CLALLAM COUNTY
Carlsborg Wastewater Facilities Plan Amendment

G&O No. 13534.01
December 2014

Gray & Osborne, Inc.

CLALLAM COUNTY

WASHINGTON

CARLSBORG WASTEWATER FACILITIES PLAN AMENDMENT

G&O #13534
DECEMBER 2014

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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EXECUTIVE SUMMARY

The purpose of the 2014 Wastewater Facilities Plan Amendment (Amendment) is to reevaluate the costs and feasibility of two alternatives for managing and treating wastewater collected in the Carlsborg UGA (CUGA). The boundaries of the CUGA are shown in Figure E-1. The Sequim Alternative includes conveyance of all wastewater collected in the CUGA to the City of Sequim for treatment and disposal. The Carlsborg Alternative includes treatment and disposal of all wastewater in the CUGA at a central Water Reclamation Facility. The two alternatives include the same proposed collection system which will initially provide service to the main Carlsborg Road corridor and will ultimately expand to provide service to the entire CUGA. This Executive Summary will provide a brief description and cost estimate for the capital facilities required for each of the alternatives.

The projected sewer service area populations used in the Amendment are provided in Table E-1. The projections are based on the information provided in the *2010 Clallam County PUD Water System Plan* (CH2M-Hill) (2010 *PUD Water System Plan*) and the *2012 Sewer Facilities Plan for Carlsborg UGA* (BHC Consultants) (2012 *Sewer Facilities Plan*).

TABLE E-1

Summary of Total and Sewer Service Populations for the Carlsborg Sewer System

Population	2010	2013	2030	2050	Buildout
CUGA Population	842	856	1,288	1,971	3,899
New population since 2013	0	0	432	1,115	3,043
Population Served by Sewers	0	0	481	1,971	3,899
Sewer ERUs	0	0	570	2,324	4,908

(1) Based on data in Tables 3-3, 3-4, 3-12 and 3-13 in the *2012 Sewer Facilities Plan* and the *2010 PUD Water System Plan.*

Wastewater flow and loading projections for the CUGA are developed in Chapter 2 in this Amendment and summarized in Table E-2. The estimated wastewater flow per Equivalent Residential Unit (ERU) is 125 gpd based on information provided in the 2012 *Sewer Facilities Plan*. The wastewater flow projections include an allowance for infiltration and inflow (I/I) and a diurnal peaking factor. Table E-2 also provides a comparison with the flow projections included in the 2012 *Sewer Facilities Plan*. An explanation of the assumptions used in the projecting future flows and loadings and the comparison to values in the 2012 *Sewer Facilities Plan* is provided in Chapter 2.

The revised wastewater flows and loadings are used to size the Carlsborg collection system, potential Carlsborg Water Reclamation Facility, potential conveyance system to the City of Sequim and to evaluate the capacity of the Sequim Water Reclamation Facility to accommodate Carlsborg's flows and loadings.

TABLE E-2

Comparison of New Projections and 2012 *Sewer Facilities Plan* Projections for ERUs, Flows and Loadings for the Carlsborg Sewer System

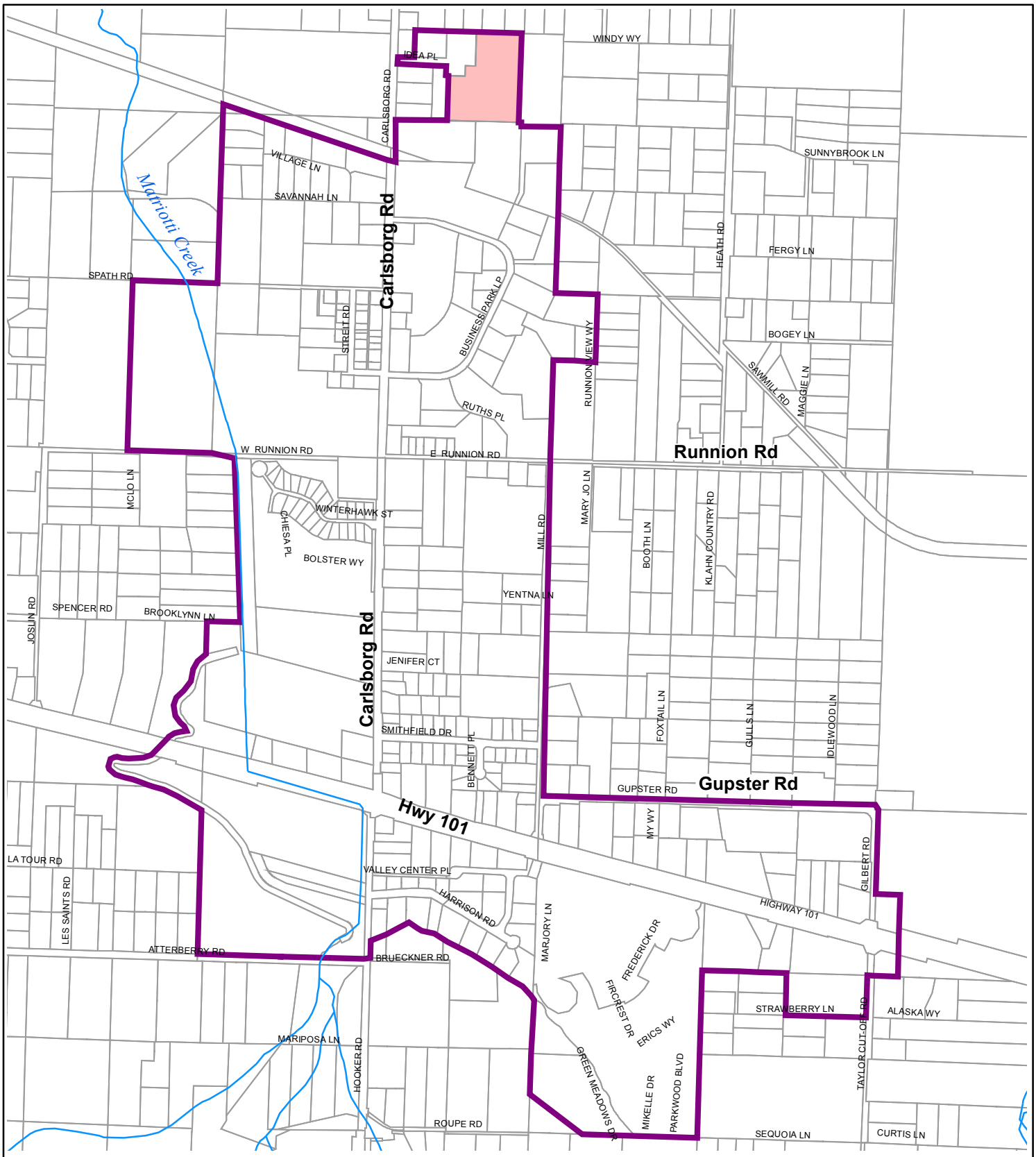
Parameter		2030		2050		Buildout	
		New Projection	2012 Sewer Facilities Plan Projection	New Projection	2012 Sewer Facilities Plan Projection	New Projection	2012 Sewer Facilities Plan Projection
Residential ERUs		260	260	1,060	1,060	2,137	2,122
Commercial ERUs		310	310	1,264	300	2,771	3,400
Total ERUs		570	570	2,324	1,360	4,908	5,522
Residential Baseflow	gpd	32,500	--	132,500	--	267,100	--
Commercial Baseflow	gpd	38,750	--	158,000	--	346,400	--
Total Baseflow	gpd	71,300	71,000	290,500	171,000	613,500	690,000
Ave Day Flow	gpd	82,100	76,000	309,800	184,000	638,700	712,000
Max Month Flow	gpd	97,700	90,000	337,800	210,000	675,100	757,000
Peak Day Flow	gpd	179,300	150,000	484,000	318,000	865,500	897,000
Peak Hour Flow	gpd	326,800(1)	270,000	1,113,000(1)	533,000	2,133,600(1)	1,205,000
Peaking Factor (Peak Hour to Average Annual)							
Per Orange Book		3.98	3.98	3.59	3.59	3.34	3.34
In Projections		3.98	3.55(2)	3.59	2.90(2)	3.34	1.69(2)
Wastewater Loadings							
BOD_5, Annual Average	lb/d	228	228	930	544	1,963	2,200
BOD_5, Maximum Month	lb/d	296	300	1,208	700	2,552	3,000
TSS, Ann Average	lb/d	257	285	1,046	680	2,209	2,750
TSS, Maximum Month	lb/d	333	400	1,360	800	2,871	3,500
Total Nitrogen, Annual Average	lb/d	41	45	169	98	357	320
Total Nitrogen, Maximum Month	lb/d	53	59	220	126	464	436

(1) Based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor, based on population projections.

CARLSBORG LOCAL COLLECTION SYSTEM

Chapter 4 of this Amendment provides an evaluation of collection and conveyance system needs for the CUGA. The conceptual plan for the local CUGA collection system includes installation of a main gravity sewer on Hooker Road and Carlsborg Road from Harrison Road on the south to either the lift station that will pump the wastewater to the City of Sequim Water Reclamation Facility (WRF) (Sequim Alternative), or to the Carlsborg WRF located in the northern portion of the CUGA (Carlsborg Alternative). The preliminary layout of the initial collection system is shown on Figure E-2.

The buildout system includes an additional lift station at Gupster Road. Wastewater from a collection area bounded by Mill Road on the west, Gupster Road on the north, Gilbert



LEGEND:

CARLSBORG UGA BOUNDARY

PUD Operations Center

N

0 650 1,300 Feet

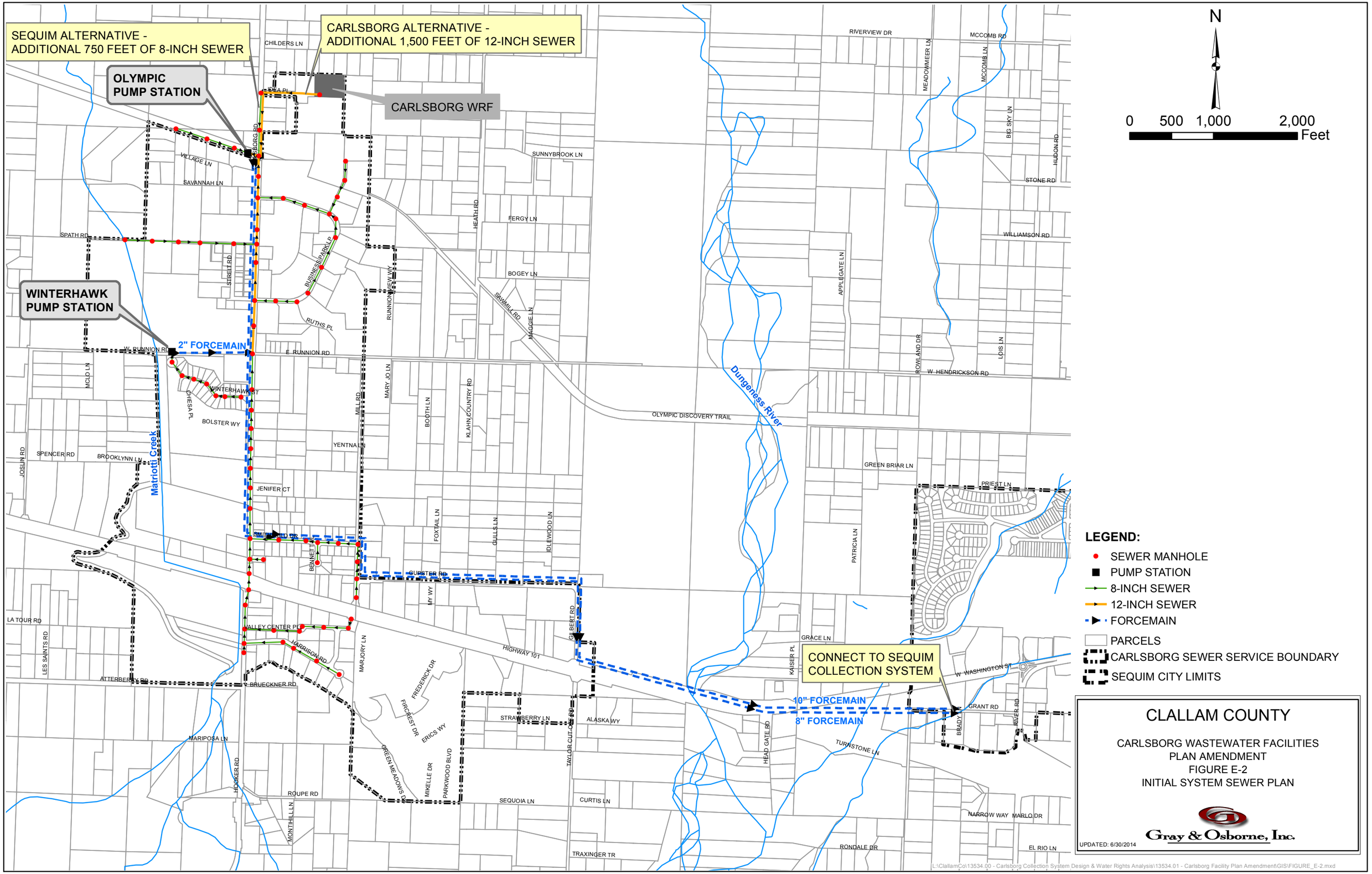
CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE E-1
CARLSBORG URBAN GROWTH AREA

Gray & Osborne, Inc.

