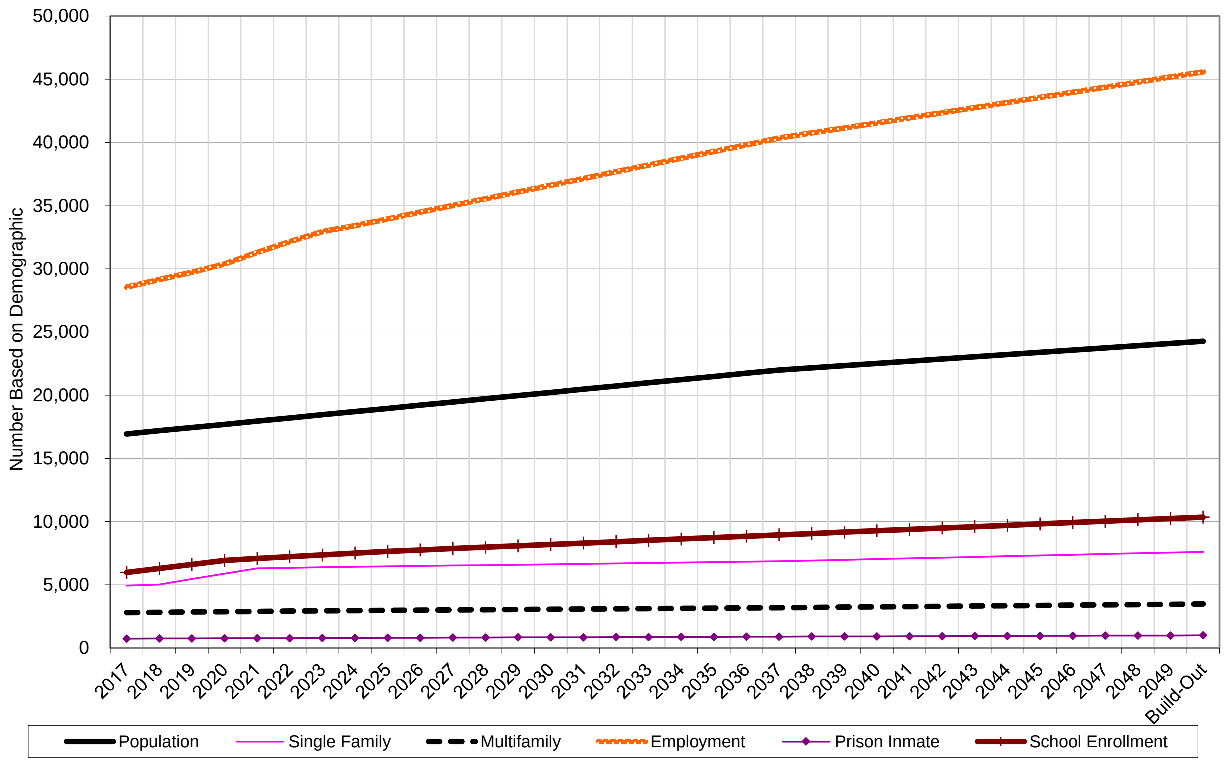
Table 3-5. Gig Harbor UGA Demographics Based on Adjusted Growth Rates

Year	Population	Households		Employment	Prison Inmates	School Enrollment
		Single Family	Multi-family			
2017	16,937	4,923	2,805	28,564	738	5,970
2037	21,994	6,858	3,185	40,351	894	8,949
Build-Out	24,275	7,608	3,477	45,586	996	10,356

Table 3-6. Gig Harbor UGA Demographics Based on Adjusted Growth Rates by Sewer Connection

Year	Single Family Households		Multifamily Households		Employment	
	Sewered	Non-Sewered	Sewered	Non-Sewered	Sewered	Non-Sewered
2017	2,035	2,889	1,580	1,225	18,929	9,635
2037	5,674	1,184	2,446	739	30,859	9,492
Build-Out	7,608	0	3,466	0	45,517	0

Figure 3-1. Gig Harbor UGA Demographics Based on Adjusted Growth Rates



3.4. Current and Future Wastewater Flow Estimates

3.4.1. Average Wastewater Unit Flow Rates

Based on the City's historical wastewater flow data and published literature, the average wastewater unit flow rates were estimated and refined during DFAM-WW simulations in an effort to correlate the total historical and calculated flows. The average wastewater unit flow rates used in the DFAM-WW are presented on Table 3-7.

Table 3-7. Average Wastewater Unit Flow Rates

Demographic	Average Wastewater Unit Flow Rate
Single Family Household [(1)]	134 gallons per household per day
Multi-Family Household [(1)]	134 gallons per household per day
Commercial Population	18 gallons per person per day
School Population	20 gallons per person per day
Prison Population	100 gallons per person per day

1. The City estimates 2.19 people per household.

The DFAM-WW has the capability to modify the average wastewater unit flow rates for further refinement and correlation if required. These modifications can vary over time within the capability of the DFAM-WW to account for such activities as conservation measures implemented by the City and its customers.

3.4.2. Wastewater Flow Projections

Before future flows were estimated, the average sanitary and sanitary peak flows were calculated using a quantity of sewered units calculated in the DFAM-WW. These data are shown on Table 3-8.

Table 3-8. Average Sanitary and Peak Flow Estimates

		2017		2037		Build-Out	
Category	Unit Wastewater Flows	Qty. of Sewered Units	ADWF (GPD)	Qty. of Sewered Units	ADWF (GPD)	Qty. of Sewered Units	ADWF (GPD)
Single Family Residential	134 gpd per unit	2,035	272,659	5,674	760,337	7,608	1,019,481
Multi-Family Residential	134 gpd per unit	1,580	211,720	2,446	327,783	3,466	464,385
Employment	18 gpd per person	18,929	340,720	30,859	555,459	45,517	819,298
Prison	100 gpd per person	738	73,800	894	89,436	996	99,600
School	20 gpd per person	5,970	119,400	8,949	178,972	10,356	207,120
Wollochet Harbor			11,000		11,000		11,000
Average Dry Weather Flow			1,018,299		1,911,988		2,609,884
Sanitary Peak Flow			1,527,449		2,867,982		3,914,826

The ADWF value for 2017 reasonably correlates to the ADWF value calculated from historical WWTP flows. The sanitary peak flows equals the ADWF multiplied by a sanitary peak factor of 1.5. This represents the peak hour flow attributed to just sanitary flow (no I&I).

The projection of future flows was estimated based on observed impacts from rainfall. The 8 acre equivalent I&I factor and estimated current and future ADWF values described above were applied to the average annual, maximum month, and maximum day flow projections. The 8 acre equivalent I&I factor and estimated current and future sanitary peak flow values were applied to the peak hour flow projections. These wastewater flow projections are shown in Table 3-9.

Note that the projected current maximum month, peak day, and current peak hour flow correlate to historical WWTP flow data using the 8 acre equivalent I&I factor and the historical maximum month, peak day, and peak hour rainfalls, respectively.

In addition, these projections include estimating I&I to remain constant in the future. This assumes that new sewers will not increase I&I and that as existing sewers may continue to deteriorate, they will be replaced over time. If the City observes increased I&I in the future, it may be due to rainfall events or the City can make the decision to study the cost/benefit of increasing capacity or performing I&I reduction projects.

In order to distribute I&I temporally (throughout time) and spatially (throughout the wastewater basins in the UGA), the total I&I quantity was distributed based on the percentage of dry weather flow in each basin over time.

Table 3-9. Wastewater Flow Projections

Year	ADWF	SPF	Equiv. I&I Factor		AWWF			MMF			MDF			PHF		
	Ave. Dry Weather Flow (MGD)	Sanitary Peak Flow (MGD)	Equiv. I&I Area (Acres)	Equiv. I&I Flow Coeffi-cient	Ave. Annual Precip. (Inch)	Ave. Annual I&I (MGD)	Average Wet Weather Flow (MGD)	Max Month Precip. (inch)	Max Month I&I (MGD)	Max Month Average Flow (MGD)	Max Day Precip. (inch)	Max Day I&I (MGD)	Max Day Flow, (MGD)	Peak Hourly Precip. (inch)	Peak Hourly I&I (MGD)	Peak Hourly Flow (MGD)
Historical	1.06	1.66					1.40			1.43			2.18			3.80
2017	1.03	1.54	8	1.00	52.4	0.03	1.06	22.0	0.16	1.19	6.0	1.30	2.35	0.4	2.09	3.65
2037	1.92	2.88	8	1.00	52.4	0.03	1.95	22.0	0.16	2.08	6.0	1.30	3.24	0.4	2.09	4.99
2050	2.62	3.93	8	1.00	52.4	0.03	2.65	22.0	0.16	2.78	6.0	1.30	3.94	0.4	2.09	6.04
Notes	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*

1. 2017 ADWF from historical data. Demographic data used to estimate unit flow factors. Future ADWF multiplied future demographic estimates by unit flow factors.
2. Sanitary peak flow equals ADWF times peaking factor of 1.5.
3. Area estimated from analysis of daily flow and daily precipitation data.
4. Coefficient estimated from analysis of daily flow and daily precipitation data.
5. Annual average precipitation from Western Regional Climate Center, Wauna 3 SW Minter Creek WA station, 1948 to 2012. Maximum annual precip was 69.58" in 1950.
6. Average Annual Inflow equals impervious area times runoff coefficient times precipitation.
7. Average wet weather flow is equal to average dry weather flow plus average annual inflow.
8. Maximum month precipitation from Western Regional Climate Center, Wauna 3 SW Minter Creek WA station, 1948 to 2012. Maximum month precip was 22.02" in November 2006.
9. Maximum Month Inflow equals impervious area times runoff coefficient times precipitation.
10. Maximum month average flow is equal to average dry weather flow plus maximum month inflow.
11. Maximum day precipitation from Gig Harbor WWTP data between June 2003 to Nov 2006 occurred on Oct 20 2003. Max day from WRCC is 5.06" on Oct 21, 2003.
12. Maximum Day Inflow equals impervious area times runoff coefficient times precipitation.
13. Maximum day flow is equal to average dry weather flow plus maximum day inflow.
14. Maximum hourly precipitation estimated from Type 1A Hyetograph. Appx 5.4% of max day rain falls in peak hour (6.0 inches * ~5.4%). (1-hour rainfall data not available)
15. Peak Hourly Inflow equal impervious area times runoff coefficient times precipitation.
16. Peak hourly flow equals sanitary peak flow plus peak hourly inflow.

4. Wastewater Collection System

4.1. Introduction

Gig Harbor's original collection system, constructed in 1974-1975, served the downtown and south-of-downtown area. The original system was called ULID (Utility Local Improvement District) #1 and included six lift stations. ULID #2 was constructed to the south of ULID #1 in 1988 to serve areas south of the City, including portions of Soundview Drive, Harbor County Drive, Point Fosdick-Gig Harbor Rd, Olympic Drive, and Harborview Dr. ULID #3 was constructed to the north of ULID #1 in 1992 to connect the Gig Harbor collection system to areas north of the City, including the Washington Corrections Center for Women (WCCW) and portions of Burnham Drive. In addition, further system expansions were built under developer agreements. Currently, the City's collection system consists of approximately 165,000 feet of gravity sewers, over 48,000 feet of forcemains, and 16 lift stations.

4.2. Existing Wastewater Collection System Facilities Inventory

4.2.1. Lift stations

Table 4-1 presents a list of the lift stations and describes the pumps in each station.

Each lift station is a duplex facility, consisting of redundant pumps which allows peak flows to be met with one pump out of service for maintenance.

4.2.2. Collection and Conveyance Pipelines (Gravity and Forcemain)

Wastewater collected from residential, commercial, and industrial customers flows by gravity through piping to their respective basin's lift station. The 16 lift stations then pump the wastewater to adjacent basins via forcemains, with the network of gravity pipes and forcemains eventually discharging all of the wastewater to the WWTP.

The majority of the City's gravity sewer pipes are PVC. Some of the larger diameter pipes constructed under ULID #1 are concrete and some gravity pipes on steep slopes consist of ductile iron. All of the system's forcemains are ductile iron.

Table 4-1. Lift station and Wet Well Configurations

Pump Sta. No.	Location	Pumps To	Year Const-ructed	No. of Pumps	Pump Type	Pump Mfr.	Flow (gpm/ pump)	Rated Head (ft)	Speed (rpm)	Variable Frequency Drives	Horse Power (bhp)	Aux. Generator
1	Vernhardson St. & Randall Dr. NW	Vernhardson St. & N. Harborview Dr.	1975	2	Centrifugal	Allis Chalmers	50	58.4	1170		7.5	Yes
2	N. Harborview Dr. & Bogue Viewing Platform	Harborview Dr. & Burnham Dr.	2006	2	Submersible	Wemco	500	51	1718	Yes (Installed 2006)	15	Yes
3A	N. Harborview Dr. near WWTP	Wastewater Treatment Plant	2002 & 2013	3	Submersible Screw Centrifugal	KSB/Wemco	2000/1100	73 & 45	1180 & 1800	Yes	65 & 28	Yes
4B	Harborview Dr. & Rosedale St.	Harborview Dr. & Novak St.	1989 & 2017	2	Submersible Screw Centrifugal	Hidrostal	1000	75	1760	Yes	30	Dri-Prime Diesel Pump
5	Harborview Dr. & Soundview	Harborview Dr. & Soundview	1973	2	Centrifugal	Allis Chalmers	100	47.4	1150		5	No
6	Ryan St. & Cascade Ave.	Ryan St. & Soundview Ave.	1973	2	Centrifugal	Allis Chalmers	100	81.0	1770		15	No
7	Hollycroft & Reid Dr.	Soundview & Olympic	1981 & 2010	2	Submersible	KSB	250	115’	1750	Yes (Installed 2006)	28	Dri-Prime Diesel Pump
8	Pt. Fosdick & Harbor Country Dr.	Soundview & Olympic	1988 & 2014	2	Centrifugal	Cornell	674	115’	1760		60	Dri-Prime Diesel Pump
9	Reid Dr. &50th St.	L.S. #7	1991	2	Centrifugal	Gorman-Rupp	140	51.5	1740		10	Standby gas motor
10	Forest Grove Apts.	Olympic Drive, MH #8-21	1990	2	Centrifugal	Hydronix	140	33	1725		7/5	Yes
11	38th Ave. & Woodland Creek	MH #8-31	1993	2	Centrifugal	Gorman-Rupp	137	90	1755		15	Yes

Table 4-1. Lift station and Wet Well Configurations

Pump Sta. No.	Location	Pumps To	Year Const-ructed	No. of Pumps	Pump Type	Pump Mfr.	Flow (gpm/ pump)	Rated Head (ft)	Speed (rpm)	Variable Frequency Drives	Horse Power (bhp)	Aux. Generator
12	Woodhill Dr. & Burnham	Burnham Dr.	1995	2	Centrifugal	Cornell	1000[2]	115	1760	Yes	50	Yes
13	Peninsula HS	Purdy Dr. near Highway 16	1995 1994	2	Centrifugal	Cornell	200	180	1760		25	Yes
14	Wagner Way	Skansie	1999	2	submersible	Flyght	110	112	1755		15	Yes
16	McCormick Ridge	Canterwood Blvd.	2004	2	submersible	Hydromatic	133	120	1750		25	Yes
21A	Hunt & Skansie	Alastra	2015	2	Submersible	KSB	393	173	1750	Yes	65	Dri-Prime Diesel Pump

4.3. Wastewater Collection System Capacity Evaluation

The hydraulic model of the City of Gig Harbor sanitary sewer system was updated as part of this Wastewater Comprehensive Plan Update. The hydraulic model of the City's wastewater collection and conveyance system is aimed to improve the City's confidence in sizing and capacity needs of collection and treatment components, and will allow the City to perform future scenarios responding to growth, such as developer plans and applications. This model has three main functions: (1) to assess the ability of the existing system to convey current flows; (2) to make recommendations for future capital improvements to the sewer system; and (3) to determine the effects of individual future developments and additions to the system. The wastewater flow data input to the model are based on DFAM-WW flow projections.

This section describes the development, update, and operation of the SewerCAD model to analyze the capacities of the existing lift stations, the pressure lines downstream of the lift stations, and the gravity lines that are immediately downstream of the discharge of the pressure lines. This evaluation of the collection system will provide a guide to the general level of ability to meet present and future flows. This analysis is a conceptual analysis and does not examine the conditions of the lift stations or pipelines. Also included in this chapter is a general description of the SewerCAD software, the assumptions used to model the City's sewer system, and model output results.

4.3.1. SewerCAD Modeling Software

SewerCAD is the City's wastewater modeling software because it can perform all the calculations that the City desires and can present the results in an easy to understand format. In addition, the City staff is familiar with Bentley products (WaterCAD is currently being used to simulate the water system) and will have fewer opportunities for confusion between the water and sewer software.

4.3.2. Model Assumptions

Assumptions pertaining to flow projections used in the development of the model are detailed in Chapter 3. The general information and assumptions in Table 4-2 were used in the development and update of the hydraulic model:

Table 4-2. SewerCAD Model Assumptions

Parameter/ System Element	Value/ Assumption in SewerCAD
Gravity Pipes	• Mannings n = 0.010 • Max. d/D = 0.8 • Min./Max. Velocity = 2 fps/ 15 fps • Min./Max Cover = 8 ft/ 20 ft • Min./Max Slope = 0.0004 ft/ft/ 0.8000 ft/ft
Lift Station Wet Wells	• All future lift station wet wells were assumed to be circular with a 8.00 ft diameter • Fixed water levels in Steady State Analyses
Forcemains	• Min./Max Slope = 0.0004 ft/ft/ 0.8000 ft/ft • All future forcemains from lift stations were sized for 2037 PHFs • All forcemains within lift stations are negligible
Manholes	• Manholes rims are set equal to ground elevation • Ground elevations for all future manholes were estimated from 2 ft contour data from Pierce County • All future manhole sump depths are assumed to be 8 ft
Lift Station Pumps	• Relative Speed Factor = 1.00 • Controls during a Steady State Analysis were ignored. • All future lift station pumps were sized for 2037 PHFs and set a one-point design curves • Pumps within the lift stations will not be running simultaneously
Reuse Facility/ Forcemains	• Free Outfall • Forcemains from lift stations to reuse facilities were sized for 2037 PHFs

- All future sewer connections within the UGA were assumed to be served by Gig Harbor's conventional gravity sewer and lift station conveyance system.
- Population growth and corresponding wastewater flows were distributed based on DFAM-WW methodology.
- All existing STEP systems will continue to be operated as STEP systems in the future.
- Possible reuse facilities will be processing the wastewater from their respective basin, as well as the wastewater from upstream lift stations.

4.3.3. Model Development

The City of Gig Harbor used a number of different sources of information on the configuration of the lift stations and sewer lines to be analyzed in order to produce an acceptable analysis of the system. The following information was used:

- Wastewater Basin Boundary Map showing the delineation of the basin boundaries.
- ULID (Utility Local Improvement District) #1-3 maps, which provided information for most of the system, including manhole sizes and elevations, pipe inverts and lengths, and some wet well levels and lift station configurations.
- A large number of record drawings, mostly in digital form, but some in hard copies, providing much of the same information as the ULIDs for locations not covered by those drawings.

- Information, in hardcopy form, on each of the lift stations, including the number and type of pumps and, in most cases, the pump curve and settings.
- Historical wastewater flow data for each of the lift stations and the WWTP.
- Information, in hard copy form, of approximate locations of sewer line additions.
- AutoCAD drawings containing manhole, gravity lines, forcemain, and lift station layers.

What is Included in Model

Initially, a preliminary model which included the "backbone" of the City's sewer collection and conveyance system, was built within the modeling system. Specifically, the "backbone" of the conceptual model included the following elements:

- All municipal lift stations, including known wet well and pumping information.
- Assumed control settings (pump on/off) based on water levels within wet wells for all current municipal lift stations.
- Pressure pipelines, which exit the existing lift stations.
- Gravity lines that transfer water from the discharge point of a lift station to the next downstream wet well or the Wastewater Treatment Plant (WWTP).
- A minimum of one gravity pipeline and manhole upstream of every lift station.
- Predefined profiles that include the alignment from each of the lift stations to the WWTP.

The preliminary hydraulic model was then expanded as part of the 2009 Wastewater Comprehensive Plan by adding additional gravity pipe segments and manholes based on record drawings provided by the City. Specifically, the model expansion included:

- Approximately 300+ additional gravity pipe segments and manholes to the conceptual model "backbone".
- Five additional lift stations in future wastewater basins: 15A, 17A, 18A, 19A, and 20A.
- Assumed control settings (pump on/off) based on water levels within wet wells for all future municipal lift stations.
- Pressure pipelines, which will exit the future lift stations.
- One gravity pipeline and manhole upstream of all future lift stations, including lift station 21A.
- Three possible satellite reclamation facilities located in wastewater basins 1, 8, and 12.
- Current and projected average dry weather flow (ADWF) and Peak Hour Flow (PHF) scenarios developed using the DFAM-WW projected flows, which were uniformly allocated to manholes based on the number of manholes upstream of a lift station.

Model updates completed as part of this comprehensive plan update included adding additional model elements based on sewer system GIS mapping efforts completed since

2009. However, while the mapping included spatial location information, elevation information (rim and invert elevations) were missing for some areas. Areas where elevation information was missing were not added to the model.

How Information was Input

All system elements (manholes, pipes, pumps, wet wells, pressure mains, etc.) were manually built within the SewerCAD model to represent each system element using an AutoCAD file containing the base sewer system as a guide. However, the information from the record drawings were not manually inputted into each of the system elements as they were drawn within SewerCAD. Instead, the information from the record drawings, such as ground, pipe inverts, manhole sump depths, etc., was organized within a series of Excel databases. These Excel databases were then "synchronized" into the model, allowing the information from the databases to be inputted for each system element without having to manually change the information for each individual element within the model.

While the synchronizing method works for inputting most of the information in the model with the Excel databases, several element features had to be inputted directly into the modeling software. The features that cannot be synchronized in include:

- Pipe diameter sizes
- Pump controls that manage when pumps are turned on or off
- Pump status
- Forcemain check valves

The record drawings present a relatively complete picture of the existing collection system with much useful information. However, some of the drawings are in excess of 30 years old, while others provide conflicting information. When information on different record drawings for the same system element was found to conflict, in general, the most recent record drawing was used, granted the most recent record drawing indicated the necessary information, or the conflicting data was verified by the City. In addition, 2foot contour data obtained from Pierce County GIS Division were used to confirm and verify any data conflicts between the record drawings and datums used.

4.3.4. Simulation of Flows in the System

Two types of flows are simulated in the model; average dry weather flow (ADWF) and peak hour flow (PHF). Basin flows are based on DFAM-WW flow projections intended to reflect current and future sewer and demographic information. The ADWF for each basin was divided by the number of manholes in each basin per the current GIS mapping of the wastewater system. That flow value was then applied to each manhole within that basin in the model. For manholes that are in the GIS mapping of the system but are not included in the model, it was determined which manhole in the model the flow loading should be applied to. Therefore, while each manhole in the GIS mapping of the system for each basin is assumed to have an equal ADWF, manholes in the model have different flows depending on the number of GIS mapped manholes assigned to each model manhole. The purpose of using the ADWF (within in the model) is to evaluate the level of calibration between the hydraulic model output and recorded historical wastewater flows.

The PHF values are also based on DFAM-WW flow projections. The PHF values incorporate I&I within the system, as well as the maximum expected flows the system may encounter during a storm event in order to evaluate the capacity of pipes and pumps. The PHF values were also distributed throughout the service area in in a similar way to that conducted for ADWF.

By distributing the ADWF and PHF values throughout the service area by manholes, the method ensures that the entire average dry weather and peak hour flows are specific for that particular basin. The method also allows each basin to be analyzed separately, which may otherwise be difficult for the larger downstream basins that have contributing flows from upstream lift stations.

4.3.5. Model Scenarios

The wastewater system was analyzed under numerous scenario-alternative combinations within the model. SewerCAD enables "parent-child" scenarios. Parent scenarios are "base" scenarios that include all system elements for that year. Child scenarios inherit the system elements from the parent scenario; however, the child scenarios allow specific alternatives from the base scenario. Alternatives within SewerCAD may include various system conditions, such as with or without the reclamation satellite facilities, or changes in pipe/pump sizing, etc. Table 4-3 summarizes the scenario-alternative combinations analyzed in the model.

A capital improvement plan (CIP) scenario was analyzed for years 2017, 2037, and 2050 (buildout). These scenarios are utilized to denote system elements that may need capacity improvements, which include pipe/manhole sizing, etc. In addition, three possible water reuse satellite locations have been identified by the City and were incorporated within the scenario analysis for years 2037 and buildout. These satellite locations are located in Basins 1, 8, and 12.

Table 4-3. SewerCAD Model Scenarios

<table>
<tr><th>Base Scenario</th><th>Child Scenario</th><th>Alternative</th></tr>
<tr><td rowspan="2">Year 2017</td><td>2017 ADWF</td><td></td></tr>
<tr><td>2017 PHF</td><td></td></tr>
<tr><td rowspan="4">Year 2037</td><td>2037 PHF</td><td></td></tr>
<tr><td>2037 CIP</td><td></td></tr>
<tr><td rowspan="2">Year 2037 With Reuse</td><td>2037 PHF With Reuse</td></tr>
<tr><td>2037 CIP With Reuse</td></tr>
<tr><td rowspan="4">Buildout</td><td>Buildout PHF</td><td></td></tr>
<tr><td>Buildout CIP</td><td></td></tr>
<tr><td rowspan="2">Buildout With Reuse</td><td>Buildout PHF With Reuse</td></tr>
<tr><td>Buildout CIP With Reuse</td></tr>
</table>

PHF and CIP scenarios for years 2037 and Buildout consist of PHF values for their respective years. The 2037 and Buildout PHF scenarios include all current system elements, future lift stations, and a minimum of one gravity pipeline and manhole upstream of the future lift stations. The CIP scenarios for those years include necessary system improvements required to meet peak flows.

The PHF and CIP with reuse scenarios consist of PHF values for their respective years. The scenarios with the reuse option (described in Section 6.4) include all current system elements, future lift stations, a minimum of one gravity pipeline and manhole upstream of the future lift stations, and all three possible reuse facilities in wastewater basins 1, 8, and 12. The reuse scenarios assume that the facilities will be processing the wastewater from their respective basins and all upstream lift stations, thereby reducing the flows downstream to the WWTP. The CIP scenarios with the reuse option for the respective years also include necessary system improvements required to meet peak flows.

4.3.6. Hydraulic Model Results and Analysis

Manholes, Forcemains, and Gravity Pipes

The system capacity analysis within the model indicates that the system in general has the capacity to handle both current and 20-year peak flow conditions. This is also the case for the scenarios that include the three possible reuse locations. In the 2017 and 2037 PHF Scenarios and the 2037 and Buildout PHF Scenarios with Reuse, there are no manholes, forcemains, or gravity pipes that were found to surcharge during peak hour flows.

However, the hydraulic model revealed seven pipe sections that did not have the capacity to handle build-out peak flows. Table 4-4 indicates the seven pipe sections that were found to be under capacity during the Buildout PHF Scenario, located along Harborview Dr. and Burnham Dr. The deficiencies were identified based on a design parameter of having gravity pipes no more than 80 percent full (d/D = 0.8). However, although the buildout PHF for the deficient pipes on Harborview Dr. exceed the flow associated with running those pipes at 80 percent full, the buildout PHF is below the full maximum flow capacity of the pipes. For the deficient pipes on Burnham Dr., a deficiency exists for both exceeding 80 percent full and the full maximum flow capacity of those pipes. In both these areas however, manholes are not surcharged.

Table 4-4 lists the current pipe capacity, the design pipe capacity, the current pipe size, and the recommended new pipe size to maintain these pipes at less than 80 percent full during buildout PHF.

Table 4-4. SewerCAD Model Pipe Capacity Deficiencies

Location	Location (Manhole ID)	Buildout Flow in Pipeline (gpm)	Existing Pipe Capacity (gpm)	Existing Pipe Size (in)	New Pipe Size (in)	Length (ft)	Buildout PHF Flow Exceeds		Manholes Surcharged?
							80% Full Flow (1)	Max Flow (2)	
Harborview Dr.	3-26 to 3-27	1,685	1,680	15	18	200	Yes	No	No
Harborview Dr.	3-27 to 3-25	1,688	1,680	15	18	175	Yes	No	No
Harborview Dr.	3-25 to 3-24	1,691	1,665	15	18	240	Yes	No	No
Burnham Dr.	3-16E to 3-15E	1,955	1,842	15	18	230	Yes	Yes	No
Burnham Dr.	3-15E to 3-14E	1,958	1,845	15	18	300	Yes	Yes	No
Burnham Dr.	3-14E to 3-13E	1,961	1,857	15	18	130	Yes	Yes	No
Burnham Dr.	3-13E to 3-12E	1,963	1,850	15	18	230	Yes	Yes	No

1. Flow associated with pipe at 80 percent full (d/D = 0.8).
2. Maximum flow capacity of the pipe.

There are some gravity pipes in the model that are surcharged (but not manholes) but where the PHF is less than the 80 percent full flow capacity of the pipe (meaning that surcharging is caused by a downstream constraint. These locations are near existing lift station wet wells where wet well fill elevations cause surcharging and are not considered to be an issue.

In all scenarios within the model, there were several gravity pipes and forcemains that did not meet the velocity design constraint of 2.0 to 15.0 fps and/or the cover design constraint of 8.0 to 20.0 ft. The amount that the gravity pipes or forcemains did not meet the design constraints was not significant enough to cause concern. However, forcemains that did not meet the minimum velocity constraint were noted, due to odor control issues that could be caused by the low velocities.

WWTP and Reuse Facilities

Within the model, the WWTP and possible reuse facilities were modeled as “outfalls”, which only indicates how much wastewater flows through the facilities. The projected amount of flow through the reuse facilities may be used for sizing purposes, but no further detailed analysis of specific reuse facilities has been conducted. However, detailed analysis of the WWTP sizing, capacity, and treatment, is presented in Chapter 5.

Lift Stations

Available pump curves and settings for all current pumps were implemented within the model. The hydraulic model does not take into account such factors as age, condition, etc., and scenarios continue with the assumption that lift station pumps are operating within their design efficiency range. Consequently, further analysis for individual lift stations was performed (see Appendix C).

4.4. Collection System Deficiencies and Needs

Although Infiltration & Inflow (I&I) is the significant component impacting capacity in the collection system and interflow of stormwater runoff resulting from rainfall appears to be the primary factor, the existing lift stations, forcemains, and gravity pipelines appear to have adequate capacity for current and future wastewater flows. It is estimated that the future dry weather flow in the collection system will increase compared to the total flows (including I&I) that currently exist in the collection system.

Based on the collection system evaluations and City staff observations and experiences, the deficiencies and limitations in the existing wastewater collection system are summarized below; projects to address the deficiencies are presented in Chapter 7.

- Many of the current lift stations are in poor condition, beyond their service life, or will not have the capacity for future peak flows. These lift stations will require replacement or may need pump replacements.
- A small number of pipe sections will not have capacity for buildout peak hour flows. These pipe sections will need to be replaced.
- For new (replacement or future) sewer pipelines, the City desires that the maximum depth be no greater than 25 feet; however, depths greater than 25 feet may be necessary in limited areas where accepted by the City on a project and site specific basis.
- Wastewater flows are currently measured at only three lift stations (3, 4 and 7). This issue makes wet weather flow management from I&I difficult to address. Collecting daily rainfall data and installing flow meters at the lift stations will help address this issue.
- To accommodate future growth within the City, the current system will require expansion to include lift stations, forcemains, and gravity sewer extensions.
- Further evaluation is needed by the City to prioritize I&I reduction projects and identify potential cost effective remedies in the wastewater collection system. These projects are part of the Chapter 7 CIP project for annual replacement, rehabilitation, and renewal of existing sanitary infrastructure.

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5. Wastewater Treatment Plant

5.1. Background

The original City of Gig Harbor Wastewater Treatment Plant (WWTP) was brought online to provide secondary treatment of municipal sewage in 1975. The original WWTP had a design capacity of 0.45 million gallons per day (MGD) with an average organic loading of 700 lbs BOD_5/day. In 1988, the WWTP was expanded to treat 0.7 MGD and an average organic loading of 1,800 lbs BOD_5/day. The WWTP was expanded again in 1996 to its current capacity of 1.6 MGD, and an average organic loading of 3,400 lbs BOD_5/day. In 2009 the City performed a major upgrade to the WWTP to expand capacity. In 2010 the outfall was removed from the harbor and extended and relocated into Colvos Passage to a depth of 191' below sea level in the Puget Sound. In 2016 the City completed Phase II of its major upgrade to the WWTP -- again to increase capacity and improve reliability. The final upgrade added UV disinfection, odor control for the digester system, a second redundant fine screen, an eductor waste dewatering structure, process water pumping system and other ancillary support equipment.

The WWTP consists of the following major components: influent flow meter, degritter, influent screens, anoxic basins, aeration basins, blowers, secondary clarifiers, return activated sludge pumps, waste activated sludge pumps, sludge thickener, aerobic digester, digested sludge pumps, sludge dewatering centrifuge, odor control, UV disinfection, chlorine contact tank, process water pumps and effluent discharge pumps. Effluent from the WWTP is piped through an outfall that discharges into Colvos Passage in the Puget Sound.

During the second phase of upgrades, a new Lab and Operations building was constructed, replacing the temporary facility put in place during Phase I construction. The Operations building also includes office and personal space for the employees.

5.2. Existing Facilities Evaluation

The City of Gig Harbor WWTP Improvements, as recommended in engineering reports and technical memoranda provided by H.R. Esvelt Engineering and Cosmopolitan Engineering, were completed in the fall of 2016. Major operation, maintenance, and capacity problems at the WWTP, including odor and noise complaints, were addressed during the upgrades, including but not limited to the following:

- Operational problems that will impact effluent quality
- Processes with high operation and maintenance costs
- Problems that result in high operation and maintenance requirements
- Processes that consume higher than necessary electrical energy
- Processes with need to upgrade to meet future capacity

With successful completion of the final phase of upgrades, the City of Gig Harbor WWTP has high confidence in its ability to collect and treat the design flow of 2.4 MGD -- with the completion being able to meet and exceed its 20-year plan for meeting capacity requirements.

5.3. WWTP Improvements

In order to serve the City's growth within a 20-year planning horizon, including outfall improvements to increase discharge capacity and extend the outfall outside Gig Harbor to Colvos Passage, the City has completed its two phases of planned upgrades providing the following permitted discharge:

5.3.1. NPDES Loading limits

The WWTP's current daily average flow is approximately 1.1 MGD. The designed and constructed improvements will exceed the 20-year planning horizon flow and waste load projections. An interim NPDES permit was issued in March of 2015, with the 1.6 MGD flow limit, and during the final phases of construction with the final permit of 2.4 MGD. The 2.4 MGD flow limit was contingent upon completion and certification of the constructed improvements. The limits under the 2.4 MGD permit are as follows:

- 2.4 MGD Maximum month flow
- 5,800 lbs/day BOD_5 influent loading
- 5,800 lbs/day TSS maximum monthly average influent loading

6. Water Reuse and Reclamation

This chapter summarizes the City's efforts regarding evaluation of the potential for reclaimed water to be a beneficial component of its wastewater management strategy. The regulatory framework surrounding water reclamation is described, followed by a summary of prior reuse-related study efforts. The potential for water reuse within the City's service area is also examined, along with options for reclaimed water system configurations. The chapter concludes with an approach to future considerations regarding this water resource management tool.

6.1. Regulatory Framework

The State has identified reclaimed water as an important water resource management strategy that can offer benefits related to potable water supply, wastewater management, and environmental enhancement. The State's Reclaimed Water Act was approved by the legislature in 1992, codified as Chapter 90.46 RCW, and was amended in 1995. RCW 90.46.010 defines "reclaimed water" as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur and is no longer considered wastewater." This law supports the beneficial reuse of reclaimed water for consumptive applications (such as irrigation, commercial and industrial process use, etc.) and non-consumptive purposes (including groundwater recharge via surface percolation or direct injection, wetland enhancement, and streamflow augmentation).