UPDATED: 6/30/2014

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE_E-1.mxd


SEQUIM ALTERNATIVE -
ADDITIONAL 750 FEET OF 8-INCH SEWER
CARLSBORG ALTERNATIVE -
ADDITIONAL 1,500 FEET OF 12-INCH SEWER
OLYMPIC PUMP STATION
CARLSBORG WRF
WINTERHAWK PUMP STATION
2" FORCEMAIN
CONNECT TO SEQUIM COLLECTION SYSTEM
10" FORCEMAIN
8" FORCEMAIN
Dungeness River
Matriotti Creek
N
0 500 1,000 2,000 Feet
LEGEND:
SEWER MANHOLE
PUMP STATION
8-INCH SEWER
12-INCH SEWER
FORCEMAIN
PARCELS
CARLSBORG SEWER SERVICE BOUNDARY
SEQUIM CITY LIMITS
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE E-2
INITIAL SYSTEM SEWER PLAN
Gray & Osborne, Inc.
UPDATED: 6/30/2014
L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE_E-2.mxd

Road on the east and Highway 101 on the south will discharge by gravity to the Gupster Road Lift Station. In addition, it is anticipated that the CUGA south of Highway 101 and east of the Parkwood Mobile Home Park will discharge by gravity, via a boring under Highway 101, to the Gupster Lift Station. Wastewater collected in the Gupster Lift Station will discharge to the main sewer trunk in Carlsborg Road.

The design criteria of the proposed collection system are shown in Table E-3.

TABLE E-3

Collection System Design Criteria

Parameter	Type	Quantity
Collection System – Sequim Alternative Initial System		
Sewer Pipe	8-inch diameter	14,085 lf
Sewer Pipe	12-inch diameter	3,225 lf
Collection System – Carlsborg Alternative Initial System		
Sewer Pipe	8-inch diameter	13,285 lf
Sewer Pipe	12-inch diameter	4,725 lf
Winterhawk Lift Station		
Peak Hour Design Flow		32 gpm
Force Main	Two – 2-inch diameter	950 lf
TDH		46 feet
Pumps	2 – submersible grinder	3 hp
Emergency Generator	Connection for portable	1
Collection System – Sequim Alternative Buildout System		
Sewer Pipe	8-inch diameter	32,050 lf
Sewer Pipe	12-inch diameter	3,225 lf
Collection System – Carlsborg Alternative Buildout System		
Sewer Pipe	8-inch diameter	31,250 lf
Sewer Pipe	12-inch diameter	4,725 lf
Gupster Lift Station		
Peak Hour Design Flow		140 gpm
Force Main	Two – 3-inch diameter, one per pump	1,200 feet each
TDH		47 ft
Pumps	Three – submersible grinder	3 hp
Emergency Generator	Permanent	25 kW

The estimated construction costs for providing the initial and buildout collection systems are included in Table E-4. The cost estimates include 8 percent mobilization, a 15 percent contingency to account for the preliminary level of the design, 8.4 percent Washington State sales tax, 12 percent construction management for the initial project

facilities, and 25 percent design, permitting, and construction management for additional facilities needed for buildout.

TABLE E-4

Sewer Collection System Project Cost Estimate for Initial and Buildout Scenarios (in 2014 Dollars)

Component	Initial Amount(1)	Buildout Amount(2)
Sequim Alternative		
Sewer Collection System	$5,040,000	$8,368,800
Winterhawk Lift Station	$284,500	$284,500
Gupster Lift Station	Not Included	$471,300
Total	**$5,324,500**	**$9,124,600**
Carlsborg Alternative		
Sewer Collection System	$5,110,600	$8,439,400
Winterhawk Lift Station	$284,500	$284,500
Gupster Lift Station	Not Included	$471,300
Total	**$5,395,100**	**$9,195,200**

(1) Assumes 80 initial connections. See Figures 4-1 and 4-2 for proposed alignments.
(2) Includes initial system project costs.

CONVEYANCE TO THE CITY OF SEQUIM

Implementation of the Sequim Alternative will require construction of a main lift station in Carlsborg and force mains to the City of Sequim via the Highway 101 Bridge to a point of connection with the City of Sequim collection system at Grant Road. The Carlsborg wastewater will be comingled with wastewater from the City and will be conveyed in a common sewer to the City's Water Reclamation Facility. The preliminary layout of the force main alignment is shown on Figure E-2. The force mains will be installed in Carlsborg Road to Smithfield Road and then east on Smithfield Road and Gupster Road and south on Gilbert Road to the Highway 101 right-of-way. The force mains will continue east within the Highway 101 right-of-way and cross the bridge in existing utility corridors in the bridge deck. Once on the east side of the bridge the force mains will follow West Washington Street to a point of connection with the Sequim collection system at Grant Road.

The proposed location for the Olympic Lift Station is within the Olympic Discovery Trail right-of-way immediately west of Carlsborg Road. The submersible lift station will be equipped with odor control equipment and an emergency generator. The preliminary design concept for the Olympic Lift Station includes a wet well that will accommodate three pumps; however, initially two 480 gpm (gallons per minute) pumps will be installed, sufficient to serve the CUGA until approximately 2040. The County will have the flexibility to install a third, similarly sized pump to accommodate future flows or

upsize one or more of the pumps to accommodate the actual growth and flow characteristics of the sewer service area. The lift station will include a restroom for use by the public, including users of the adjacent Olympic Discovery Trail. A preliminary layout of the lift station site is shown in Figure E-3.

The installed conveyance system is assumed to consist of a dual pipe force main consisting of an 8-inch diameter force main and a 10-inch-diameter force main in order to maintain scouring velocities and minimize chemical costs for odor control. The 8-inch diameter force main will be used initially. The Olympic Lift Station will be sized initially to pump 480 gpm, which will provide adequate capacity through approximately 2040 and will ensure flushing velocity in the 8-inch force main. When flows exceed approximately 480 gpm the discharge from the Olympic Lift Station will be directed to the 10-inch diameter force main. When flows exceed approximately 725 gpm both the 8-inch and 10-inch-diameter force mains will be utilized.

The design criteria of the Olympic Lift Stations and conveyance force mains are shown in Table E-5.

TABLE E-5

Olympic Lift Station and Conveyance to City of Sequim Design Criteria

Parameter	Type	Quantity
Olympic Lift Station		
Peak Hour Design Flow	--	480 gpm(1)
TDH	--	244 ft
Pumps	Two – submersible (provide space for third pump)	90 hp
Emergency Generator	Permanent	250 kW
Force Main	8-inch diameter 10-inch diameter	15,400 feet each

(1) Flow required to maintain scouring velocity in 8-inch force main.

The estimated construction costs for providing the Olympic Lift Station and conveyance force mains to the City of Sequim are included in Table E-6. The cost estimates include 8 percent mobilization, a 15 percent contingency to account for the preliminary level of the design, 8.4 percent Washington State sales tax, 12 percent construction management fees for the initial project facilities, and 25 percent design, permitting, and construction management fees for additional facilities needed for buildout.

TABLE E-6

Olympic Lift Station and Conveyance Force Mains to the City of Sequim Project Cost Estimate and Operation and Maintenance Costs (in 2014 Dollars)

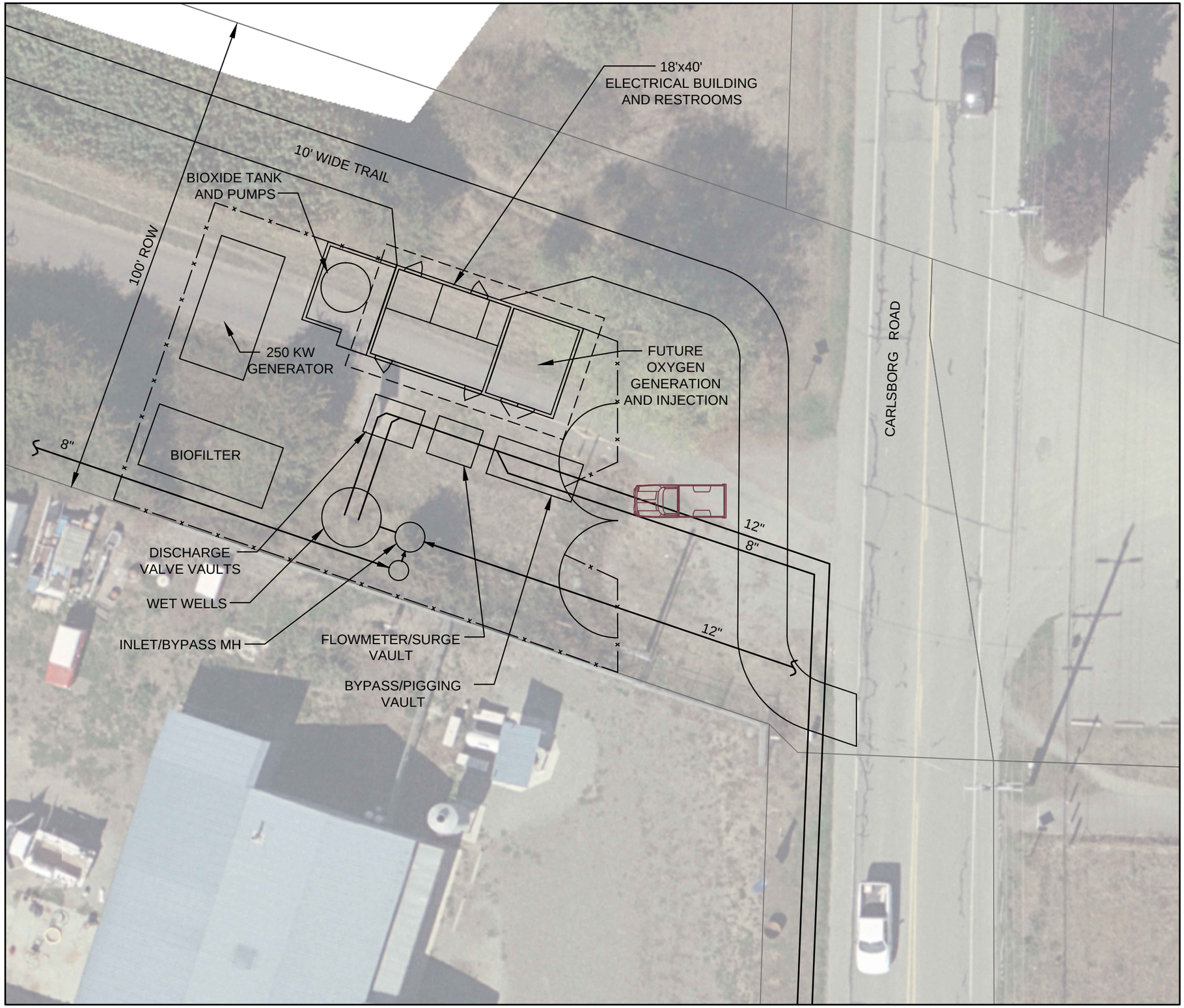
Component	Initial Project Cost	Buildout Project Cost(1)
Olympic Lift Station	$2,711,600	$3,958,300
Force Mains	$3,313,000	$3,313,000
Total	**$6,024,600**	**$7,271,300**
Average Annual Operation and Maintenance	**$110,000**	**$180,000**

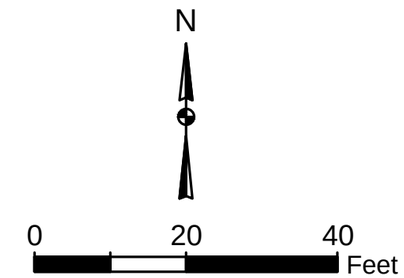
(1) Included initial project cost.

IMPACT OF CUGA FLOWS ON THE CITY OF SEQUIM CONVEYANCE SYSTEM

This Amendment assumes that the pumped flow from the CUGA would discharge into the City of Sequim gravity collection system at Manhole 24-3-06 (Grant Road, west of North River Road). The CUGA flows would commingle with wastewater collected in the City and be conveyed in the portion of the existing Sequim collection system shown in Figure E-4. The hydraulic model of the Sequim collection system indicated that approximately 1,500 feet of existing sewer would need to be upsized to accommodate the 2030 peak hour flows from the City and the pumped discharge (480 gpm) from the CUGA. The amount of Sequim sewer pipe which would need to be replaced increases as the combined City of Sequim peak hour flows and the pumped discharge from Carlsborg increases. Approximately 13,500 feet of sewer is estimated to be needed to be upsized to accommodate the buildout flows in the City and the CUGA.

An estimate of the project costs required to accommodate the projected initial year and Buildout wastewater flows is provided in Table E-7. The project costs presented in Table E-7 include 8.6 percent Washington State sales tax (the current tax rate in the City), 25 percent contingency due to the preliminary nature of the estimates and 25 percent design, permitting, construction management and administrative services costs.





CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE E-3
OLYMPIC LIFT STATION LAYOUT

Gray & Osborne, Inc.

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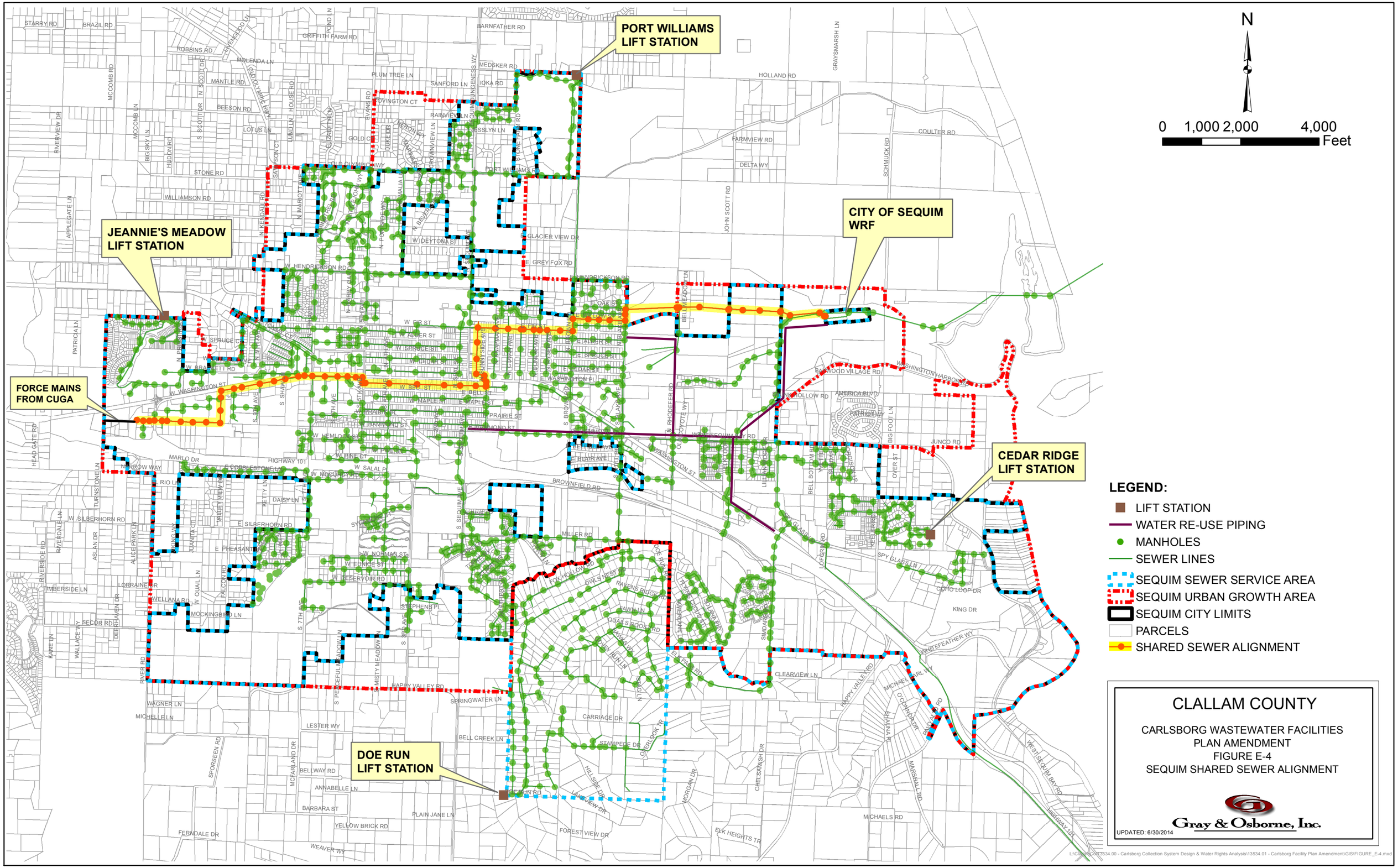

PORT WILLIAMS LIFT STATION
CITY OF SEQUIM WRF
JEANNIE'S MEADOW LIFT STATION
FORCE MAINS FROM CUGA
CEDAR RIDGE LIFT STATION
DOE RUN LIFT STATION
N
0 1,000 2,000 4,000
Feet
LEGEND:
LIFT STATION
WATER RE-USE PIPING
MANHOLES
SEWER LINES
SEQUIM SEWER SERVICE AREA
SEQUIM URBAN GROWTH AREA
SEQUIM CITY LIMITS
PARCELS
SHARED SEWER ALIGNMENT
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE E-4
SEQUIM SHARED SEWER ALIGNMENT
Gray & Osborne, Inc.
UPDATED: 6/30/2014

TABLE E-7

Estimated Pipe Replacement in the City of Sequim Required to Accommodate Projected Initial and Buildout Sequim and Pumped Carlsborg Flows (in 2014 Dollars)

CUGA Pumped Flow Rate (gpm)	Pipe Replacement (ft)	Estimated Project Cost	Percentage of Overall Capacity Attributable to CUGA (Peak Hour)	Estimated CUGA Share of the Project Cost
Initial Year	1,462	$319,000	61%	$194,600
Buildout	13,253	$4,250,000	69.0%	$2,932,500

CUGA TREATMENT ALTERNATIVES

Chapter 5 of this Amendment reevaluates the facilities required to provide treatment of Class A reclaimed water and disposal of the treated effluent and biosolids at a new treatment facility in the vicinity of the CUGA and at the City of Sequim WRF.

TREATMENT AT A CARLSBORG WRF

A Carlsborg WRF would initially consist of a sequencing batch reactor (SBR) and an effluent filter, with capacity for the projected 2030 flow and loading rates in keeping with the analysis provided in the *2012 Sewer Facilities Plan*. The SBR tanks would be designed to allow for future expansion and conversion to a membrane bioreactor (MBR) with capacity for the projected 2050 and buildout flow and lading rates. It is assumed the WRF would be constructed on a 5.5-acre parcel of land directly east of the PUD Idea Place operations center. The proposed site plan for an SBR water reclamation facility designed of the project 2030 flow and loading rates is shown in Figure E-5.

The Carlsborg WRF would be designed to produce Class A reclaimed water in accordance with the Washington State *Water Reclamation and Reuse Standards* (Ecology, 1997) and *Criteria for Sewage Works Design* (Ecology 2008). The raw wastewater from the Carlsborg sewer system would be pumped to the headworks structure by an influent pump station. Three SBR tanks would provide secondary treatment and nitrogen removal. The SBR system would be followed by coagulation, flocculation, filtration and ultraviolet disinfection systems to produce Class A reclaimed water. Waste sludge produced by the SBR would be stored in an aerated holding tank until transfer by the utility to another facility for treatment.

The *2012 Plan* included a hydrogeological report of the potential Idea Place WRF site (in Appendix C). Seepage tests resulted in an observed groundwater infiltration rate of 12.4 inches/hour. Using a standard approach that estimates a long term infiltration as

10 percent of short term actual (observed) rate, the estimated limiting long term infiltration rate is 1.24 inches/hr (19 gpd/ft^2).

The infiltration basin would be sized for the projected 2030 maximum day flow of 179,300 gpd at a minimum. Eight equally-sized infiltration basins were planned for infiltration of the buildout flow rate. Two of these basins, each with approximate dimensions of 50 feet by 120 feet, are sufficient for the projected 2030 maximum day flow. The basins would be excavated 3 feet below ground level with 3:1 horizontal to vertical slopes.

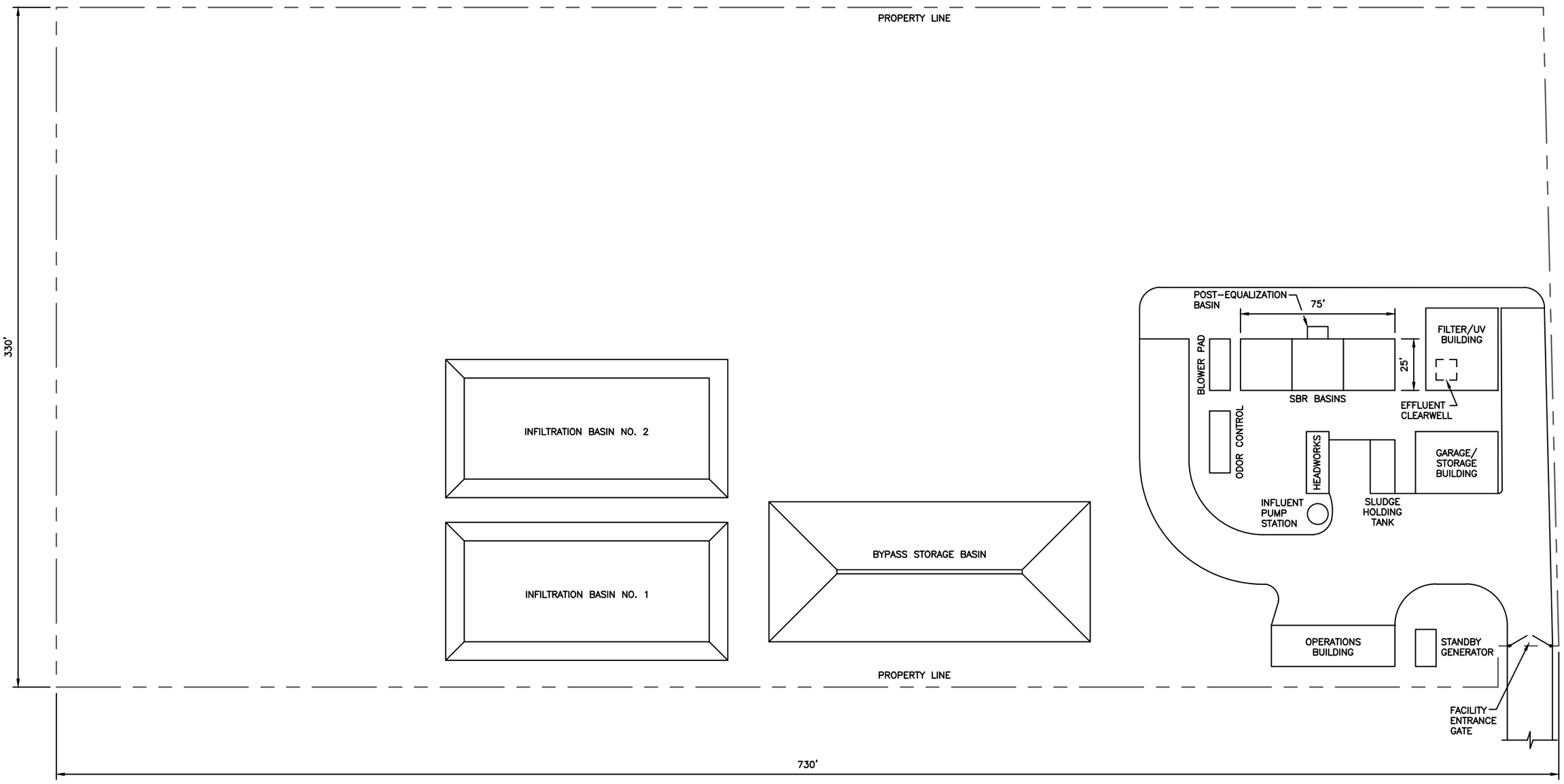
Consistent with the 2012 *Sewer Facilities Plan*, the Carlsborg SBR basins would be converted to an MBR process after 2030. Instead of three SBR basins in parallel, the tankage would be converted into a single train of tanks in series. One SBR basin would be converted into an anoxic/equalization basin. With the liquid level typically low, the basin would provide some initial anoxic volume for nitrogen removal. The anoxic/equalization basin provides storage volume for when the influent flow exceeds the membrane capacity (set at peak day flow). Mixed liquor would be pumped to the anoxic basin and then flow through the aeration basin into one of four membrane tanks. One membrane tank would be redundant. Permeate pumps pull clean permeate out of the membrane cassettes in the membrane tanks. A new Membrane Equipment Building would be constructed to house the permeate pumps and other equipment associated with the MBR system. The UV disinfection system in the Filter Building and some of the other mechanical equipment would be expanded or replaced with larger equipment designed for the future flow rates.

The volume of sludge produced would be much greater with the design 2050 flow and loading rates than the initial WRF. In accordance with the *2012 Plan*, it is proposed to construct a 40-day SRT aerobic digester in the WRF expansion. Due to limitations and cost of disposal of Class B biosolids in the vicinity, a Class A lime-heat biosolids treatment process by FKC) is recommended, which would produce dewatered Class A biosolids for free distribution to the community.

An additional bypass storage pond and three additional groundwater infiltration basins would be constructed to provide capacity for the design 2050 flow rates.

Figure E-6 provides a site plan for an MBR process at the Carlsborg water reclamation facility.

The estimated capital, operation and maintenance and life cycle costs for the Carlsborg WRF for the 2030 and 2050 flow and loading rates are presented in Table E-8. The project costs presented in Table E-8 include 7.9 percent Washington State sales tax, 20 percent contingency due to the preliminary nature of the estimates and 25 percent design, permitting, construction management and administrative services costs.



SCALE: 1'=50'

CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE E-5
CARLSBORG WRF
SBR SITE PLAN (DESIGN YEAR 2030)

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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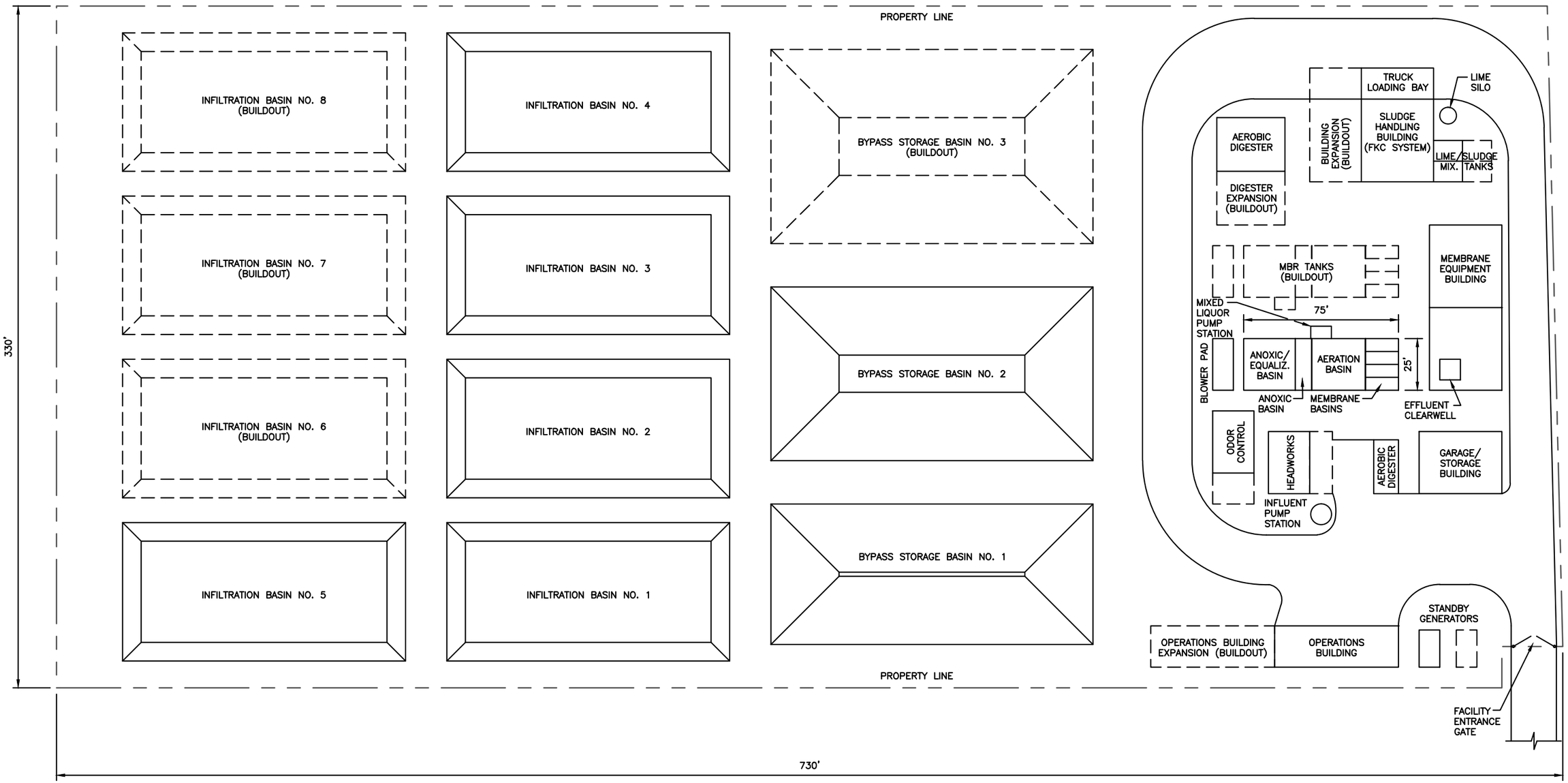

SCALE: 1'=50'

CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES PLAN AMENDMENT
FIGURE E-6
CARLSBORG WRF
MBR SITE PLAN (DESIGN YEAR 2050)

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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TABLE E-8

Carlsborg WRF Project, Operation and Maintenance and Life Cycle Cost Estimate (in 2014 Dollars)

Component	Initial Project Cost (2016 – 2030)	2030 – Buildout Project Cost(1)
Carlsborg WRF (20l6 – 2030)	$10,650,000	$24,260,000
Average Annual O&M	$379,000	$748,000
15-year Life Cycle Costs	**$16,335,000**	**$39,220,000**

(1) Included initial project cost.