Water reclamation projects are reviewed and permitted jointly by the State Department of Health (DOH) and the Department of Ecology (Ecology). The State adopted the Reclaimed Water Rule (WAC 173-219) in early 2018, to guide the implementation of reclaimed water projects and programs. In Washington, there are two primary classes of reclaimed water (A and B). Class A reclaimed water represents the highest level of treatment, referring to water that is oxidized, coagulated, filtered, and disinfected to certain standards. Class A is acceptable for the widest range of uses.

The City has acknowledged the State's acceptance and promotion of reclaimed water as being a viable and important water resource management tool. A goal currently considered in the City's Comprehensive Plan (within the Utilities Element) pertains to exploring options for the City to create and utilize Class A reclaimed water at the Wastewater Treatment Plant, and evaluating the benefits and potential uses for reclaimed water throughout the City. This goal is consistent with the State's Growth Management Act and countywide planning policies, and furthers the purpose of the City's Comprehensive Plan by identifying opportunities to generate higher quality effluent from the Wastewater Treatment Plant.

6.2. Other City Reclaimed Water Planning Efforts

The City has previously explored the feasibility of implementing a reclaimed water program.

The City's 2012 Water Reclamation and Reuse Site Evaluations and Study (see Appendix D) provides preliminary direction on the potential production and distribution of reclaimed water to meet a variety of objectives associated with water supply and wastewater management. The report represents an initial step in the City's evaluation of reclaimed water program feasibility, including:

- Identification of potential benefits of a reclaimed water program.
- Identification of potential reclaimed water uses and their associated demands.
- Evaluation of alternative reclaimed water production and distribution system configurations, including an analysis of costs and benefits.
- Summary of recommended next steps to determine reclaimed water program feasibility, and considerations to be made if the City proceeds with implementing a reclaimed water program in the future.

Concurrent to developing this update of the Wastewater Comprehensive Plan, the City is also updating its Water System Plan (WSP). Per Municipal Water Law requirements, that WSP Update includes a discussion of the potential for implementation of a reclaimed water program.

Through these other efforts, City staff have continued to refine potential options for a reclaimed water program. Staff have briefed the City Council on the role that reclaimed water could potentially play in the future management of the City's wastewater. While no additional analysis of reclaimed water was conducted as part of this Wastewater Comprehensive Plan update, future consideration of reuse possibilities is captured in the capital improvement program.

6.3. Potential for Use of Reclaimed Water in the City

The City's 2012 Water Reclamation and Reuse Site Evaluations and Study (see Appendix D) identified potential reclaimed water uses based on prior City planning efforts, and supplemented with additional analyses. A summary of potential reclaimed water uses within and near city limits include:

- Large City Water Customers
- Non-City Water Users with Large Irrigation Needs
- Environmental Enhancement Uses
- Dual Distribution System Uses
- Other Uses
    - Wilkenson Farm Park
    - City Park at Lift Station No. 1
    - Samuel Jersich and Skanskie Brothers Parks at Lift Station No. 4
    - Maintenance Activities at the Wastewater Treatment Plant
    - Service Activities throughout the City

6.4. Options for Reclaimed Water System Configurations

Reclaimed water systems have three primary components: a production (treatment) facility, transmission and distribution infrastructure (pumps and pipes), and end use sites (as described above). In terms of reclaimed water production, there are generally two options available to the City: centralized versus decentralized facilities.

A centralized approach to reclaimed water production involves expanding the City's Wastewater Treatment Plant to include the additional level of treatment needed to generate Class A reclaimed water. This would involve the installation of filtration equipment or a membrane bioreactor (MBR). MBR technology combines biological treatment processes with membrane filtration to remove organic contaminants and nutrients while also physically separating suspended solids from the water. Additional modifications to the existing facility regarding disinfection and controls would also likely be required.

By comparison, a decentralized approach involves the strategic installation of smaller, satellite reclaimed water production facilities further upstream in the wastewater conveyance system. Typically located at wastewater flow convergence points or lift stations, these facilities are used to capture wastewater flows from certain basins, and then generate reclaimed water for use in those areas. While a range of treatment approaches may be employed at a satellite facility, many utilities are implementing MBR technology in these types of applications, due to the small footprint required relative to other, more conventional forms of wastewater treatment.

The primary benefits of the centralized approach include maximizing the reclaimed water production potential (i.e., all wastewater flows generated in the City may be available for conversion to reclaimed water), and employing the existing treatment processes and facilities already in place. However, a centralized approach is often accompanied by high transmission/distribution costs associated with the lift stations and pipelines needed to convey the generated reclaimed water to use sites.

While the volume of reclaimed water generated at satellite facilities is often less than that produced at central wastewater treatment plant sites, the reclaimed water conveyance costs can often be much less, as the production facilities are in closer proximity to use sites. An additional benefit of satellite facilities is the reduction in wastewater flows to the central Wastewater Treatment Plant. This can defer or eliminate the need to upsize conveyance facilities (especially in sewer basins where significant growth is expected), reduce operating costs associated with lift station pumping, and defer or eliminate the need to expand capacity at the central Wastewater Treatment Plant.

The City has the potential to implement either or both of these approaches if reclaimed water continues to be pursued. City staff have preliminarily identified areas at the current Wastewater Treatment Plant where additional filtration or MBR facilities could be located. The City's 2012 Water Reclamation and Reuse Site Evaluations and Study (see Appendix D) selected three use areas and sites for continued evaluation, based upon amount of current and projected wastewater flow, and proximity to potential use sites. These three sites are described briefly below.

- **Wastewater Treatment Plant**. A reuse facility at the WWTP would be used primarily for irrigation of Haven of Rest Cemetery, located adjacent to the WWTP. A secondary use may be to augment stream flows in nearby Donkey Creek.
- **Lift Station No. 12**. A satellite reuse facility at this location has the potential to reduce flows to the Wastewater Treatment Plant by approximately 200,000 gpd. Potential uses of reclaimed water generated at this site include irrigation at the Canterwood Golf Course and stream augmentation.
- **Lift Station No. 8A**. A reuse facility at this location would process wastewater flows from future growth in sewer basin 8A, and has the potential to reduce flows to the Wastewater Treatment Plant by 125,000 gpd. Primary use locations would include the Madrona Links Golf Course and the Tacoma Narrows Airport.

The Study in Appendix D includes a cost/benefit summary. Additional analysis is required to fully evaluate the costs and benefits associated with facilities at these potential locations.

6.5. Future Planning Efforts

The City acknowledges the value a reclaimed water program might offer in the future, especially with regard to the following needs and objectives:

- Meeting effluent requirements that may become more stringent, particularly with regard to the protection and enhancement of Puget Sound.
- Optimizing Wastewater Treatment Plant capacity.
- Managing potable water withdrawals.
- Offsetting and mitigating for additional water rights.
- Enhancing local area surface and ground waters.

Therefore, although not planning for specific capital improvements related to reclaimed water, the City will continue to consider the costs and benefits of various types of reclaimed water programs and how they may best fit within the City's water resource management strategy. The Capital Improvement Program outlined in Chapter 7 includes budgeted resources to support such future evaluations.

If the City elects to further consider implementation of a reclaimed water program in the future, the key next steps include:

- Periodically re-evaluate the feasibility of reclaimed water program implementation in the context of changing objectives and drivers.
- Further define and analyze the conceptual approach to a reclaimed water production and distribution system.
- Specifically with regard to refining the possibility of using reclaimed water for water rights mitigation, consider:
    - Continued participation in regional groundwater modeling (USGS).
    - Identify more specifically potential mitigation needs.

- Conduct feasibility of using groundwater recharge or surface water augmentation in the context of a water right mitigation plan.

- Further evaluate implementation of a "purple pipe" region in the City, an area in which building and development regulations may be modified to require installation of purple pipe in the course of residential and commercial development, and where reclaimed water use will be required for certain water needs when the resource is available to the area.

Other considerations the City will need to further explore prior to implementation of a reclaimed water program include:

- Monitor regulatory changes.
- Identify program financing.
- Develop end user agreements.
- Conduct public outreach.

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7. Capital Improvement Program

To address the collection system, Wastewater Treatment Plant (WWTP), and potential wastewater reuse needs, the City plans to implement the Capital Improvement Program (CIP) presented in this chapter. The probable cost estimates for these improvements are also included in this chapter.

The timing of each improvement project is provided for budgeting and financial projection purposes. The desired implementation schedule and project priorities are based on priorities of City Staff. The probable cost estimates included are based on 2018 dollars and previous cost estimates for similar projects and conditions.

The completion of each project may require adjustments and refinement of the CIP. The City retains the flexibility to reschedule, expand, or reduce the projects included in the CIP and to add new projects to the CIP, as best determined by the City when new information becomes available for review and analysis.

7.1. Capital Improvement Project Descriptions

The CIP projects are improvements within the City's wastewater system that will be needed to address deficiencies during the next 20-year planning period. The CIP improvements are categorized into five groups: Wastewater Treatment Plant, Wastewater Gravity, Wastewater Collection, Wastewater Lift Station & Forcemain, and Wastewater Reclamation & Reuse.

As discussed in Chapter 4: Wastewater Collection System, several improvements within the wastewater collection system will be necessary. The improvements include current lift station improvements and upsizing a small number of pipe sections. In addition, flow meters will need to be installed at remaining lift stations in order to address wet weather flow management and I&I Issues.

The improvements needed to address issues and deficiencies identified are summarized in Table 7-2. Detailed project descriptions and cost estimates are presented in Appendix C.

7.2. Capital Improvement Program Implementation

Table 7-2 (on page 7-5) provides the schedule for implementation of capital improvement projects. The table lists the project name, the scheduled year for implementation, and a probable cost estimate.

For each proposed project, a cost estimate in 2018 dollars is provided. Cost estimates are also given for each project using projected future dollars with a 7 percent inflation factor for each year.

A number of projects are projected to be needed but will likely not be necessary until 2030 or later. The following is a summary of those projects:

- 2028 – 2037 projects
  - Install Flow Meter – LS 5
  - Upsize gravity pipe on Burnham Dr
  - LS 5 Improvements
  - Install Flow Meter- LS 10
- 2038 – 2050 projects
  - Future LS 7A and Forcemain
  - Future LS 8A and Forcemain
  - Future LS 9A and Forcemain
  - Future LS 10A and Forcemain
  - Future LS 11A and Forcemain
  - Future LS 15A and Forcemain
  - Future LS 17A and Forcemain
  - Future LS 18A and Forcemain
  - Future LS 19A and Forcemain
  - Future LS 20A and Forcemain

Table 7-1. Gig Harbor Capital Improvement Plan Summary

CIP Project ID #	Project Title/Description	Project Description	Project Justification	Project Desired Implementation Schedule, Priorities, & Predecessors
Wastewater Lift Station & Force Main (WWLSFM) 1-14	Lift Station Improvements	Submersible pumps will be replace within the lift station and a dry primed pump will be added or a new lift station will be constructed to replace the current lift station.	Pumps within the station are in poor condition, reaching the end of their useful service life, and need to be replaced.	High priority lift station improvements are desired to be completed between 2018 and 2037 in the following order: 1. LS 6 2. LS 1 3. LS 9 4. LS 14 5. LS 5 6. LS 12 7. LS 13 8. LS 8 9. LS 10 10. LS 11
WWLSFM 1-16	Install Flow Meter	Install flow meters at existing lift stations.	Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal.	Desired to install at approximately 2 to 3 lift stations per year between 2009 and 2014 in the following order: 1. LS 9 2. LS 6 3. LS 12 4. LS 1 5. LS 5 6. LS 8 7. LS 14 8. LS 16 9. LS 13 10. LS 2 11. LS 11 12. LS 10
WWLSFM 7A-11A	Future LS & Forcemain	A new lift station will be constructed to replace the current lift stations 7 and 11.	The existing lift station is not located in the "low spot" of the basin, and will be replaced and relocated to reduce the number of lift stations needed to serve the basin.	Unscheduled; dependent on growth and development.
WWLSFM 15A-20A	Future LS & Forcemain	New lift stations 15 and 21 will be constructed.	The lift station will be constructed to provide service for future growth.	Unscheduled; dependent on growth and development.

Table 7-1. Gig Harbor Capital Improvement Plan Summary

CIP Project ID #	Project Title/Description	Project Description	Project Justification	Project Desired Implementation Schedule, Priorities, & Predecessors
WWTP 1	WWTP Improvements	Major improvements to increase and expand existing WWTP capacity were completed 2010-2016. Focus is on maintenance, repair and replacements for the next 10 years. Beyond 10 years will be planning for future capital improvements. Replacement of digester blowers is planned in the near term.	Capacity needed for growth and meeting regulations.	2018
Wastewater Reclamation & Reuse (WWRR) 1	Reuse & Reclamation Studies	Research and studies will be conducted to determine whether the use of reuse and reclamation locations will be beneficial to the sewer system.	Reuse facilities may alleviate the effluent load to the WWTP.	2023
WWRR 2.1-2.3	Satellite Reuse Plant in WW Basins	Construct reclamation facilities.	If justified through study and analysis to be beneficial to City.	Unscheduled
Wastewater Gravity (WWG) 1	Upsize gravity pipe on Harborview Dr. (North of intersection of Harborview Dr. and Stinson Ave)	Upsize three gravity pipes along Harborview Dr from 15 in. to 18 in. diameter.	Existing pipes will not have the capacity for PHFs at buildout.	Unscheduled. Based on growth, but not estimated to be needed until after 2038. Or built in conjunction with road reconstruction possibly before required. Current flow/slope does not meet scouring requirements.
WWG 2	Upsize gravity pipe on Burnham Dr	Upsize four gravity pipes along Burnham Dr from 15 in. to 18 in. diameter.	Existing pipes will not have the capacity for PHFs at buildout.	Unscheduled. Based on growth, but not estimated to be needed until after 2038.
WWG 3	Future Gravity Sewer Extension	Gravity Sewers will be added to the current collection system.	Gravity sewers will be constructed to provide service for future growth.	Unscheduled but dependent on growth & development.
Wastewater Collection (WWC) 1	I&I Repairs Manholes / Pipelines	Complete repairs on manholes and pipelines to reduce sewer infiltration and inflow (I&I).	I&I causes higher flows of sewage in conveyance systems and to the treatment plant.	To be performed biennially based on authorized City budget for this activity.
WWC 2	Annual Replacement, Rehabilitation & Renewal	Annual efforts will be taken to rehabilitate or replace collection system elements.	System elements may be in poor condition or reaching the end of its useful service life and needs to be replaced or rehabilitated.	To be performed annually based on authorized City budget for this activity.

Table 7-2. Capital Improvement Projects Implementation

Project Identification Number [1]	Project Title	Staff Preferred Priorities (by project grouping)	10 year CIP Estimated Total Project Cost Costs are in 2018 dollars	Year Scheduled for Implementation	Implementation Schedule 3% Annual Inflation Factor; Costs are in Projected Future Dollars 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Cost Allocation [2] Existing Customers	Future Customers	Developer Funded
WWLSFM-1	LS 1 Improvements	1	$105,000	2018	$105,000										32%	68%	
WWLSFM-6	LS 6 Improvements	1b	$1,172,778	2020		$140,000	$1,100,000								86%	14%	
WWLSFM-8	LS 8 Improvements	3	$972,133	2024		$30,000					$1,126,000				99%	1%	
WWLSFM-9	LS 9 Improvements	2	$400,000	2018	$400,000										71%	0%	29%
WWLSFM-10	LS 10 Improvements	11	$92,000	2026									$117,000		65%	35%	
WWLSFM-11	LS 11 Improvements	14	$90,465	2027										$150,000	18%	82%	
WWLSFM-12	LS 12 Improvements	6	$1,413,874	2020			$1,500,000								48%	52%	
WWLSFM-13	LS 13 Improvements	7	$518,000	2023						$601,000					83%	17%	
WWLSFM-14	LS 14 Improvements	3a	$62,000	2018	$62,000										34%	66%	
WWLSFM-16	LS 16 Improvements	4	$62,000	2019		$64,000									98%	2%	
WWLSFM-1.1	Install Flow Meter- LS 1	1a	$25,000	2018	$25,000										32%	68%	
WWLSFM-2.1	Install Flow Meter- LS 2	8	$25,000	2026									$32,000		30%	70%	
WWLSFM-6.1	Install Flow Meter- LS 6	5	$25,000	2020		$26,000									98%	2%	
WWLSFM-8.1	Install Flow Meter- LS 8	9	$21,500	2024							$26,000				46%	54%	
WWLSFM-9.1	Install Flow Meter- LS 9	2a	$27,000	2018	$27,000										99%	1%	
WWLSFM-11.1	Install Flow Meter- LS 11	12	$25,000	2027										$33,000	65%	35%	
WWLSFM-12.1	Install Flow Meter- LS 12	6a	$25,000	2020			$27,000								18%	82%	
WWLSFM-13.1	Install Flow Meter- LS 13	7a	$25,000	2023						$29,000					48%	52%	
WWLSFM-14.1	Install Flow Meter- LS 14	3b	$25,000	2022					$29,000						83%	17%	
WWLSFM-16.1	Install Flow Meter- LS 16	10	$25,000	2022					$29,000						34%	66%	
WWTP-1	WWTP Improvements	1	$400,000	2018	$400,000										X	X	
WWRR-1	Reuse & Reclamation Studies	1	$100,063	2023						$116,000					64%	36%	
WWG-1	Upsize gravity pipe on Harborview Dr (north of intersection of Harborview Dr. and Stinson Ave.)		$1,657,759	2026									$2,100,000		X	X	
WWC-1	I&I Repairs Manholes / Pipeline		$699,311			$225,000			$175,000		$200,000		$200,000				
WWC-2	Renewal	1	$80,000	Annual	$80,000	$83,000	$85,000	$88,000	$91,000	$93,000	$96,000	$99,000	$102,000	$105,000			
WWC-3	Murphy's Landing Sediment Removal Design and Permitting	1	$24,272	2019		$25,000									100%		
		TOTALS	**$8,098,155**		**$1,099,000**	**$593,000**	**$2,712,000**	**$88,000**	**$324,000**	**$839,000**	**$1,448,000**	**$99,000**	**$2,551,000**	**$288,000**	**$3,773,997**	**$1,371,088**	**$116,000**

NOTES

(1) Project Identification Numbers: WWLSFM = Wastewater Lift Station & Force Main; WWTP = Wastewater Treatment Plant; WWRR = Wastewater Reclamation & Reuse; WWG = Wastewater Gravity; WWC = Wastewater Collection

(2) Cost Allocation total is in 2018 dollars: Existing customer's share (typically funded by rates) is based on 2017 flows; Future customers share (typically funded by GFCs) is based on projected 2037 flows.

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7.3. Wastewater System Staffing Assessment

Staffing to operate and maintain the wastewater system needs to adjust accordingly with implementation of future capital projects to address growth and increased flows.

Wastewater system operations and maintenance are categorized by the City in three primary areas: administration, wastewater treatment plant (WWTP), and collection system. The collection system is subcategorized for operation and maintenance of the sewer pipelines and the lift stations.

In 2017, nine full time equivalent (FTE) staff are in the wastewater division, consisting of:

Administration

- 1 supervisor
- 1 assistant

Wastewater Treatment Plant

- 2 senior operators
- 3 operators
- 0.5 maintenance technician

Collection System (sewers and lift stations)

- 1 collection system technician II
- 0.5 maintenance technician

Current staffing for administration and the wastewater treatment plant is adequate; however, staffing is deficient for the collection system for the following activities requiring City staffing on a routine basis:

- Approximately 150 restaurants using grease interceptors.
- The City's industrial customers and pretreatment program.
- Sewer piping asset management through annual television inspection and cleaning.

Future staffing will require additional FTEs at the wastewater treatment plant to respond to future regulatory requirements for screenings at the headworks, increased solids handling (digestion and dewatering), increased general plant maintenance activities, and for the collection system due to growth increases in the quantity of sewer pipelines and lift stations to operate and maintain. Future staffing needs also take into account staffing efficiencies for operations and maintenance expected with the implementation of the Cartegraph management system. A total of 4 additional FTEs are planned to be needed in the future. The City's wastewater division staffing projections are shown in Table 7-3.

Table 7-3. Wastewater Division Staffing Projections (FTEs)

Category	2018	2019	2020	2021	Future	Buildout
Administration	2	2	2	2	2	2
Wastewater Treatment Plant	5.5	6 +1(2)	6.75(2)	6	7	6.5 to 7
Screenings/Headworks/ Maintenance		*+ 0.5(5)*	*+0.5(3)*			
Collection System	1.5	2	2	2	4	4 to 4.5
Sewer Pipelines			*+ 0.25(3)*	*+1(4)*		
Lift Stations			*+ 0.25(3)*		*+1(4)*	
TOTAL	9	10.5	11.75	11	13	13

Notes:

1. FTE = Full Time Equivalent
2. Wastewater treatment plant staffing includes succession plan to replace 2 FTEs planning retirement (one senior operator and one operator).
3. Laborer
4. Maintenance technician
5. Seasonal

8. Financial Evaluation

8.1. Introduction

This chapter provides a review of the existing wastewater utility's financial performance as well as a forecast of future operating and capital expenses projected over the next ten years. Based on this forecast, the City's ability to fund planned capital improvements is assessed and monthly rate increases required to fund required capital are identified.

8.2. Existing Rates

Table 8-1 lists existing (2018) wastewater monthly rates. The listed commodity charges are applied to each 100 hundred cubic feet (CCF) of water used during winter months applied to the entire calendar year. The City performed a rate study in 2014 and by ordinance has passed annual rate increases through the year 2020. Table 8-1 lists the rate increases that will occur in 2019 and 2020. Note that actual wastewater rate increases in 2019 and 2020 are split with slightly different increases applied to the base and commodity charges; however, this analysis utilizes a 4% increase in 2019 and 3% increase in 2020 to approximate the future revenues from rates.

Table 8-1. Existing Wastewater Monthly Rates

Customer Classes	Monthly Base Charge	Commodity Charge ($/CCF)	2019 Rate Increase	2020 Rate Increase
Commercial/Schools/Government	87.71	8.14	4%	3%
Multi-Residential (per living unit)	28.92	4.64	4%	3%
Residential	37.57	4.62	4%	3%

8.3. Historical Operating Cash Flows

Table 8-2 and Table 8-3 provide a list of historical operating cash flows from 2015 and 2016 as well as the wastewater utility's budgets for 2017. The City's 2017 budget (department request) is used in this analysis since at the time of this report the City has not completed their 2017 annual report.

Only revenues and expenses associated with month-to-month operations are included. Historical cash flows are presented since they indicate whether existing rates can fund existing operations and since future operating expenses and revenues are based in large part on historical levels. Revenues and expenses associated with capital are not presented since historical capital cash flows are unrelated to future capital cash flows that are addressed in a subsequent section.

Table 8-2. Historical Revenues from Operations (2015 – 2018)

Operating Revenues	2015	2016	2017 Dept Req
Sewer State utilities tax	148,717	165,083	175,949
Inspection fees - House Stub	4,370	4,900	4,000
Inspection fees - Step Sys	130	650	100
Sewer service charges	18,063	8,142	0
Sewer svc. - city residential	1,818,764	2,080,020	2,186,650
Sewer svc. - city commercial	1,228,039	1,339,660	1,440,178
Sewer svc. - city governmental	48,663	62,810	66,895
Sewer svc. - county residential	341,126	352,252	390,191
Sewer svc. - county commercial	24,852	28,266	30,158
Sewer svc. - county governmental	617,595	670,026	739,621
Late penalties	1,494	1,824	2,000
Engineering plan review fees	15,372	2,270	0
Engr plan review fees	1,600	540	0
Other gov't revenues	546	585	500
TOTAL REVENUES	**4,269,331**	**4,717,028**	**5,036,242**

Table 8-3. Historical Expenses from Operations (2015 – 2018)

Operating Expenses	2015	2016	2017 Dept Req
Admin - Public Works			
Regular salaries	164,171	166,923	174,200
Overtime	3,177	3,983	2,000
Personnel benefits	74,223	76,223	82,700
Small tools & equipment	0	64	
Professional services	0	0	
Water quality study	0	0	
Comprehensive sewer plan	0	0	
Engineering study - wwtp capacity study	0	0	
Travel	0	0	
Subtotal Admin - Public Works	**241,571**	**247,193**	**258,900**
Administration - General			
Regular salaries	157,377	152,820	158,900
Overtime	938	368	200
Personnel benefits	61,601	60,066	64,900
Office & operating supplies	2,123	2,013	2,000
Small tools & equipment	21,038	6,493	4,000
Professional services	18,808	7,545	10,000
Engineering	0	0	0
Legal fees	1,004	9,522	6,000
Communications	17,799	17,228	22,000
Travel	1,509	3,463	5,000
Advertising	874	288	500
Operating rentals & leases	2,083	3,510	3,000
Insurance	98,702	180,061	198,067
Public utility services	1,417	1,663	2,000
Repairs & maintenance	257	313	0

Table 8-3. Historical Expenses from Operations (2015 – 2018)

Operating Expenses	2015	2016	2017 Dept Req
Miscellaneous	8,852	12,759	12,000
Training	2,376	1,373	2,000
Subtotal Administration - General	**396,758**	**459,485**	**490,567**
Maint. & Opns. - Collection			
Regular salaries	219,296	240,753	122,400
Overtime	9,738	9,783	10,000
Personnel benefits	111,976	132,993	65,600
Office & operating supplies	53,028	33,023	147,000
Fuel	4,610	3,662	7,500
Small tools & equipment	14,093	10,040	16,350
Professional services	6,675	24,849	131,000
Video inspection	6,554	2,675	30,000
Communications	9,245	11,011	29,380
Advertising	147	0	0
Operating rentals & leases	207	24,941	5,000
Public utility services	1,824	2,717	8,000
Electric - pump stations	32,483	30,583	32,000
Repairs & maintenance	69,759	49,700	223,500
Sewer line breaks	0	0	25,000
Miscellaneous	175	886	2,000
Subtotal Maint. & Opns. - Collection	**539,810**	**577,616**	**854,730**
Maintenance - Treatment Plant			
Regular salaries	3,794	1,345	
Overtime	1,230	319	
Personnel benefits	3,354	862	
Uniforms	0	5,030	
Machinery & equipment	0	0	0
Subtotal Maint. - Treatment Plant	**8,378**	**7,556**	**0**
Cust Svc - Billing/Accounting			
Regular salaries	17,997	20,857	22,200
Overtime	0	0	0
Personnel benefits	9,710	7,657	8,500
Office & operating supplies	0	0	0
Small tools & equipment	0	0	0
Communications	11,404	11,412	
Operating rentals & leases	0	0	
Subtotal Cust Svc - Billing/Accounting	**39,111**	**39,926**	**30,700**
Operations - Collection Systems			
Regular salaries	954	745	
Overtime	0	0	
Personnel benefits	254	296	
Office & operating supplies	0	54	
Professional Services	0	0	
External taxes & assessments	0	0	
Repairs & maintenance	0	0	
Subtotal Operations - Collection Syst	**1,208**	**1,095**	**0**
Operations - Treatment Plant			
Regular salaries	341,077	375,984	492,600
Overtime	11,149	13,124	10,000

Table 8-3. Historical Expenses from Operations (2015 – 2018)

Operating Expenses	2015	2016	2017 Dept Req
Personnel benefits	142,883	149,826	235,700
Uniforms	1,849	2,660	2,250
Office & operating supplies	167,427	233,566	265,300
Fuel	4,735	3,743	7,000
Small tools & equipment	17,730	12,240	35,229
Professional services	62,115	34,455	236,027
Communications	3,445	6,691	7,000
Travel	571	1,423	3,500
Operating rentals & leases	1,282	1,828	3,000
Public utility services	10,572	8,184	10,000
Utilities - sludge disposal	111,500	84,077	135,000
Utilities - electrical	131,486	138,630	180,000
Utilities - garbage	11,185	10,003	11,000
Repairs & maintenance	14,011	33,209	90,500
Miscellaneous	10,611	11,766	7,000
Conference/training	136	1,132	6,000
External taxes & assessments	56,817	77,333	73,516
Subtotal Operations - Treatment Plant	**1,100,581**	**1,199,874**	**1,810,622**
Inspection			
Regular salaries	12,626	13,109	19,900
Overtime	2,354	1,018	1,000
Personnel benefits	6,208	6,455	8,000
Subtotal Inspection	**21,188**	**20,582**	**28,900**
Capital Projects			
Machinery & equipment	5,815		340,000
Subtotal Capital Projects	**5,815**	**0**	**340,000**
TOTAL OPERATING EXPENSES	**2,354,420**	**2,553,327**	**3,814,419**

Table 8-4. Net Income from Operations (2015 – 2018)

Operating Cash Flows	2015	2016	2017 Dept Req
Total revenues from Table 8-2	4,269,331	4,717,028	5,036,242
Total Expenses from Table 8-3	-2,354,420	-2,553,327	-3,814,419
Net Income from Operations	1,914,911	2,163,701	1,221,823

8.4. Financial Assessment of Existing Operations

As shown in Table 8-4, the wastewater utility and existing monthly rates have been sufficient to fund ongoing operations over the past four years. However, the City also funds annual debt payments from rate revenues and therefore the annual debt load must be considered when assessing the performance and adequacy of existing rates. Prior to 2018, the wastewater utility had annual debt payments of approximately $1.8M a year. As indicated in Table 8-4, revenues from existing rates were sufficient to fund operating expenses as well as debt payment in 2015 and 2016 but were not sufficient in 2017 to fund all debt payments. However, in comparing operating expenses in 2016 and 2017, several expenses in 2017 (e.g. professional services and repair and maintenance) were atypically large and are not expected to continue at that level. In the 2014 rate study, the City implemented a series of wastewater rate increases through the year 2020 specifically to address the utility's ability to repay annual debt. These planned rate increases are expected to completely offset future debt payments by the year 2018.

8.5. Projected Operating Cash Flows

A projection of future operating revenues and expenses is required to analyze whether additional rate increases will be required to fund future operations. Table 8-6 and Table 8-7 present a forecast of future revenues and expenses based on historical cash flows from Table 8-2 and Table 8-3, discussions with staff, and annual inflationary/forecast factors. Inflationary factors include such items as general inflation, annual cost of living adjustments (COLAs), and annual increases in benefit costs (Benefits). Forecast factors are variables such as the State's excise tax rate on sewer revenues and the interest-earning rate on deposited cash. The inflationary/forecast factors listed in Table 8-5 are annual and are applied to appropriate revenues and expenses to forecast future cash flows from operations. The sewer excise tax rate listed in Table 8-5 of 1.73% reflects the combined rate paid by the City considering the percentage of revenue taxed at the collections rate of 3.852% and the amount of revenues taxed at the treatment and transmission rate of 1.5% as allowed by RCW.

The projection of future operating expenses also includes the addition of two new maintenance personnel. One Full time equivalent (FTE) employee is added in 2019 and an additional FTE is added in 2021. Both new costs are recorded under the heading New Operations Employees under the group titled Admin- Public Works.

Customer growth is also required to project future operating revenues and expenses. Growth increases revenues from rates as well as marginally increasing some expenses such as pumping costs. In consultation with City staff, this analysis uses an annual growth of 3% per year for the years 2018 through 2021 and 1% a year from 2022 through 2027. Growth is only predicted to occur in the residential and commercial classes but not in either the City or County governmental classes (including the department of corrections).

Since the City pays debt payments from operating revenues, this analysis includes projected annual debt payments as operating expenses. Table 8-8 lists scheduled debt payments for the wastewater utility through the year 2027. Based on the financial projection documented herein, the City is not expected to issue any additional debt through the year 2027. Table 8-8 includes two items that show positive annual payments. These are payment associated with Build America Bonds (BABs) credits that offset annual debt payments.

The City's financial strategy leverages the fact that future debt levels will decrease by more than $400K in 2021 and an additional $300K by 2026. The combined impact of decreasing the burden on rate revenues by over $700K is equivalent to implementing a 15% rate increase. The wastewater utility does have a balloon payment that results in a spike in debt costs in 2025 but it is one time only.

Table 8-5. Annual Inflationary/Forecast Factors

Forecast Factors	Annual Increase
Interest Earnings Rate	1.00%
COLA	3.00%
Benefits	4.00%
Inflation	2.50%
Electricity	5.00%
State Sewer Excise Tax	1.73%

8.6. Capital Cash Flows

Capital revenues and expenses need to be incorporated into the budget forecast to provide a complete economic outlook and assess the ability of monthly rates to fund future operations and construct capital improvements. Capital revenues include funds generated from general facility charges, earned interest income from cash deposits, and proceeds from any new loans. Capital expenses include the capital improvement costs as identified in Chapter 7 as well as scheduled debt payments.

Table 8-9 lists projected capital revenues. General facility charge revenues (GFCs) are one-time payments made by new customers connecting to the wastewater system and are based on the City's existing GFC fee of $9,640 per equivalent residential connection. Projected GFC revenue is based on the current GFC fee of $9,640 per ERU multiplied by approximately 200 new ERUs per year from 2018 through 2021 and 80 new ERUs from 2022 through 2027. Earned interest income is based on an interest rate of 1.0% annual return and is projected based on estimated cash reserve balances that are listed in Table 8-10.

Annual capital expenses are summarized in Table 8-10 and the annual capital costs listed are as detailed in Table 7-2 in Chapter 7.

8.7. Summary

A comprehensive picture of the future of the wastewater utility's financial outlook can now be created based on the cash flows in Table 8-6, Table 8-7, Table 8-8, and Table 8-9. Table 8-10 shows a summary projection of all cash flows and cash reserves. As indicated by Table 8-10, the City can fund operations and all planned capital costs through the year 2027 with the currently adopted rate increases in 2019 and 2020. All capital projects can be funded from a combination of net revenue from operations and capital revenue from general facility charges and the City will not need to issue any additional debt or increase monthly rates other than the increases already enacted by ordinance for 2019 and 2020. Additionally, the forecast indicates that even with the cash funding of all capital improvements the wastewater utility will increase cash reserves from a current level of $2.19M in 2018 to almost $12.4M by the end of 2027.

It is important that the City monitor growth because revenues from general facility charges are a significant source of funds needed to pay for the planned capital improvements.

City staff, over many years, planned for the completed treatment plant and outfall improvements. These facilities often impact heavily on rates due to their high capital costs. Over the last ten years annual rate increases were implemented as well as raises to the general facility charge to offset increasing costs and debt levels. By plan, these rate increases were minimized by taking advantage of the retirement of debt in 2021 and 2026 that will cumulatively decrease annual debt payments by over $700K a year (the equivalence of implementing a 15% rate increase).