TREATMENT AT SEQUIM WRF

Treatment of the Carlsborg wastewater at the City of Sequim WRF is evaluated in the Amendment. The Sequim WRF has sufficient capacity (1.67 mgd average maximum month flow, 4,036 lb/day BOD5 and 3,855 lb/day TSS) to treat projected wastewater flows and loadings from Carlsborg in addition to the projected City of Sequim wastewater flows and loadings through 2030. However, the Sequim WRF is projected to exceed 85 percent of the NPDES-permitted flow and loading criteria prior to 2030 which would require the City to submit a plan and schedule to maintain adequate capacity to Ecology.

The Sequim WRF would need to be expanded to accommodate 2050 projected wastewater flows and organic loads from the City only and from the combined City and CUGA flow. The Sequim WRF Phase 2 Expansion that would be required to provide capacity for the projected 2050 flows and organic load from the City and the CUGA includes headworks improvements, conversion of the existing equalization basin to an aeration basin, construction of a new equalization basin, construction of a new clarifier and expansion of the existing effluent filtration, flocculation, UV disinfection and solids treatment capacity.

The County will need to purchase capacity in the existing treatment facilities and pay a share of future improvements. The *Carlsborg Sewer Draft Financial Plan* prepared by FCS Group (June 2014), included in Appendix H, assumes that the County will pay an up-front capacity charge that recognizes the net book value of the City's past investment in it treatment assets. The capacity charge will apply only to pre-2016 assets since City capital costs after January 2016 (the assumed date when CUGA wastewater would be discharged to the Sequim WRF) would be paid on a cost share on a pay-as-you-go basis.

The Carlsborg capacity fee for connection to the Sequim sewer system for treatment at the Sequim WRF is expected to be based on a ratio of maximum month flows in 20 years (2035). Based on initial projections, the Carlsborg wastewater utility would purchase a 6.3 percent share of the existing Sequim WRF assets, including the water reuse system, at

an estimated cost of $898,903. The Carlsborg wastewater system would pay the same share of all future Sequim WRF capital improvement projects through 2035.

Operations and maintenance costs for the Sequim WRF and Reuse system would be incorporated into the rate per gallon of wastewater treated. The estimated rate is $0.0098/gallon including an out-of-city multiplier of 1.15. Assuming an average annual wastewater flow of 82,100 gpd in 2030 the operations and maintenance cost of the Sequim Option in 2030 is approximately $294,000.

In addition to operations and maintenance costs, the cost of WRF expansion or improvements will be the responsibility of the CUGA on a pay-as-you-go basis. Table E-9 includes the estimated Sequim WRF capacity charges and share of City of Sequim capital improvement projects associated with the WRF that the CUGA would participate in.

TABLE E-9

Sequim WRF Project, Operation and Maintenance and Life Cycle Cost Estimate (in 2014 Dollars)

Component	Initial Project Cost (2016 – 2030)	2030 – Buildout Project Cost(1)
Sequim WRF Capacity, Sequim CIP (20l6 – 2030)	$1,036,200	$7,728,400
Average Annual O&M	$294,000	$540,000
15-year Life Cycle Costs	**$5,446,200**	**$18,528,400**

(1) Included initial project cost.

FUTURE WATER RIGHTS MITIGATION

This Amendment evaluates the impact to water resources within the CUGA if either the Sequim Alternative or the Carlsborg Alternative is implemented. In particular, the Amendment evaluated the potential streamflow mitigation that would be required to provide additional water to meet the development needs of the CUGA. Pacific Groundwater Group (PGG) prepared several Technical Memoranda, included in Appendix A and summarized in Chapter 6, which estimate the amount of additional water rights that may be required for buildout demand in Carlsborg and present potential mitigation requirements and remedies. The PGG analysis estimates that an additional 417 acre-foot/year water right would be required to provide sufficient potable water for the CUGA at buildout. Furthermore, PGG used the 2008 Dungeness Model to evaluate the amount of stream depletion if the additional water right was pumped from the middle or deep aquifer and the well was located within the CUGA. The 2008 Dungeness Model predicts that the streams protected under WAC 173-518 would be depleted by 60.4 percent of the average pumping rate for a well located in the Carlsborg area

completed in the middle aquifer and 24.6 percent of pumping rate for a well completed in the deep aquifer.

PGG evaluated twelve mitigation scenarios that include various combinations of mitigation (infiltration) scenarios on the east and west sides of the Dungeness River. In addition, the costs of the four recommended mitigation scenarios were evaluated. The conclusion drawn from the cost analysis is that for both the middle aquifer and deep aquifer pumping scenarios, infiltration on the east side of the Dungeness River with supplemental mitigation for several small streams is estimated to require less expensive mitigation requirements than infiltration on the west side of the Dungeness River.

One option considered for the Sequim Alternative is to return reclaimed water from Sequim to Carlsborg for infiltration and reuse within Carlsborg. The estimated cost to construct a line sized to convey the buildout Carlsborg flow as reclaimed water back to Carlsborg is $5 to $6 million. In developing this cost estimate, it was assumed that (1) the 16-inch pipeline would run over 20,000 feet from the Sequim City Shop facility to Idea Place, (2) the pipeline would not be constructed in a common trench with the force main carrying wastewater to Carlsborg, due to the Department of Ecology's requirements for 10-foot horizontal separation of wastewater and reclaimed water lines, and (3) construction of the line would require significant pavement restoration. Based on the analysis of water rights/mitigation in Chapter 6 and Appendix A, it is not anticipated that construction of this reclaimed waterline is necessary, as the east side of the Dungeness River is the most cost-effective and beneficial primary location for reclaimed water infiltration. Thus, construction of the reclaimed water return line to Carlsborg is not recommended.

EVALUATION OF ALTERNATIVES

Chapter 7 in this Amendment presents a comparison of the Sequim and Carlsborg Alternatives. A summary of the costs of the initial system and upgrades required in 2030 to provide capacity through the year 2050 for the Sequim Alternative and the Carlsborg Alternative are presented in Table E-10.

Based on the evaluation in this Amendment, the Sequim Alternative is recommended. The Sequim Alternative has been found to have lower projected capital, operating and life cycle costs, and advantages based on non-monetary criteria, including reduced risk to the County, reduced public/aesthetic concerns, and increased environmental benefits.

TABLE E-10

Comparison of Sequim Alternative and Carlsborg Alternative Collection and O&M Costs

Facility	Sequim Alternative	Carlsborg Alternative
Initial System (2016-2030)		
Carlsborg Collection System	$5,324,500	$5,395,000
Lift Station, Conveyance, WRF Capacity, Sequim CIP	$7,060,800	--
Carlsborg WRF	--	$10,650,000
Average Annual O&M (2016-2030)	$323,000	$379,000
15-year Life Cycle Cost – Initial System	**$17,230,300**	**$21,730,000**
Additional System to Serve 2050 Flows		
Carlsborg Collection System	$3,800,000	$3,800,000
WRF Capacity, Sequim CIP, Sequim Collection System Improvements	$6,692,200	--
Carlsborg WRF	--	$13,610,000
Annual O&M (2030-2050)	$675,000	$748,000
20-year Life Cycle Cost – 2030-2050 System	**$23,992,200**	**$32,370,000**
TOTAL COSTS (2015 to 2050)	**$41,222,500**	**$54,100,000**

(1) Costs are total project costs in 2014 dollars, inclusive of future design, construction management, tax and contingency.

CHAPTER 1

INTRODUCTION

This 2014 *Carlsborg Wastewater Facilities Plan Amendment* ("Amendment") addresses the comprehensive planning needs for the collection, transmission, and treatment of wastewater, and the production of reclaimed water, for the Carlsborg Urban Growth Area (CUGA) in Clallam County for the next 20 years and beyond. Carlsborg, located to the west of the City of Sequim, is an unincorporated urban growth area (UGA) with an estimated 2010 population of 842 people. Currently, Carlsborg residents use individual on-site or group septic tanks and drainfields to treat and dispose of wastewater.

This Amendment has been prepared for Clallam County to amend the evaluation of wastewater collection and treatment alternatives included in the *2012 Sewer Facilities Plan for Carlsborg UGA, BHC, Inc.* (*2012 Sewer Facilities Plan*). The *2012 Sewer Facilities Plan*, prepared for Clallam County PUD No. 1 (PUD) in association with Clallam County, has been conditionally approved by the Washington State Department of Ecology (Ecology) as a General Sewer Plan and Wastewater Facility Plan.

This Amendment has been prepared in accordance with the provisions of the Revised Code of Washington (RCW), Section 90.48, *Water Pollution Control*, Washington Administrative Code (WAC) Section 173-240-050, *General Sewer Plan*, and WAC 173-240-060, *Engineering Report.* Development of the Amendment has been coordinated with County planning efforts for the CUGA.

This Amendment is intended to be feasible in terms of engineering, economic, regulatory, and political frameworks. The alternatives described in the Amendment are consistent with State regulations relating to the prevention and control of discharge of pollutants into State waters, anti-degradation of existing and future beneficial uses of ground waters, anti-degradation of surface waters, and water reuse. As an *amendment*, this document is not intended to comprehensively address all of Ecology's requirements for a Wastewater Facility Plan and a General Sewer Plan; only information that has changed since the submission of the *2012 Sewer Facilities Plan*, or is immediately relevant or important background to the discussion, is included. Included in the Plan are an evaluation of alternatives and conceptual designs and cost estimates for recommended facilities.

As noted in the *2012 Sewer Facilities Plan*, the designation of Carlsborg as an urban growth area in the year 2000 means that urban services must be provided, including sewers, to at least part of the CUGA, and a plan is needed to extend these services eventually to include the entire CUGA, although implementation of services may be phased. In addition, older conventional onsite septic systems in Carlsborg are not removing sufficient nitrogen from the sewage, which is a contributor to nitrate levels in local groundwater approaching the maximum contaminant level (MCL) for drinking

water in some parts of the CUGA. (The most recent data for samples taken in 2014 from the PUD's well shows nitrate concentrations continuing to increase.) Therefore, Clallam County desires to construct a new wastewater collection system for the CUGA.

PURPOSE OF AMENDMENT

This Amendment has been prepared for the County to reconsider alternatives for wastewater management, including the "Sequim Alternative" which includes treatment of Carlsborg wastewater at the existing City of Sequim Water Reclamation Facility (WRF) and treatment at a WRF in Carlsborg, the "Carlsborg Alternative". The *2012 Sewer Facilities Plan* recommended construction of a new Carlsborg WRF at the PUD Operations Center in the CUGA. However, siting a new WRF at this location was opposed by adjacent landowners, and the PUD has indicated that the site is no longer available for this purpose; therefore, for the Carlsborg Alternative, this Amendment assumes a Carlsborg WRF would be constructed at an adjacent site.

In evaluating the Sequim Alternative, potential routes for conveying Carlsborg flows to Sequim are evaluated and the impact of Carlsborg flows and loadings on the Sequim WRF are examined. For both alternatives, capital, O&M, and life cycle costs and non-monetary considerations for conveyance and treatment are evaluated. The findings of archaeological, geotechnical, environmental and wetlands evaluations are incorporated into the analysis.

In order to factor in all costs for providing wastewater treatment for the CUGA, an evaluation of management options for the wastewater generated in Carlsborg and an evaluation of the role reclaimed water could play in the future water needs for the CUGA is included. The PUD, the water purveyor for the CUGA, has determined that additional water rights will be needed to provide service to the buildout populations for the entire CUGA. The *2012 Sewer Facilities Plan* assumed that if wastewater generated in Carlsborg is conveyed to Sequim for treatment, an equal volume of reclaimed water would be returned to Carlsborg for reuse. The PUD's original plan for providing sewer service to the CUGA included reuse of the reclaimed water generated at a WRF within the CUGA for irrigation and outdoor water use along Carlsborg Road, fire training and infiltration in percolation ponds to help mitigate for hydrologic impacts associated with a future water right. This assumption is re-evaluated in this Amendment through hydraulic modeling and an evaluation of water rights/water mitigation for each alternative.

An alternative for wastewater management for the CUGA is recommended based on the evaluation and cost estimates in this Amendment. A financial plan is presented to ensure that the utility can be sustainable and self-supporting in the long run. A State Environmental Policy Act (SEPA) checklist is presented which is consistent with the recommended alternative.

BACKGROUND

Figure 1-1 shows the location of the CUGA and its proximity to Sequim, while Figure 1-2 provides a map of the CUGA. Highway 101 crosses the CUGA in the south, and the northern portion of the CUGA is bisected by Carlsborg Road which runs north-south. Water is provided to the majority of the CUGA by the PUD. The PUD Operations Center, the location proposed for a new WRF in the *2012 Sewer Facilities Plan,* is in the northeast corner of the CUGA.

The majority of businesses in the CUGA are concentrated along Highway 101, Carlsborg Road, and the Business Park Loop in the northeast. Per the *Carlsborg UGA Economic Profile* (Clallam County Economic Development Council, September 2011), the CUGA is a major economic center and manufacturing hub in Clallam County. The profile noted that the CUGA has 113 businesses, supporting 1,050 jobs, including 112 full-time workers in manufacturing. The profile also stresses the importance of construction of a sewer system in Carlsborg, allowing Carlsborg to retain its diverse zoning and allowing businesses to expand. Failure to construct a sewer system would result in a change to the Growth Management Act (GMA) designation for the CUGA to a rural category with requirements for "a low density rural setting free from commercial, industrial, and moderate density residential development." Many of the current firms operating in the CUGA would be prevented from expanding and which would place their long-term economic viability at serious risk.

SYSTEM OWNERSHIP AND MANAGEMENT

Clallam County will own and manage the new collection system in Carlsborg. The County will own and manage the conveyance line to Sequim if the Sequim Alternative is implemented. The County will own and manage the new WRF if the Carlsborg Alternative is implemented.

The County is governed by a Board of County Commissioners (BOCC) and an appointed County Administrator. The sewer system will be managed by the County's Public Works Department under the direction of the Administrative Director. The County's mailing address is:

Clallam County
223 East 4th Street
Port Angeles, Washington 98362

The Carlsborg Citizen Advisory Committee (CCAC) represents a cross-section of those individuals who live, work, or own real property within the CUGA. The CCAC acts as a liaison between the citizens in the CUGA and the BOCC by gathering and analyzing information, and providing recommendations regarding community and growth management issues.

GEOGRAPHY, TOPOGRAPHY, SOIL CONDITIONS, SENSITIVE AREAS AND CLIMATE

Geography, topography, soil conditions, sensitive areas and climate were adequately addressed in the *2012 Sewer Facilities Plan* and are not addressed in this Amendment except where immediately relevant to the discussion.

WATER RESOURCES

An evaluation of the impacts to groundwater and surface water of reuse/disposal of treated effluent for both the Sequim and Carlsborg Alternatives was conducted for this Amendment by Pacific Groundwater Group (PGG). The evaluation included hydraulic modeling using the 2008 Dungeness Flow Model and an evaluation of water rights/water mitigation, in compliance with the new Dungeness Water Rule and an Interlocal Agreement (March 2013) between the County and the PUD. A summary of the evaluation is provided in Chapter 6, and the full report is included in Appendix A.

SEQUIM WASTEWATER SYSTEM

Because the City of Sequim will be the County's partner if the Sequim Alternative is implemented, the nature and capacity of Sequim's wastewater collection and treatment facilities are addressed in this Amendment. A map of Sequim is included in Figure 1-3. The City is located in Clallam County across the Dungeness River to the east of Carlsborg. The City owns and operates a municipal sewer system and WRF which serves the majority of incorporated Sequim, the Bell Hill community in unincorporated Clallam County south of Sequim, and other smaller surrounding areas. Sequim's collection system includes over 43 miles of sewer line, four City owned and operated pump stations (Port Williams, Doe Run, Jenny's Meadow, and Cedar Ridge), and a pump station managed by a developer at Sequim Bay Lodge. The Sequim Bay Lodge pump station receives wastewater from a pump station located at Sequim Bay State Park. The Sequim Bay Lodge, Doe Run and Sequim State Park pump stations are located outside of the City limits. Sequim also manages approximately 7,320 feet of outfall pipe from the WRF to a diffuser located approximately 1,900 feet into the Strait of Juan de Fuca at a depth of 53 feet. The City of Sequim's sewer system consists mostly of gravity pipelines except for three force mains, one of which conveys septic tank effluent from the pump station at Sequim Bay Lodge. The Sequim collection system contains approximately 2,520 sewer connections.

Sequim's WRF was expanded in 2008 – 2009. The WRF (capacity – 1.67 million gallons per day) includes a conventional activated sludge process with nutrient removal, effluent filtration, ultraviolet disinfection, and production of Class A reclaimed water (the highest quality level certified by the State) and Class A Exceptional Quality Biosolids (the highest quality level certified by the State). The City's 2013 NPDES Permit is included in Appendix B.

STRAIT OF JUAN DE FUCA

DUNGENESS BAY

DUNGENESS

SUNLAND

PORT ANGELES

CARLSBORG

101

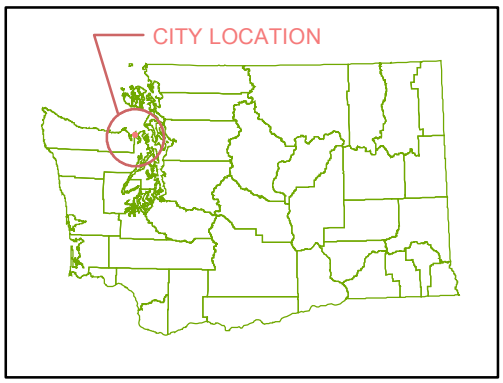
CITY OF SEQUIM

SEQUIM BAY

DUNGENESS RIVER

BLYN

CLALLAM COUNTY



N

0 2,500 5,000 10,000 Feet

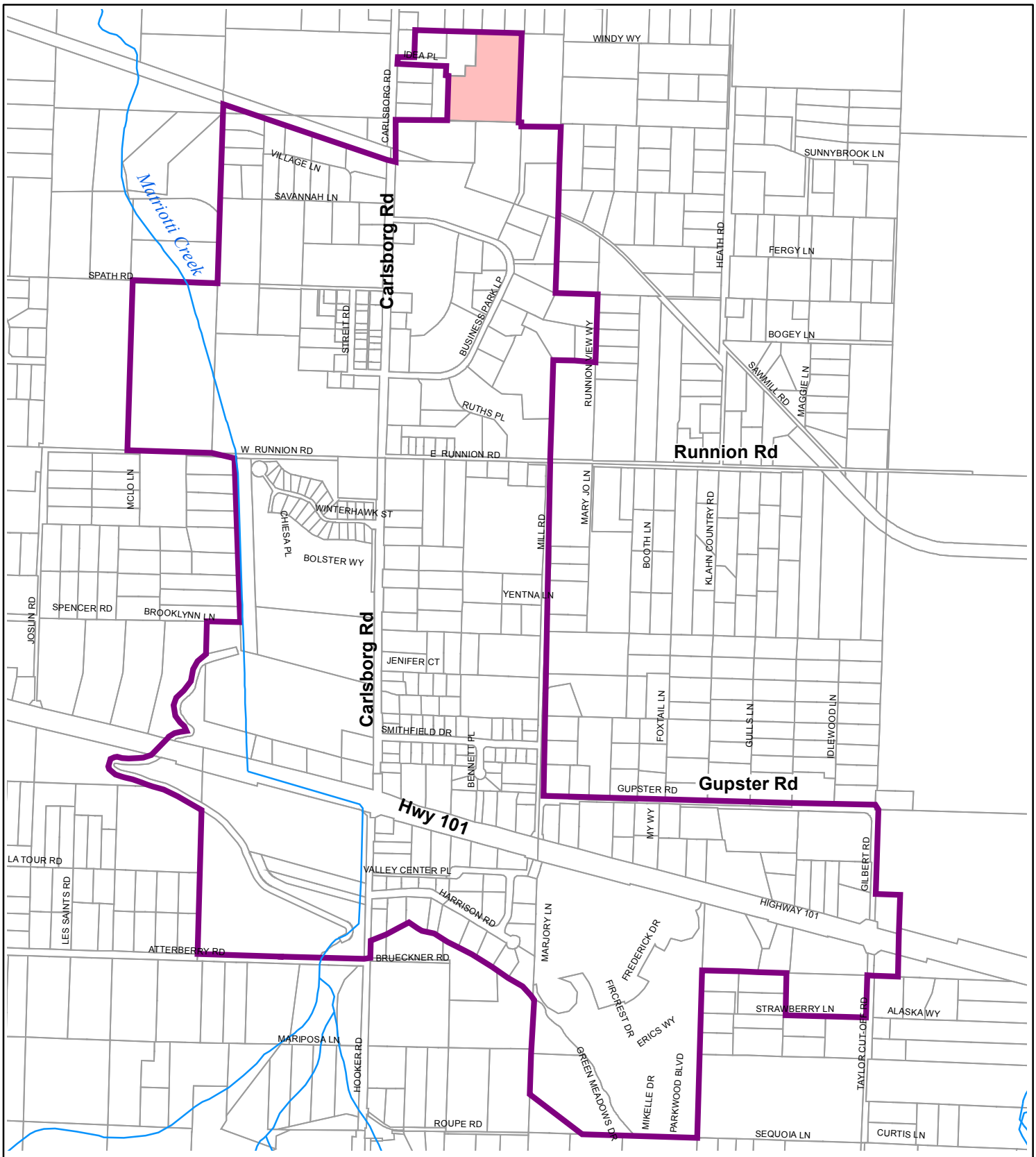
CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 1-1
LOCATION MAP

Gray & Osborne, Inc.

UPDATED: 6/13/2014

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE 1-1.mxd



LEGEND:

CARLSBORG UGA BOUNDARY

PUD Operations Center

N

0 650 1,300 Feet

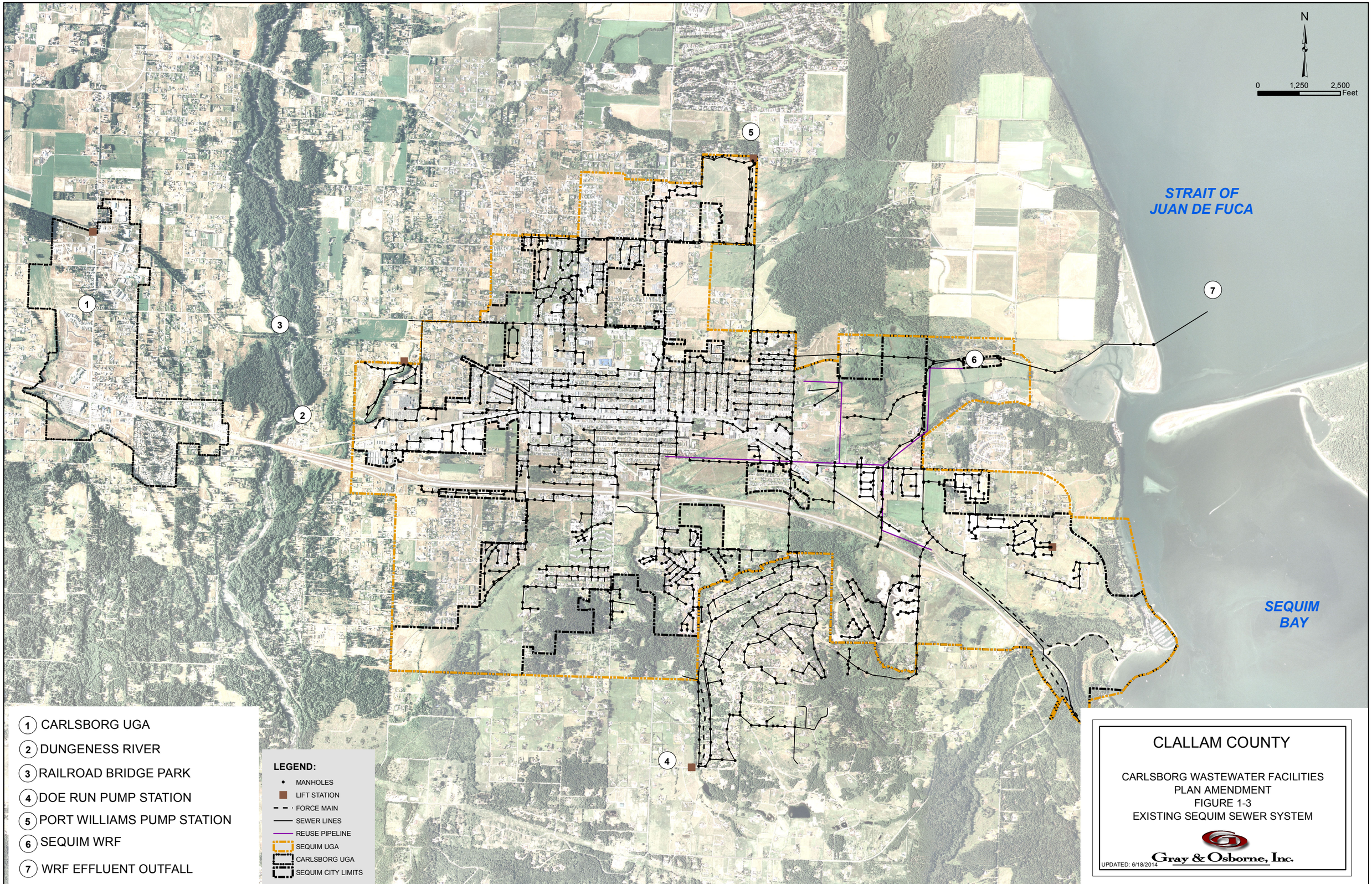
CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 1-2
CARLSBORG URBAN GROWTH AREA

Gray & Osborne, Inc.

UPDATED: 6/13/2014

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE1-2.mxd



L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE 1-3.mxd

Reclaimed water is provided to Sequim City Shops facility, a landscape irrigation system along Sequim Avenue, and the Reuse Demonstration Site. Reclaimed water is supplied to a fire hydrant at the City Shops for truck filling or local use. Reclaimed water can be stored in the City Shop detention pond. The water reuse pipeline consists of a 2.54-mile trunk line that the runs from the WRF to the City Shop, a 0.46-mile branch line to Sequim's Reuse Demonstration Site and a 0.96-mile branch line to the south, towards U.S. Highway 101.

The Reuse Demonstration Site is a 29-acre parcel of land located directly north of Carrie Blake Park in eastern Sequim. Reclaimed water is used at the demonstration site for landscape irrigation, streamflow augmentation to Bell Creek, and for toilet flushing in the Reuse Interpretive Center.