Table 8-6. Projected Operating Revenues

Operating Revenues	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Sewer State utilities tax	207,000	220,700	233,000	243,700	250,700	257,900	265,300	272,900	280,700	288,800
Inspection fees - House Stub	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Inspection fees - Step Sys	100	100	100	100	100	100	100	100	100	100
Sewer svc. - city residential	2,432,400	2,605,600	2,764,300	2,904,200	2,991,900	3,082,300	3,175,300	3,271,200	3,370,000	3,471,800
Sewer svc. - city commercial	1,602,100	1,716,100	1,820,600	1,912,800	1,970,500	2,030,000	2,091,300	2,154,500	2,219,600	2,286,600
Sewer svc. - city governmental	72,200	75,100	77,300	78,900	80,500	82,100	83,700	85,400	87,100	88,800
Sewer svc. - county residential	434,000	464,900	493,300	518,200	533,900	550,000	566,600	583,700	601,300	619,500
Sewer svc. - county commercial	33,600	36,000	38,200	40,100	41,300	42,500	43,800	45,200	46,500	47,900
Sewer svc. - county governmental	798,800	830,800	855,700	872,800	890,200	908,100	926,200	944,700	963,600	982,900
Late penalties	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Other gov't revenues	500	500	500	500	500	500	500	500	500	500
TOTAL REVENUES	**5,586,700**	**5,955,800**	**6,289,000**	**6,577,300**	**6,765,600**	**6,959,500**	**7,158,800**	**7,364,200**	**7,575,400**	**7,792,900**

Table 8-7. Projected Operating Expenses

Operating Expenditures	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Admin - Public Works										
Regular salaries	175,900	181,200	186,600	192,200	198,000	203,900	210,000	216,300	222,800	229,500
Overtime	2,000	2,100	2,100	2,200	2,300	2,300	2,400	2,500	2,500	2,600
Personnel benefits	86,100	88,700	91,300	94,100	96,900	99,800	102,800	105,900	109,100	112,300
New Personnel for operations	-	92,700	111,400	196,700	202,600	208,700	214,900	221,400	228,000	234,900
Small tools & equipment	-	-	-	-	-	-	-	-	-	-
Professional services	-	-	-	-	-	-	-	-	-	-
Water quality study	-	-	-	-	-	-	-	-	-	-
Comprehensive sewer plan	-	-	-	-	-	-	-	-	-	-
Engineering study - wwtp capacity study	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-	-
SUBTOTAL ADMIN - PUBLIC WORKS	**264,000**	**364,700**	**391,400**	**485,200**	**499,800**	**514,700**	**530,100**	**546,100**	**562,400**	**579,300**
Administration - General										
Regular salaries	166,000	171,000	176,100	181,400	186,800	192,400	198,200	204,200	210,300	216,600
Overtime	200	200	200	200	200	200	200	200	300	300
Personnel benefits	68,400	70,500	72,600	74,700	77,000	79,300	81,700	84,100	86,600	89,200
Office & operating supplies	2,000	2,100	2,100	2,200	2,200	2,300	2,300	2,400	2,400	2,500
Small tools & equipment	4,000	4,100	4,200	4,300	4,400	4,500	4,600	4,800	4,900	5,000
Professional services	10,000	10,300	10,500	10,800	11,000	11,300	11,600	11,900	12,200	12,500
Engineering	-	-	-	-	-	-	-	-	-	-
Legal fees	6,000	6,200	6,300	6,500	6,600	6,800	7,000	7,100	7,300	7,500
Communications	25,000	25,600	26,300	26,900	27,600	28,300	29,000	29,700	30,500	31,200
Travel	5,000	5,100	5,300	5,400	5,500	5,700	5,800	5,900	6,100	6,200
Advertising	500	500	500	500	600	600	600	600	600	600
Operating rentals & leases	3,200	3,300	3,400	3,400	3,500	3,600	3,700	3,800	3,900	4,000
Insurance	217,900	223,300	228,900	234,700	240,500	246,500	252,700	259,000	265,500	272,100
Public utility services	2,000	2,100	2,200	2,300	2,400	2,600	2,700	2,800	3,000	3,100
Repairs & maintenance	-	-	-	-	-	-	-	-	-	-
Miscellaneous	15,000	15,400	15,800	16,200	16,600	17,000	17,400	17,800	18,300	18,700
Training	2,000	2,100	2,100	2,200	2,200	2,300	2,300	2,400	2,400	2,500
SUBTOTAL ADMINISTRATION - GENERAL	**527,200**	**541,800**	**556,500**	**571,700**	**587,100**	**603,400**	**619,800**	**636,700**	**654,300**	**672,000**
Maint. & Opns. - Collection										

Table 8-7. Projected Operating Expenses

Operating Expenditures	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Regular salaries	128,400	132,300	136,200	140,300	144,500	148,900	153,300	157,900	162,700	167,500
Overtime	10,000	10,300	10,600	10,900	11,300	11,600	11,900	12,300	12,700	13,000
Personnel benefits	69,900	72,000	74,200	76,400	78,700	81,000	83,500	86,000	88,500	91,200
Office & operating supplies	138,000	141,500	145,000	148,600	152,300	156,100	160,000	164,000	168,100	172,300
Fuel	7,500	7,700	7,900	8,100	8,300	8,500	8,700	8,900	9,100	9,400
Small tools & equipment	6,200	6,400	6,500	6,700	6,800	7,000	7,200	7,400	7,600	7,700
Professional services	131,000	134,300	137,600	141,100	144,600	148,200	151,900	155,700	159,600	163,600
Video inspection	30,000	30,800	31,500	32,300	33,100	33,900	34,800	35,700	36,600	37,500
Communications	30,300	31,100	31,800	32,600	33,400	34,300	35,100	36,000	36,900	37,800
Advertising	-	-	-	-	-	-	-	-	-	-
Operating rentals & leases	5,000	5,100	5,300	5,400	5,500	5,700	5,800	5,900	6,100	6,200
Public utility services	8,200	8,900	9,600	10,400	11,100	11,700	12,400	13,200	14,000	14,800
Electric - pump stations	33,000	35,600	38,600	41,700	44,200	46,900	49,700	52,700	55,900	59,300
Repairs & maintenance	210,000	215,300	220,600	226,100	231,800	237,600	243,500	249,600	255,900	262,300
Sewer line breaks	25,000	25,600	26,300	26,900	27,600	28,300	29,000	29,700	30,500	31,200
Miscellaneous	2,000	2,100	2,100	2,200	2,200	2,300	2,300	2,400	2,400	2,500
SUBTOTAL MAINT. & OPNS. - COLLECTION	**834,500**	**859,000**	**883,800**	**909,700**	**935,400**	**962,000**	**989,100**	**1,017,400**	**1,046,600**	**1,076,300**
Cust Svc - Billing/Accounting										
Regular salaries	22,400	23,100	23,800	24,500	25,200	26,000	26,700	27,500	28,400	29,200
Overtime	-	-	-	-	-	-	-	-	-	-
Personnel benefits	8,800	9,100	9,300	9,600	9,900	10,200	10,500	10,800	11,100	11,500
Office & operating supplies	-	-	-	-	-	-	-	-	-	-
Small tools & equipment	-	-	-	-	-	-	-	-	-	-
Communications	-	-	-	-	-	-	-	-	-	-
Operating rentals & leases	-	-	-	-	-	-	-	-	-	-
SUBTOTAL CUST SVC - BILLING/ACCOUNTING	**31,200**	**32,200**	**33,100**	**34,100**	**35,100**	**36,200**	**37,200**	**38,300**	**39,500**	**40,700**
Operations - Treatment Plant										
Regular salaries	502,200	517,300	532,800	548,800	565,200	582,200	599,700	617,600	636,200	655,300
Overtime	10,000	10,300	10,600	10,900	11,300	11,600	11,900	12,300	12,700	13,000
Personnel benefits	245,300	252,700	260,200	268,000	276,100	284,400	292,900	301,700	310,700	320,100
Uniforms	2,300	2,400	2,400	2,500	2,500	2,600	2,700	2,700	2,800	2,900
Office & operating supplies	262,800	269,400	276,100	283,000	290,100	297,300	304,800	312,400	320,200	328,200
Fuel	7,000	7,200	7,400	7,500	7,700	7,900	8,100	8,300	8,500	8,700
Small tools & equipment	8,700	8,900	9,100	9,400	9,600	9,800	10,100	10,300	10,600	10,900
Professional services	182,000	186,600	191,200	196,000	200,900	205,900	211,100	216,300	221,700	227,300

Table 8-7. Projected Operating Expenses

Operating Expenditures	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Communications	7,000	7,200	7,400	7,500	7,700	7,900	8,100	8,300	8,500	8,700
Travel	3,500	3,600	3,700	3,800	3,900	4,000	4,100	4,200	4,300	4,400
Operating rentals & leases	3,000	3,100	3,200	3,200	3,300	3,400	3,500	3,600	3,700	3,700
Public utility services	10,300	11,100	12,000	13,000	13,800	14,700	15,500	16,500	17,500	18,500
Utilities - sludge disposal	139,100	150,400	162,600	175,900	186,500	197,800	209,800	222,500	235,900	250,200
Utilities - electrical	185,400	200,500	216,900	234,500	248,700	263,800	279,700	296,600	314,600	333,600
Utilities - garbage	11,000	11,300	11,600	11,800	12,100	12,400	12,800	13,100	13,400	13,700
Repairs & maintenance	73,500	75,300	77,200	79,200	81,100	83,200	85,200	87,400	89,600	91,800
Miscellaneous	7,000	7,200	7,400	7,500	7,700	7,900	8,100	8,300	8,500	8,700
Conference/training	6,000	6,200	6,300	6,500	6,600	6,800	7,000	7,100	7,300	7,500
External taxes & assessments	93,000	99,100	104,700	109,500	112,600	115,800	119,100	122,600	126,100	129,700
SUBTOTAL OPERATIONS - TREATMENT PLANT	**1,759,100**	**1,829,800**	**1,902,800**	**1,978,500**	**2,047,400**	**2,119,400**	**2,194,200**	**2,271,800**	**2,352,800**	**2,436,900**
Inspection										
Regular salaries	20,100	20,700	21,300	22,000	22,600	23,300	24,000	24,700	25,500	26,200
Overtime	1,000	1,000	1,100	1,100	1,100	1,200	1,200	1,200	1,300	1,300
Personnel benefits	8,300	8,500	8,800	9,100	9,300	9,600	9,900	10,200	10,500	10,800
SUBTOTAL INSPECTION	**29,400**	**30,200**	**31,200**	**32,200**	**33,000**	**34,100**	**35,100**	**36,100**	**37,300**	**38,300**
Capital Projects										
Machinery & equipment	20,000	20,500	21,000	21,500	22,100	22,600	23,200	23,800	24,400	25,000
SUBTOTAL CAPITAL PROJECTS	**20,000**	**20,500**	**21,000**	**21,500**	**22,100**	**22,600**	**23,200**	**23,800**	**24,400**	**25,000**
TOTAL O&M EXPENSES	**3,465,400**	**3,678,200**	**3,819,800**	**4,032,900**	**4,159,900**	**4,292,400**	**4,428,700**	**4,570,200**	**4,717,300**	**4,868,500**

Table 8-8. Projected Debt Payments

Annual Debt Payments	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
2008 PWTF Loan (Outfall)	-558,500	-555,900	-553,200	-550,600	-547,900	-545,300	-542,600	-540,000	-537,400	-534,700
2010 W/S Revenue Bonds	-357,800	-355,600	-349,500	-346,100	-342,100	-337,400	-335,400	-329,100	-84,300	-84,300
2010B W/S Revenue Bonds	-324,200	-324,200	-744,200	-304,100	-304,100	-304,100	-304,100	-2,644,100	-174,200	-174,200
2010C W/S Revenue Bonds	-423,100	-422,300	0	0	0	0	0	0	0	0
2010 BAB Credits	58,800	55,600	52,300	48,700	44,900	40,800	36,500	31,900	29,500	29,500
2010B BAB Credits	113,500	113,500	113,500	106,400	106,400	106,400	106,400	106,400	61,000	61,000
2012 PWTF WWTP-Phase 2 (100% sewer)	-286,300	-285,600	-284,900	-284,200	-283,500	-282,800	-282,100	-281,400	-280,700	-280,000
2017 W/S Revenue Bonds (69% sewer, 31% water)	-318,500	-318,700	-320,600	-315,500	-317,200	-318,700	-316,600	-315,900	-318,400	-317,000
Total	**-2,096,100**	**-2,093,200**	**-2,086,600**	**-1,645,400**	**-1,643,500**	**-1,641,100**	**-1,637,900**	**-3,972,200**	**-1,304,500**	**-1,299,700**

Table 8-9. Capital Revenues

Capital Revenues	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
GFC revenue	1,928,000	2,024,400	2,120,800	2,120,800	771,200	771,200	771,200	771,200	771,200	771,200
CIAC	104,000	-	-	-	-	-	-	-	-	-
Earned Interest Income	26,800	40,200	47,600	61,700	84,100	96,800	104,700	105,300	102,700	113,200
Total Capital Revenues	**2,058,800**	**2,064,600**	**2,168,400**	**2,182,500**	**855,300**	**868,000**	**875,900**	**876,500**	**873,900**	**884,400**

Table 8-10. Summary of Wastewater Utility Cash Flows & Cash Reserves

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Annual Rate Increase	4%	4%	3%	2%	2%	2%	2%	2%	2%	2%
Operational Summary										
(+) Total Operating Revenues	5,586,700	5,955,800	6,289,000	6,577,300	6,765,600	6,959,500	7,158,800	7,364,200	7,575,400	7,792,900
(-) Total Operation & Maintenance	-3,465,400	-3,678,200	-3,819,800	-4,032,900	-4,159,900	-4,292,400	-4,428,700	-4,570,200	-4,717,300	-4,868,500
(-) Total Debt	-2,096,100	-2,093,200	-2,086,600	-1,645,400	-1,643,500	-1,641,100	-1,637,900	-3,972,200	-1,304,500	-1,299,700
Net Revenue	**25,200**	**184,400**	**382,600**	**899,000**	**962,200**	**1,026,000**	**1,092,200**	**-1,178,200**	**1,553,600**	**1,624,700**
Capital Summary										
Start of Year Cash	2,190,000	3,175,000	4,857,000	4,669,900	7,663,400	9,156,800	10,211,800	10,731,900	10,331,200	10,207,600
(+) Connection Charges & Interest Inc.	1,954,800	2,064,600	2,168,400	2,182,500	855,300	868,000	875,900	876,500	873,900	884,400
(+) Transfer from Operations	25,200	184,400	382,600	899,000	962,200	1,026,000	1,092,200	-	1,553,600	1,624,700
(+) Total Loan Funds	-	-	-	-	-	-	-	-	-	-
(+) Total CIAC Funds	104,000	-	-	-	-	-	-	-	-	-
(-) Total Capital Expenses	(1,099,000)	(567,000)	(2,738,100)	(88,000)	(324,100)	(839,000)	(1,448,000)	(99,000)	(2,551,100)	(288,000)
(-) Transfer to Operations	-	-	-	-	-	-	-	(1,178,200)	-	-
Net Capital Revenue	985,000	1,682,000	(187,100)	2,993,500	1,493,400	1,055,000	520,100	(400,700)	(123,600)	2,221,100
End of Year Cash	**3,175,000**	**4,857,000**	**4,669,900**	**7,663,400**	**9,156,800**	**10,211,800**	**10,731,900**	**10,331,200**	**10,207,600**	**12,428,700**

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Appendix A. SEPA Checklist

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GIG HARBOR
"THE MARITIME CITY"

DEVELOPMENT SERVICES

Determination of Nonsignificance (DNS)
W.A.C. 197-11-970

Environmental Review Application No.: PL-SEPA-17-0001, PL-SEPA-17-0009, PL-SEPA-17-0010.

Parcel Numbers: See individual proposals for applicable parcel numbers

Action: 2016 Annual Comprehensive Plan Amendments

INDIVIDUAL PROPOSALS

1. PL-SEPA-17-0001: 2017 Comprehensive Plan Amendments. Review and update of the multiple Comprehensive Plan elements to address requested amendments from PSRC regarding consistency with VISION2040 and updates under the Growth Management Act. A complete update the Transportation Element and adoption of the City of Gig Harbor Active Transportation Plan.
Location: City Wide

Proponent: City of Gig Harbor, 3510 Grandview Street, Gig Harbor, WA 98335

2. PL-SEPA-17-0009: Water, Wastewater and Storm Systems Functional Plan Updates. Six-year update to the City's functional plans for the water, wastewater and storm system, including updates to the City's Capital Facilities Element to ensure consistency as required under state law.
Location: City wide – Proposal is not site-specific

Proponent: City of Gig Harbor, 3510 Grandview Street, Gig Harbor, WA 98335

3. PL-SEPA-17-0010: Henderson Comprehensive Plan Amendment and associated Development Agreement. Private application requesting a land use map amendment from Residential Low to Residential High Transition. Additionally, the applicant has requested a concurrent development agreement to shift additional density to the site requesting the land use map amendment from adjacent properties.

Location: 6014 and 6016 Woodhill Drive NW, Gig Harbor WA 98332 (Tax

ID Nos. 0122258002, 0122258003, 0122254011, 0122254011)

Proponent: Henderson Burnham LLC, 11126 Vipond Drive NW, Gig Harbor WA 98332

Lead Agency: City of Gig Harbor
The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public upon request.

[x] This DNS is issued under WAC 197-11-340(2); **Comments must be submitted by September 3, 2018**.

Any interested person may appeal the adequacy of this SEPA Threshold Determination to the Gig Harbor City Council pursuant to the procedures set forth under Chapter 18.04 of the Gig Harbor Municipal Code if a written request for appeal is received within 7 days after the end of the comment period, or September 10, 2018, whichever is later. The written appeal must be submitted with a filing fee of three hundred dollars ($300.00).

Contact: Lindsey Sehmel, Senior Planner; Phone: (253) 851-6170

Responsible Official: Jennifer Kester
Position Title: Planning Director Phone: (253) 851-6170

Address: City of Gig Harbor
3510 Grandview Street
Gig Harbor, WA 98335

Signature ______________________ Date: July 5, 2018

cc: Proponents

NOTICE OF DETERMINATION OF NONSIGNIFICANCE

The City of Gig Harbor issued a Determination of Nonsignificance (DNS) under the State Environmental Policy Act Rules (Chapter 197-11-WAC) for the following comprehensive plan amendments:

1. **PL-SEPA-17-0001: 2017 Comprehensive Plan Amendments.** Review and update of the multiple Comprehensive Plan elements to address requested amendments from PSRC regarding consistency with VISION2040 and updates under the Growth Management Act. A complete update the Transportation Element and adoption of the City of Gig Harbor Active Transportation Plan.

2. **PL-SEPA-17-0009: Water, Wastewater and Storm Systems Functional Plan Updates.** Six-year update to the City's functional plans for the water, wastewater and storm system, including updates to the City's Capital Facilities Element to ensure consistency as required under state law.

3. **PL-SEPA-17-0010: Henderson Comprehensive Plan Amendment and associated Development Agreement.** Private application requesting a land use map amendment from Residential Low to Residential High Transition. Additionally, the applicant has requested a concurrent development agreement to shift additional density to the site requesting the land use map amendment from adjacent properties.

After review of the completed environmental checklists and other information on file with the agency, the City of Gig Harbor has determined the above proposal will not have a probable significant adverse impact on the environment.

Copies of the DNS are available at no charge from the City of Gig Harbor Planning Department, 3510 Grandview Street, Gig Harbor, WA 98335. Telephone: (253) 851-6170.

Two public hearings on the proposed comprehensive plan amendments is tentatively scheduled before the City of Gig Harbor Planning Commission on Thursday July 19· 2018 at 6 p.m. and with the City of Gig Harbor City Council on September 24, 2018 at 5:30 p.m. in the Gig Harbor Civic Center Council Chambers located at 3510 Grandview Street. The public is invited to comment on this DNS at the public hearing, or by submitting written comments to the above address no later than **September 3, 2018**. This DNS does not become final until the end of the comment period. The deadline for appealing the final SEPA Threshold Determination is **September 10, 2018**.

Publish – Legal Notice - Peninsula Gateway – July 5, 2018

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Appendix B. Wastewater System Map

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GIG HARBOR
"THE MARITIME CITY"

City of Gig Harbor

Sewer System Map

Updated August 4, 2017

HDR

LEGEND

Sewer Force Main
- 1.5-in
- 2-in
- 4-in
- 6-in
- 8-in
- 10-in
- 24-in
- Future

Gravity Sewer
- Unknown
- 6-in
- 8-in
- 10-in
- 12-in
- 15-in
- 18-in
- 24-in

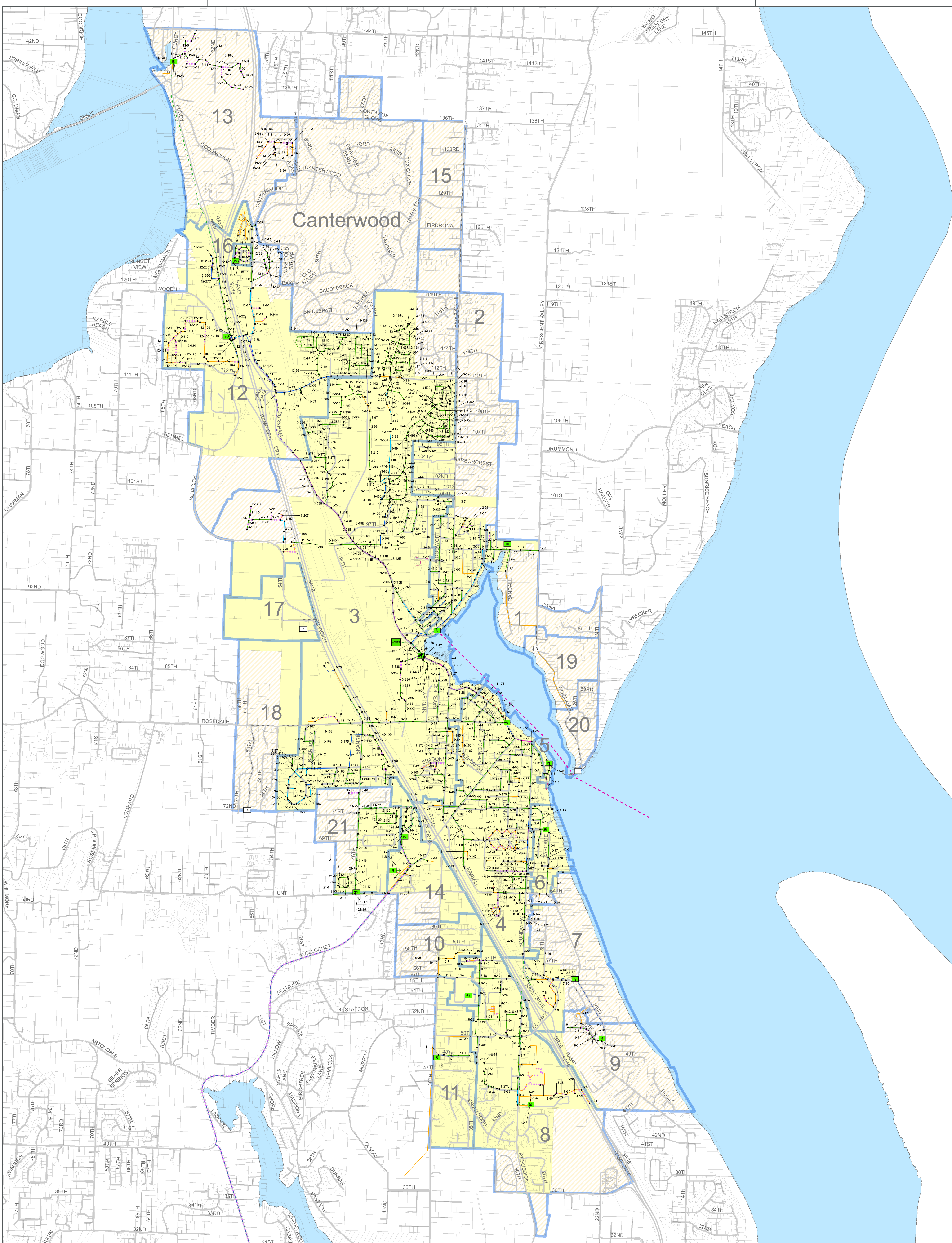
- Future Gravity Sewer
- Private Sewer

Gravity Dry Sewer
- 8-in
- Unknown

- Sewer Manhole 1-1
- WWTP
- Existing Lift Station
- Future Lift Station
- Tax Parcel
- Road
- Wastewater Basin
- Water Body
- City of Gig Harbor
- Urban Growth Area

N

0 0.25 0.5 1
Miles



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Appendix C. Capital Improvement Program Project Descriptions and Details

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City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-1	Project Title:	LS 1 Improvements	Staff Preferred Priorities (by project grouping):	1

Identified Need or Deficiency Project will Address: Capacity & Age/Condition

Project Description:	Lift station will not be replaced; submersible pumps will be installed in existing wetwell, and existing generator will remain	Project Justification:	Pumps within the station are in poor condition, reaching the end of their useful service life and need to be replaced

Lift Station Pump Design Flow:	85 gpm	Lift Station Pump Design Head:	60 feet	Forcemain Diameter:	4 inches

Estimated Total Project Cost (2018 dollars):	105,000	Annual Inflation Factor:	N/A
Year Scheduled for Implementation:	2018	Estimated Total Project Cost at Year of Implementation:	105,000
Cost Estimate Basis:	Cost estimate prepared	Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	100%	Future Customers:	0%	Developer:	

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 1					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$7,300		$7,300
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$17,300		$17,300
Structural	1	LS	$0		$0
Mechanical	1	LS	$31,400		$31,400
Construction Subtotal					**$56,000**
Construction Contingency			30%	$	16,800
Construction Engineering			10%	$	5,600
Sales Tax			9%	$	4,928
Subtotal				$	83,328
Estimated Construction Cost				$	84,000
Design Engineering			15%	$	12,600
Administration			5%	$	4,200
Legal & Financial			5%	$	4,200
Subtotal				$	21,000
Estimated Design/Engineering Cost				$	21,000
Estimated Total Project Cost				**$**	**105,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR "THE MARITIME CITY"

Project ID:	WWLSFM-6	Project Title:	LS 6 Improvements	Staff Preferred Priorities (by project grouping):	1b

Identified Need or Deficiency Project will Address: Age/Condition

Project Description:	Submersible pumps will be replaced within the lift station and a dry primed pump will be added	Project Justification:	Pumps within the station are reaching the end of its useful service life, and needs to be replaced

Lift Station Pump Design Flow:	30 gpm	Lift Station Pump Design Head:	85 feet	Forcemain Diameter:	4"

Estimated Total Project Cost (2018 dollars):	1,172,778	Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2020	Estimated Total Project Cost at Year of Implementation:	1,240,000
Cost Estimate Basis:	Cost estimate prepared	Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	86%	Future Customers:	14%	Developer:	

Date: 10/27/08
Version 1

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Lift Station 6				
Item	**Qty**	**Units**	**Unit Cost**	**Extended Amount**
Mobilization/Demobilization	1	LS	$90,800	$90,800
Demolition	1	LS	$27,000	$27,000
Site Work	1	LS	$29,000	$29,000
Structural	1	LS	$59,700	$59,700
Concrete	1	LS	$75,500	$75,500
Miscellaneous Metals	1	LS	$13,000	$13,000
Piping and Valving	1	LS	$116,032	$116,032
Odor Control	1	LS	$129,145	$129,145
HVAC	1	LS	$12,914	$12,914
Electrical	1	LS	$19,868	$19,868
I&C	1	LS	$123,184	$123,184
			Construction Subtotal	**$696,143**
		Construction Contingency	30%	$ 208,843
		Construction Engineering	10%	$ 69,614
		Sales Tax	9%	$ 61,261
			Subtotal	$ 1,035,861
			Estimated Construction Cost	$ 1,036,000
		Design Engineering	10.6%	$ 110,023
		Administration	1.3%	$ 12,950
		Legal & Financial	1.3%	$ 12,950
			Subtotal	$ 135,923
			Estimated Design/Engineering Cost	$ 136,000
			Estimated Total Project Cost	**$ 1,172,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWLSFM-8

Project Title: LS 8 Improvements

Staff Preferred Priorities (by project grouping): 3

Identified Need or Deficiency Project will Address: Undersized well

Project Description: submersible pumps. A dri-prime diesel pump was installed in 2013 to replace the generator. minor upgrades were made to piping and valving to maintain

Project Justification: Pumps within the station are reaching the end of its useful service life, and needs to be replaced

Lift Station Pump Design Flow: 400 gpm

Lift Station Pump Design Head: 110 feet

Forcemain Diameter: 6"

Estimated Total Project Cost (2018 dollars): 972,133

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2024

Estimated Total Project Cost at Year of Implementation: 1,126,000

Cost Estimate Basis: Cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 99%

Future Customers: 1%

Developer:

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 8					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$2,000		$2,000
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$4,100		$4,100
Structural	1	LS	$0		$0
Mechanical	1	LS	$9,300		$9,300
			Construction Subtotal		**$15,400**
Construction Contingency			30%	$	4,620
Construction Engineering			10%	$	1,540
Sales Tax			9%	$	1,355
			Subtotal	$	22,915
			Estimated Construction Cost	$	23,000
Design Engineering			15%	$	3,450
Administration			5%	$	1,150
Legal & Financial			5%	$	1,150
			Subtotal	$	5,750
			Estimated Design/Engineering Cost	$	6,000
			Estimated Total Project Cost	**$**	**29,000**

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Future Lift Station 8A					
Item	**Qty**	**Units**	**Unit Cost**	**Extended Amount**	
Mobilization/Demobilization	1	LS	$66,000		$66,000
Site/Civil	1	LS	$60,400		$60,400
Electrical/Instrumentation	1	LS	$135,300		$135,300
Structural	1	LS	$108,400		$108,400
Mechanical	1	LS	$136,200		$136,200
			Construction Subtotal		**$506,300**
	Construction Contingency		30%	$	151,890
	Construction Engineering		10%	$	50,630
	Sales Tax		9%	$	44,554
			Subtotal	$	753,374
			Estimated Construction Cost	$	754,000
	Design Engineering		15%	$	113,100
	Administration		5%	$	37,700
	Legal & Financial		5%	$	37,700
			Subtotal	$	188,500
			Estimated Design/Engineering Cost	$	189,000
			Estimated Total Project Cost	**$**	**943,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWLSFM-9

Project Title: LS 9 Improvements

Staff Preferred Priorities (by project grouping): 2

Identified Need or Deficiency Project will Address: Age/Condition

Project Description: Submersible pumps will be replaced within the lift station and a dry primed pump will be added

Project Justification: Development driven due to increase in flow

Lift Station Pump Design Flow: 50 gpm

Lift Station Pump Design Head: 25 feet

Forcemain Diameter: N/A

Estimated Total Project Cost (2018 dollars): 400,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2018

Estimated Total Project Cost at Year of Implementation: 400,000

Cost Estimate Basis: N/A

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 69%

Future Customers: 31%

Developer:

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 9					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$28,000		$28,000
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$66,800		$66,800
Structural	1	LS	$0		$0
Mechanical	1	LS	$119,900		$119,900
			Construction Subtotal		**$214,700**
Construction Contingency			30%	$	64,410
Construction Engineering			10%	$	21,470
Sales Tax			9%	$	18,894
			Subtotal	$	319,474
			Estimated Construction Cost	$	320,000
Design Engineering			15%	$	48,000
Administration			5%	$	16,000
Legal & Financial			5%	$	16,000
			Subtotal	$	80,000
			Estimated Design/Engineering Cost	$	80,000
			Estimated Total Project Cost	**$**	**400,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-10
Project Title:	LS 10 Improvements
Staff Preferred Priorities (by project grouping):	11
Identified Need or Deficiency Project will Address:	Location
Project Description:	To be located to a more regional location to support growth within the basin
Project Justification:	Station location does not support local growth
Lift Station Pump Design Flow:	60 gpm
Lift Station Pump Design Head:	40 feet
Forcemain Diameter:	4"
Estimated Total Project Cost (2018 dollars):	N/A
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	N/A
Estimated Total Project Cost at Year of Implementation:	N/A
Cost Estimate Basis:	N/A
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	Future Customers:	Developer:
5%		95%

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 10					
Item	**Qty**	**Units**	**Unit Cost**	**Extended Amount**	
Mobilization/Demobilization	1	LS	$6,300		$6,300
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$15,000		$15,000
Structural	1	LS	$0		$0
Mechanical	1	LS	$27,500		$27,500
			Construction Subtotal		**$48,800**
	Construction Contingency		30%	$	14,640
	Construction Engineering		10%	$	4,880
	Sales Tax		9%	$	4,294
			Subtotal	$	72,614
			Estimated Construction Cost	$	73,000
	Design Engineering		15%	$	10,950
	Administration		5%	$	3,650
	Legal & Financial		5%	$	3,650
			Subtotal	$	18,250
			Estimated Design/Engineering Cost	$	19,000
			Estimated Total Project Cost	**$**	**92,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWLSFM-11

Project Title: LS 11 Improvements

Staff Preferred Priorities (by project grouping): 14

Identified Need or Deficiency Project will Address: Age/Condition

Project Description: Submersible pumps will be replaced within the lift station and a dry primed pump will be added

Project Justification: Pumps within the station are reaching the end of its useful service life, and needs to be replaced

Lift Station Pump Design Flow: 50 gpm

Lift Station Pump Design Head: 75 feet

Forcemain Diameter: 4"

Estimated Total Project Cost (2018 dollars): 92,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2027

Estimated Total Project Cost at Year of Implementation: 117,000

Cost Estimate Basis: Cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 100%

Future Customers:

Developer:

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 11					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$6,200		$6,200
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$14,700		$14,700
Structural	1	LS	$0		$0
Mechanical	1	LS	$26,900		$26,900
			Construction Subtotal		**$47,800**
Construction Contingency			30%	$	14,340
Construction Engineering			10%	$	4,780
Sales Tax			9%	$	4,206
			Subtotal	$	71,126
			Estimated Construction Cost	$	72,000
Design Engineering			15%	$	10,800
Administration			5%	$	3,600
Legal & Financial			5%	$	3,600
			Subtotal	$	18,000
			Estimated Design/Engineering Cost	$	18,000
			Estimated Total Project Cost	**$**	**90,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-12
Project Title:	LS 12 Improvements
Staff Preferred Priorities (by project grouping):	6
Identified Need or Deficiency Project will Address:	Capacity & Age/Condition
Project Description:	Dry pit will be replaced using existing wetwell with addition of submersible pumps. Back up generation is likely to remain due to high discharge head
Project Justification:	Pumps within the station are reaching the end of its useful service life, and needs to be replaced
Lift Station Pump Design Flow:	1,010 gpm
Lift Station Pump Design Head:	120 feet
Forcemain Diameter:	6"
Estimated Total Project Cost (2018 dollars):	1,413,874
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2020
Estimated Total Project Cost at Year of Implementation:	1,500,000
Cost Estimate Basis:	Cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	48%
Future Customers:	52%
Developer:	

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 12					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$99,100		$99,100
Site/Civil	1	LS	$79,500		$79,500
Electrical/Instrumentation	1	LS	$212,000		$212,000
Structural	1	LS	$142,600		$142,600
Mechanical	1	LS	$226,600		$226,600
			Construction Subtotal		**$759,800**
Construction Contingency			30%	$	227,940
Construction Engineering			10%	$	75,980
Sales Tax			9%	$	66,862
			Subtotal	$	1,130,582
			Estimated Construction Cost	$	1,131,000
Design Engineering			15%	$	169,650
Administration			5%	$	56,550
Legal & Financial			5%	$	56,550
			Subtotal	$	282,750
			Estimated Design/Engineering Cost	$	283,000
			Estimated Total Project Cost	**$**	**1,414,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR
"THE MARITIME CITY"

Project ID:	WWLSFM-13
Project Title:	LS 13 Improvements
Staff Preferred Priorities (by project grouping):	7
Identified Need or Deficiency Project will Address:	Capacity & Age/Condition
Project Description:	Submersible pumps will be replaced within the lift station
Project Justification:	Pumps within the station are reaching the end of its useful service life, and needs to be replaced
Lift Station Pump Design Flow:	310 gpm
Lift Station Pump Design Head:	190 feet
Forcemain Diameter:	6"
Estimated Total Project Cost (2018 dollars):	518,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2023
Estimated Total Project Cost at Year of Implementation:	601,000
Cost Estimate Basis:	Cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	83%
Future Customers:	17%
Developer:	