Outside of the Reuse Demonstration Site, reclaimed water is also used for a number of non-potable water uses at the WRF as wash-down water and construction water at the City Shop facility, and for several irrigation uses throughout Sequim.

Sequim is interested in adopting a regional approach to wastewater treatment which would include additional service areas outside its UGA. This concept of having larger, centralized wastewater plants serving several neighboring communities has been applied elsewhere in the State of Washington with significant benefits including:

- Lower annual operating costs and system maintenance costs for users.
- Lower costs for staffing and plant supervision.
- Overall increase in efficiency of wastewater treatment.
- Resource specialization.
- Easier system design to accommodate future growth.

Disadvantages to regional treatment include:

- Potential resistance from community members outside the City due to lack of local utility control.
- Short-term increase in annual costs for small community members.
- Potential high capital costs for construction of conveyance capacity.

Sequim is the largest city in the region with an existing WRF. As such, the City is a logical choice for the primary wastewater service provider to the region. In addition to Carlsborg, other areas outside the current UGA might be candidates for participation in a regional WRF in the future, including Blyn, east of Sequim.

RELATED PLANNING DOCUMENTS

The following documents were consulted in the preparation of this Amendment:

1. *City of Sequim Class A Reclaimed Water – 100 Percent Upland Reuse Plan. Amendment to Comprehensive Facilities Plan,* Gray & Osborne, 1998.

2. *Hydrogeologic Assessment of the Sequim-Dungeness Area, Clallam County, Washington*, USGS, Thomas, B., Goodman, L., and Olsen, T., 1999.

3. *Wastewater Comprehensive Plan*, City of Sequim, Gray & Osborne, April 2003.

4. *Water Reclamation Facility Expansion Engineering Report*, City of Sequim, Gray & Osborne, September 2007.

5. *Sewer Feasibility Study for the Carlsborg UGA*, Clallam County PUD No. 1, BHC Consultants LLC, July 2007.

6. *Sea Level Rise in Coastal Waters of Washington State*, University of Washington and Washington Department of Ecology, 2008.

7. *The Washington Climate Change Impacts Assessment Evaluating Washington's Future in a Changing Climate*, University of Washington, Climate Impacts Group, 2009.

8. *City of Sequim 2008 Hydrologic Monitoring Report*, City of Sequim, Pacific Groundwater Group, December 2009.

9. *Public Utility District No. 1 of Clallam County (PUD) Water System Plan*, CH2M Hill, 2010.

10. *Carlsborg Wastewater Feasibility Study*, City of Sequim, Gray & Osborne, August 2011.

11. *Carlsborg UGA Economic Profile*, Clallam County Economic Development Council / Carlsborg Business and Property Owners Association, September 2011.

12. *Sewer Facilities Plan for Carlsborg UGA*, Clallam County PUD No. 1, BHC Consultants LLC, 2012.

13. *Preparing for a Changing Climate Washington State's Integrated Climate Response Strategy*, Department of Ecology, 2012.

14. *Jamestown S'Klallam Tribe Climate Vulnerability Assessment and Adaptation Plan*, Jamestown S'Klallam and Adaptation International, 2013

CHAPTER 2

POPULATION AND WASTEWATER FLOW AND LOADING PROJECTIONS

This chapter provides information regarding existing and future populations, water and sewer customers, water consumption, and wastewater flows and loadings for the Carlsborg UGA (CUGA). These projections will be used in the design of wastewater collection and conveyance facilities for the CUGA and in the evaluation of treatment alternatives and water reuse/mitigation alternatives involved with the construction and operation of a wastewater collection system in the CUGA.

This chapter builds on the evaluations presented in the PUD's 2010 *Water System Plan* (CH2M Hill), the 2012 *Sewer Facilities Plan* (BHC), and *Carlsborg Sewer Technical Memorandum No. 1 – Carlsborg Urban Growth Area Water and Wastewater Flow Projections* (Gray & Osborne, 2014, included as Appendix C). Wastewater projections are provided in this chapter based on projected future water demands, similar to the approach used in the 2012 *Sewer Facilities Plan*. Estimated future water demand was extracted from the 2010 *Water System Plan*.

BACKGROUND

The sewer service area for the new Carlsborg sewer utility will be the CUGA. Wastewater flow projections for the CUGA in this Amendment are based on water use in the CUGA. The PUD provides water service to approximately half of the Carlsborg UGA and some properties outside of the UGA. The remainder of the UGA is served by private wells and several smaller private water purveyors. Approximately 111 individual lots within the Carlsborg UGA are served by private wells. Some of these parcels are residential, and others are commercial properties. A map showing the PUD's Carlsborg water service area is included as Figure 2-1.

Clallam County would like the PUD to expand its water service area to include the entire UGA, and the PUD is interested in doing so provided that expanding service does not have an adverse impact on their existing water rights or ability to secure additional water rights. As noted in Chapter 1, per the March 2013 Interlocal Agreement between the PUD and Clallam County (included as Appendix D), the County must evaluate the cost impact to the CUGA of reuse of the reclaimed water outside of the CUGA as would occur with the Sequim Alternative, and determine if future CUGA water customers would be adversely affected. If Carlsborg residents will be adversely affected, the County is obligated to acquire additional existing water rights or secondary mitigation options to offset any adverse affects associated with the Sequim Alternative for the area outside the PUD's current local utility district area but inside the UGA.

DEFINITION OF TERMS

Proper design of wastewater treatment and conveyance facilities requires an analysis of the quantity and quality of wastewater generated from each of the contributing sources. Several terms and abbreviations used in the analysis are described below.

WATER-RELATED DEFINITIONS

Average Daily Demand

Average daily demand (ADD) is the total volume of water delivered to the system over a year divided by 365 days. The average use in a single day expressed in gallons per day.

Maximum Daily Demand (MDD)

Maximum daily demand is the largest volume of water delivered to the system in a single day expressed in gallons per day. The water supply sources, treatment plant and transmission lines should be designed to handle the maximum day demand.

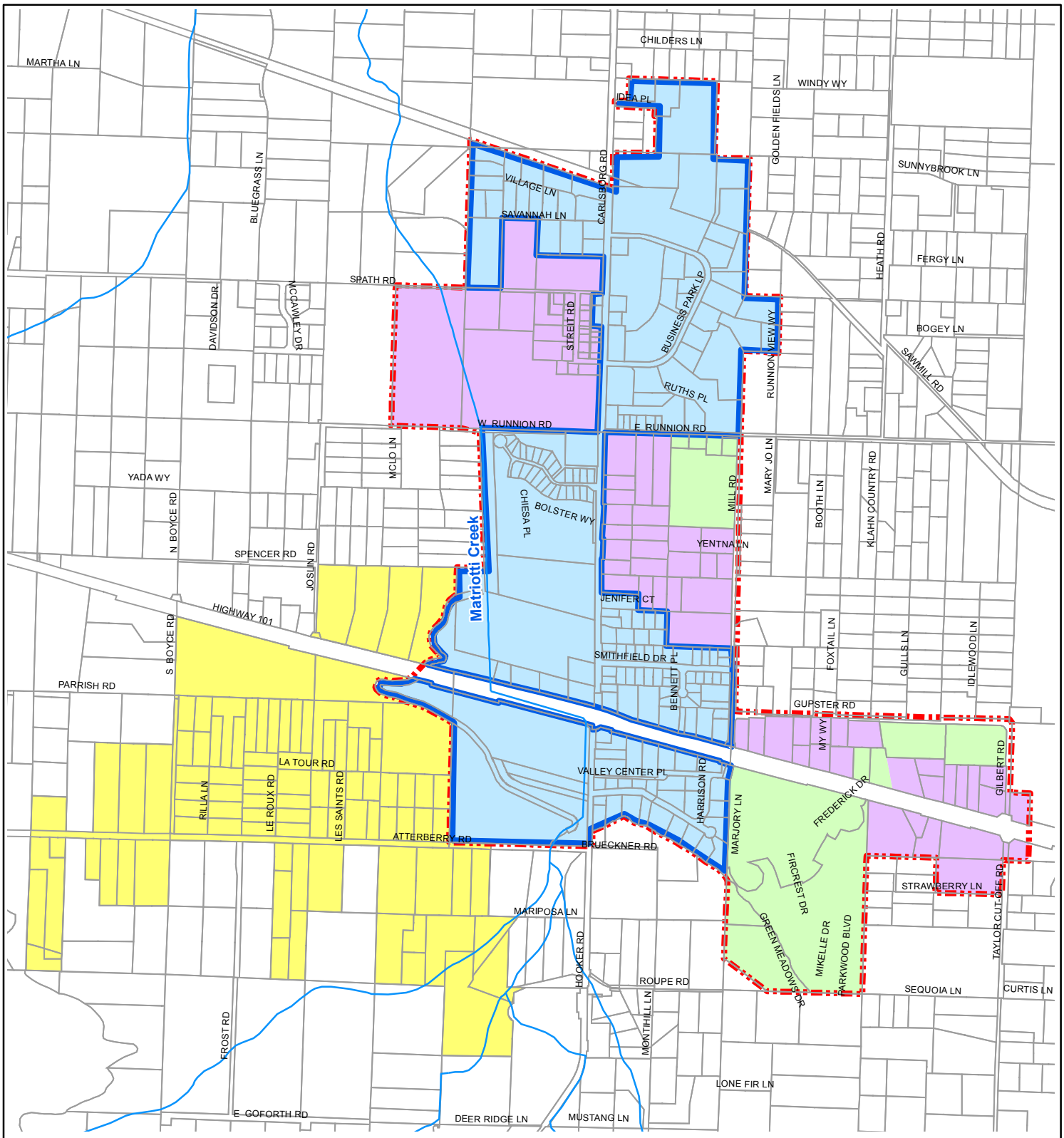
Equivalent Residential Unit (ERU, Water)

An equivalent residential unit for water consumption (ERU, water) is a baseline water consumer that represents the average single-family residential household. Average annual water consumed by a single-family household, or ERU, is usually expressed in units of gallons per day (gpd).

WASTEWATER-RELATED DEFINITIONS

Wastewater

Wastewater is water-carried waste from residential, commercial and public use facilities, together with quantities of groundwater and surface water which enter the sewer system through defective piping and direct surface water inlets. The total wastewater flow is typically expressed in gallons per day (gpd), or millions of gallons per day (mgd). Typically, wastewater is predominantly domestic in origin with lesser amounts contributed by commercial and industrial businesses and by public use facilities such as schools, parks, hospitals, and municipal functions. Infiltration and inflow entering the sewer system during periods of high groundwater levels is another contributor to wastewater.



LEGEND:

- PARCELS
- CURRENT LUD WATER SERVICE AREA INSIDE CUGA
- CARLSBORG UGA BOUNDARY AND SEWER SERVICE AREA
- CURRENT LUD WATER SERVICE AREA OUTSIDE CUGA
- AREA OUTSIDE WATER SERVICE AREA AND INSIDE CARLSBORG UGA
- PRIVATE WATER SYSTEM

N

0 650 1,300 Feet

CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 2-1
CARLSBORG UGA WATER AND
SEWER SERVICE AREA BOUNDARY

Gray & Osborne, Inc.

UPDATED: 6/19/2014

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE2-1.mxd

Base Flow Wastewater

Base flow wastewater is wastewater generated from residential, commercial and industrial sources. Base flow wastewater (also known as sanitary flow) does not include infiltration and inflow.

Domestic Wastewater

Domestic wastewater is wastewater generated from single- and multi-family residences, permanent mobile home courts, and group housing facilities such as nursing homes. Domestic wastewater flow is often expressed as a unit flow based on the average contribution from each person per day. The unit quantity is typically expressed in terms of gallons per capita per day (gpcd) or gallons per ERU per day.

Equivalent Residential Unit (ERU, Wastewater)

An equivalent residential unit (ERU) is a baseline wastewater generator that represents the average single-family residential household. Average annual flow contributed by a single-family household, or ERU, is usually expressed in units of gallons per day (gpd).

The flow associated with each wastewater ERU is typically considerably less than the flow associated with each water ERU, due to the amount of water that is not returned to the sewer because of loss, evaporation, commercial consumptive use, or irrigation.

Non-Residential Wastewater

Non-residential wastewater is wastewater generated from business activities, such as restaurants, hotels and motels, stores, service stations, schools, public facilities, and office buildings. Non-residential wastewater quantities are expressed in this chapter in terms of ERUs, by dividing the total flow per category by the average flow per ERU. In this chapter, non-residential wastewater is identified as commercial wastewater.

Infiltration (in Wastewater)

Infiltration (in wastewater) is groundwater entering a sewer system. Storm events or irrigation can trigger a rise in the groundwater levels and increase infiltration. The greatest infiltration is observed following significant storm events during prolonged periods of precipitation.

Inflow (in Wastewater)

Inflow (in wastewater) is surface water entering the sewer system from yard, roof and footing drains, from cross connections with storm drains and through holes in manhole covers. Peak inflow occurs during heavy storm events when storm sewer systems are taxed beyond their capacity, resulting in hydraulic backups and local ponding and

discharge into the sanitary sewer. Inflow, like infiltration, can be expressed in terms of gallons per capita per day or gallons per acre per day. Typically, inflow and infiltration (I/I) are combined and used as a guide to making recommendations on improving collection system performance, efficiency and capacity.

Since infiltration and inflow (I/I) is related to the total amount of piping and appurtenances in the ground and not to any specific source of wastewater, it is generally expressed in terms of the population or total land area being served. The unit quantity generally used is gallons per capita per day (gpcd), or gallons per acre per day (gpad). As Sequim is a neighboring area with similar weather patterns and soils, Sequim WRF flow records are utilized to predict infiltration in the Carlsborg system on the basis of gallons per acre per day during dry and wet weather periods. In eastern Washington, many WWTPs experience peak flows during irrigation season (typically summer). With relatively dry climates and irrigation in the area, it might be expected that Sequim, like eastern Washington, would similarly experience peak flows in the irrigation season. However, based on an analysis of Sequim WRF flow records, irrigation did not appear to be a major source of infiltration, and it will be assumed that flows from the Carlsborg UGA will peak in or near the winter wet season.

Average Dry Weather Flow (DWF)

Average dry weather flow is wastewater flow during periods when the groundwater table is low and precipitation is at its lowest of the year. For the Carlsborg/Sequim area, the dry weather flow period is defined as July, August and September. During these months, the wastewater strength is highest due to the lack of dilution with the ground and surface water components of I/I. Higher strength wastewater coupled with higher temperatures and longer detention times in the sewer system create the greatest potential for system odors during this time. The average dry weather flow is the average daily flow during July, August and September.

Average Annual Flow (AAF)

Average annual flow is the average daily flow over a calendar year. This flow parameter is used to estimate annual operation and maintenance costs for treatment and pump station facilities.

Maximum Month Flow (MMF)

Maximum month flow is the highest average daily flow for any given month during a calendar year. In western Washington, the maximum month flow typically occurs during winter months. This wintertime flow is composed of the normal domestic, commercial and public use flows with significant contributions from I/I. The predicted maximum month flow at the end of the design period is used as the design flow for sizing treatment processes and selecting treatment equipment.

Peak Day Flow (PDF)

Peak day flow is the highest daily average flow during a calendar year. The PDF is used in sizing membrane filtration and UV disinfection facilities.

Peak Hour Flow (PHF)

Peak hour flow is the highest hourly flow during a calendar year. The peak hour flow occurs in response to a significant storm event preceded by prolonged periods of rainfall, which have previously developed a high groundwater table in the service area. Peak hour flows are used in sizing the hydraulic capacity of wastewater collection, treatment and pumping components. Peak hour flow is typically determined from treatment plant flow records. In its *Criteria for Sewage Works Design* (Orange Book), Ecology also recommends a formula to calculate a "diurnal peaking factor" that may be applied to the average design flows in order to estimate peak hour flows. This formula is based on the population as well as the average annual flows (AAF).

Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand (BOD) is a measure of the oxygen required by microorganisms in the biochemical oxidation (digestion) of organic matter. BOD is an indicator of the organic strength of the wastewater and is measured in either milligrams per liter (mg/L) or pounds per day (lb/day). If BOD is discharged untreated to the environment, biodegradable organics will deplete natural oxygen resources and result in the development of septic (anaerobic) conditions. BOD data together with other parameters are used in the sizing of the treatment facilities and provide a measurement for determining the effectiveness of the treatment process. The term BOD typically refers to a 5-day BOD, often written BOD_5, since the BOD test is typically run for 5 days. The total BOD of a wastewater is primarily composed of two components – a carbonaceous oxygen demand (CBOD) and a nitrogenous oxygen demand (NBOD).

Total Suspended Solids (TSS)

Total suspended solids represents the filterable solid matter carried in the waste stream. The total suspended solids (TSS) concentration in a wastewater sample is determined by filtering a known volume of the sample, drying the filter paper and measuring the increase in weight of the filter paper. TSS is expressed using the same terms as BOD; milligrams per liter for concentration and pounds per day for mass load. The amount of TSS in the wastewater is used in the sizing of treatment facilities and provides another measure of the treatment effectiveness. The concentration of TSS in wastewater affects the treatment facility biosolids production rate, storage requirements, and ultimate disposal requirements.

EXISTING AND PROJECTED FUTURE CUGA WATER CONSUMPTION

The water demand and water service area projections developed in the 2010 *Water System Plan* were used in this chapter. The PUD does not serve the entire CUGA, however, water use for the entire CUGA was estimated to in order to gauge wastewater flows for the CUGA. Currently, commercial ERUs make up 56.46 percent of the total water demand in the Carlsborg system; therefore, the number of ERUs for the full UGA were projected using the same proportion of 56.46 percent commercial and 43.54 percent residential water demand determined in the 2010 *Water System Plan.*

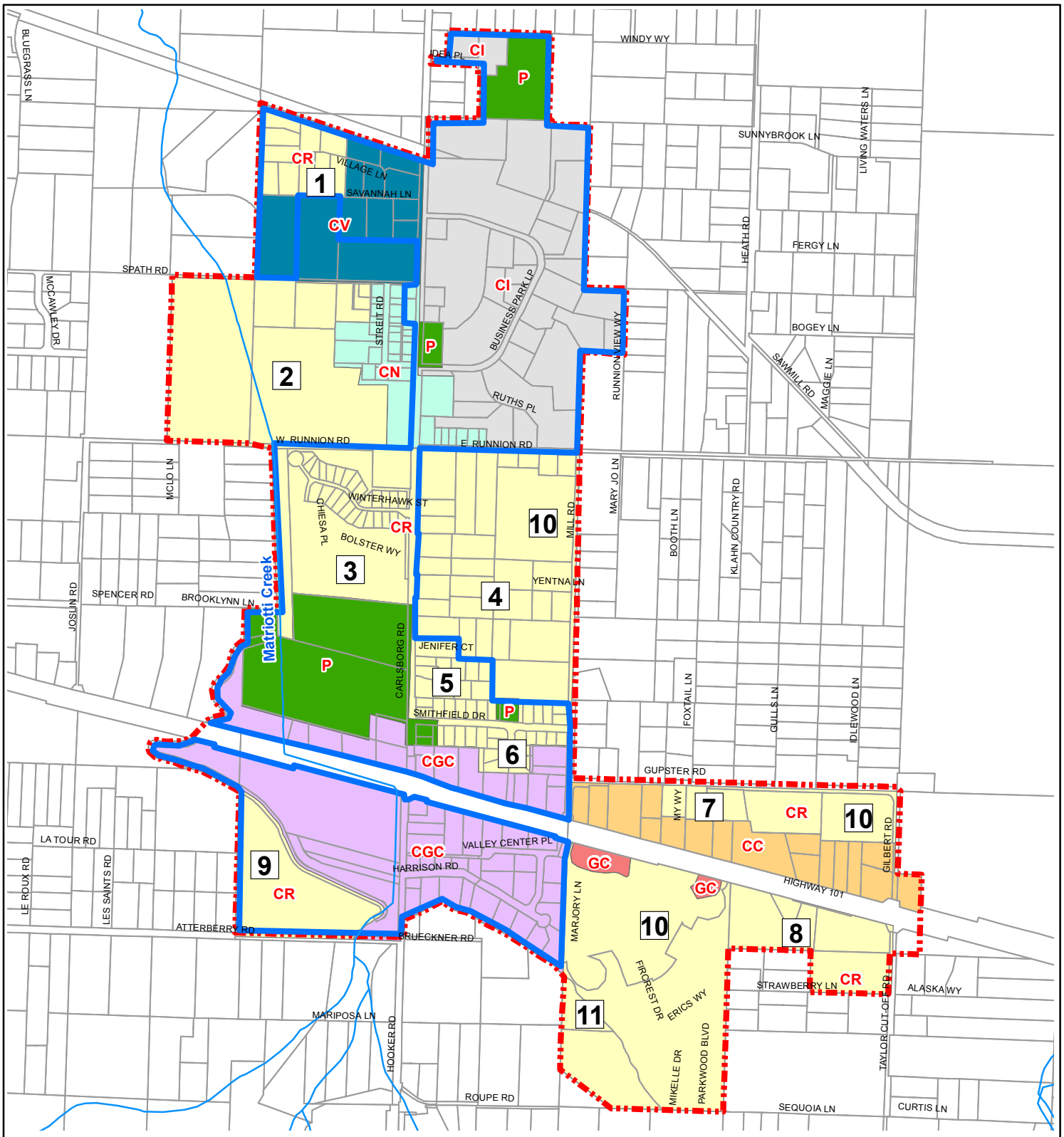
In 2010, the Carlsborg Community Advisory Council (CCAC) made residential zoning recommendations (shown in Figure 2-2). These zoning recommendations have not been adopted by the County to date but were utilized as a basis for water demand projections in the 2010 *Water System Plan*. (Note: Future wetland delineation, wildlife conservation, and airport influence restrictions may reduce zoning densities and overall ERUs; however, these factors are considered minor and have not been reflected in projections for consistency with past documents.)

Section 4.5 of the 2013 Interlocal Agreement between the County and PUD states:

> *"In the event that the County proceeds with the Sequim Alternative and water-use mitigation costs to future water customers in the UGA are adversely affected by treatment and infiltration of water in Sequim vs. Carlsborg, the County will purchase or otherwise procure for the PUD additional existing water rights to supply water for full buildout of the area outside the PUD's current local utility district (LUD) water service area but within the UGA, in a quantity sufficient to offset any adverse effects."*

Figure 2-1 shows areas within and outside the LUD water service area. The ERUs and water consumption in the CUGA associated with areas within and outside the LUD water service area are presented in *Technical Memorandum No. 1* in Appendix C.

The number of ERUs and water consumption at buildout, was projected assuming the percentage of commercial ERUs (and demand) was kept constant at 56.46 percent of the total in the UGA. Using this approach yields 2,342 residential ERUs and 2,771 commercial ERUs for a total of 5,113 water ERUs at buildout in the CUGA, which includes 205 ERUs that would be provided water by the PUD but will not contribute wastewater flow since the ERUs are located outside of the CUGA. The projected number of ERUs is consistent with the approach used in Appendix E of the 2010 *Water System Plan*.



LEGEND:

- CURRENT LUD WATER SERVICE AREA
- CARLSBORG UGA BOUNDARY

ZONING:

- CR - CARLSBORG RESIDENTIAL
- CC - CARLSBORG COMMERCIAL
- CGC - CARLSBORG GENERAL COMMERCIAL
- CI - CARLSBORG INDUSTRIAL
- CN - CARLSBORG VILLAGE CENTER
- CV - CARLSBORG VILLAGE COMMERCIAL
- GC - GENERAL COMMERCIAL
- P - PUBLIC LAND
- PARCELS

N

0 550 1,100 Feet

CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 2-2
CARLSBORG UGA RECOMMENDED ZONING

Gray & Osborne, Inc.

UPDATED: 6/19/2014

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A detailed explanation of the apportionment of residential and commercial buildout water ERUs is provided in *Technical Memorandum No. 1* (Appendix C). To apportion commercial ERUs, the areas for each of the CCAC-recommended commercial zones in Table 3-2 of the *2012 Sewer Facilities Plan* were used (modified as necessary based on the Water Service Area boundaries); the number of commercial ERUs was assumed to be simply proportional to the area. Residential ERUs were apportioned based on the preliminary CCAC zoning recommendations.

Table 2-1 provides a summary of ERUs and average daily demand for the Carlsborg Water System at buildout, based on the information in Tables 2, 3 and 4 in *Technical Memorandum No. 1*.

TABLE 2-1

Summary of ERUs and Average Daily Demand for Carlsborg Water System at Buildout

Total Buildout	**Water ERUs(1)**	**Average Daily Demand (ADD)(1) (gpd)**
Residential		
Residential (within CUGA, not in mobile home parks)	1,676	298,328
Mobile Home Residential	461	82,058
Outside CUGA Residential(1)	205	36,490
Total Residential	**2,342**	**416,876**
Commercial		
Total Commercial(4)	**2,771**	**493,261**
Grand Total in CUGA and Current Water Service Area	**5,113**	**910,137**

(1) Based on the apportionment in Tables 1, 2, 3 and 4 (and summarized in Table 5) in Technical Memorandum No. 1.

(2) ADD: 178 gpd/ERU (Clallam Public Utility PUD Water System Plan) = 162 gpd +10 percent non-revenue

(3) The term "commercial" includes water used by commercial and industrial employees, industrial processes, and water used by public facilities including schools.

(4) Assumes, for calculation purposes, that the number of commercial ERUs is 56.46 percent of the total within the UGA, per PUD input. The Water Plan had effectively used this 56.46 percent value for areas both inside and outside the UGA, which resulted in a slightly different split of TOTAL ERUs (2,226 residential ERUs and 2,887 commercial ERUs)

PROJECTED FUTURE CUGA SEWERED POPULATION AND WASTEWATER FLOWS

Table 2-2 summarizes projected populations for the Carlsborg sewer system, based on information in the 2010 *Water System Plan* and *2012 Sewer Facilities Plan.*

TABLE 2-2

Summary of Population and ERUs for the Carlsborg Sewer System

Population	2010	2013	2030	2050	Buildout
CUGA Population	842	856	1,288	1,971	3,899
New population since 2013	0	0	432	1,115	3,043
Population Served by Sewers	0	0	481	1,971	3,899
Sewer ERUs	0	0	570	2,324	4,908

(1) Based on data in Tables 3-3, 3-4, 3-12 and 3-13 in the *2012 Sewer Facilities Plan* and the *2010 PUD Water System Plan.*

Tables 2-3 and 2-4 summarize estimated wastewater flows for the Carlsborg sewer system projected for years 2030, 2050 and at Buildout. In projecting future ERUs and populations for the CUGA, the assumptions used in the 2012 *Sewer Facilities Plan* were used, with some exceptions, as described below.

ASSUMPTIONS USED FOR WASTEWATER FLOW AND LOADING PROJECTIONS

1. The projected *wastewater* base flow per ERU of 125 gallons per ERU per day (gpd/ERU) developed in the 2012 *Sewer Facilities Plan* was based on an evaluation of winter water use within the CUGA. The development of this gpd/ERU value is consistent with accepted industry practices and is accepted for this Amendment. The assumed value of 125 gpd/ERU value is 70.2 percent of the *water* ERU value of 178 gpd/ERU. By comparison, the City of Sequim average wastewater ERU value of 110 gpd/ERU is 67.5 percent of the average water ERU value of 163 gpd/ERU, (City of Sequim 2013 *General Sewer Plan* and City of Sequim 2013 *Water System Plan*). (Note that the base flow does not include infiltration and inflow.)

2. As noted in Appendix E of the 2010 *Water System Plan*, commercial *water* ERUs are 56.46 percent of the total current number of ERUs (214 out of 379); however, 59 ERUs of these 214 water ERUs are for supply to a bottled water company. The majority of this water will not be returned to the sewer. However, for conservative projections of future flows at buildout, it is assumed that commercial sewer ERUs are 56.46 percent of total sewer ERUs. (Note: as used in this chapter, the term "commercial" includes sewage from commercial and industrial employees, industrial wastewater, and flows from public facilities including schools.)