Date: 10/27/08
Version 1

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Lift Station 13					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$36,200		$36,200
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$78,700		$78,700
Structural	1	LS	$0		$0
Mechanical	1	LS	$163,100		$163,100
			Construction Subtotal		**$278,000**
Construction Contingency			30%	$	83,400
Construction Engineering			10%	$	27,800
Sales Tax			9%	$	24,464
			Subtotal	$	413,664
			Estimated Construction Cost	$	414,000
Design Engineering			15%	$	62,100
Administration			5%	$	20,700
Legal & Financial			5%	$	20,700
			Subtotal	$	103,500
			Estimated Design/Engineering Cost	$	104,000
			Estimated Total Project Cost	**$**	**518,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR "THE MARITIME CITY"

Project ID: WWLSFM-14

Project Title: LS 14 Improvements

Staff Preferred Priorities (by project grouping): 3a

Identified Need or Deficiency Project will Address: Age/Condition

Project Description: Update existing pumps. Replace failing coatings in wetwell. Two phase approach coat wetwell and replace pumps in the future

Project Justification: Coatings in wetwell are failing

Lift Station Pump Design Flow: 100 gpm

Lift Station Pump Design Head: 85 feet

Forcemain Diameter: N/A

Estimated Total Project Cost (2018 dollars): 62,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2018

Estimated Total Project Cost at Year of Implementation: 62,000

Cost Estimate Basis: Cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 34%

Future Customers: 66%

Developer:

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 14					
Item	**Qty**	**Units**	**Unit Cost**		**Extended Amount**
Mobilization/Demobilization	1	LS	$4,200		$4,200
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$9,800		$9,800
Structural	1	LS	$0		$0
Mechanical	1	LS	$18,300		$18,300
			Construction Subtotal		**$32,300**
Construction Contingency			30%	$	9,690
Construction Engineering			10%	$	3,230
Sales Tax			9%	$	2,842
			Subtotal	$	48,062
			Estimated Construction Cost	$	49,000
Design Engineering			15%	$	7,350
Administration			5%	$	2,450
Legal & Financial			5%	$	2,450
			Subtotal	$	12,250
			Estimated Design/Engineering Cost	$	13,000
			Estimated Total Project Cost	**$**	**62,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-16
Project Title:	LS 16 Improvements
Staff Preferred Priorities (by project grouping):	4
Identified Need or Deficiency Project will Address:	Age/Condition
Project Description:	Routine maintenance and repair
Project Justification:	Coatings failing
Lift Station Pump Design Flow:	15 gpm
Lift Station Pump Design Head:	105 feet
Forcemain Diameter:	4"
Estimated Total Project Cost (2018 dollars):	62,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2019
Estimated Total Project Cost at Year of Implementation:	64,000
Cost Estimate Basis:	Cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	98%
Future Customers:	2%
Developer:	

GIG HARBOR WW COMP PLAN
DRAFT CAPITAL IMPROVEMENT PROGRAM
LIFT STATION COST ESTIMATE

Date: 10/27/08
Version 1

Lift Station 16					
Item	**Qty**	**Units**	**Unit Cost**	**Extended Amount**	
Mobilization/Demobilization	1	LS	$4,200		$4,200
Site/Civil	1	LS	$0		$0
Electrical/Instrumentation	1	LS	$9,800		$9,800
Structural	1	LS	$0		$0
Mechanical	1	LS	$18,300		$18,300
			Construction Subtotal		**$32,300**
		Construction Contingency	30%	$	9,690
		Construction Engineering	10%	$	3,230
		Sales Tax	9%	$	2,842
			Subtotal	$	48,062
			Estimated Construction Cost	$	49,000
		Design Engineering	15%	$	7,350
		Administration	5%	$	2,450
		Legal & Financial	5%	$	2,450
			Subtotal	$	12,250
			Estimated Design/Engineering Cost	$	13,000
			Estimated Total Project Cost	**$**	**62,000**

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWLSFM-1.1

Project Title: Install Flow Meter- LS 1

Staff Preferred Priorities (by project grouping): 1a

Identified Need or Deficiency Project will Address: I&I Management

Project Description: Install flow meters at existing lift stations

Project Justification: Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal

Lift Station Pump Design Flow: N/A

Lift Station Pump Design Head: N/A

Forcemain Diameter:

Estimated Total Project Cost (2018 dollars): 25,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2019

Estimated Total Project Cost at Year of Implementation: 25,000

Cost Estimate Basis: Assumed; no cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 32%

Future Customers: 68%

Developer:

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR "THE MARITIME CITY"

Project ID: WWLSFM-2.1

Project Title: Install Flow Meter- LS 2

Staff Preferred Priorities (by project grouping): 8

Identified Need or Deficiency Project will Address: I&I Management

Project Description: Install flow meters at existing lift stations

Project Justification: Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal

Lift Station Pump Design Flow: N/A

Lift Station Pump Design Head: N/A

Forcemain Diameter:

Estimated Total Project Cost (2018 dollars): 25,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2026

Estimated Total Project Cost at Year of Implementation: 32,000

Cost Estimate Basis: Assumed; no cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 30%

Future Customers: 70%

Developer:

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-6.1
Project Title:	Install Flow Meter- LS 6
Staff Preferred Priorities (by project grouping):	5
Identified Need or Deficiency Project will Address:	I&I Management
Project Description:	Install flow meters at existing lift stations
Project Justification:	Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	4"
Estimated Total Project Cost (2018 dollars):	25,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2019
Estimated Total Project Cost at Year of Implementation:	26,000
Cost Estimate Basis:	Assumed; no cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	98%
Future Customers:	2%
Developer:	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR
"THE MARITIME CITY"

Project ID:	WWLSFM-8.1
Project Title:	Install Flow Meter- LS 8
Staff Preferred Priorities (by project grouping):	9
Identified Need or Deficiency Project will Address:	I&I Management
Project Description:	Install flow meters at existing lift stations
Project Justification:	Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	6"
Estimated Total Project Cost (2018 dollars):	25,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2024
Estimated Total Project Cost at Year of Implementation:	26,000
Cost Estimate Basis:	Assumed; no cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	Future Customers:	Developer:
46%	54%	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-9.1
Project Title:	Install Flow Meter- LS 9
Staff Preferred Priorities (by project grouping):	2a
Identified Need or Deficiency Project will Address:	I&I Management
Project Description:	Install flow meters at existing lift stations
Project Justification:	Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	4"
Estimated Total Project Cost (2018 dollars):	27,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2019
Estimated Total Project Cost at Year of Implementation:	27,000
Cost Estimate Basis:	Assumed; no cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	99%
Future Customers:	1%
Developer:	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWLSFM-11.1

Project Title: Install Flow Meter- LS 11

Staff Preferred Priorities (by project grouping): 12

Identified Need or Deficiency Project will Address: I&I Management

Project Description: Install flow meters at existing lift stations

Project Justification: Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal

Lift Station Pump Design Flow: N/A

Lift Station Pump Design Head: N/A

Forcemain Diameter:

Estimated Total Project Cost (2018 dollars): 25,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2027

Estimated Total Project Cost at Year of Implementation: 33,000

Cost Estimate Basis: Assumed; no cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 65%

Future Customers: 35%

Developer:

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR "THE MARITIME CITY"

Project ID:	WWLSFM-12.1
Project Title:	Install Flow Meter- LS 12
Staff Preferred Priorities (by project grouping):	6a
Identified Need or Deficiency Project will Address:	I&I Management
Project Description:	Install flow meters at existing lift stations
Project Justification:	Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	6"
Estimated Total Project Cost (2018 dollars):	25,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2020
Estimated Total Project Cost at Year of Implementation:	27,000
Cost Estimate Basis:	Assumed; no cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	18%
Future Customers:	82%
Developer:	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

GIG HARBOR "THE MARITIME CITY"

Project ID: WWLSFM-13.1

Project Title: Install Flow Meter- LS 13

Staff Preferred Priorities (by project grouping): 7a

Identified Need or Deficiency Project will Address: I&I Management

Project Description: Install flow meters at existing lift stations

Project Justification: Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal

Lift Station Pump Design Flow: N/A

Lift Station Pump Design Head: N/A

Forcemain Diameter: 6"

Estimated Total Project Cost (2018 dollars): 25,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2023

Estimated Total Project Cost at Year of Implementation: 29,000

Cost Estimate Basis: Assumed; no cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 48%

Future Customers: 52%

Developer:

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWLSFM-14.1
Project Title:	Install Flow Meter- LS 14
Staff Preferred Priorities (by project grouping):	3b
Identified Need or Deficiency Project will Address:	I&I Management
Project Description:	Install flow meters at existing lift stations
Project Justification:	Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	4"
Estimated Total Project Cost (2018 dollars):	25,000
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2022
Estimated Total Project Cost at Year of Implementation:	29,000
Cost Estimate Basis:	Assumed; no cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	Future Customers:	Developer:
83%	17%	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWLSFM-16.1

Project Title: Install Flow Meter- LS 16

Staff Preferred Priorities (by project grouping): 10

Identified Need or Deficiency Project will Address: I&I Management

Project Description: Install flow meters at existing lift stations

Project Justification: Flow meters are needed for collection system management, I&I evaluations, and annual replacement, rehabilitation, and renewal

Lift Station Pump Design Flow: N/A

Lift Station Pump Design Head: N/A

Forcemain Diameter:

Estimated Total Project Cost (2018 dollars): 25,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2022

Estimated Total Project Cost at Year of Implementation: 29,000

Cost Estimate Basis: Assumed; no cost estimate prepared

Required Permtting Schedule:

Cost Allocation:

Existing Customers: 34%

Future Customers: 66%

Developer:

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWTP-1	Project Title:	WWTP Improvements	Staff Preferred Priorities (by project grouping):	

Identified Need or Deficiency Project will Address: Treatment and capacity upgrades

Project Description: Phase I Improvements

Project Justification: Treatment and capacity upgrades

Lift Station Pump Design Flow:

Lift Station Pump Design Head:

Forcemain Diameter:

Estimated Total Project Cost (2018 dollars): 400,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: 2018

Estimated Total Project Cost at Year of Implementation: 400,000

Cost Estimate Basis: Based on Bid January 2009

Required Permtting Schedule:

Cost Allocation:

Existing Customers: x

Future Customers: x

Developer:

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWRR-1
Project Title:	Reuse & Reclamation Studies
Staff Preferred Priorities (by project grouping):	1
Identified Need or Deficiency Project will Address:	Future Wastewater Management Alternative
Project Description:	Research and studies will be conducted to determine whether the use of reuse and reclamation locations will be beneficial to the sewer system
Project Justification:	Reuse facilities may alleviate the effluent load to the WWTP
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	
Estimated Total Project Cost (2018 dollars):	100,063
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2023
Estimated Total Project Cost at Year of Implementation:	116,000
Cost Estimate Basis:	Assumed; no cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	64%
Future Customers:	36%
Developer:	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID:	WWG-1
Project Title:	Upsize gravity pipe on Harborview Dr (north of intersection of Harborview Dr. and Stinson Ave.)
Staff Preferred Priorities (by project grouping):	
Identified Need or Deficiency Project will Address:	Capacity
Project Description:	Upsize three gravity pipes along Harborview Dr from 15 in. to 18 in. diameter
Project Justification:	Existing pipes will not have the capacity for PHFs at buildout
Lift Station Pump Design Flow:	N/A
Lift Station Pump Design Head:	N/A
Forcemain Diameter:	
Estimated Total Project Cost (2018 dollars):	1,657,7759
Annual Inflation Factor:	3%
Year Scheduled for Implementation:	2026
Estimated Total Project Cost at Year of Implementation:	2,100,000
Cost Estimate Basis:	Cost estimate prepared
Required Permtting Schedule:	

Cost Allocation:

Existing Customers:	x
Future Customers:	x
Developer:	

City of Gig Harbor
Wastewater Comprehensive Plan Update
Capital Improvement Program
Project Details

Project ID: WWC-2

Project Title: Annual Replacement, Rehabilitation, and Renewal

Staff Preferred Priorities (by project grouping): 1

Identified Need or Deficiency Project will Address: Age/Condition

Project Description: Annual efforts will be taken to rehabilitate or replace collection system elements

Project Justification: System elements may be in poor condition or reaching the end of its useful service life and needs to be replaced or rehabilitated

Lift Station Pump Design Flow: N/A

Lift Station Pump Design Head: N/A

Forcemain Diameter:

Estimated Total Project Cost (2018 dollars): 80,000

Annual Inflation Factor: 3%

Year Scheduled for Implementation: Annual

Estimated Total Project Cost at Year of Implementation:

Cost Estimate Basis: Assumed; no cost estimate prepared

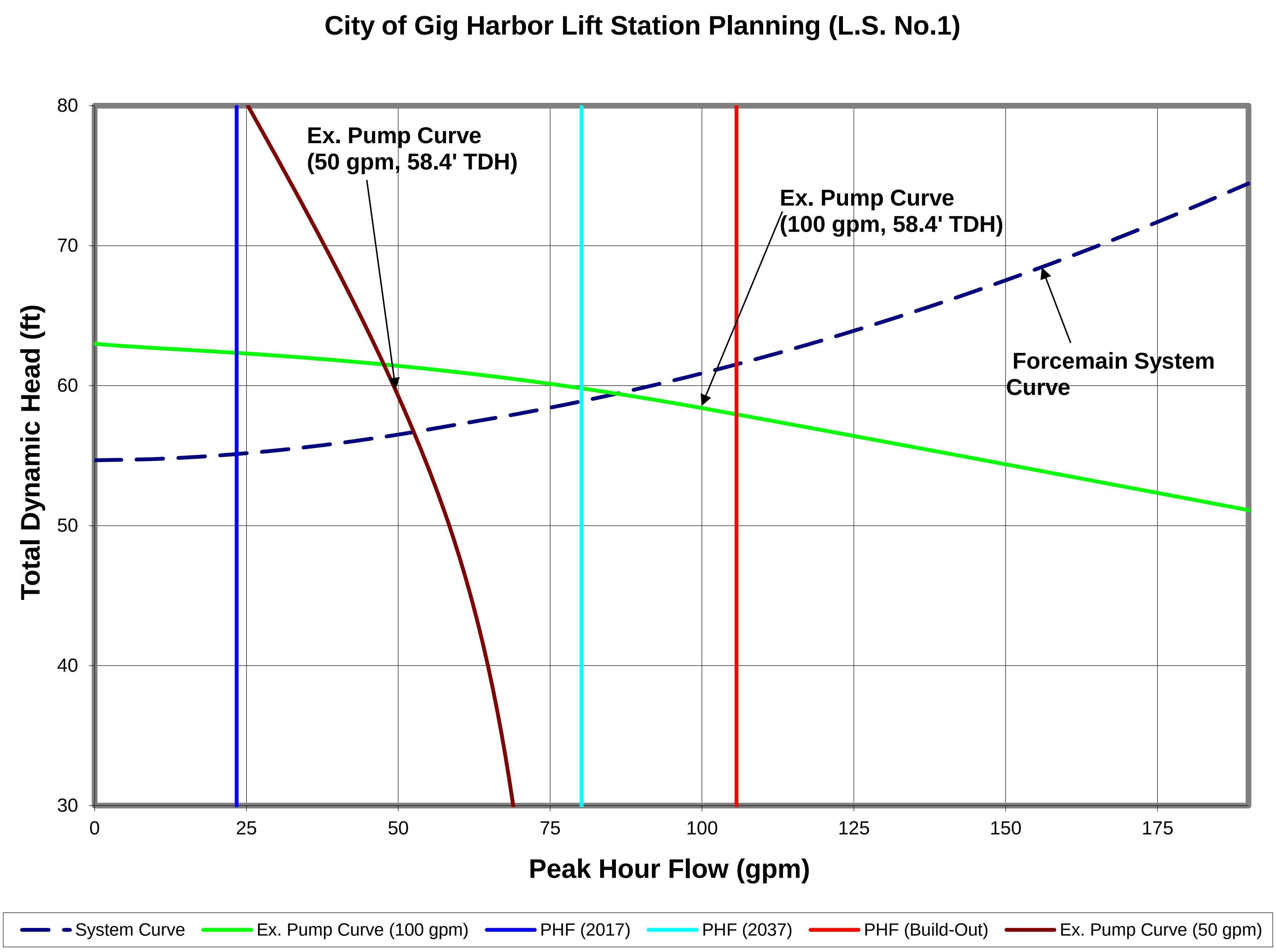
Required Permtting Schedule:

Cost Allocation:

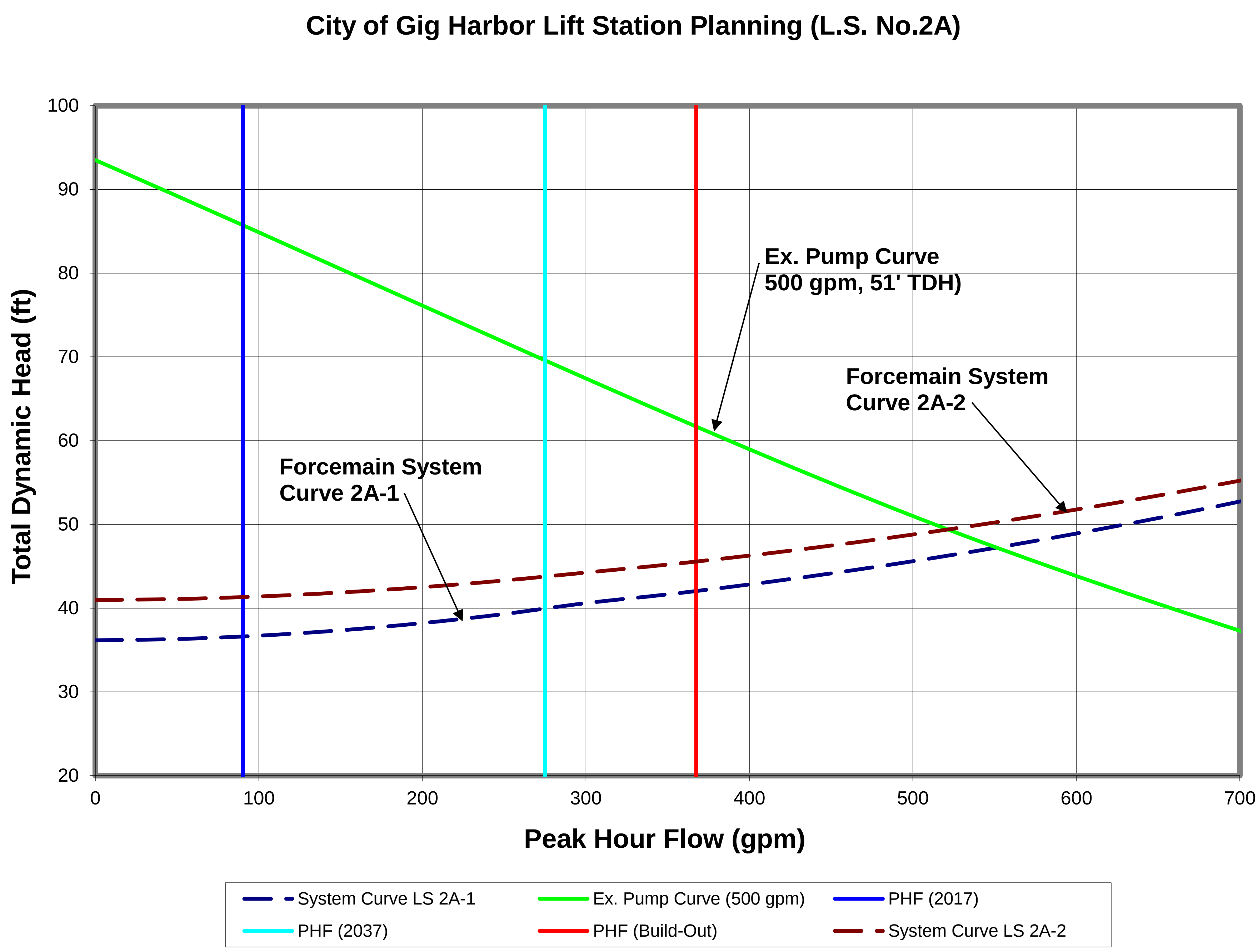
Existing Customers: 64%

Future Customers: 36%

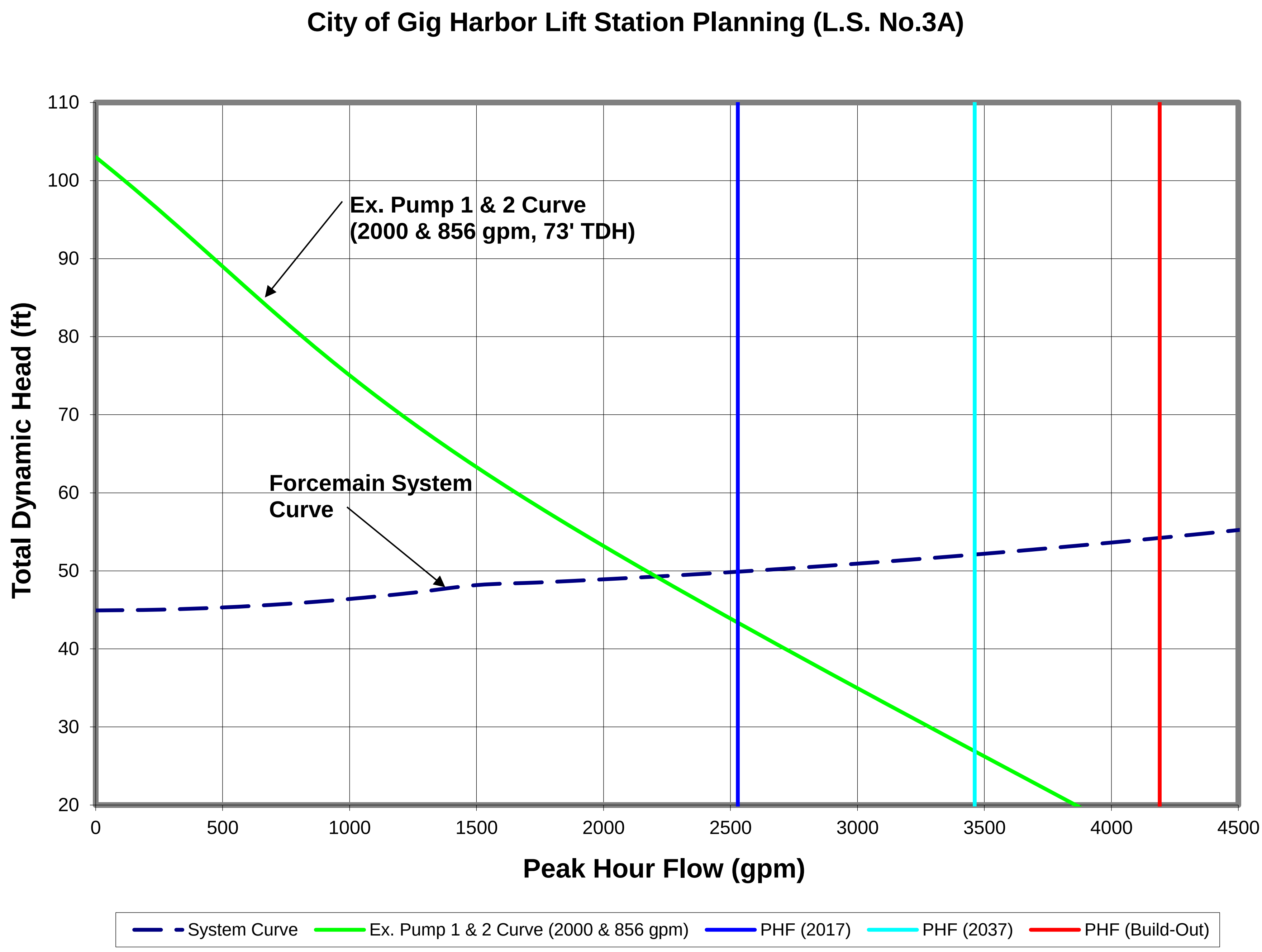
Developer:



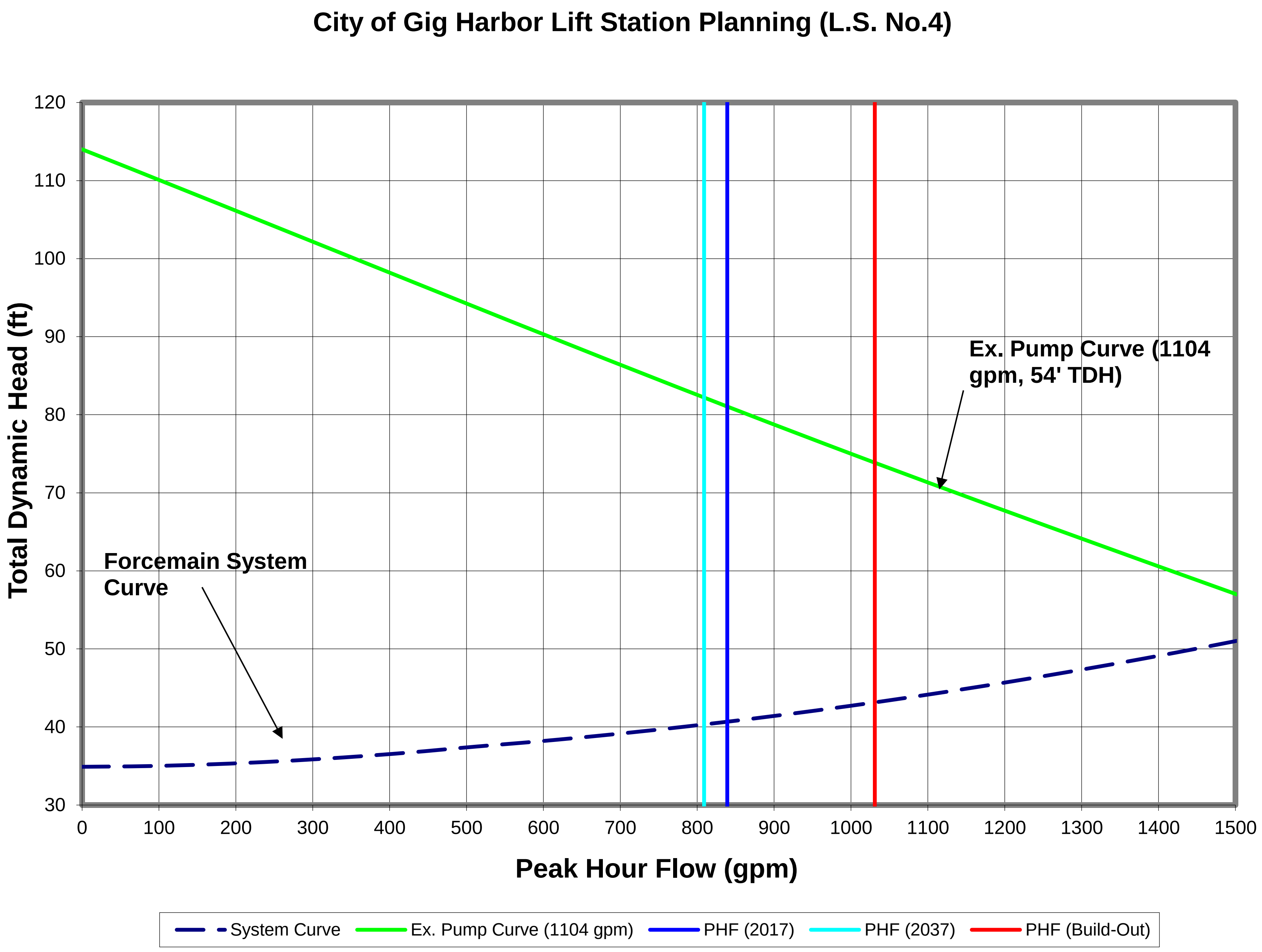
City of Gig Harbor Lift Station Planning (L.S. No.1)
Total Dynamic Head (ft)
80
70
60
50
40
30
0
25
50
75
100
125
150
175
Peak Hour Flow (gpm)
Ex. Pump Curve
(50 gpm, 58.4' TDH)
Ex. Pump Curve
(100 gpm, 58.4' TDH)
Forcemain System
Curve
System Curve
Ex. Pump Curve (100 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)
Ex. Pump Curve (50 gpm)



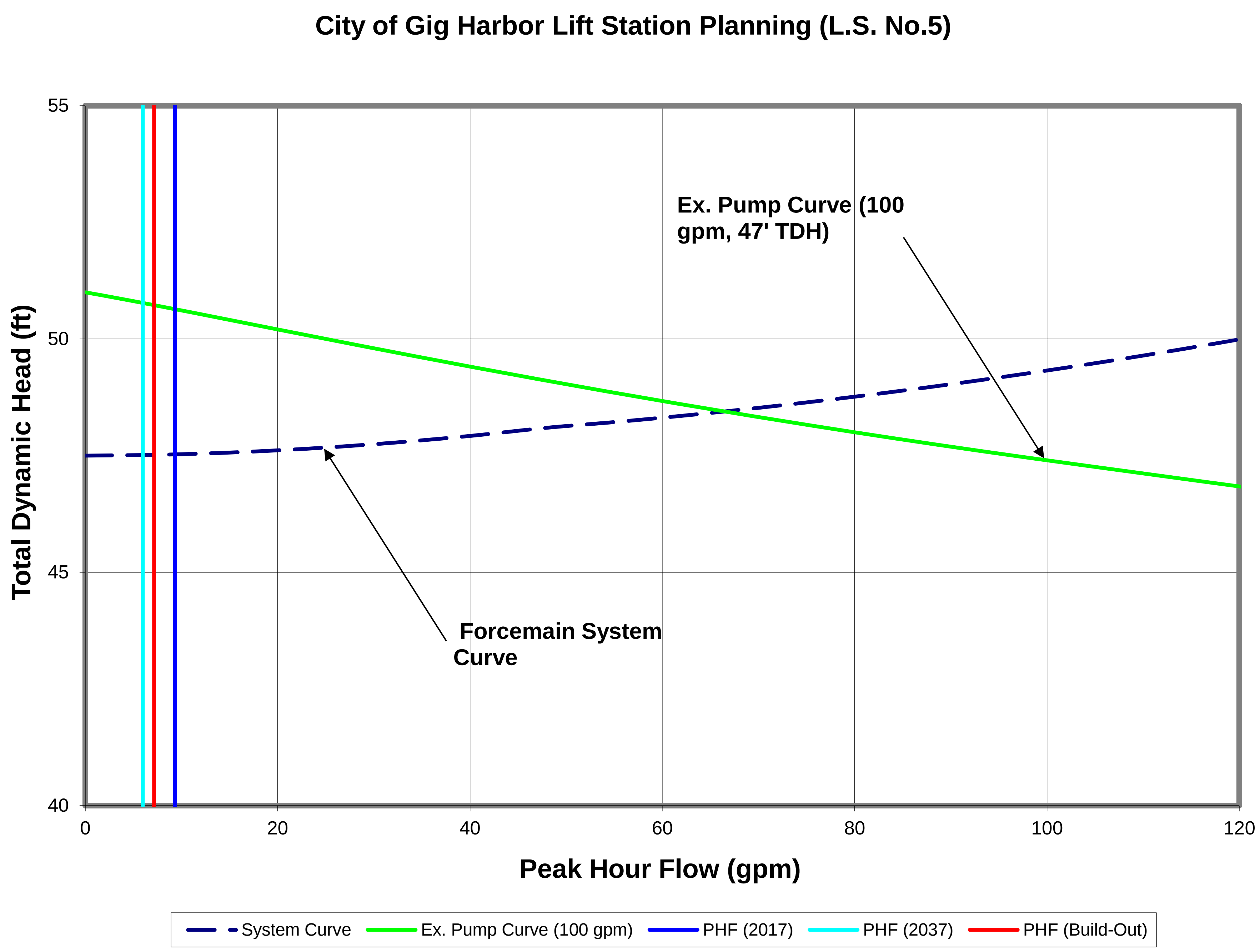
City of Gig Harbor Lift Station Planning (L.S. No.2A)
Total Dynamic Head (ft)
100
90
80
70
60
50
40
30
20
0
100
200
300
400
500
600
700
Peak Hour Flow (gpm)
Ex. Pump Curve
500 gpm, 51' TDH)
Forcemain System
Curve 2A-2
Forcemain System
Curve 2A-1
System Curve LS 2A-1
Ex. Pump Curve (500 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)
System Curve LS 2A-2



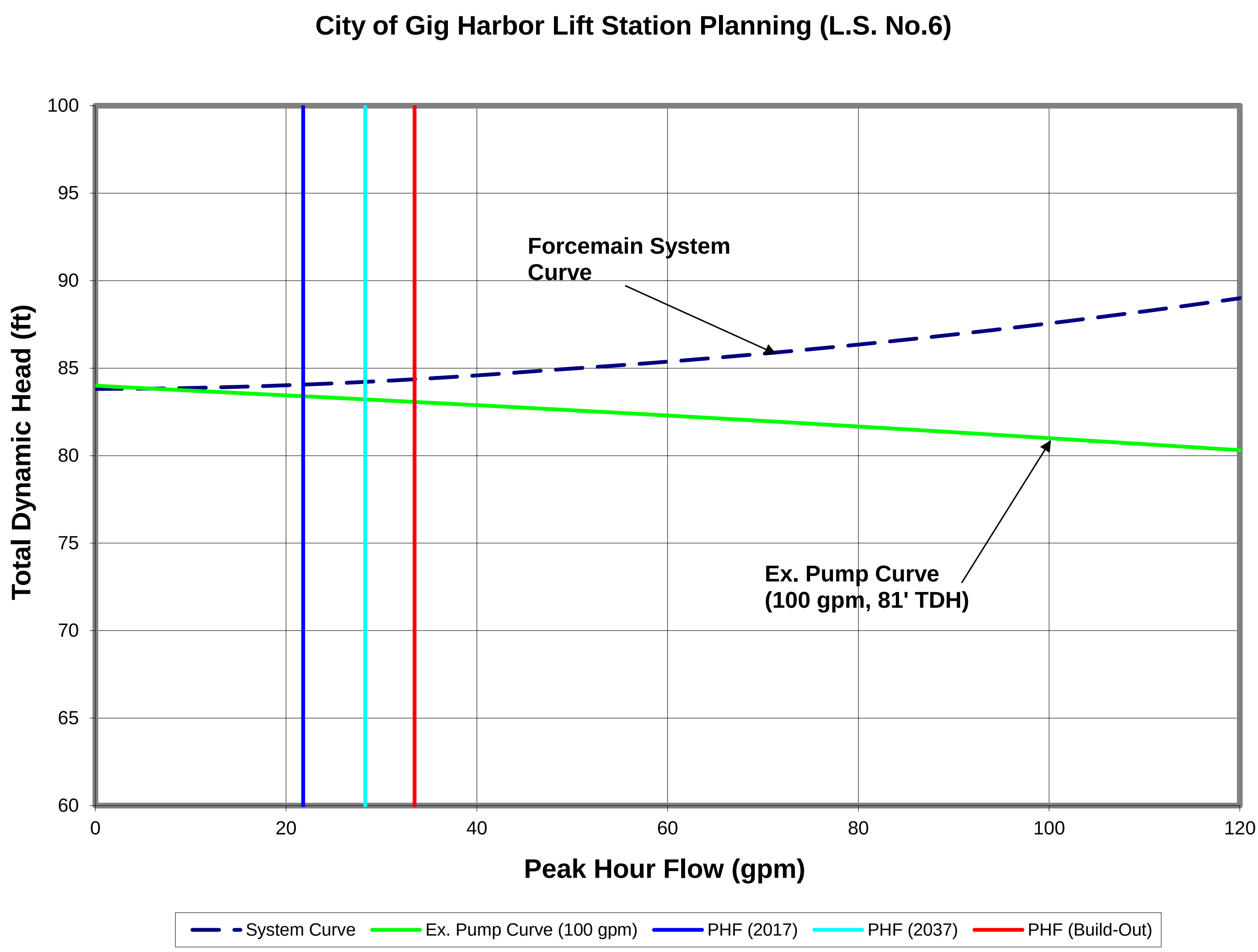
City of Gig Harbor Lift Station Planning (L.S. No.3A)
Ex. Pump 1 & 2 Curve
(2000 & 856 gpm, 73' TDH)
Forcemain System
Curve
Total Dynamic Head (ft)
110
100
90
80
70
60
50
40
30
20
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Peak Hour Flow (gpm)
System Curve
Ex. Pump 1 & 2 Curve (2000 & 856 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)

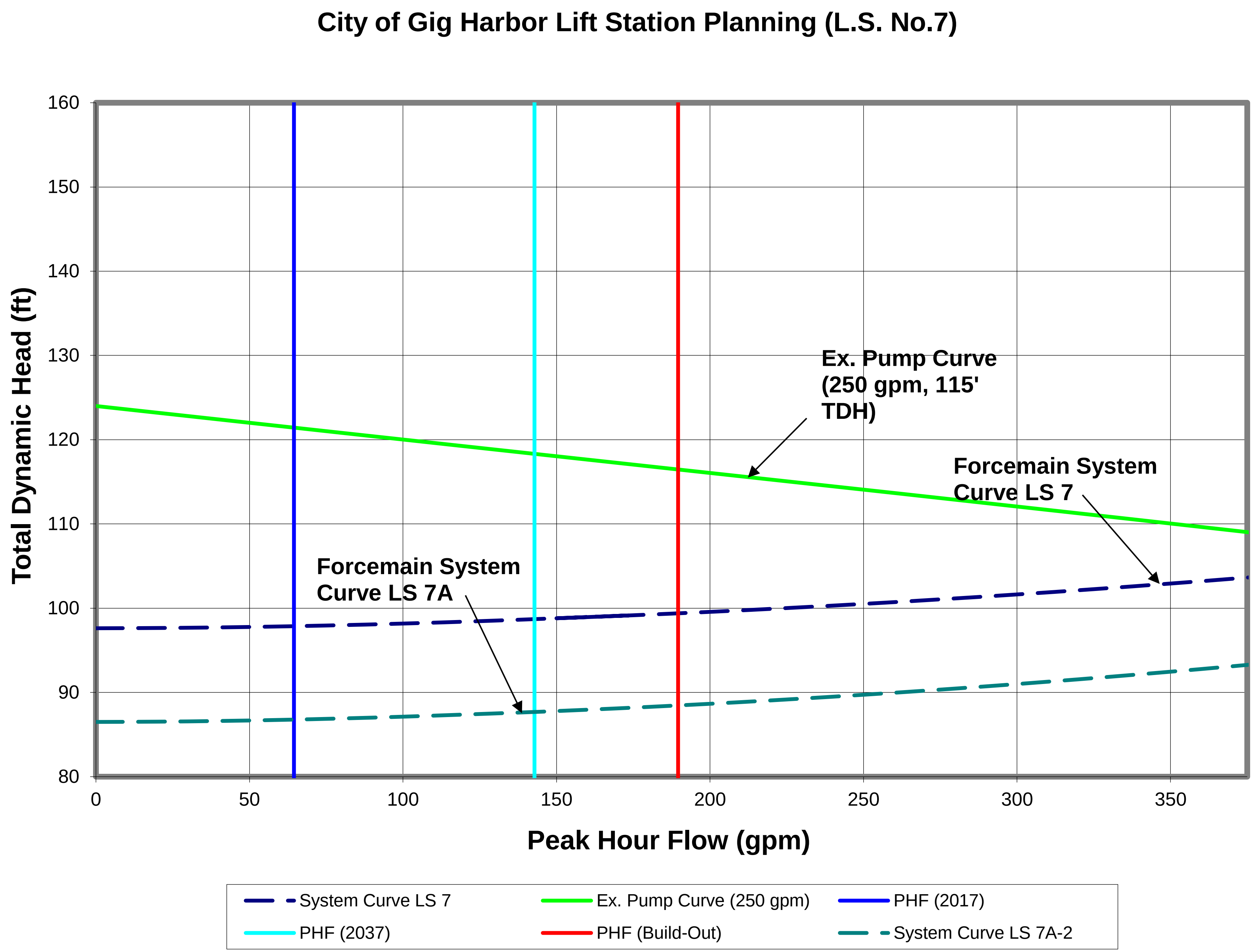


City of Gig Harbor Lift Station Planning (L.S. No.4)
Total Dynamic Head (ft)
120
110
100
90
80
70
60
50
40
30
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
Peak Hour Flow (gpm)
Ex. Pump Curve (1104 gpm, 54' TDH)
Forcemain System Curve
System Curve
Ex. Pump Curve (1104 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)

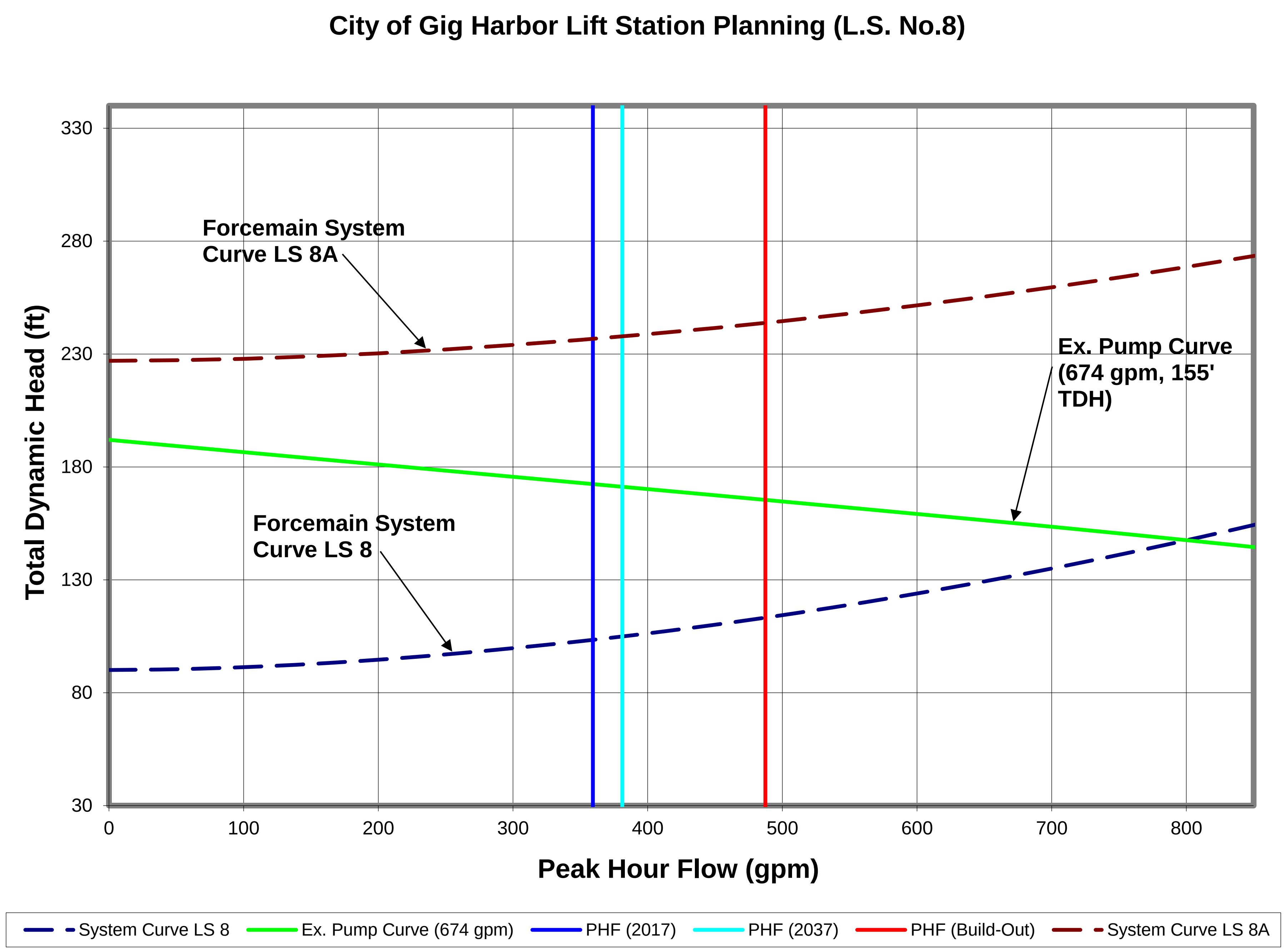


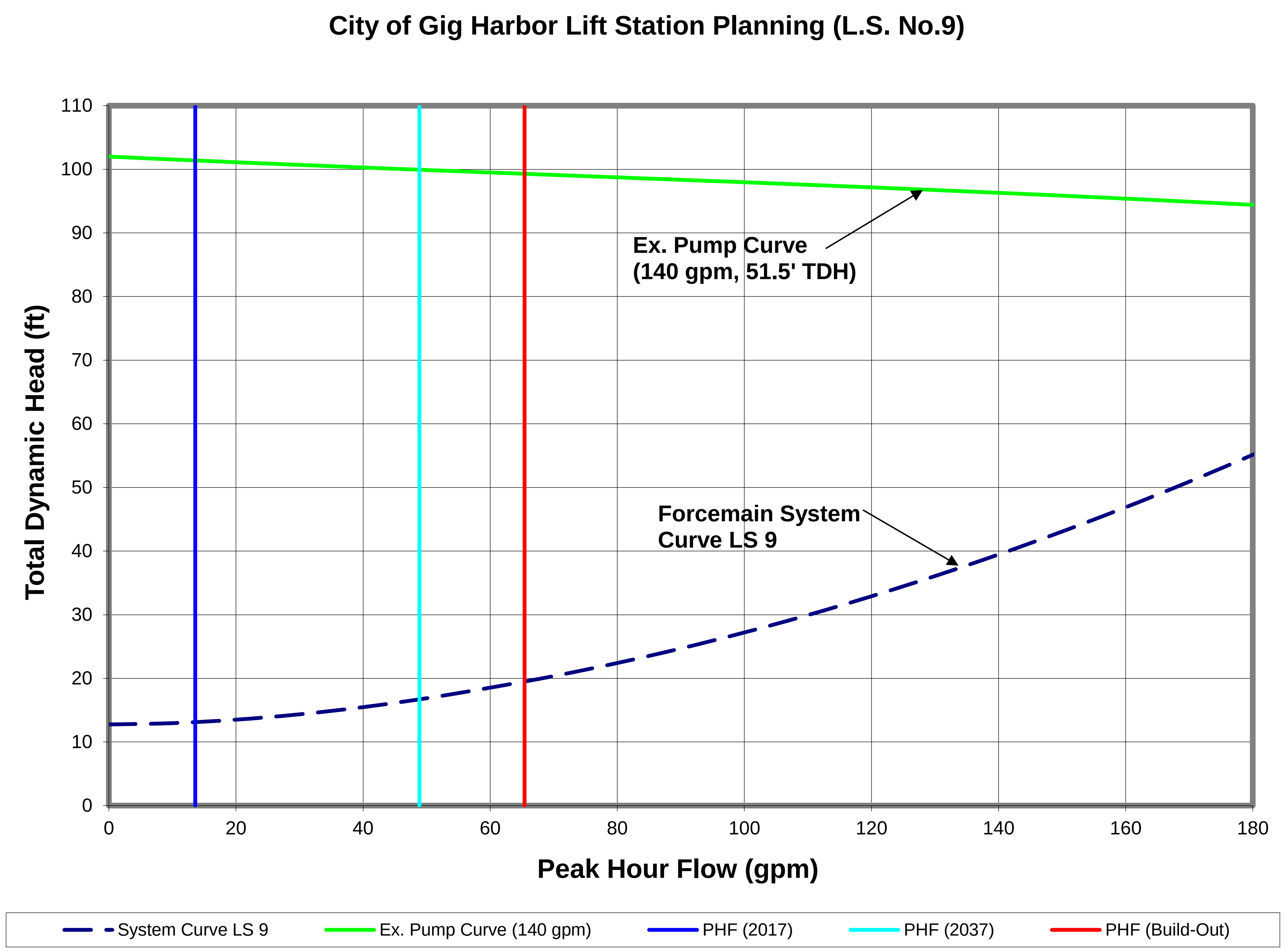
City of Gig Harbor Lift Station Planning (L.S. No.5)
Total Dynamic Head (ft)
55
50
45
40
0
20
40
60
80
100
120
Peak Hour Flow (gpm)
Ex. Pump Curve (100 gpm, 47' TDH)
Forcemain System Curve
System Curve
Ex. Pump Curve (100 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)


City of Gig Harbor Lift Station Planning (L.S. No.6)
Total Dynamic Head (ft)
100
95
90
85
80
75
70
65
60
0
20
40
60
80
100
120
Peak Hour Flow (gpm)
Forcemain System Curve
Ex. Pump Curve (100 gpm, 81' TDH)
System Curve
Ex. Pump Curve (100 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)

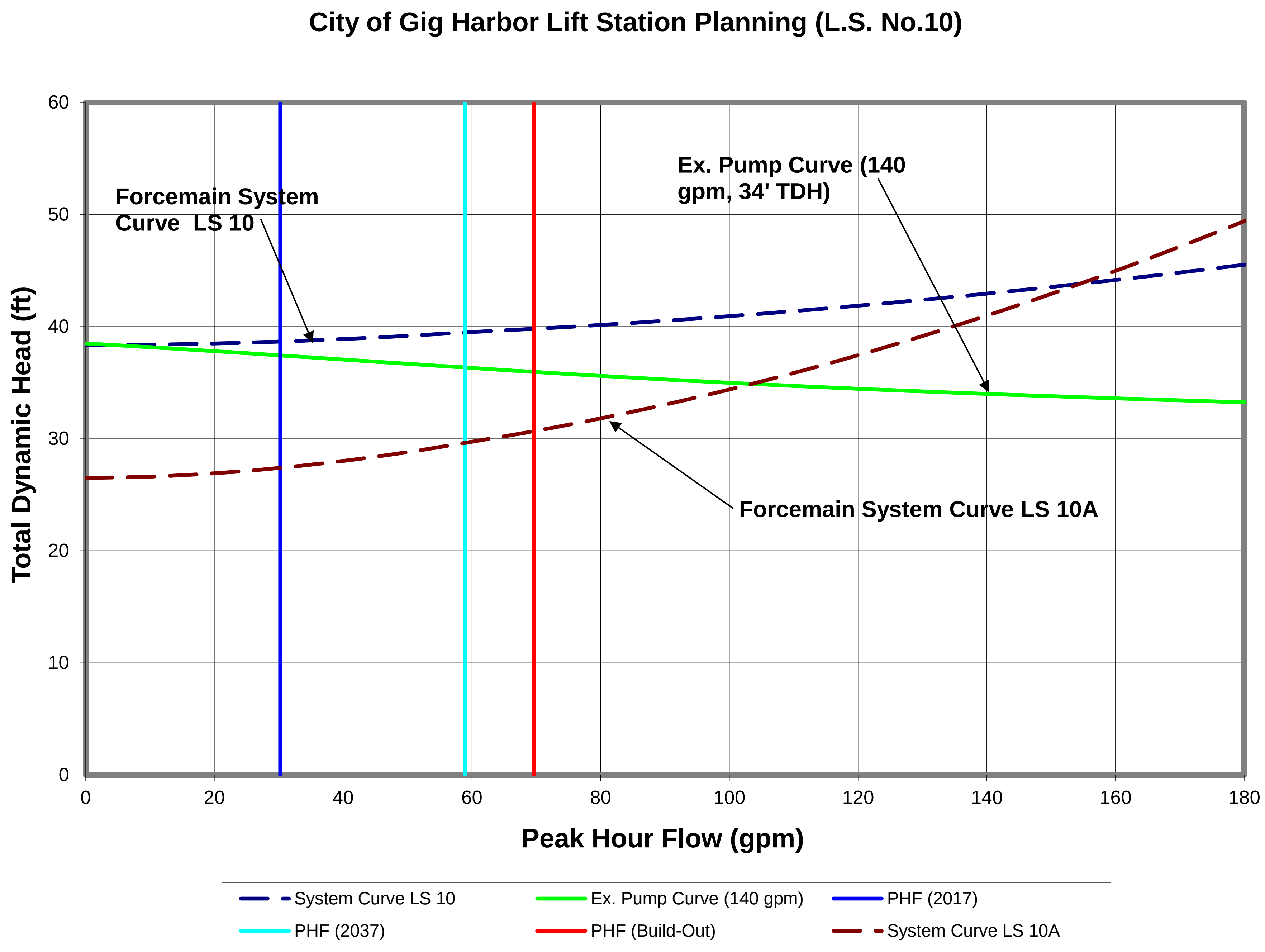


City of Gig Harbor Lift Station Planning (L.S. No.7)
Total Dynamic Head (ft)
160
150
140
130
120
110
100
90
80
0
50
100
150
200
250
300
350
Peak Hour Flow (gpm)
Ex. Pump Curve (250 gpm, 115' TDH)
Forcemain System Curve LS 7
Forcemain System Curve LS 7A
System Curve LS 7
Ex. Pump Curve (250 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)
System Curve LS 7A-2


City of Gig Harbor Lift Station Planning (L.S. No.8)
Forcemain System Curve LS 8A
Ex. Pump Curve (674 gpm, 155' TDH)
Forcemain System Curve LS 8
Total Dynamic Head (ft)
330
280
230
180
130
80
30
0
100
200
300
400
500
600
700
800
Peak Hour Flow (gpm)
System Curve LS 8
Ex. Pump Curve (674 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)
System Curve LS 8A

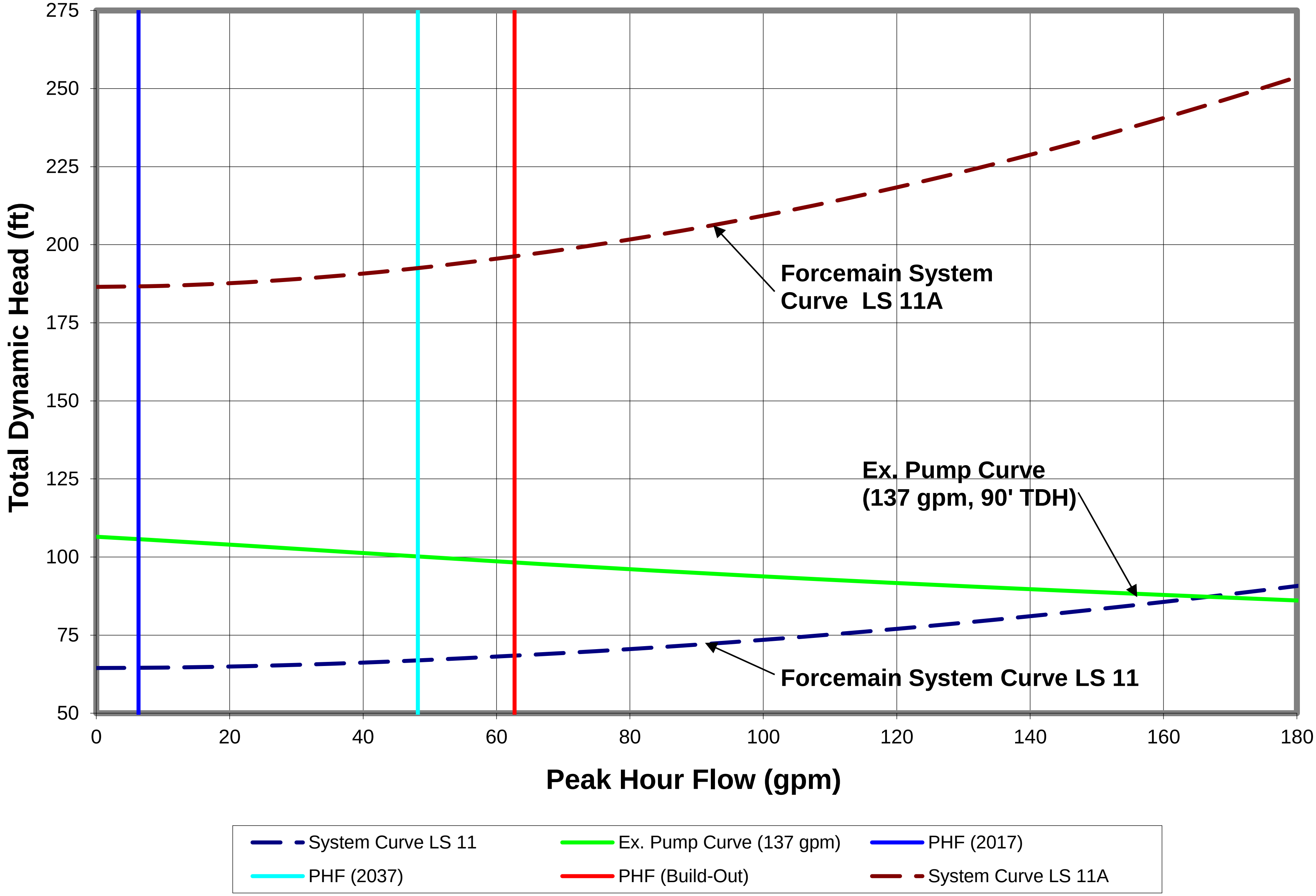


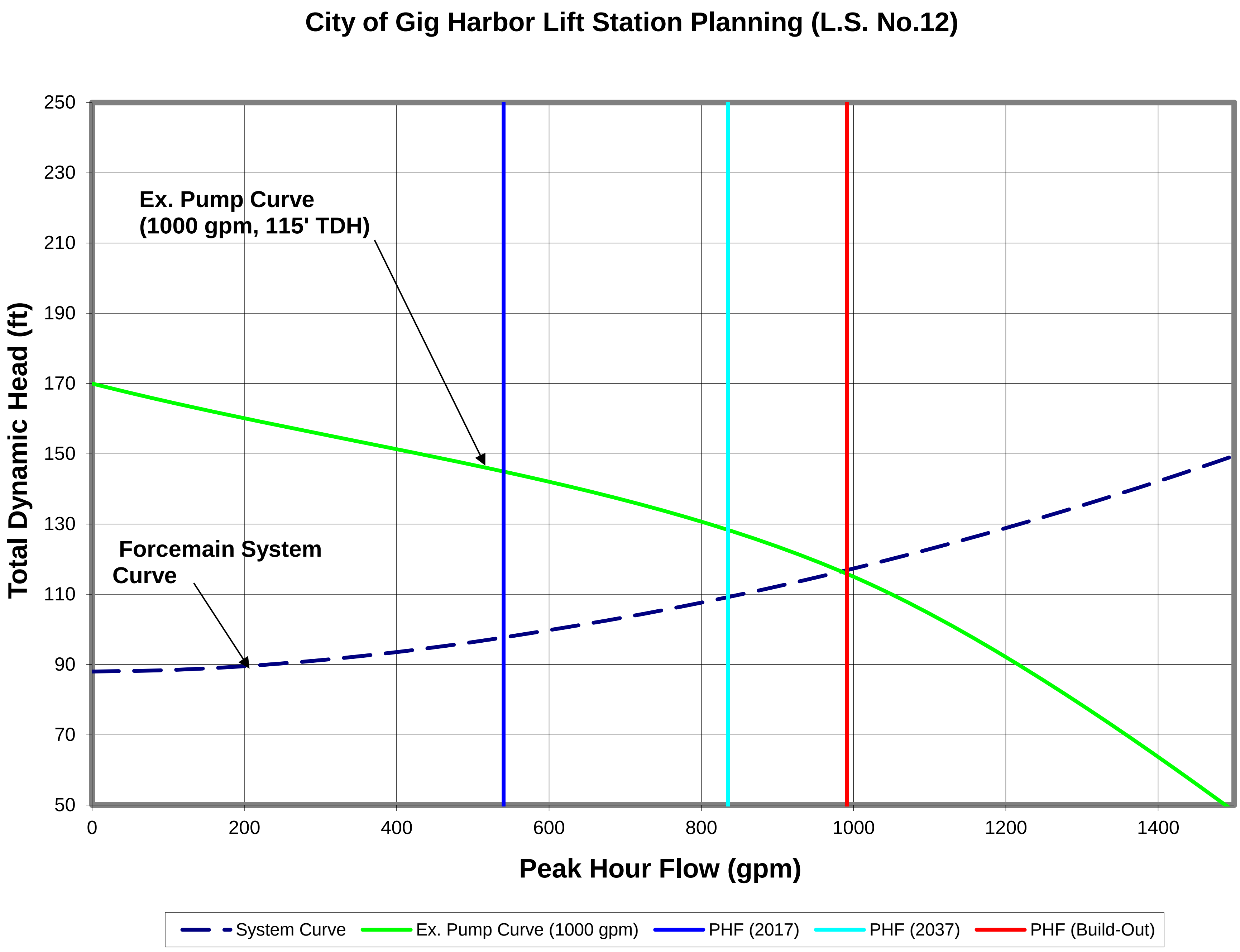
City of Gig Harbor Lift Station Planning (L.S. No.9)
Total Dynamic Head (ft)
110
100
90
80
70
60
50
40
30
20
10
0
Ex. Pump Curve
(140 gpm, 51.5' TDH)
Forcemain System
Curve LS 9
0
20
40
60
80
100
120
140
160
180
Peak Hour Flow (gpm)
System Curve LS 9
Ex. Pump Curve (140 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)

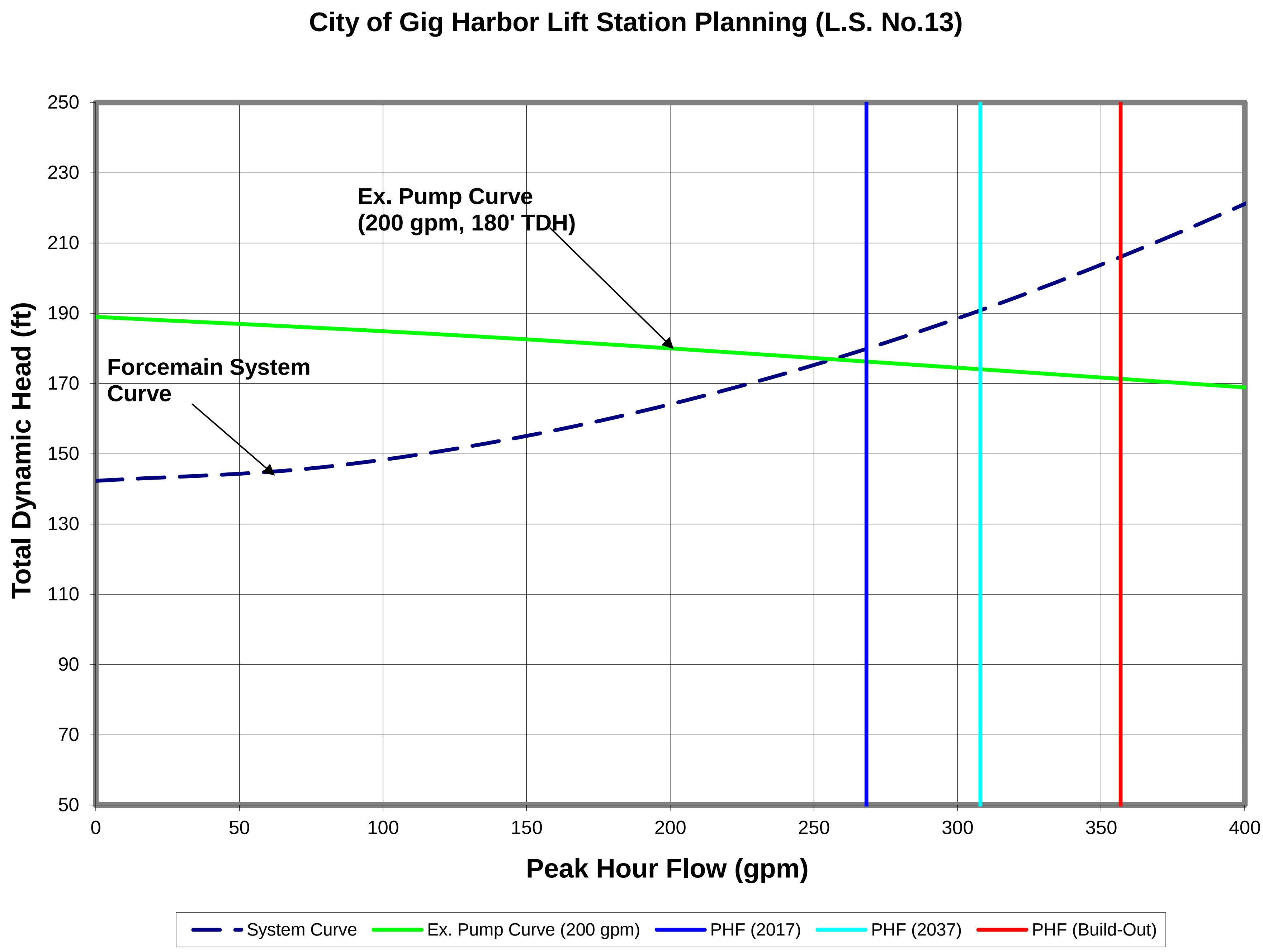


City of Gig Harbor Lift Station Planning (L.S. No.10)
Forcemain System Curve LS 10
Ex. Pump Curve (140 gpm, 34' TDH)
Forcemain System Curve LS 10A
Total Dynamic Head (ft)
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
Peak Hour Flow (gpm)
System Curve LS 10
Ex. Pump Curve (140 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)
System Curve LS 10A

City of Gig Harbor Lift Station Planning (L.S. No.11)

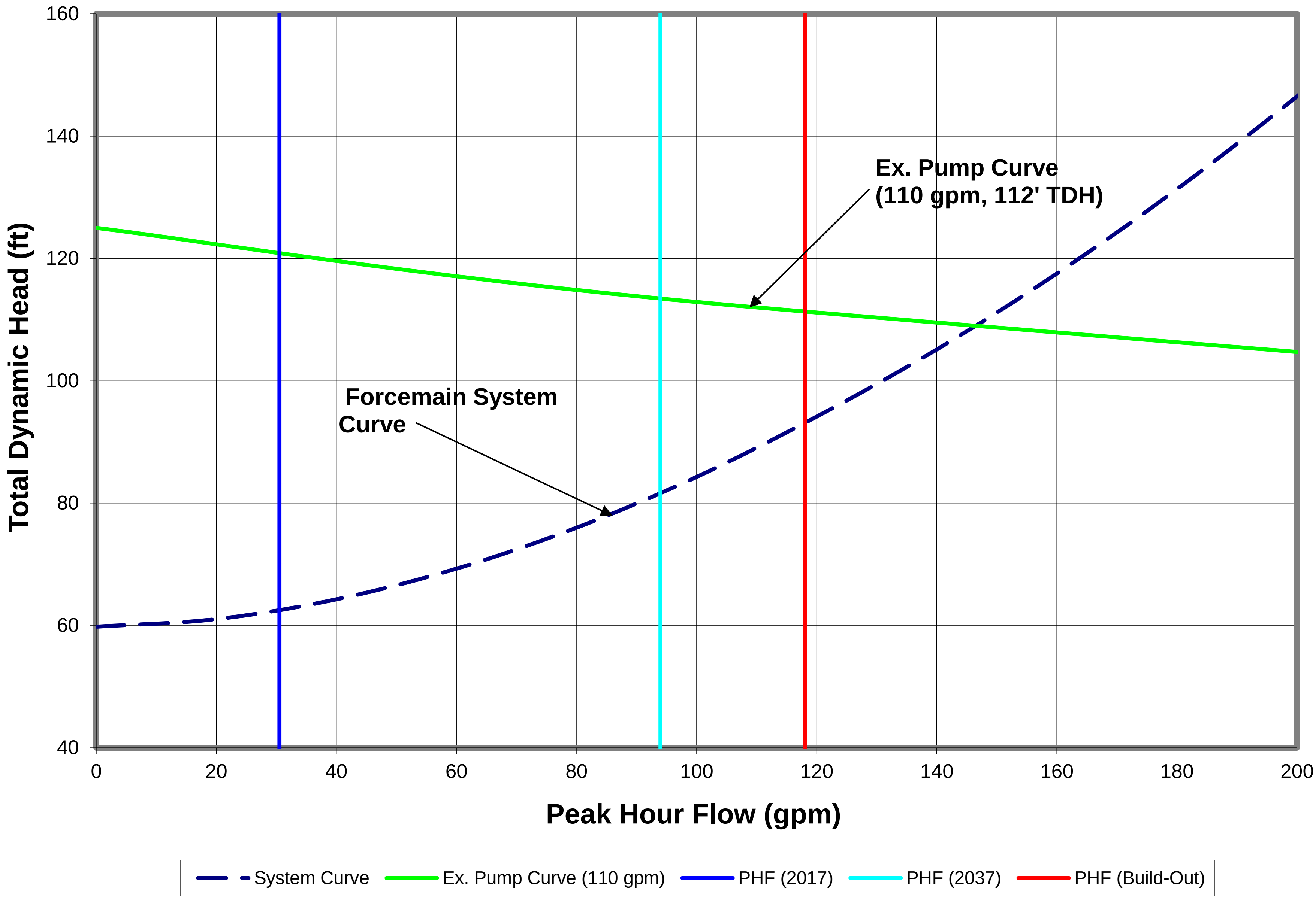


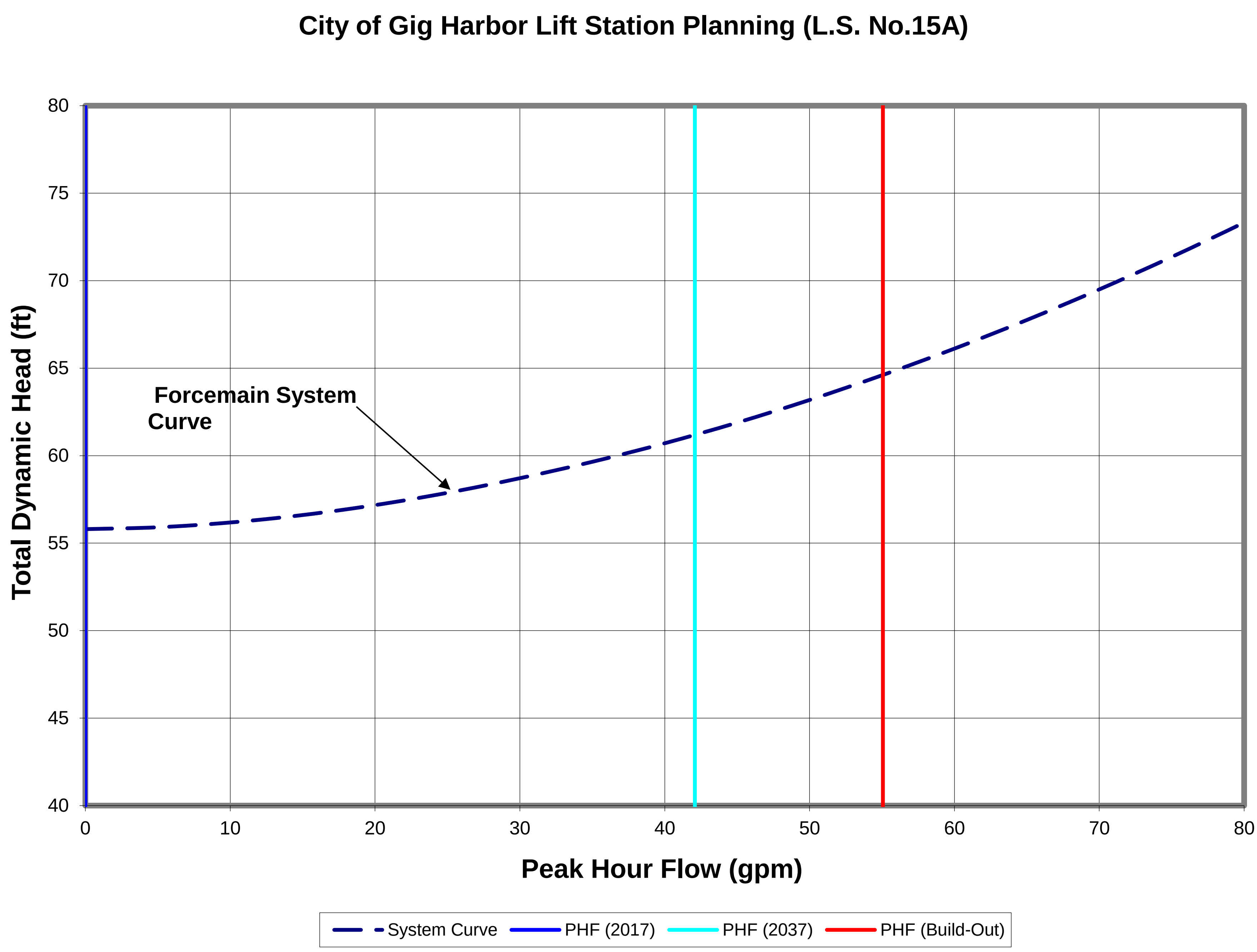

City of Gig Harbor Lift Station Planning (L.S. No.12)
Total Dynamic Head (ft)
250
230
210
190
170
150
130
110
90
70
50
0
200
400
600
800
1000
1200
1400
Peak Hour Flow (gpm)
Ex. Pump Curve
(1000 gpm, 115' TDH)
Forcemain System
Curve
System Curve
Ex. Pump Curve (1000 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)



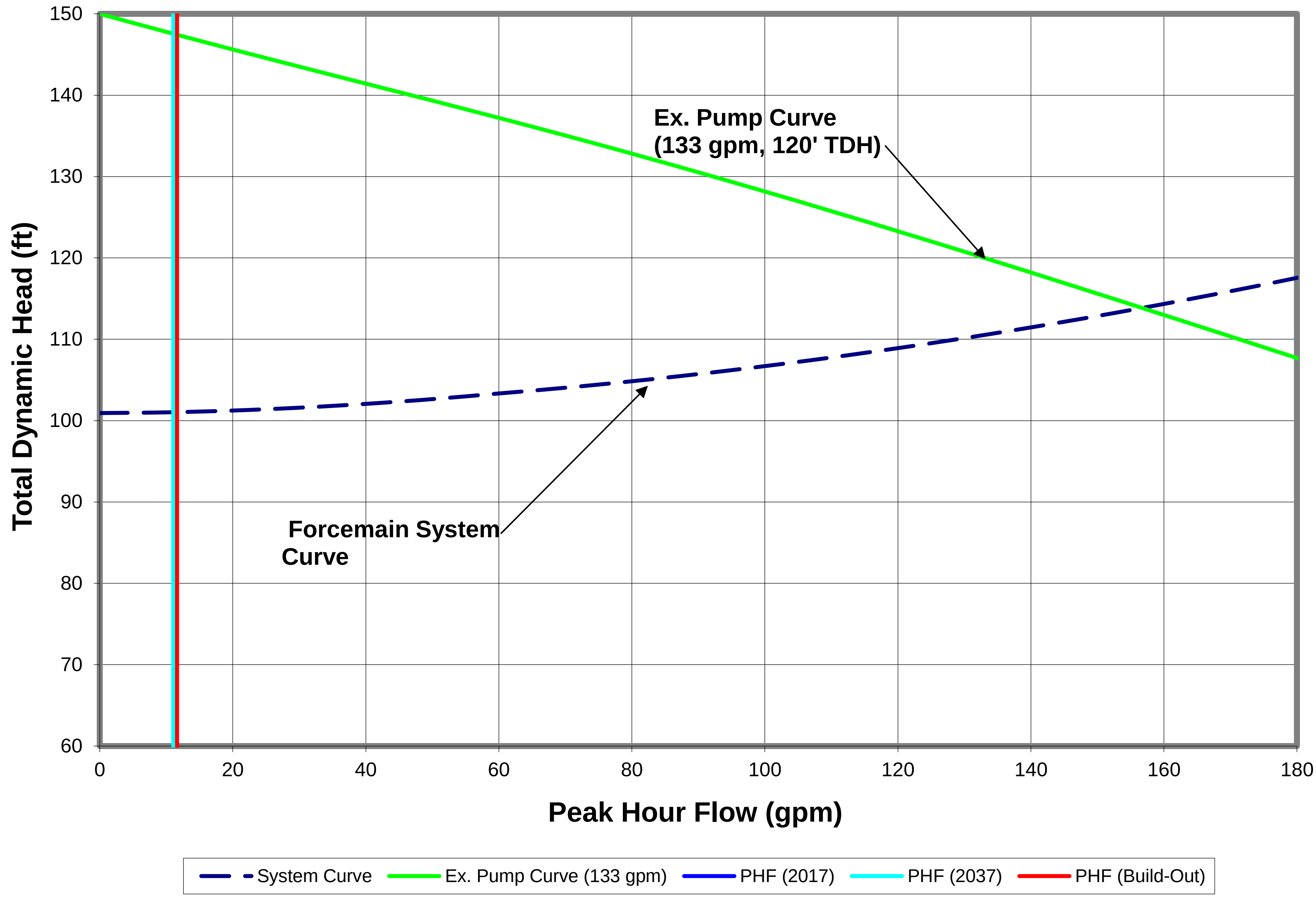
City of Gig Harbor Lift Station Planning (L.S. No.13)
Total Dynamic Head (ft)
250
230
210
190
170
150
130
110
90
70
50
0
50
100
150
200
250
300
350
400
Peak Hour Flow (gpm)
Ex. Pump Curve
(200 gpm, 180' TDH)
Forcemain System
Curve
System Curve
Ex. Pump Curve (200 gpm)
PHF (2017)
PHF (2037)
PHF (Build-Out)

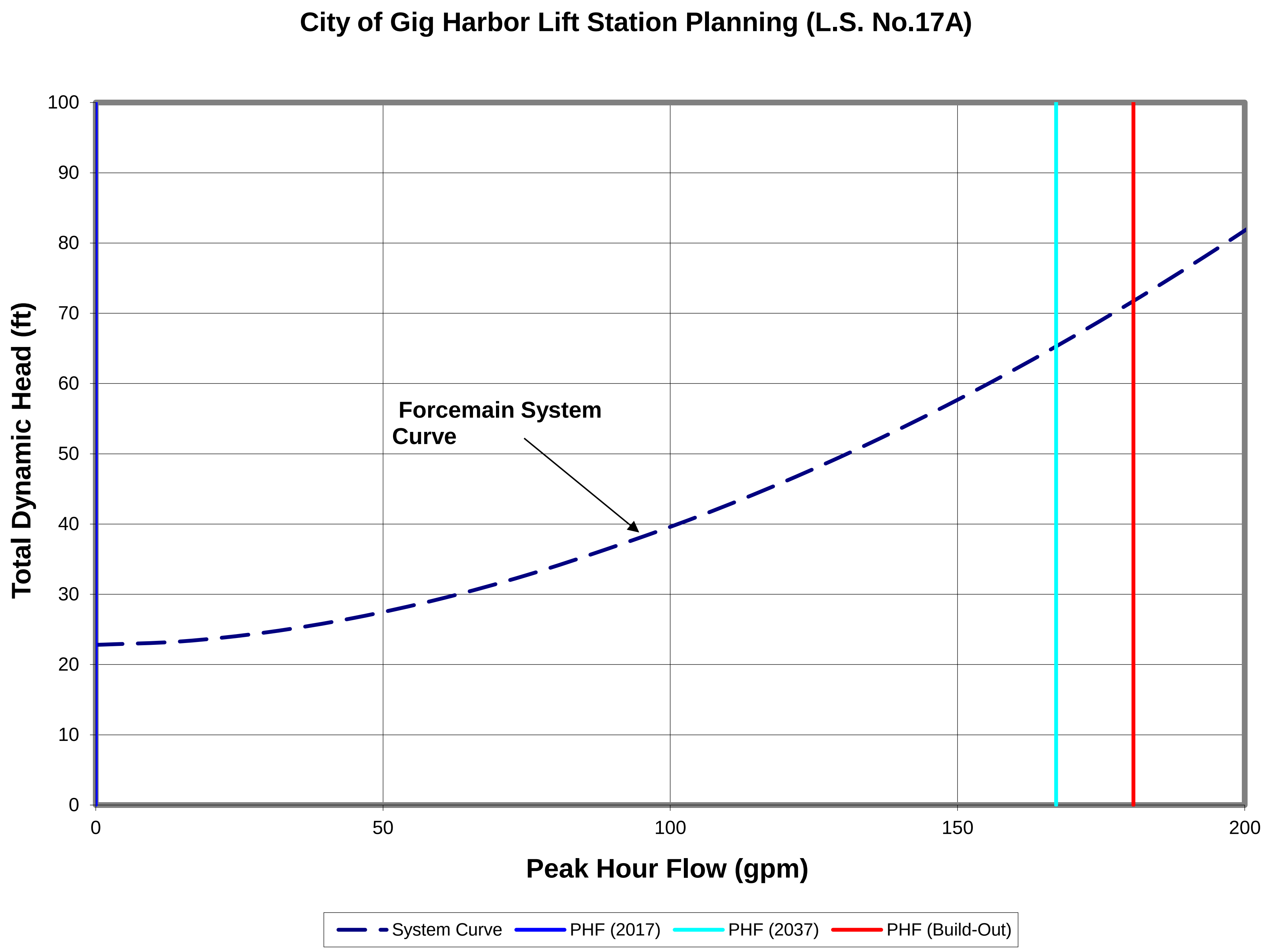
City of Gig Harbor Lift Station Planning (L.S. No.14)

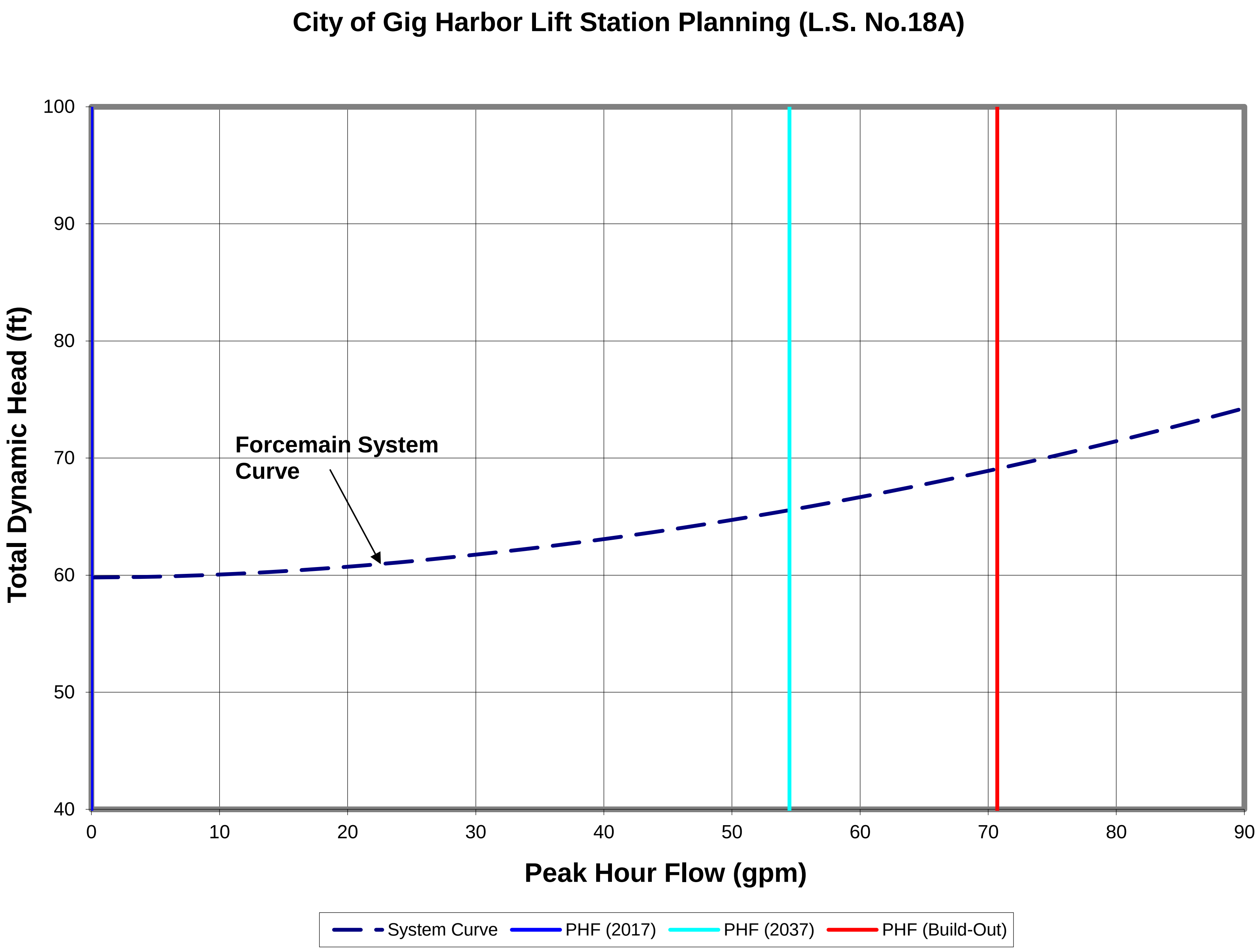


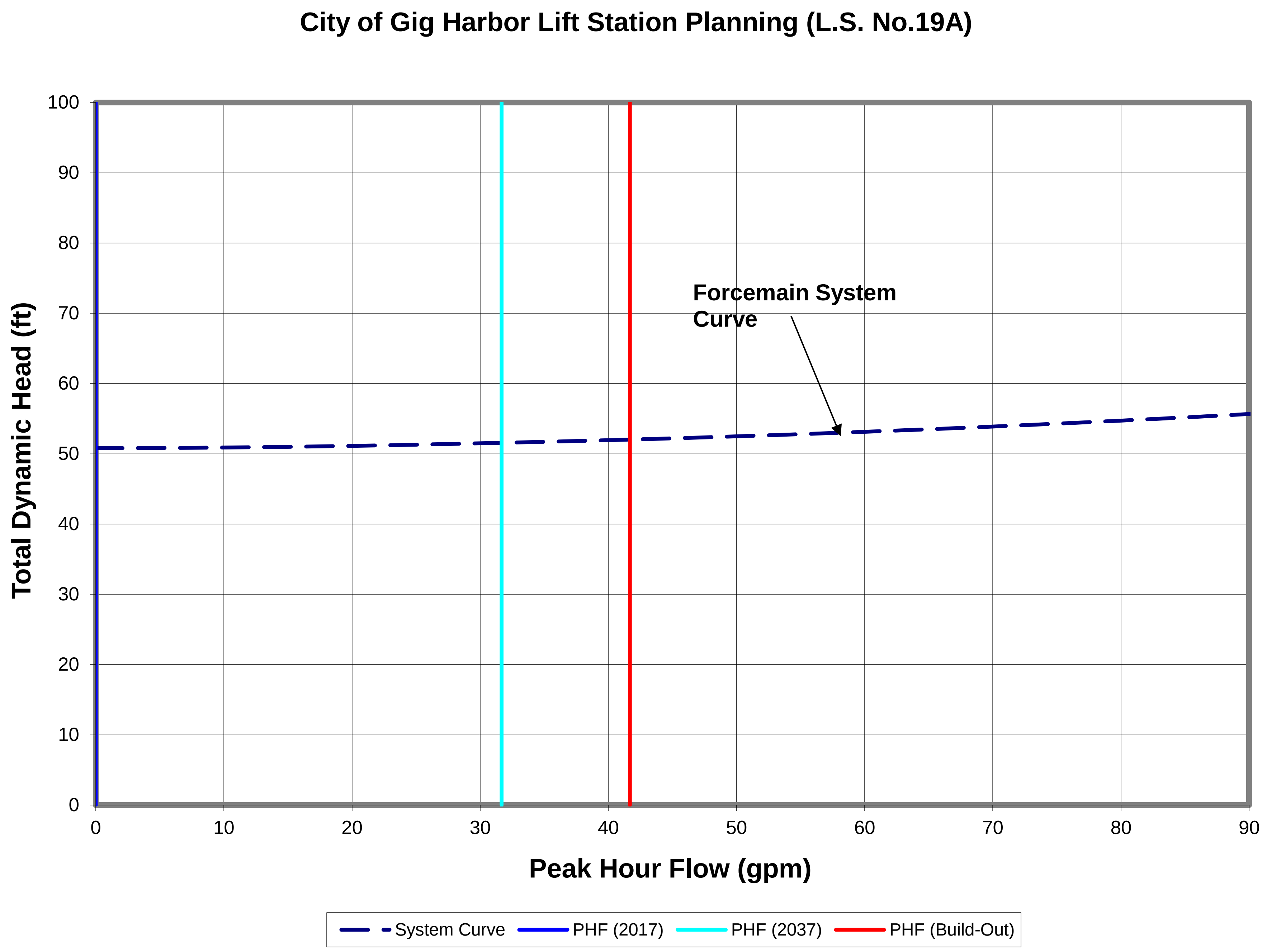

City of Gig Harbor Lift Station Planning (L.S. No.15A)
Total Dynamic Head (ft)
80
75
70
65
60
55
50
45
40
0
10
20
30
40
50
60
70
80
Forcemain System Curve
Peak Hour Flow (gpm)
System Curve
PHF (2017)
PHF (2037)
PHF (Build-Out)

City of Gig Harbor Lift Station Planning (L.S. No.16)

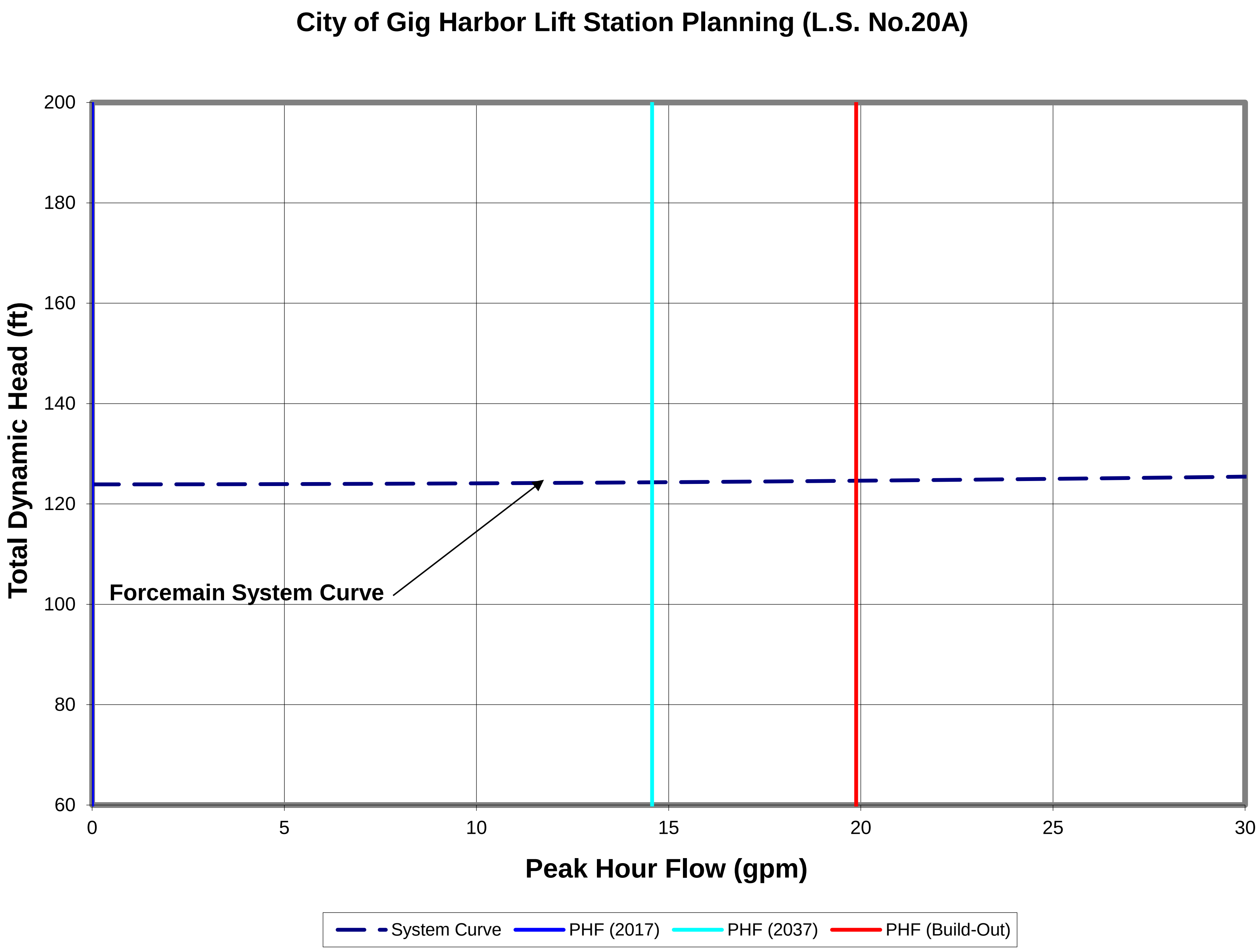



City of Gig Harbor Lift Station Planning (L.S. No.17A)
Total Dynamic Head (ft)
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
Peak Hour Flow (gpm)
Forcemain System Curve
System Curve
PHF (2017)
PHF (2037)
PHF (Build-Out)

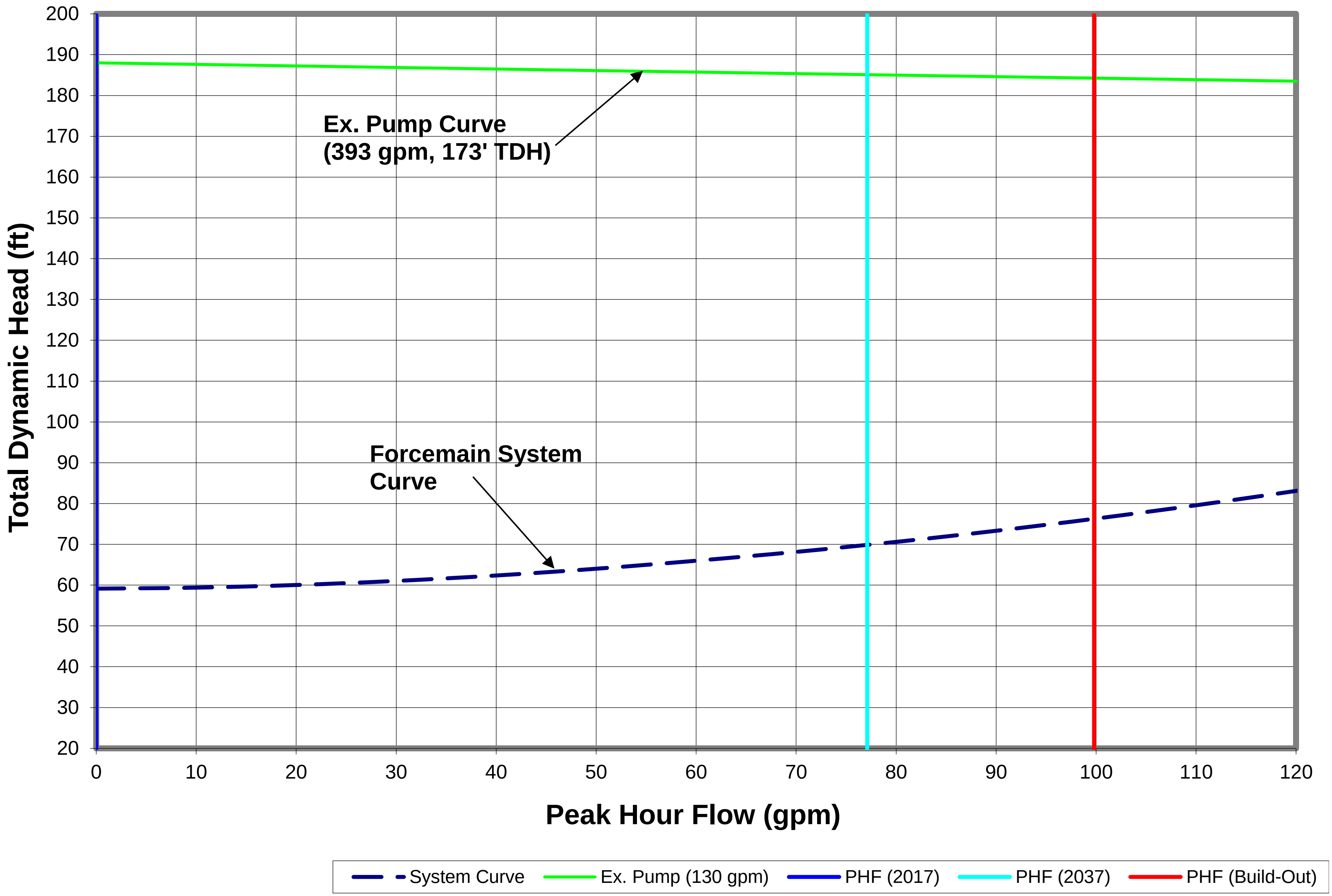

City of Gig Harbor Lift Station Planning (L.S. No.18A)
Total Dynamic Head (ft)
100
90
80
70
60
50
40
0
10
20
30
40
50
60
70
80
90
Peak Hour Flow (gpm)
Forcemain System Curve
System Curve
PHF (2017)
PHF (2037)
PHF (Build-Out)



City of Gig Harbor Lift Station Planning (L.S. No.19A)
Total Dynamic Head (ft)
100
90
80
70
60
50
40
30
20
10
0
Forcemain System Curve
0
10
20
30
40
50
60
70
80
90
Peak Hour Flow (gpm)
System Curve
PHF (2017)
PHF (2037)
PHF (Build-Out)


City of Gig Harbor Lift Station Planning (L.S. No.20A)
Total Dynamic Head (ft)
200
180
160
140
120
100
80
60
0
5
10
15
20
25
30
Peak Hour Flow (gpm)
Forcemain System Curve
System Curve
PHF (2017)
PHF (2037)
PHF (Build-Out)

City of Gig Harbor Lift Station Planning (L.S. No.21A)



Appendix D. Water Reclamation and Reuse Site Evaluations Study

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City of Gig Harbor

Water Reclamation and Reuse Site Evaluations and Study

Final Report

December 2012

HDR Engineering, Inc.
4717 97th Street, NW
Gig Harbor, WA 98332

Certificate of Engineer

City of Gig Harbor
Water Reclamation and Reuse Site Evaluations and Study

The material and data contained in this report were prepared under the direction and supervision of the undersigned, whose seal as a professional engineer licensed to practice in the State of Washington, is affixed below.

Jeffrey M. Hansen, P.E.
Project Manager

HDR Engineering Inc.

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1.0 Introduction

The City of Gig Harbor (City) identified in its 2010 Comprehensive Plan, 2009 Wastewater Comprehensive Plan Update (WW Comp Plan), and 2009 Water System Plan (WSP) a need to investigate the potential for producing and beneficially using reclaimed water from the City's wastewater infrastructure. In response to this identified need, the City conducted this planning effort, referred to as the *Water Reclamation and Reuse Site Evaluations and Study (Study)*. The intent of this Study is to provide the City with preliminary direction on the potential production and distribution of reclaimed water to meet a variety of objectives associated with water supply and wastewater management.

This report represents an initial step in the City's evaluation of reclaimed water program feasibility. The report contains the following:

- Identification of potential benefits of a reclaimed water program.
- Identification of potential reclaimed water uses and their associated demands.
- Evaluation of alternative reclaimed water production and distribution system configurations, including an analysis of costs and benefits.
- Summary of the recommended next steps to determine reclaimed water program feasibility, and considerations to be made if the City proceeds with implementing a reclaimed water program in the future.

2.0 Potential Benefits of a Reclaimed Water Program

The City acknowledges the value a reclaimed water program might offer, especially with regard to the following drivers:

- **Wastewater Effluent Water Quality Requirements.** The water quality requirements associated with secondary wastewater effluent (e.g., nitrogen limits) may become more stringent in the future, particularly with regard to the protection and enhancement of Puget Sound. The timing and magnitude of changed requirements is unknown. However, it is noted that a reclaimed water program might aid the City in meeting such future enhanced requirements through a reduction in the volume of effluent discharged to Puget Sound.
- **Wastewater Treatment Plant Capacity.** The City has recently expanded the capacity of its wastewater treatment plant (WWTP) through a variety of improvements. The City's current National Pollutant Discharge Elimination System (NPDES) permit sets a discharge limit of 1.6 million gallons per day (mgd) for maximum month flow (MMF). A planned improvement of transitioning to ultraviolet (UV) light disinfection for water quality treatment is projected to increase the physical capacity of the WWTP to 2.4 mgd. This improvement is scheduled to be completed by the end of 2015, and would support forecasted wastewater flows beyond 2025. The design buildout of the WWTP is 3.5 mgd, which will support projected maximum month design flows beyond Year 2050 (2.81 mgd, per the WW Comp Plan). While capacity at the WWTP is not projected to be a significant concern until after 2050, installation of a reclaimed water production facility at certain locations other than at the WWTP would mitigate the need for future WWTP capacity likely beyond 2050.

- **Water Supply Management.** Reclaimed water can be used for certain nonpotable water uses, such as irrigation. Such water uses often strain potable water supplies, especially during peak use seasons. A reclaimed water program could therefore reduce the stress placed upon existing groundwater supplies within the City and extend the ability of these resources to meet future water needs.
- **Water Right Mitigation.** The City has multiple applications for new water rights pending with the Washington State Department of Ecology. The approval of some of these applications may ultimately be contingent upon the City implementing mitigation for surface water impacts if surface water bodies are determined to be linked to proposed groundwater withdrawals. The potential for such mitigation is greatest with respect to the City's water rights application associated with the proposed Well 9. This new well will be located in the northern part of the Urban Growth Area (UGA), and will serve as an important water supply to meet the needs of future growth in Northern Gig Harbor. If mitigation is determined to be required, in terms of introducing more water to specific ground or surface waters, reclaimed water could potentially be used to fulfill such needs.
- **Environmental Enhancement.** Reclaimed water may be used for various environmental enhancements, such as groundwater recharge and streamflow augmentation. While these are the same applications that may be used in the water rights mitigation context described above, additional benefits can be provided related to both fisheries and aquatic habitat.

While a reclaimed water program can provide additional benefits, the benefits described in this section are of most significance to the City. Of these potential drivers, water rights mitigation is the arena in which the City may likely first be able to realize the benefits of a reclaimed water program. However, as discussed further in Section 4.3, the timing and magnitude of such needs has yet to be determined. And although the other drivers may not result in pressing needs in the near future for the City, their requirements in the long-term could be significant. It is for all of these reasons that the City is exploring the feasibility of a reclaimed water program.

3.0 Potential Reclaimed Water Uses

Prior to this Study, the City identified potential reclaimed water uses, as documented in the WW Comp Plan and the WSP. This work was reviewed and supplemented with additional analysis, including a review of billing records associated with the City's largest water customers and an analysis of City mapping to identify other potential large use sites. Details regarding the methodology used to identify potential uses and their associated demands are provided in this section.

3.1 Allowable Uses of Reclaimed Water

Class A reclaimed water is considered in this analysis as it represents the highest level of regulated treatment and public health protection, and therefore results in the greatest range of potential allowable beneficial uses. *Reclaimed water* is defined in RCW 90.46.010 as "water derived in any part from wastewater with a domestic wastewater component that has been adequately and reliably treated, so that it can be used for beneficial purposes." More specifically, *Class A reclaimed water* is defined in the State's Reclaimed Water Standards

(1997)[1] as "reclaimed water that, at a minimum, is at all times an oxidized, coagulated, filtered, disinfected wastewater." Specific treatment levels are outlined in the Reclaimed Water Standards.

Class A reclaimed water is allowable for the following types of uses: landscape/turf irrigation, some food and nonfood crop irrigation, decorative fountains, sewer flushing, street cleaning, dust control, construction water, fire fighting, toilet/urinal flushing, making concrete, industrial cooling and process water, and various forms of environmental enhancement (e.g., groundwater recharge, wetland enhancement, and streamflow augmentation), some of which require additional levels of treatment beyond the standard Class A requirements.

Based upon the location of the City, the activities taking place therein, and typical water use characteristics, the potential uses of reclaimed water most feasible in the City include:

- **Irrigation (landscape and turf).** This can include irrigation of parks, school fields, and other open green spaces.
- **Other Outdoor City Uses.** This can include street sweeping, dust control, construction water, etc.
- **Environmental Enhancement.** This would most likely take the form of groundwater recharge and/or streamflow augmentation, and is considered mainly in the context of water rights mitigation.

As noted previously, there are other uses for which reclaimed water is allowed according to the State, such as toilet and urinal flushing. Such uses are not focused upon in this analysis because the volumes represented by them are small, and implementing such uses poses significant additional costs (e.g., in-building plumbing retrofits) compared to the applications described above. However, as noted further below, the City acknowledges there is potential for implementation of such uses in discreet portions of the City, depending on how a reclaimed water system is developed.

3.2 Identification and Grouping of Potential Uses

A step-wise process was used to identify potential reclaimed water uses within and near the City, as follows:

1. **Identify Large City Water Customers.** City billing records were reviewed for the previous three years (2009 – 2011) to identify the City's largest water customers (those using on average more than 1,000 ccf[2] of water annually). From this analysis, customers with dedicated irrigation meters that have significant use are identified, as well as customers without dedicated irrigation meters but that have large irrigation needs.
2. **Identify Non-City Water Users with Large Irrigation Needs.** A review of large irrigated sites in and near the City that have a source of water other than the City's water system was performed. These areas include golf courses and cemeteries.

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[1] Source: Washington State Departments of Health and Ecology. *Water Reclamation and Reuse Standards*. Publication No. 97-23. September 1997.

[2] Ccf = hundred cubic feet, the City's water utility billing increment.

3. **Identify Environmental Enhancement Areas.** General areas where groundwater recharge or streamflow augmentation may be beneficial and feasible have been identified.
4. **Define "Use Areas".** The above use locations were organized into logical geographical groupings, based on proximity to one another and to potential reclaimed water production sites (i.e., City wastewater treatment plant or existing lift stations).
5. **Identify Other Uses in "Use Areas".** Once the potential use areas were identified, other smaller uses in or near the areas were noted.
6. **Other Potential Dual Distribution System Uses.** As noted in Section 3.1, there are other allowable uses of reclaimed water, such as in-building uses and smaller scale irrigation at residences. The City envisions the potential for development of such uses in one "purple pipe" region within the City. This would be one area in the City, in proximity to a reclaimed water production facility, comprised of fairly undeveloped (or underdeveloped) properties, for which building and development regulations may one day require the use of reclaimed water for in-building purposes (e.g., toilet and urinal flushing) and irrigation. No specific use locations or demands have been estimated for such potential future uses, but the opportunity is noted here for further consideration at a later date.

3.3 Reclaimed Water Demand Calculations

Reclaimed water demand projections were developed for the potential use areas. Various reclaimed water demand volumes and rates of use are important for conceptual level planning and for the sizing of production and distribution system components. The following metrics were calculated for potential reclaimed water uses:

- **Annual demand,** so as to understand total potential annual reclaimed water usage.
- **Average day in maximum month,** in order to estimate peak daily demands during the irrigation season. Typically, reclaimed water systems are sized such that production capacity is equal to or greater than the average day in the maximum month (similar to how potable water systems are designed for source capacity to be at least equal to maximum day demand). This metric is calculated as the maximum month demand divided by 18 days of irrigation, assuming that irrigation does not typically occur every day in the maximum month. Maximum month demand for irrigation sites is calculated as 30 percent of total annual water use. This is based on monthly crop irrigation requirements for areas in western Washington at approximately the same latitude as Puyallup[3].
- **Instantaneous demand,** in order to estimate peak needs during times of irrigation. For large irrigation sites (e.g., golf courses), this is calculated assuming the average day demand in the maximum month is continuous over a 24-hour period. This reflects an assumption that there is onsite storage (e.g., in ponds or tanks) to aid in meeting peak instantaneous needs at specific use sites. For smaller irrigation sites that are connected

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[3] Source: USDA Natural Resources Conservation Service. *Irrigation Guide* (September 1997). Appendix B (Washington State Crop Irrigation Requirements and Crop Consumptive Use). The value of 30 percent is calculated as the highest monthly crop irrigation requirement (CIR) for pasture/turf (5.09 inches) divided by the total annual CIR (17.62 inches).

directly to the reclaimed water distribution system (i.e., with no onsite equalizing storage), this is calculated as the average day in the maximum month divided by eight hours of irrigation (to reflect that most sites are not continuously irrigated).

It is important to note that these potential reclaimed water demand metrics represent planning-level estimates. More detailed analysis of site-specific reclaimed water demand will be required if and when the City moves forward with further planning for certain areas and begins the design of required infrastructure.

Other key assumptions used in preparing the demand forecast are:

- **Demands Based on City Records**. For those uses that currently utilize City water, billing records were used to estimate annual demands. Average day in the maximum month and instantaneous demands were then calculated per the methodology described above.
- **Irrigation Demands for Large Areas**. For large potential irrigation areas that do not currently use City water or for which annual usage was not known (such as golf courses, cemeteries, etc.), annual irrigation demand was calculated assuming 0.48 million gallons (MG) per acre[4]. Average day in the maximum month and instantaneous demands were then calculated per the methodology described above.
- **Other City Uses**. The potential reclaimed water demands associated with other, non-irrigation City uses are small compared to potential large irrigation uses. Thus, estimates previously developed for the WW Comp Plan and the WSP were carried forward in this analysis.

4.0 Potential Reclaimed Water Use Sites and Demands

This section provides a summary of potential reclaimed water uses within and near City Limits, along with their associated demands (calculated based on the methodology presented in the previous section).

4.1 Large City Water Customers

City billing records were reviewed, with those customer accounts using on average more than 1,000 ccf of water annually identified. Twenty-four such accounts fall into this category, as depicted in Table 1. Only those that have dedicated irrigation meters are considered further in this analysis as potential reclaimed water customers. While those accounts that do not have dedicated irrigation meters may have some irrigation potential, it is difficult to calculate what portion of their total consumption is associated with that use. In any event, such volumes are assumed in this analysis to be small and would not represent primary uses of reclaimed water.

As such, customer locations such as the Washington Corrections Center for Women and St. Anthony's Hospital (inside building use) are not considered as potential reclaimed water uses. Although their overall water use is high, most of the water used is related to activities that are not suitable for reclaimed water use. However, as noted in Section 3.2, some inside building

[4] Based on a seasonal CIR of 17.62 inches (see footnote 3 on previous page) applied over one acre.

uses (e.g., toilet and urinal flushing) may be plausible in the future in discreet, "purple pipe" regions in the City.

Therefore, of the 24 largest water accounts in the City, five represent irrigation and are included as potential reclaimed water uses. This is reflected in Table 2, which provides the overall summary of potential reclaimed water demands. These locations are also depicted on Figure 1.

Table 1. Largest City Water Customers (2009-2011)

Customer		User Type	Average Annual Water Use (1)	
			(ccf)	(gal)
1	WA Correction Center for Women	Commercial	34,988	26,171,024
2	St Anthony's Hospital (building)	Commercial	10,530	7,876,440
3	Tacoma Pierce County YMCA (GH)	Commercial	8,970	6,709,560
4	Harborwood West Apartments	Multi-family	8,765	6,556,220
5	**Spinnaker Ridge Assn (irrigation)**	**SFR**	**4,861**	**3,636,028**
6	Harbor Village Apartments	Multi-family	4,455	3,332,340
7	**St Anthony's Hospital (irrigation)**	**Irrigation**	**3,862**	**2,888,776**
8	Costco (building)	Commercial	3,342	2,499,816
9	Little Boat Home Owners Assoc.	SFR	3,138	2,347,224
10	Northview Terrace Condos	Multi-family	3,038	2,272,424
11	Gig Harbor Villa Apartments	Multi-family	2,987	2,234,276
12	Stinson Park	Multi-family	2,923	2,186,404
13	**Peninsula School District**	**Irrigation**	**2,701**	**2,020,348**
14	St Joseph's Hospital	Commercial	2,581	1,930,588
15	Peninsula School District	Commercial	2,503	1,872,244
16	**Costco irrigation**	**Irrigation**	**2,363**	**1,767,524**
17	The Great Car Wash	Commercial	2,081	1,556,588
18	Rosedale Town Homes	Multi-family	2,012	1,504,976
19	Albertson's (building)	Commercial	1,974	1,476,552
20	Wesley Inn	Commercial	1,878	1,404,744
21	Fred Meyer	Commercial	1,671	1,249,908
22	Sound Vista Village	Commercial	1,574	1,177,352
23	Rush Properties	Commercial	1,518	1,135,464
24	**Albertson's (irrigation)**	**Irrigation**	**1,067**	**798,116**
Large Customer Total			**115,782**	**86,604,936**

ccf = 100 cubic feet; gal = gallons

Bold text indicates potential reclaimed water user (irrigation) carried forward in analysis.

(1) Based on City billing data, 2009-2011.

Table 2. Summary of Potential Reclaimed Water Uses and Demands

Use Site No. [1]	Potential Use Site Name	Size (acres) [2]	Potential Reclaimed Water Demand: Annual [3] (gallons)	Average Day in Max Month [4] (gpd)	Instantaneous [5] (gpm)
Use Area 1 - WWTP					
N-1	Haven of Rest Cemetery	30	14,400,000	240,000	167
C-1	Donkey Creek Park	1	480,000	8,000	17
O-1	WWTP Maintenance		500,000	8,333	17
O-2	Street Sweeping [6]		90,000	1,875	5
O-3	Dust Control [7]		2,160,000	18,000	50
E-1	Streamflow Augmentation - Donkey Creek		---	---	---
E-2	Streamflow Augmentation - Unnamed Creek		---	---	---
	Subtotal - Use Area 1		**17,630,000**	**276,208**	**256**
Use Area 2 - Lift Station No. 8A					
N-3	Madrona Links Golf Course	100	48,000,000	800,000	556
C-10	Point Fosdick Drive and Uptown	1	240,000	4,000	8
O-2	Street Sweeping [6]		90,000	1,875	5
O-3	Dust Control [7]		2,160,000	18,000	50
	Subtotal - Use Area 2		**50,490,000**	**823,875**	**619**
Use Area 3 - Lift Station No. 12					
N-2	Canterwood Golf & Country Club	200	96,000,000	1,600,000	1,111
C-3	St. Anthony's (Irrigation)		2,888,776	48,146	100
O-2	Street Sweeping [6]		90,000	1,875	5
O-3	Dust Control [7]		2,160,000	18,000	50
E-4	Aquifer Recharge/Streamflow Augmentation - McCormick Creek		---	---	---
E-5	Aquifer Recharge/Streamflow Augmentation - Crescent Creek		---	---	---
E-6	Aquifer Recharge/Streamflow Augmentation - Donkey Creek		---	---	---
	Subtotal - Use Area 3		**101,138,776**	**1,668,021**	**1,267**
Use Area 4 - Lift Station No. 4					
C-4	Wilkenson Farm	9	4,320,000	72,000	150
C-5	Samuel Jerisch Park	1	240,000	4,000	8
C-6	Skansie Brothers Park	1	480,000	8,000	17
C-7	Spinnaker Ridge Association		3,636,028	60,600	126
C-8	Gig Harbor High School	25	1,147,925	19,132	40
C-9	Discovery Elementary	19	872,423	14,540	30
O-2	Street Sweeping [6]		90,000	1,875	5
O-3	Dust Control [7]		2,160,000	18,000	50
	Subtotal - Use Area 4		**12,946,376**	**198,148**	**427**
Use Area 5 - Lift Station No. 1					
C-2	Crescent Creek Park	4	1,920,000	32,000	67
O-2	Street Sweeping [6]		90,000	1,875	5
O-3	Dust Control [7]		2,160,000	18,000	50
E-3	Streamflow Augmentation - Crecent Creek		---	---	---
	Subtotal - Use Area 5		**4,170,000**	**51,875**	**122**

Notes for Table 2:

(1) C = Current City Water Customer; N = Non-City Water User; O = Other (non-irrigation) City Water Use; E = Environmental Enhancement Use
Use locations identified on Figures 1-6.
All uses are for landscape/turf irrigation, unless otherwise noted.

(2) Based on review of area mapping.

(3) Large City customers, based on City billing records (see Table 1).
Large Non-City Customer Uses, based on seasonal crop irrigation requirement (CIR) of 17.62 inches, which translates to 0.48 MG per year.
Other City Uses, based on prior estimates and discussions with City staff.

(4) Irrigation Uses, assumes 30% of annual demand is in max month, and irrigation occurs over 18 days in the month.
Non-irrigation uses, see other notes associated with each use.

(5) Large Irrigation Uses (i.e., where onsite ponds would provide storage), assumes constant rate.
Other irrigation uses, assumes 8-hour irrigation period.

(6) Assumes use during 4 days per month, 12 months per year, with trucks filling for up to 6 hours per day.

(7) Assumes use during 20 days per month, 6 months per years, with trucks filling for up to 6 hours per day.

4.2 Non-City Water Users with Large Irrigation Needs

There are other significant irrigation water uses within the City and its UGA that do not presently utilize City water. These have been identified based on a review of City mapping. They are included below as potential reclaimed water uses; however, it is noted that no discussions with the site owners/managers have occurred to further determine the feasibility and/or desire for use of reclaimed water at these locations. These potential uses are as follows:

- **Haven of Rest Cemetery.** Located adjacent to State Route (SR) 16 and above the wastewater treatment plant (WWTP), Haven of Rest Cemetery (HRC) is an established cemetery with approximately 30-acres of land that requires irrigation.
- **Madrona Links Golf Course.** Madrona Links Golf Course (MLGC) is an existing 18-hole public golf course located on 36th street in Gig Harbor within the UGA. With approximately 100 acres available for irrigation, ponds for reclaimed water storage could be constructed and integrated into the course landscaping.
- **Canterwood Golf and County Club.** Having many the same needs and demands as MLGC, this private 18-hole golf course is located in north Gig Harbor and has the potential for use of reclaimed water for irrigating approximately 200 acres of land.

4.3 Environmental Enhancement Uses

As discussed in Section 3, Class A reclaimed water may be used for various environmental enhancements, such as groundwater recharge and streamflow augmentation. These applications can provide benefits related to both fisheries and aquatic habitat, and can also be used in the context of water rights mitigation.

As noted in Section 2, this latter benefit may be of future interest to the City, primarily with respect to its water rights application associated with the proposed Well 9. The proposed well location is in an area where groundwater withdrawals may have impacts on multiple surface water bodies (i.e., McCormick and Crescent Creeks) that could require mitigation. Such impacts have not been quantified; therefore, it is challenging to estimate the potential reclaimed water demand that may be beneficial to aid in mitigating these impacts. However, for the purpose of conceptual-level planning, general locations of potential groundwater recharge and streamflow augmentation have been identified that are in proximity to other use sites, as shown in Figures 2-6 and discussed further in Section 5.

Future steps the City plans to take in the evaluation of these potential uses include:

- Participate in the regional groundwater modeling effort currently underway by the U.S. Geological Survey (USGS). The USGS work has been extended to capture the Gig Harbor area, and will provide robust hydrogelogic information that will be utilized in future water rights decisions and mitigation plan development. The initial conceptual model is to be developed by approximately 2015, with the qualified numeric model complete by 2017.
- Identify, with more specificity, potential mitigation needs.
- Conduct feasibility of using groundwater recharge or surface water augmentation in the context of a water right mitigation plan. This is a valid use of reclaimed water, and one

that is being implemented in other areas such as Thurston County. However, further definition is needed from steps a and b before more definitive evaluation is warranted.

Because these steps have yet to be taken, potential reclaimed water demands associated with these uses are not calculated in this analysis.

4.4 Dual Distribution System Uses

As discussed in Section 3.2, the City acknowledges the potential for development of other, smaller-scale uses (e.g., toilet and urinal flushing in buildings, and residential landscape/turf irrigation) in one "purple pipe" region within the City. This would be one area in the City, in proximity to a reclaimed water production facility, comprised of fairly undeveloped (or underdeveloped) properties, for which building and development regulations may one day require the use of reclaimed water for in-building purposes (e.g., toilet and urinal flushing) and irrigation. This would involve development of a more extensive "dual distribution system" with purple piping extended to multiple parcels within the area.

No specific use locations or demands have been estimated for such potential future uses, but the opportunity is noted here for further consideration at a later date.

4.5 Other Uses

A variety of other, typically smaller volume, uses of reclaimed water are possible within the City. These include:

1. **Wilkenson Farm Park.** Located on Rosedale Street, this park has approximately nine acres of irrigable turf, and an existing pond which could be used for storage of reclaimed water.
2. **City Park at Lift Station No. 1.** Crescent Creek Park is approximately four acres in size and represents a small potential use area.
3. **Samuel Jerisch and Skansie Brothers Parks at Lift Station No. 4.** Parks are approximately one acre in size and represent small potential use sites.
4. **Maintenance Activities at WWTP.** This includes general washing/flushing of sludge lines and clarifiers, rinsing of digesters during annual maintenance and site landscape irrigation needs. There is a current and ongoing need for water to perform these tasks; however, they represent relatively low aggregate volumes of water.
5. **Service Activities throughout the City.** These generally include street sweeping, storm drain maintenance, dust control, and use by contractors for construction water. The amount of water used for these activities is relatively insignificant but generally occurs during summer months when potable water demand is high.

5.0 Potential Use Areas and System Configurations

The potential reclaimed water uses identified in Section 4 have been organized into logical geographical "use areas." These are typically centered around at least one significant potential user. Given these clusters of use sites, initial conceptual configurations of reclaimed water system alternatives have been developed, including potential reclaimed water production facility locations and key distribution system infrastructure.

Production facilities are most feasible at wastewater treatment plants or near points in the wastewater collection system where flows are sufficient to support production of reclaimed water to fulfill sizeable needs. As such, the City is considering the potential for reclaimed water production both at its WWTP and at lift stations where wastewater flows from multiple areas converge and where there is sufficient land area for development of a production facility. These latter, decentralized sites are also referred to as “satellite” production facilities.

Given the above approach, five potential reclaimed water use areas have been identified. These are described below, and are depicted on Figures 2-6. Summaries of potential reclaimed water demands associated with each are provided in Table 2, while a summary of available wastewater flows at the potential production facilities is provided in Table 3, based on hydraulic modeling conducted for the WW Comp Plan.

Comparisons between potential demands and available flows are also provided in the following descriptions. Because the primary demands are irrigation and would occur during summer, these comparisons are made with dry weather flows (DWF).

Table 3. Summary of Potential Reclaimed Water Demand and Available Wastewater Flow

Use Area No.	Potential Reclaimed Water Production Facility Location	Potential Reclaimed Water Demands, Average Day in Max Month (MGD)	Wastewater Flow Projections (MGD) (1)								
			Dry Weather Flow (2)			Annual Average Flow			Maximum Month Flow		
			2006	2025	2050	2006	2025	2050	2006	2025	2050
1 (3)	WWTP	0.28	0.73	1.76	2.18	0.78	1.88	2.32	0.97	2.35	2.90
2 (5)	LS 8A	0.82	0.11	0.21	0.29	0.12	0.22	0.30	0.15	0.27	0.38
3	LS 12	1.67	0.16	0.41	0.48	0.17	0.43	0.52	0.22	0.54	0.64
3	Canterwood STEP (4)	1.67	0.07	0.08	0.09	0.07	0.08	0.09	0.09	0.10	0.11
4	LS 4	0.20	0.26	0.46	0.61	0.28	0.49	0.65	0.35	0.61	0.81
5	LS 1	0.05	0.01	0.05	0.06	0.01	0.05	0.07	0.01	0.07	0.08

(1) Source: City of Gig Harbor Wastewater Comprehensive Plan Update, hydraulic model (2009).

(2) Annual Average Flow multiplied by 0.94 (three year average ratio of DWF:AAF between 2004-2006).

(3) Flow at the Wastewater Treatment Plant includes tributary flow from Use Areas 2-5.

(4) Canterwood STEP system is tributary to Lift Station 12.

(5) Lift Station 8A is upstream of Lift Station 4.

5.1 Use Area 1 – Wastewater Treatment Plant

The primary reclaimed water use at this use area would be irrigation of HRC, located above the WWTP. This option would involve upgrading the WWTP to Class A production standards and installation of distribution and storage infrastructure to convey reclaimed water up the hill to HRC. With a limited amount of work within the public right of way, restoration and construction costs would be limited in comparison to the other options that require pipe installation in the roadway or roadside shoulder.

Primary Uses: Irrigation of large grass and landscape areas at HRC.

Secondary Uses: Donkey Creek is in the immediate vicinity. Reclaimed water may be diverted to the creek to augment flows as needed. A second, unnamed creek passes along the WWTP property line that could also potentially be used for streamflow augmentation. Donkey Creek Park is located adjacent to the WWTP and would be a candidate for site irrigation of the park and landscape beds. An opportunity also exists for a fill station for use in area landscape activities, water fill-up for street sweeping and storm drain maintenance. Reclaimed water can also be used at the WWTP for uses that do not require potable water.

Comparison of Available Wastewater Flows with Potential Demands: As noted in Table 3, the DWF at the WWTP is projected to increase from 0.73 mgd in 2006, to 2.18 mgd by 2050. By comparison, potential average day reclaimed water demands in the maximum month are estimated at approximately 0.28 mgd (see Table 2), not including potential environmental enhancement uses. Therefore, there would be sufficient wastewater flows to support identified uses.

Proposed Infrastructure:

- Additional infrastructure as needed at WWTP to produce Class A reclaimed water.
- Distribution line to HRC, generally to be directionally drilled from the WWTP to the cemetery.
- Distribution line to Donkey Creek (directional drill).
- Street crossing of Harborview Drive (open cut) and connection to site irrigation.
- Existing closed depression pond at HRC may be usable for reclaimed water storage.
- Addition of fill station or cistern to site for use in secondary activities.

5.2 Use Area 2 – Lift Station No. 8A

Lift Station No. 8 (LS 8) is located 350 feet east of the intersection of Point Fosdick Drive and Harbor County Drive, in the vicinity of Madrona Links Golf Course (MLGC) and the Uptown Retail Center. A planned future lift station in this area is Lift Station No. 8A, to be located at the end of 36th Avenue (to the southwest of the existing LS 8 site). The LS 8A site is a potential location for a satellite reclaimed water production facility, as this will be a collection point for existing and future flows in that wastewater basin.

The opportunity to go over land may help in controlling initial construction and restoration cost through the use of directional drill installation and HDPE pipe.

Primary Uses: Irrigation of the golf course and landscape areas.

Secondary Uses: Irrigation of Point Fosdick Dr and Uptown retail center.

Comparison of Available Wastewater Flows with Potential Demands: As noted in Table 3, the DWF at the WWTP is projected to increase from 0.11 mgd in 2006, to 0.29 mgd by 2050. By comparison, potential average day reclaimed water demands in the maximum month are estimated at approximately 0.80 mgd (see Table 2), not including potential environmental enhancement uses. Therefore, wastewater flows could support only a portion of identified uses.

Proposed Infrastructure:

- Satellite reclaimed water facility at LS 8A site. Further evaluation would be needed to determine if there will be a sufficient amount of space available on the site when land is purchased by the City for the lift station.
- Reclaimed water forcemain to MLGC and Uptown retail center. These lines may be directionally drilled, minimizing the amount of surface restoration for the project.
- Revision of the existing ponds for water storage for use during summer months.
- Onsite improvements to existing irrigation lines.

5.3 Use Area 3 – Lift Station No. 12

Use Area 3 centers around potential large reclaimed water uses at Canterwood Golf and Country Club and St. Anthony's Hospital. There are two potential means of producing reclaimed water in this area:

- Lift Station No. 12 (LS 12). At the intersection of Woodhill Drive and Burnham Drive, LS 12 could serve as a location for production of reclaimed water that could be used throughout Northern Gig Harbor. There is a casing across SR 16 that may be able to be used for a distribution line to reach potential use locations on the east of SR 16.
- Canterwood STEP. There is an existing STEP sewer system for the residential development adjoining the golf course, with a point of discharge manhole on Canterwood Boulevard. The ability to remove some of this effluent from the City's sewer conveyance system and convert it to reclaimed water may have beneficial effects on the downstream portions of the City's system.

Primary Uses: Golf course and development common areas irrigation.

Secondary Uses: Irrigation at St Anthony's, groundwater recharge, and streamflow augmentation for McCormick, Crescent, and Donkey Creeks.

Comparison of Available Wastewater Flows with Potential Demands: As noted in Table 3, the DWF at LS 12 is projected to increase from 0.16 mgd in 2006, to 0.48 mgd by 2050. By comparison, potential average day reclaimed water demands in the maximum month are estimated at approximately 1.7 mgd (see Table 2), not including potential environmental enhancement uses. Therefore, wastewater flows could support only a portion of identified uses. DWF from the Canterwood STEP system is much less than that of LS 12, estimated to be 0.10 mgd.

Proposed Infrastructure:

- If LS 12 site is utilized:
  - Satellite reclaimed water facility at the LS 12 site, or on a nearby parcel to the south that is presently for sale by owner.
  - Reclaimed water distribution line from LS 12 to Canterwood Boulevard and up Canterwood Boulevard.
  - Onsite improvements to irrigation lines.
- If Canterwood STEP site is utilized:

- o Satellite reclaimed water facility in proximity to the manhole collecting Canterwood STEP flows.
- o Reclaimed water distribution line(s) through the development into the course. It should be assumed that a portion of this can be achieved with directional drill, but a significant amount of open cut will be required for some forcemains. A pipeline will also need to be installed to the hospital but may be achieved over land, minimizing the amount of work in the public right of way.
- o Reconstruction of the golf course site ponds for water storage for use during summer months.
- o Onsite improvements to irrigation lines.

5.4 Use Area 4 – Lift Station No. 4

At the intersection of Harborview Drive and Rosedale Street in the City of Gig Harbor, Lift Station No. 4 (LS 4) would be the primary location for reclaimed water production for any of the uses identified for adjacent parks or the Wilkenson Farm (WF). A reclaimed water pipeline would be required and constructed within the public right of way from the LS 4 location to the WF Park.

Primary Uses: Irrigation of the parks including possible irrigation of WF.

Secondary uses: Irrigation of school fields and Spinnaker Ridge landscaping.

Comparison of Available Wastewater Flows with Potential Demands: As noted in Table 3, the DWF at LS 4 is projected to increase from 0.26 mgd in 2006, to 0.61 mgd by 2050. By comparison, potential average day reclaimed water demands in the maximum month are estimated at approximately 0.20 mgd (see Table 2). Therefore, it appears there would be sufficient wastewater flows to support identified uses.

Proposed Infrastructure:

- Satellite reclaimed water facility at or near LS 4.
- Open-cut reclaimed water forcemain to Wilkenson Farm.
- Installation/improvement of onsite irrigation lines.

5.5 Use Area 5 – Lift Station No. 1

Lift Station No. 1 (LS 1) is located in the southwest corner of Crescent Creek Park in East Gig Harbor, with access from Vernhardsen Street/96th. This option would involve using a portion of the park for a satellite production facility.

Primary Uses: Irrigation of the upper and lower fields at the park.

Secondary Uses: Additional stream flow to Crescent Creek and a potential fill station for street sweeping and offsite irrigation.

Comparison of Available Wastewater Flows with Potential Demands: As noted in Table 3, the DWF at LS 1 is projected to increase from 0.01 mgd in 2006, to 0.06 mgd by 2050. By comparison, potential average day reclaimed water demands in the maximum month are estimated at approximately 0.05 mgd (see Table 2), not including potential environmental enhancement uses. Therefore, wastewater flows could support only a small portion of identified uses.

Proposed Infrastructure:

- Satellite reclaimed water production facility at the park.
- Onsite improvements/connections to irrigation lines.
- Forcemain.
- Fill station.

5.6 Initial Screening of Use Areas

The five potential system configuration alternatives described above were evaluated during an initial screening to determine which ones warranted more in-depth analysis and development of cost estimates. Of the five, the following three were selected for continued evaluation:

- Alternative 1: Use Area 1 – WWTP
- Alternative 2: Use Area 2 – LS No. 8A
- Alternative 3: Use Area 3 – LS No. 12

Use Area 4 (LS No. 4) was removed from further consideration due to the low reclaimed water use potential, relative to other options, and considerable site constraints. Use Area 5 (LS No. 1) was excluded due to the very low reclaimed water use potential and its proximity to the WWTP. For Alternative 3, it is assumed that the LS No. 12 site, or a nearby parcel to the south that is presently for sale by owner, would be used for siting a reclaimed water production facility, and that the STEP site would not be used, due to the significantly lower flows generated at that location.

6.0 Cost Estimates

Opinions of probable construction cost and annual operating costs were developed for the three alternatives passing the initial screening: Alternatives 1 through 3. This section summarizes the approach and results of the cost estimating.

6.1 Cost Estimating Approach

Planning level (AACE[5] Class 4) cost estimates have been developed for each of the three alternatives. Due to the conceptual nature of this analysis and the many variables influencing project costs, actual costs are expected to be within a range of –20% to +30% of the total estimated project cost

[5] Association for the Advancement of Cost Engineering.

For each alternative, both capital and annual operating costs have been prepared. The following components and key assumptions were considered in the development of the capital cost estimates:

- **Construction Cost**. This includes all labor, equipment, and material costs associated with construction of the primary elements of the system configurations. Due to the preliminary level of this analysis, and given the alternatives evaluated, a detailed line-item break down of construction costs has not been prepared. Costs for some items have been estimated using construction cost curves for similar projects throughout the country, while costs for other parameters are based on unit costs developed utilizing recent bid tabulations from similar water and sewer construction projects. As such, these construction costs are assumed to include contractor overhead and profit. Additional details on key capital cost components are provided below.
    - **Reclaimed Water Production Facility**. Alternative 1 involves the implementation of additional unit processes at the City's WWTP necessary to generate Class A reclaimed water. Based on a cursory evaluation of the City's existing WWTP, including the 2010 upgrades to the facility, the key additional component that is necessary for production of reclaimed water is filtration. While there are multiple technologies available to fulfill this requirement, the reclaimed water industry is generally moving away from traditional sand, mixed-media, and cloth filtration approaches and towards membrane filtration. Therefore, the installation of a membrane filtration system is assumed in this cost estimate.

      Alternatives 2 and 3 involve construction of new satellite reclaimed water production facilities. While there are various treatment technologies and facility configurations that can be used to produce Class A reclaimed water, the most common treatment strategy currently being studied and implemented in the context of satellite facilities of the size considered in this analysis (i.e., 0.2 – 0.5 mgd) is the use of membrane bioreactors (MBRs). Other options exist, but these are typically designed for smaller volumes and installation within residential developments, and most have not received certification for production of Class A reclaimed water use in a municipal context. Therefore, the construction costs of a satellite reclaimed water production facility within the system configurations described in Alternatives 2 and 3 are based on application of MBR technology. Key components of the treatment facilities required for an MBR facility are listed below:

        - Preliminary and Fine Screening
        - Grit Removal
        - Aeration Basins
        - Membranes
        - Chlorine Disinfection (with distribution system residual)
        - Odor Control

      For Alternatives 2 and 3, the reclaimed water facility is sized to process the 2025 MMF at their respective sites. It is assumed in each case that there is sufficient wastewater remaining in the conveyance system to transport solids downstream to the WWTP for solids processing at that central location. Therefore, the costs for these reclaimed water production facilities does not include solids handling.

The construction costs for this type of satellite MBR facility are estimated using an MBR cost curve based on other similarly-sized facilities built or designed throughout the country. These costs represent total facility costs, including redundant process units as necessary to satisfy reliability requirements for generation of Class A reclaimed water.

- **Storage Facilities**. Storage facilities will be required so the reclaimed water system has an adequate volume of water to meet instantaneous demands. For the purpose of this analysis, it is assumed that very large reclaimed water use sites will have their own storage facilities (e.g., ponds at golf courses). City storage facilities are therefore sized to provide at least one day's worth of reclaimed water use associated with other applications.
- **Pumping Facilities**. Pumping facilities will be required at the reclaimed water production facility and/or throughout the reclaimed water distribution system in order to convey the flows to customer use sites.
- **Transmission Piping**. Transmission and distribution piping will be required to deliver reclaimed water to customer use sites. Such infrastructure will be installed in phases to accommodate future expansion to potential customers. Transmission and distribution system costs do not include on-site retrofits that may be required at customer use sites (e.g., provision of cross-connection control).

The capital costs presented here do not include the costs associated with the additional facilities needed to implement the environmental enhancement applications of beneficial reuse. The nature of such facilities (e.g., location and size of wetlands and/or groundwater infiltration basins) is unknown and highly variable. The City will further explore such costs/issues when an alternative is selected. Once suitable options are identified, costs for any additional pumping, transmission piping, and end use facilities will need to be included in the capital costs provided in this Study.

These costs also do not include any land purchases that may be required. For example, Alternative 3 will likely require the purchase of additional land, since the existing LS 12 site is fairly small. A parcel that appears potentially suitable is one to the south of the LS 12 site and that is for sale by owner as of December 2012. No detailed appraisal of potential purchase cost has been made; however, it is noted that as of December 4, 2012, the Pierce County Assessor-Treasurer's office lists the assessed value of this five-acre property at $246,500.

- **Construction Contingency**. Given the uncertainties associated with estimating construction costs at this planning level, a construction contingency has been included. This is estimated to be 30 percent of the total Capital Construction Cost.
- **Sales Tax**. This is calculated as 8.5 percent of the (Capital Construction plus Construction Contingency) cost.
- **Engineering Design/Permitting**. This includes associated project costs, such as survey, engineering design, permit acquisition, community outreach, project administration, and construction management. These costs are estimated to be 30 percent of the (Construction plus Construction Contingency plus Sales Tax) cost.

Annual operating and maintenance costs are developed for energy consumption (mainly associated with distribution pumping equipment, and assuming $0.09/kW-hr) and labor costs associated with normal operations/maintenance (which is assumed to equal one full time equivalent, or approximately $80,000 per year for each alternative). These costs do not include chemical costs (as might be associated with chlorine disinfection), additional pumping costs associated with year-round environmental enhancement uses (i.e., only summer irrigation use is considered in the costs presented), or other periodic maintenance needs. Such details should be added to these cost estimates if the City further explores implementation of a particular option.

All costs are in December 2012 dollars (ENR Seattle Cost Index of 9,412.52).

6.2 Cost Estimates

Tables 4 through 6 present the opinions of probable construction cost for Alternatives 1 through 3, respectively. As noted in the tables, Alternative 1 has the lowest estimated project capital cost of $3.8 million (M). Alternatives 2 and 3 have estimated project capital costs of $5.8M and $7.1M, respectively.

Table 4. Alternative 1 Cost Estimate: Use Area 1 – WWTP

Item	Quantity	Unit	Unit Cost	Total Cost
Capital Costs				
Membrane Filtration at WWTP	280,000	gpd	$2	$560,000
8" HDPE Reuse Pipe	2,000	LF	$100	$200,000
Reclaimed Water Fill Station	1	LS	$100,000	$100,000
Storage Tank	300,000	gal	$1.50	$450,000
Reuse Pump Station (300 gpm - 22 hp)	1	LS	$450,000	$450,000
Subtotal				**$1,760,000**
Mobilization/Demobilization	1	LS	8%	$281,600
Temporary Erosion/Sedimentation Control	1	LS	5,000	$5,000
Traffic Control	1	LS	10,000	$10,000
Subtotal				**$2,056,600**
Construction Contingency	1	LS	30%	$616,980
Subtotal - Construction Costs				**$2,673,600**
Sales Tax	1	LS	8.5%	$227,256
Construction Budget - Conceptual Design Estimate				**$2,901,000**
Engineering Design/Permitting	1	LS	30%	$871,000
Total Estimated Project Capital Cost				**$3,772,000**
Annual Operating and Maintenance Costs				
Energy				$1,000
Labor				$80,000
Total Annual Operating Costs				**$81,000**

Table 5. Alternative 2 Cost Estimate: Use Area 2 – LS No. 8A

Item	Quantity	Unit	Unit Cost	Total Cost
Capital Costs				
Complete MBR Plant, 0.20 MGD	200,000	gpd	$8	$1,600,000
8" HDPE Reuse Pipe	6,800	LF	$100	$680,000
Dewatering and Shoring	6,800	LF	$5	$34,000
Storage Tank	30,000	gal	$2	$60,000
Reuse Pump Station (300 gpm - 22 hp)	1	LS	$450,000	$450,000
Subtotal				**$2,824,000**
Mobilization/Demobilization	1	LS	5%	$282,400
Temporary Erosion/Sedimentation Control	1	LS	10,000	$10,000
Traffic Control	1	LS	25,000	$25,000
Subtotal				**$3,141,400**
Construction Contingency	1	LS	30%	$942,420
Subtotal - Construction Costs				**$4,083,900**
Sales Tax	1	LS	8.5%	$347,132
Construction Budget - Conceptual Design Estimate				**$4,432,000**
Engineering Design/Permitting	1	LS	30%	$1,330,000
Total Estimated Project Capital Cost				**$5,762,000**
Annual Operating and Maintenance Costs				
Energy				$5,000
Labor				$80,000
Total Annual Operating Costs				**$85,000**

Table 6. Alternative 3 Cost Estimate: Use Area 3 – LS No. 12

Item	Quantity	Unit	Unit Cost	Total Cost
Capital Costs				
Complete MBR Plant, 0.40 MGD	400,000	gpd	$6	$2,400,000
8" HDPE Reuse Pipe	4,500	LF	$100	$450,000
SR16 Crossing	500	LF	$60	$30,000
Dewatering and Shoring	4,500	LF	$5	$22,500
Storage Tank	75,000	gal	$2	$150,000
Reuse Pump Station (400 gpm - 29 hp)	1	LS	$450,000	$450,000
Subtotal				**$3,502,500**
Mobilization/Demobilization	1	LS	5%	$350,250
Temporary Erosion/Sedimentation Control	1	LS	10,000	$10,000
Traffic Control	1	LS	20,000	$20,000
Subtotal				**$3,882,750**
Construction Contingency	1	LS	30%	$1,164,825
Subtotal - Construction Costs				**$5,047,600**
Sales Tax	1	LS	8.5%	$429,046
Construction Budget - Conceptual Design Estimate				**$5,477,000**
Engineering Design/Permitting	1	LS	30%	$1,644,000
Total Estimated Project Capital Cost				**$7,121,000**
Annual Operating and Maintenance Costs				
Energy				$6,000
Labor				$80,000
Total Annual Operating Costs				**$86,000**

7.0 Summary and Recommendations

This section provides a summary of the findings from the analysis, and outlines the recommended next steps to determine reclaimed water program feasibility, as well as key considerations to be made if the City elects to move forward with implementing a reclaimed water program.

7.1 Cost / Benefit Summary

Table 7 provides a summary of the three alternatives selected from the initial screening. This summary contains a quantitative comparison involving the costs (from Section 6), projected reclaimed water volumes (from Section 5), and a calculation of the cost per unit volume of reclaimed water produced.

Also provided in Table 7 are the results of an alternatives analysis workshop (held on December 5, 2012), where the three alternatives were discussed amongst City and HDR Engineering, Inc. staff. The alternatives were compared to one another according to seven criteria constituting a blend of quantitatively and qualitatively assessed features/attributes. These criteria are defined in detail in Appendix A, which also contains the detailed results from the workshop, including criteria weighting and alternative scoring. The seven criteria used in the analysis were:

- Potential Reclaimed Water Production, Annual
- Potential for Water Rights Mitigation and/or Environmental Enhancement Uses
- Constructability
- Environmental and Permitting Requirements
- Aesthetic Impacts and Public Acceptance/Reaction
- Unit Cost per Volume
- Increased WWTP Capacity

In evaluating the summary of results presented in Table 7, Alternative 3 results in the lowest cost per unit volume of reclaimed water produced and also received the highest total weighted score from the alternatives analysis workshop. This latter result is primarily a result of this alternative having the greatest potential volume of reclaimed water to be put to beneficial use, and the largest potential for water rights mitigation, which may be the most near-term beneficial use opportunity for reclaimed water that the City will have.

The alternatives analysis workshop also resulted in Alternatives 1 and 2 having very similar total weighted scores, less than that of Alternative 3.

These results do not in and of themselves suggest that the City should proceed with implementing Alternative 3. Rather, it indicates at this level of analysis that this option appears to be preferable to the others.

Table 7. Alternatives Summary

	Alt 1 WWTP	Alt 2 LS No. 8A	Alt 3 LS No. 12
<u>Quantitative Summary</u>			
Wastewater Flow Projection, Dry Weather Flow in 2025 (mgd)[1]	1.76	0.21	0.41
Potential Reclaimed Water Demand, Average Day in Max Month (mgd)[2]	0.28	0.82	1.67
Facility Design Capacity (mgd)[3]	0.28	0.20	0.40
Potential Reclaimed Water Production, Annual (mg)[4]	17.6	36.0	72.0
Total Estimated Project Capital Cost (Million $)[5]	$3.8	$5.8	$7.1
20-Year Cost, (Million $)[6]	$5.4	$7.5	$8.8
Unit Cost ($/1,000 gallons)[7]	$15.32	$10.36	$6.14
<u>Qualitative Summary</u>[8]			
Total Weighted Score from Alternatives Analysis Workshop (points)	205	216	384

Notes:

(1) See Table 3.

(2) See Table 3. Potential reclaimed water demand is associated only with identified irrigation uses and does not include potential volumes associated with environmental enhancement applications.

(3) Based on the lesser of available source water (i.e., 2025 Dry Weather Flow) or Reclaimed Water Demand.

(4) For Alternative 1, calculated as annual total reclaimed water demand (see Table 2), since that is the volume upon which facility sizing is based. For Alternatives 2 and 3, calculated as the facility design capacity multiplied by 180 days of potential irrigation, since potential demand is not limiting and the full design capacity could presumably be utilized during the entire irrigation season.

(5) See Tables 4 through 6.

(6) Includes Total Estimated Project Capital Cost plus Annual Operating Costs (see Tables 4 through 6).

(7) 20-Year cost divided by potential reclaimed water production over 20 year period.

(8) See Appendix A for detailed results. Total Weighted Score is out of a possible total of 500 points (with a higher score being a more favored option).

7.2 Recommended Next Steps

If the City elects to further consider implementation of a reclaimed water program in the future, key next steps are recommended below:

- Periodically re-evaluate the feasibility of reclaimed water program implementation in the context of changing objectives and drivers. This is best done in the course of comprehensive utility planning efforts, such as future updates to the water system plan and the wastewater comprehensive plan.
- Further define and analyze the conceptual approach to a reclaimed water production and distribution system. This may involve conceptual-level planning regarding development of a potential reclaimed water production site or sites, and associated key distribution infrastructure (e.g., main pipelines).
- Specifically with regard to refining the possibility of using reclaimed water for water rights mitigation, proceed with the following:
    a. Continue to participate in the regional groundwater modeling effort currently underway by the USGS. This will provide robust hydrogelogic information that will be utilized in future water rights decisions and mitigation plan development.
    b. Identify, with more specificity, potential mitigation needs.

c. Conduct feasibility of using groundwater recharge or surface water augmentation in the context of a water right mitigation plan. However, further definition is needed from steps a and b before more definitive evaluation is warranted.

- Further evaluate implementation of a "purple pipe" region in the City, an area within which building and development regulations may be modified to require installation of purple pipe in the course of residential and commercial development, and where reclaimed water use will be required for certain water needs (e.g., toilet and urinal flushing, irrigation) when the resource is available to the area. Next steps would include identification of the optimal "purple pipe" region, and modification of building and development codes and regulations.

Other considerations the City will need to further explore prior to implementation of a reclaimed water program include:

- **Regulatory Changes**. The State is in the process of revising its reclaimed water regulations, but the timing of adoption of any such changes, and their content/impact, is unknown at this point. The City should continue tracking developments associated with those efforts, and periodically assess the nature of the impacts they may have on the alternative reclaimed water system configurations currently under consideration.

- **Program Financing**. The capital expense associated with a reclaimed water program is significant. It is very rare for revenues generated directly by a reclaimed water program to fully recoup costs. Therefore, a cost recovery framework must be developed that accounts for the full range of benefits a program imparts. This may lead to allocation of cost recovery amongst multiple beneficiaries:
  - Reclaimed water customers
  - Water rate payers
  - Wastewater rate payers
  - Environment

  Developing a cost recovery framework in this way will aid in: (a) attracting customers and allowing them to see a payback for their investment, (b) growing the customer base and improving economies of scale, and (c) realizing the broader economic and environmental benefits over time. This type of analysis will be required for a reclaimed water program of any significant size to be successful.

- **End User Agreements**. To this point, the implementation discussion has focused primarily upon producing, conveying, and delivering reclaimed water. However, there are critical considerations regarding the end users. Agreements specific to the delivery and use of reclaimed water are required for successful implementation of a reclaimed water program. Key elements of end user agreements include terms and conditions of service and definition of customer responsibilities, with respect to such things as supply reliability and cross-connection control.

- **Public Outreach.** Prior to investing significant resources into reclaimed water program implementation, it is recommended that a public outreach strategy be developed to inform the public of the benefits of such a program and the City's vision for how it would integrate into a larger framework of sustainable water resource management.

Figures

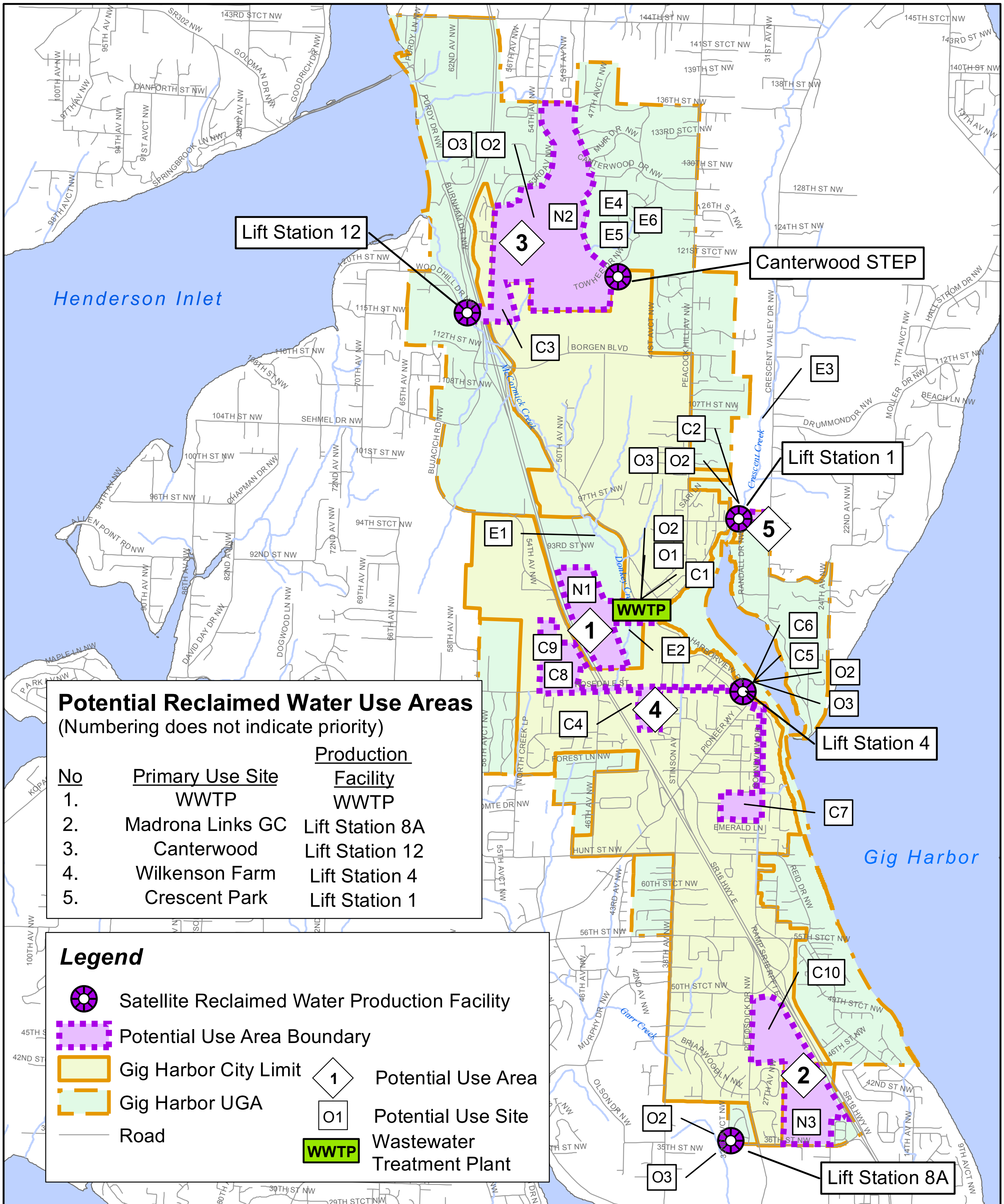

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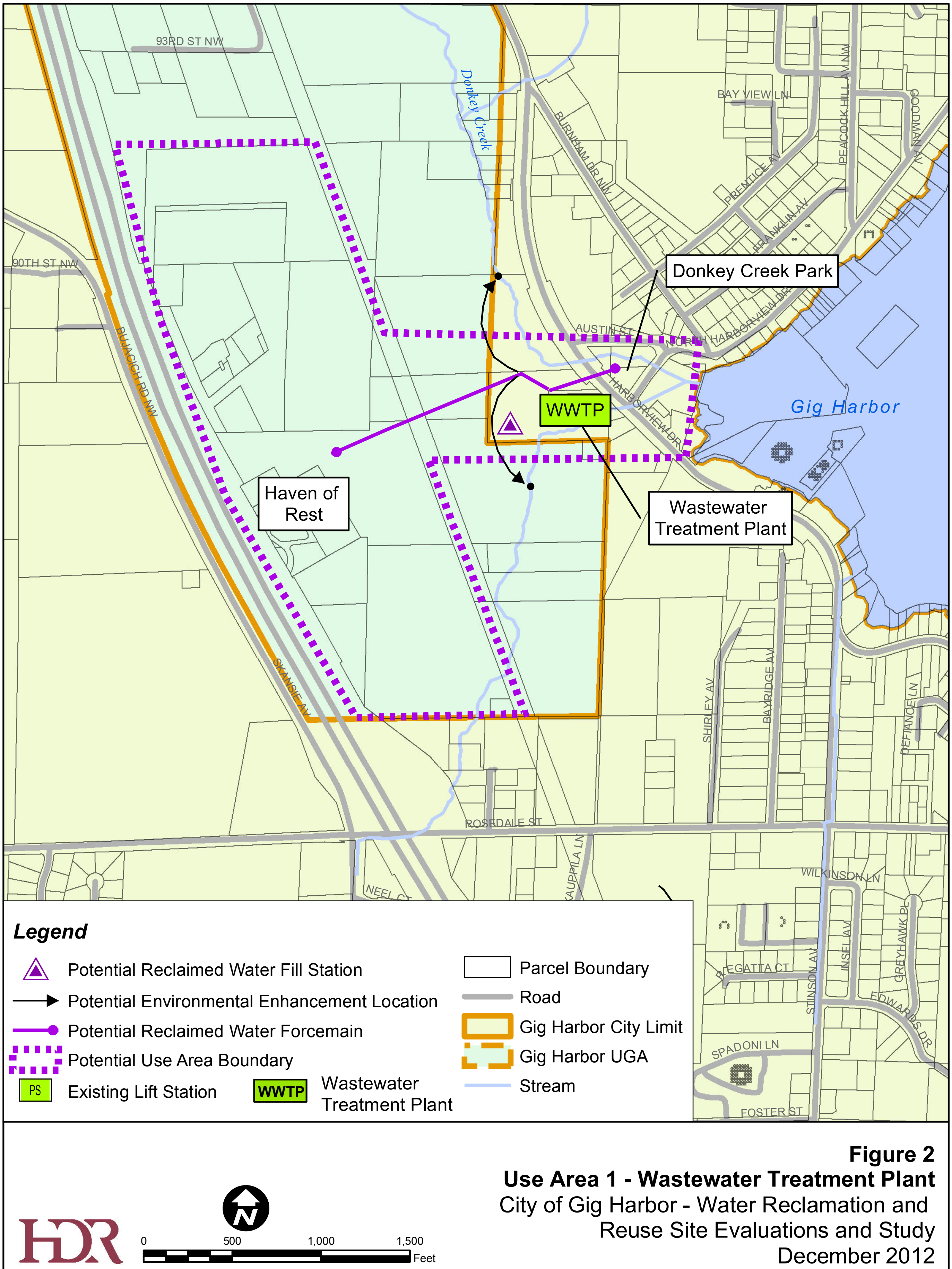
Figure 1
Potential Reclaimed Water Use Areas
City of Gig Harbor - Water Reclamation and Reuse Site Evaluations and Study
December 2012



HDR

Figure 2

Use Area 1 - Wastewater Treatment Plant

City of Gig Harbor - Water Reclamation and Reuse Site Evaluations and Study

December 2012

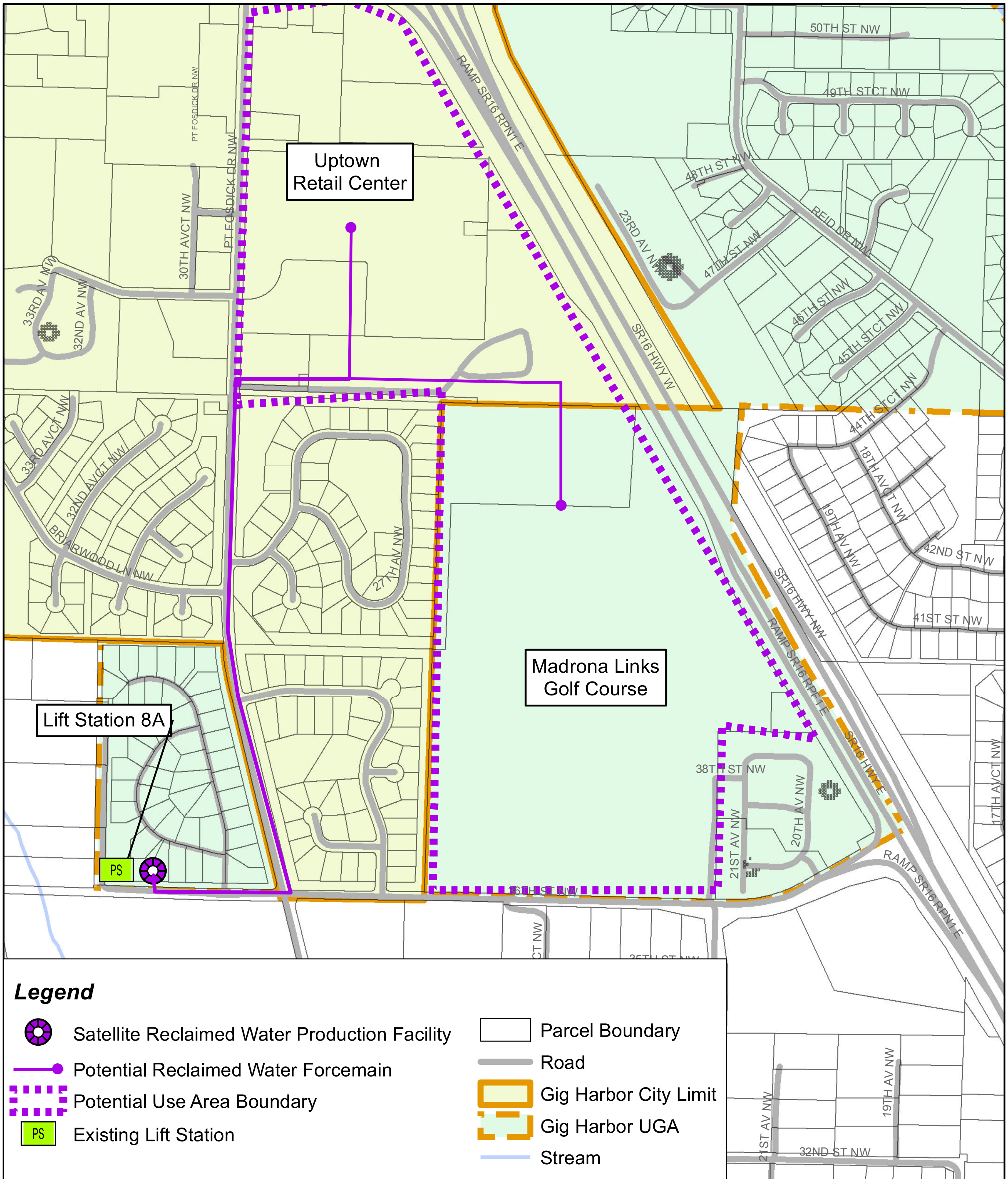


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Figure 3
Use Area 2 - Lift Station No. 8A
City of Gig Harbor - Water Reclamation and Reuse Site Evaluations and Study
December 2012

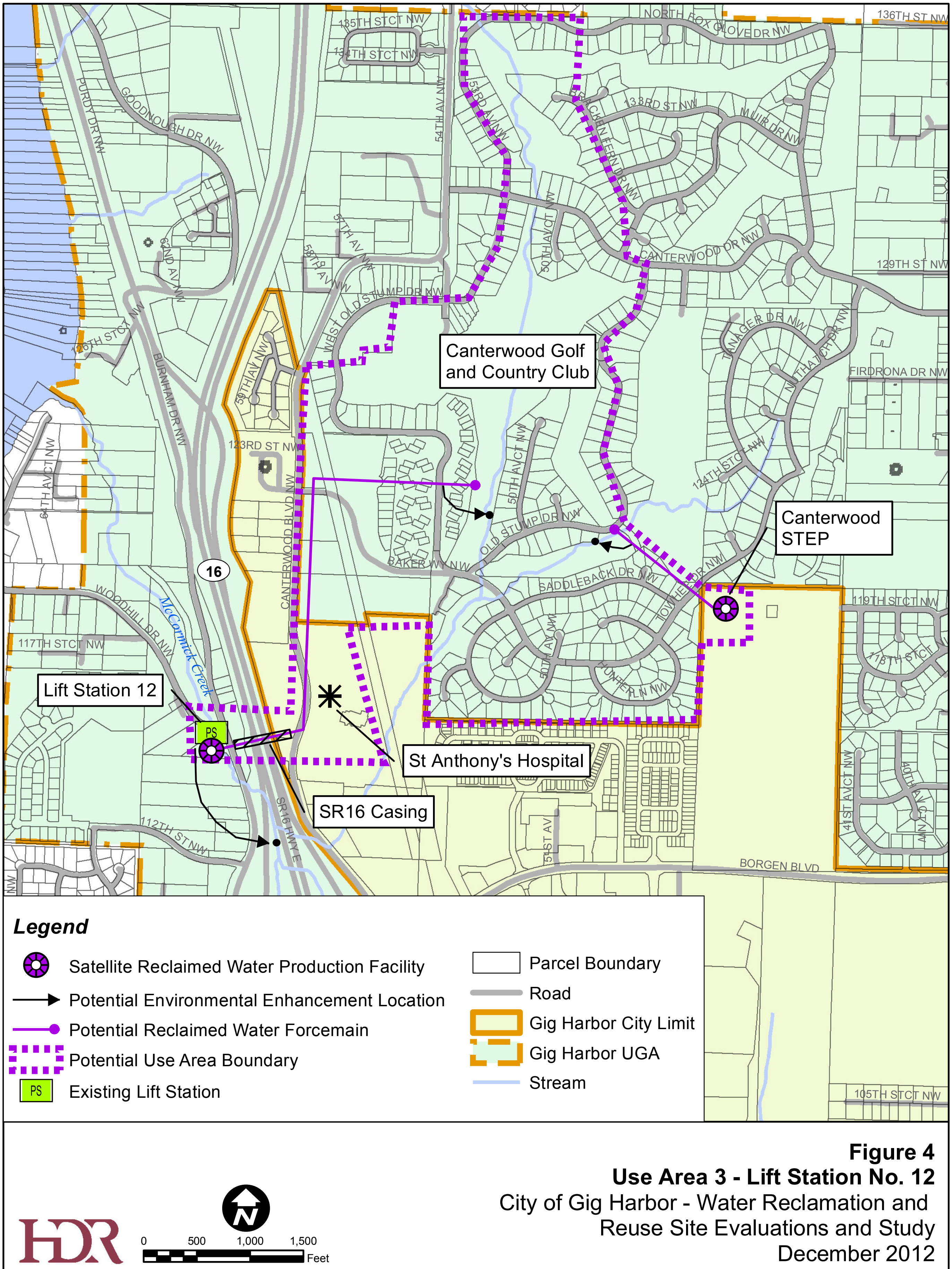

Figure 4
Use Area 3 - Lift Station No. 12
City of Gig Harbor - Water Reclamation and Reuse Site Evaluations and Study
December 2012

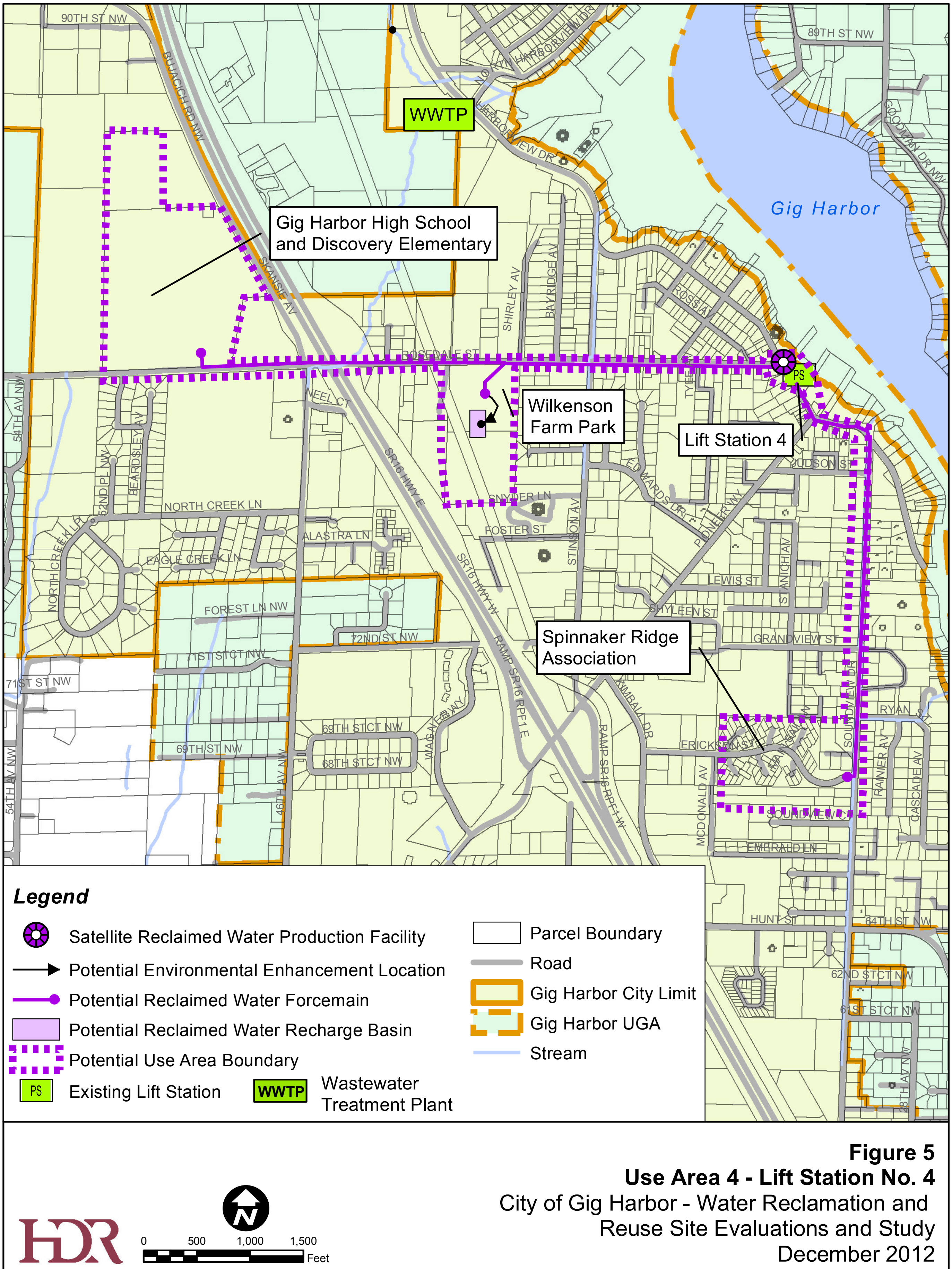

Figure 5
Use Area 4 - Lift Station No. 4
City of Gig Harbor - Water Reclamation and Reuse Site Evaluations and Study
December 2012

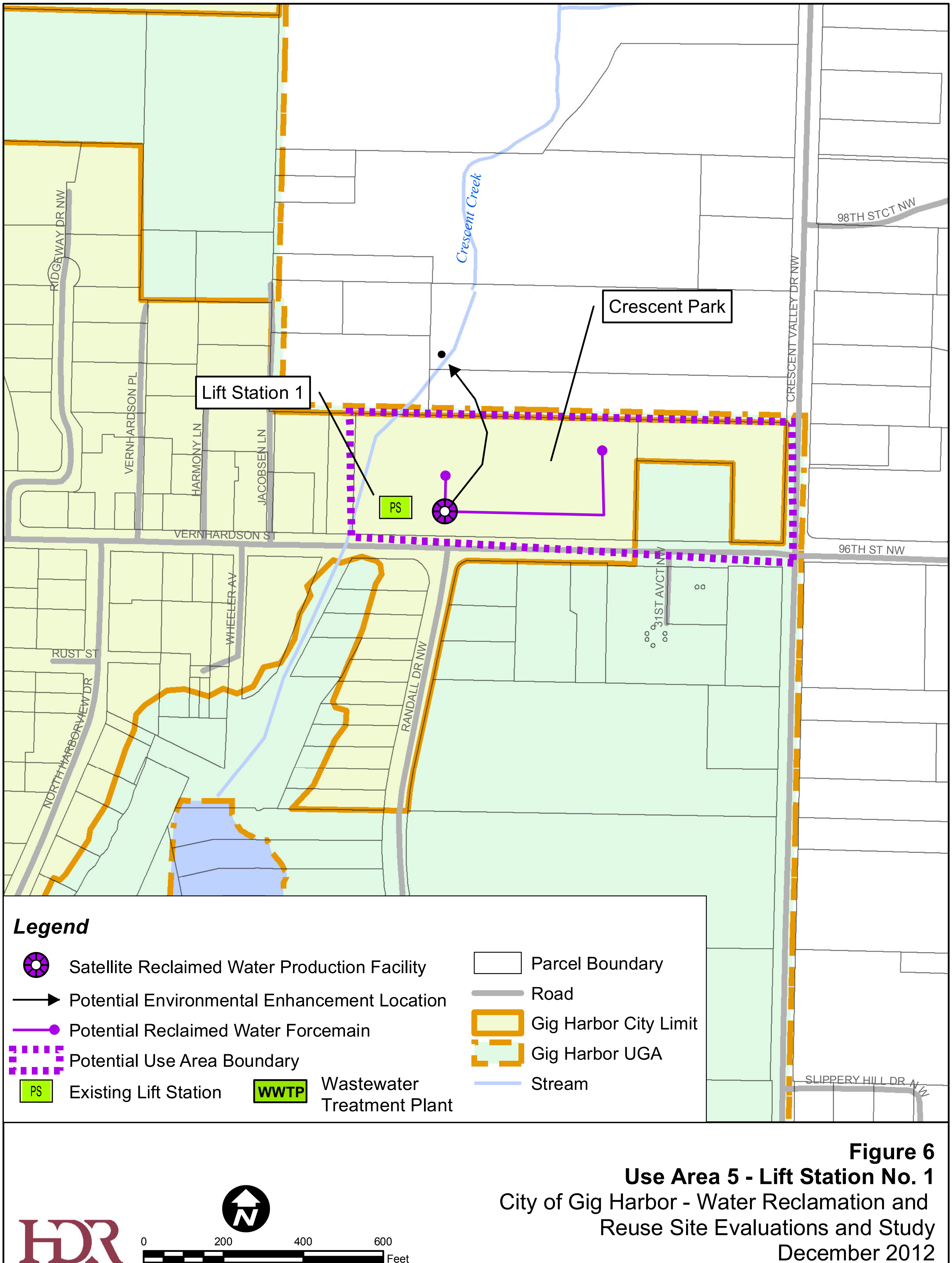

Figure 6
Use Area 5 - Lift Station No. 1
City of Gig Harbor - Water Reclamation and Reuse Site Evaluations and Study
December 2012

Appendix A
Alternatives Analysis Workshop Results

ALTERNATIVES DESCRIPTION

Alternative Title		Estimated Capital Cost	Description
1	**Wastewater Treatment Plant (WWTP)**	**$3.8 M**	Design Capacity = 0.28 mgd Annual reclaimed water production and beneficial use = 17.6 MG Potential large irrigation uses: Haven of Rest Cemetery, Donkey Creek Park Upgrade of WWTP (filtration) to produce Class A reclaimed water Distribution Piping (2,000 LF) Storage Tank (300,000 gal) Pumping Station (22 hp) Unit Cost ($/1,000 gal) = $15.32
2	**Lift Station No. 8A (LS 8A)**	**$5.8 M**	Design Capacity = 0.20 mgd Annual reclaimed water production and beneficial use = 36.0 MG Potential large irrigation uses: Madrona Links Golf Course Complete MBR plant to produce Class A reclaimed water Distribution Piping (6,800 LF) Storage Tank (30,000 gal) Pumping Station (22 hp) Unit Cost ($/1,000 gal) = $10.36
3	**Lift Station No. 12 (LS 12)**	**$7.1 M**	Design Capacity = 0.40 mgd Annual reclaimed water production and beneficial use = 72.0 MG Potential large irrigation uses: Canterwood Golf & Country Club, St. Anthony's Complete MBR plant to produce Class A reclaimed water Distribution Piping (4,500 LF) Storage Tank (75,000 gal) Pumping Station (29 hp) Unit Cost ($/1,000 gal) = $6.14

CRITERIA DEFINITION and SCORING GUIDANCE

Criteria		Definition	Rating Guidance
A	**Potential Reclaimed Water Production, Annual (VOLUME)**	Annual reclaimed water produced and put to beneficial use for irrigation and other outdoor, mainly summer-time uses. Results in decreased WWTP marine discharge. Does not include potential volumes associated with water rights mitigation or environmental enhancement.	1 = Minimal to no reclaimed water use 3 = Mid-level of reclaimed water use 5 = Highest level of reclaimed water use
B	**Potential for Water Rights Mitigation and/or Environmental Enhancement Uses (WATER RIGHTS)**	Location of proposed reclaimed water production facility is in proximity to areas where reclaimed water could be used in a water right mitigation strategy, and/or for groundwater recharge or streamflow augmentation.	1 = No potential 3 = Moderate potential 5 = Highest level of potential
C	**Constructability (TEMPORARY IMPACTS)**	Complexity of construction and construction techniques required, and level of impact to public during construction (e.g., noise impacts to neighboring properties, traffic impacts).	1 = Most complex construction required, and/or highest level of disruption for the public 3 = Moderate construction complexity, and/or level of disruption 5 = Lowest construction complexity, and/or level of disruption
D	**Environmental and Permitting Requirements (PERMITTING)**	Wetlands, streams, cultural resources, shoreline requirements, etc.	1 = Permitting effort is extensive and significant mitigation is required 3 = Mid-level impact and easily attainable mitigation 5 = Permitting effort is minimal and no mitigation required
E	**Aesthetic Impacts and Public Acceptance/Reaction (AESTHETICS)**	Location and nature of proposed facilities may impart visual and noise impacts to surrounding properties and the general public during operation.	1 = Highest level of potential negative impact 3 = Mid-level impact 5 = No negative impact
F	**Unit Cost per Volume (COST)**	Cost (in $/1,000 gallons) of reclaimed water produced, based on 20-year capital and operational costs	1 = Highest unit cost 3 = Mid-level unit cost 5 = Lowest unit cost
G	**Increased WWTP Capacity (CAPACITY)**	Relative amount of increased WWTP capacity due to implementation of a reclaimed water alternative	1 = No increase 3 = Mid-level increase 5 = Greatest increase

CRITERIA WEIGHTING MATRIX

Which criteria will provide the greater benefit relative to the project Need and Purpose?		TOTAL	%
Potential Reclaimed Water Production, Annual (VOLUME)	A	2.0	21.1%
Potential for Water Rights Mitigation and/or Environmental Enhancement Uses (WATER RIGHTS)	B	1.0	10.5%
Constructability (TEMPORARY IMPACTS)	C	0.5	5.3%
Environmental and Permitting Requirements (PERMITTING)	D	1.5	15.8%
Aesthetic Impacts and Public Acceptance/Reaction (AESTHETICS)	E	1.0	10.5%
Unit Cost per Volume (COST)	F	2.0	21.1%
Increased WWTP Capacity (CAPACITY)	G	1.5	15.8%
		9.5	100.0%

ALTERNATIVE SCORING

	Criteria	Criteria Weight	Alternatives No.	Alternatives Description	Rating (1-5) Score	Weighted Score
A	Potential Reclaimed Water Production, Annual (VOLUME)	21	1	Wastewater Treatment Plant (WWTP)	1.00	21
			2	Lift Station No. 8A (LS 8A)	2.50	53
			3	Lift Station No. 12 (LS 12)	5.00	105
B	Potential for Water Rights Mitigation and/or Environmental Enhancement Uses (WATER RIGHTS)	11	1	Wastewater Treatment Plant (WWTP)	3.00	32
			2	Lift Station No. 8A (LS 8A)	1.00	11
			3	Lift Station No. 12 (LS 12)	5.00	53
C	Constructability (TEMPORARY IMPACTS)	5	1	Wastewater Treatment Plant (WWTP)	2.00	42
			2	Lift Station No. 8A (LS 8A)	1.00	21
			3	Lift Station No. 12 (LS 12)	3.00	63
D	Environmental and Permitting Requirements (PERMITTING)	16	1	Wastewater Treatment Plant (WWTP)	2.00	32
			2	Lift Station No. 8A (LS 8A)	3.00	47
			3	Lift Station No. 12 (LS 12)	1.00	16
E	Aesthetic Impacts and Public Acceptance/Reaction (AESTHETICS)	11	1	Wastewater Treatment Plant (WWTP)	5.00	53
			2	Lift Station No. 8A (LS 8A)	2.00	21
			3	Lift Station No. 12 (LS 12)	3.00	32
F	Unit Cost per Volume (COST)	21	1	Wastewater Treatment Plant (WWTP)	1.00	11
			2	Lift Station No. 8A (LS 8A)	3.00	32
			3	Lift Station No. 12 (LS 12)	5.00	53
G	Increased WWTP Capacity (CAPACITY)	16	1	Wastewater Treatment Plant (WWTP)	1.00	16
			2	Lift Station No. 8A (LS 8A)	2.00	32
			3	Lift Station No. 12 (LS 12)	4.00	63

SCORING SUMMARY

	Alternative	Total Weighted Score
1	Wastewater Treatment Plant (WWTP)	205
2	Lift Station No. 8A (LS 8A)	216
3	Lift Station No. 12 (LS 12)	384