3. The numbers of commercial and residential ERUs utilized for the 2030 projections in the *2012 Sewer Facilities Plan* have been retained in this chapter. The same ratio (310 to 260 or 1.192) of commercial to

residential ERUs for 2030 was used for the new 2050 projections. Therefore, the projected commercial ERUs for year 2050 have been increased from the 300 estimated in the *2012 Sewer Facilities Plan* to 1,264.

4. Based on the assumption that 56.46 percent of the sewer ERUs in the CUGA are commercial, the total number of sewer ERUs at buildout in the CUGA is 4,908 (the 5,113 identified in the PUD's sewer service area minus the 205 that are within the water service area but outside the CUGA).

5. The areal I/I rates in gallons per acre per day (gpad) utilized for annual average, maximum month, peak day and peak hour flow projections were based on an analysis of flows in the Sequim system, with a 25 percent safety factor added. These I/I rates were higher than the areal I/I rates cited for Carlsborg projections in the 2012 *Sewer Facilities Plan*. The I/I rates were added to base flow to generate the annual average, maximum month, and peak day flows (consistent with typical industry practice, and how they were derived through an analysis of flows in the Sequim system).

6. A diurnal peaking factor (ratio of peak hour to average flow) provided in the State *Criteria for Sewage Works Design* (Orange Book) was utilized in projection of peak hour flows. This had the effect of increasing peak hour flow projections above those in the 2012 *Sewer Facilities Plan*. (The 2012 *Sewer Facilities Plan* did not use a diurnal peaking factor, instead the Plan added peak hour projected infiltration and inflow to peak day flow to calculate projected peak hour flow.)

Table 2-3 summarizes the projected ERUs and flows projected for 2030. The ERU projections are identical to those in the 2012 *Sewer Facilities Plan.* However, the flows are somewhat higher due to higher I/I rates and the inclusion of a diurnal peaking factor.

TABLE 2-3

Projected ERUs and Flows for the Carlsborg Sewer System – 2030

		Value	Units	Unit Flow (gpd)	Total Flow (gpd)
Base Flow	Total Residential	260	ERU	125	32,500
	Total Commercial	310	ERU	125	38,750
	Total Base Flow	570	ERU	125	71,300
Average Day Flow	Avg. Day I/I	240	acres	45	10,800
	Base Flow +Avg. Day I/I				82,100
Maximum Month Flow	Max Mo I/I	240	acres	110	26,400
	Base Flow +Max Mo I/I				97,700
Peak Day Flow	Peak Day I/I	240	acres	450	108,000
	Base Flow +Peak Day I/I				179,300
Peak Hour Flow(2)	Avg. Day x Peaking Factor				326,800

(1) Based on 20 years of growth from 2010, to be consistent with the 2012 *Sewer Facilities Plan.*
(2) Based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor of 3.98.

Table 2-4 summarizes the projected ERUs and flows projected for 2050. The residential ERU projections are identical to those in the 2012 *Sewer Facilities Plan.* However, the commercial ERUs are substantially higher, as the same ratio of commercial to residential ERUs used for the 2030 projections has been maintained. Overall, this results in substantially higher ERUs and flows for 2050 relative to the projections in the 2012 *Sewer Facilities Plan.*

TABLE 2-4

Projected ERUs and Flows for the Carlsborg Sewer System – 2050

		Value	Units	Unit Flow (gpd)	Total Flow (gpd)
Base Flow	Total Residential	1,060	ERU	125	132,500
	Total Commercial(3)	1,264	ERU	125	157,981
	Total Base Flow	2,324	ERU	125	290,481
Average Day Flow	Avg. Day I/I	430	acres	45	19,350
	Base Flow +Avg. Day I/I				309,800
Maximum Month Flow	Max Mo I/I	430	acres	110	47,300
	Base Flow +Max Mo I/I				337,800
Peak Day Flow	Peak Day I/I	430	acres	450	193,500
	Base Flow +Peak Day I/I				484,000
Peak Hour Flow(2)	Avg. Day x Peaking Factor				1,113,000

(1) Based on 40 years of growth from 2010, to be consistent with the 2012 *Sewer Facilities Plan.*
(2) Based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor of 3.59.
(3) For estimating commercial ERUs, the ratio of commercial to residential from 2030 was used.

Table 2-5 summarizes the projected ERUs and flows projected for Buildout. The ERU projections are identical to those in the PUD's 2010 *Water System Plan* (after subtraction of the 205 ERUs outside of UGA), however, the total sewer ERUs (4,908) are considerably less than the 5,500 ERUs projected in the 2012 *Sewer Facilities Plan*. Therefore, the majority of the flows and loading projections are less than those in the 2012 *Sewer Facilities Plan.* However, the projected peak hour flow is substantially higher, due to the use of a diurnal peaking factor that was not included in the 2012 *Sewer Facilities Plan*

TABLE 2-5

Projected ERUs and Flows for the Carlsborg Sewer System - Buildout

		Value	Units	Unit Flow (gpd)	Total Flow (gpd)
Base Flow	Total Residential	2,137	ERU	125	267,100
	Total Commercial	2,771	ERU	125	346,400
	Total Base Flow	4,908	ERU	125	613,500
Average Day Flow	Avg. Day I/I	560	acres	45	25,200
	Base Flow +Avg. Day I/I				638,700
Maximum Month Flow	Max Mo I/I	560	acres	110	61,600
	Base Flow +Max Mo I/I				675,100
Peak Day Flow	Peak Day I/I	560	acres	450	252,000
	Base Flow +Peak Day I/I				865,500
Peak Hour Flow(1)	Avg. Day x Peaking Factor				2,133,600

(1) Based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor of 3.34.

Table 2-6 summarizes the ERUs, flows and loadings projected in this Amendment compared to the projections in the *2012 Sewer Facilities Plan.* The new projections for ERUs and flows in Table 2-6 are based on the analyses summarized in Tables 2-3, 2-4 and 2-5 above. The current projections for annual average wastewater loadings of 5-Day Biochemical Oxygen Demand (BOD_5) are based on a planning value of 1.8 residents per ERU and a loading value of 0.4 pounds per ERU (as used in the *2012 Sewer Facilities Plan)* while the Total Suspended Solids (TSS) loadings are based on a loading value of 0.45 pounds per ERU. Total Nitrogen loadings were estimated based on standard ratio of influent Total Nitrogen to BOD_5 of 40 mg/L to 220 mg/L. The table also compares the peak hour to average annual peaking factor calculated from Ecology's *Criteria for Sewage Works Design* (which takes into account both diurnal and I/I factors) with the peaking factor calculated from the projections in this Amendment and the *2012 Sewer Facilities Plan.*

TABLE 2-6

Comparison of New Projections and 2012 *Sewer Facilities Plan* Projections for ERUs, Flows and Loadings for the Carlsborg Sewer System

Parameter		2030		2050		Buildout	
		Current Amendment Projection	2012 Sewer Facilities Plan Projection	Current Amendment Projection	2012 Sewer Facilities Plan Projection	Current Amendment Projection	2012 Sewer Facilities Plan Projection
Residential ERUs		260	260	1,060	1,060	2,137	2,122
Commercial ERUs		310	310	1,264	300	2,771	3,400
Total ERUs		570	570	2,324	1,360	4,908	5,522
Residential Base Flow	gpd	32,500	--	132,500	--	267,100	--
Commercial Base Flow	gpd	38,750	--	158,000	--	346,400	--
Total Base Flow	gpd	71,300	71,000	290,500	171,000	613,500	690,000
Average Day Flow	gpd	82,100	76,000	309,800	184,000	638,700	712,000
Maximum Month Flow	gpd	97,700	90,000	337,800	210,000	675,100	757,000
Peak Day Flow	gpd	179,300	150,000	484,000	318,000	865,500	897,000
Peak Hour Flow	gpd	326,800 (1)	270,000	1,113,000 (1)	533,000	2,133,600 (1)	1,205,000
Peaking Factor (Peak Hour Flow to Average Annual Flow)							
Per Orange Book		3.98	3.98	3.59	3.59	3.34	3.34
In Projections		3.98	3.55	3.59	2.90	3.34	1.69
Wastewater Loadings							
BOD_5, Annual Average	lb/d	228	228	930	544	1,963	2,200
BOD_5, Maximum Month	lb/d	296	300	1,208	700	2,552	3,000
TSS, Annual Average	lb/d	257	285	1,046	680	2,209	2,750
TSS, Maximum Month	lb/d	333	400	1,360	800	2,871	3,500
Tot. Nitrogen, Annual Average	lb/d	41	45	169	98	357	320
Tot. Nitrogen, Maximum Month	lb/d	53	59	220	126	464	436

(1) Based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor, based on population projections.
(2) Inferred peaking factor based on ratio of peak hour flow to average day flow in the 2012 *Sewer Facilities Plan*.

CHAPTER 3

REGULATORY REQUIREMENTS

The purpose of this chapter is to identify and summarize the pertinent federal and state regulations that affect the planning, design, and approval of both the Sequim and Carlsborg Alternatives discussed in this Plan. This chapter builds on the analysis of regulatory requirements provided in the 2012 *Sewer Facilities Plan.*

Subsequent sections of this Plan address technical requirements of the regulations at a level of detail appropriate for the evaluation provided by that section.

FEDERAL STATUTES, REGULATIONS, AND PERMITS

FEDERAL CLEAN WATER ACT AND NPDES PERMITS

The Federal Water Pollution Control Act is the principal law regulating the water quality of the nation's waterways. Originally enacted in 1948, it was significantly revised in 1972 and 1977, when it was given the common title of the Clean Water Act (CWA). The CWA has been amended several times since 1977. The National Pollutant Discharge Elimination System (NPDES) is established by Section 402 of the CWA and subsequent amendments. In Washington State, the State Department of Ecology (Ecology) issues and administers NPDES permits for the United States Environmental Protection Agency (EPA). Most NPDES permits, including the permit for Sequim, have a 5-year lifespan and place limits on the quantity and quality of pollutants that may be discharged.

Sequim NPDES Permit

Sequim's current NPDES Waste Discharge and Reclaimed Water Permit WA0022349 was issued on March 18, 2014, and is included as Appendix B. The City's WRF is authorized to discharge to either Bell Creek in Carrie Blake Park or the Strait of Juan de Fuca. The City's permit requires the treatment plant effluent to meet Class A reclaimed water treatment standards regardless of whether it is discharged to the outfall or pumped to the City's reuse facilities, unless there is an "upset condition." In case of an "upset condition," such as extreme flow events (48 hours of flow greater than the maximum day flow) or catastrophic system failure (earthquake, lightning strike), the City is authorized to discharge secondary effluent-quality water (lower quality water than Class A reuse water through the marine outfall. Effluent not meeting Class A reclaimed water standards may not be pumped to the City's reuse facilities or discharged into Bell Creek under any conditions.

Condition S4 of the City's NPDES permit requires the City to prepare a plan and schedule to maintain adequate capacity when actual flows or loadings to the WRF exceed

85 percent of design capacity for 3 consecutive months, OR when the projected increase would reach design capacity within 5 years.

Potential Carlsborg NPDES Permit

If a new Carlsborg Water Reclamation Facility were to be constructed and operated, Clallam County would be required to have its own permit. It is likely that many of the discharge limitations would be similar to those in Sequim's permit, with the exception of standards (e.g., those for ammonia) related to Sequim's surface water discharges. Given its anticipated location, configuration, and permitting status, a Carlsborg WRF would not be able to discharge water with quality lower than that for Class A reclaimed water without a permit violation.

Industrial Pretreatment/Source Control

Section 307 of the CWA established the National Pretreatment Program; 40 CFR Part 403 lists the federal pretreatment requirements. This program is designed to protect publicly owned treatment works (POTW) from *pass-through* of pollutants or *interference* with the treatment process from industrial or other non-residential discharges that is not "domestic-equivalent" (similar in quality to domestic wastewater). *Pass-through* is defined as "a discharge that exits the POTW into waters of the United States in quantities or concentrations, which alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation). *Interference* is defined as a discharge that inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use, or disposal.

Sequim's NPDES permit includes requirements for ensuring prevention of pass-through and interference. These requirements are typical for NPDES permits, and would be expected to be present in an NPDES permit for a Carlsborg WRF. The permit requirements include:

1. Working with Ecology to ensure that all commercial and industrial dischargers are compliant with 40 CFR Part 403.

2. Identification and reporting of existing, new, and proposed industrial users.

3. Prohibitions on flammability, pH (5 to 11), toxicity, viscosity, and dangerous wastes.

Sequim's NPDES permit and Sewer Use Ordinance do not currently include numeric pretreatment limits for pollutants, generally, since Sequim currently has only a few dischargers of wastewater that is not "domestic-equivalent" (commercial/industrial dischargers). However, the number of commercial/industrial dischargers is expected to

increase within the City, and will further increase if the Sequim Alternative is implemented in Carlsborg. Accordingly, the City is considering developing numeric effluent limits for commercial/industrial dischargers and revising its Sewer Use Ordinance, in order to institute procedures to verify compliance with 40 CFR Part 403. Typically, such ordinances will include "local limits," concentration or loading limits for a number of pollutants, primarily metals, developed through an engineering assessment of impacts. The most commonly regulated pollutants are arsenic, cadmium, chromium, copper, lead, molybdenum, mercury, nickel, selenium, silver, zinc, and oil and grease. Priority pollutant organics may also be regulated if typically present in the wastewater.

Other Relevant Clean Water Act Provisions

A 401 Water Quality Certification is required under the CWA for any activity that may result in discharge to surface waters including excavation activities that occur in streams, wetlands, or other waters of the nation. The EPA has delegated 401 Certification to Ecology.

Section 404 of the CWA regulates discharges of fill or dredged materials in wetlands, including any related draining, flooding, and excavation. Pipeline and pump station projects in wetlands will require a Section 404 permit, in addition to any related local permits. In most cases, activities impacting greater than 1/3 of an acre will also require a Section 401 certification.

Proposed EPA Capacity, Management, Operation, and Maintenance Regulations

EPA has proposed a new round of regulations regarding sewer system Capacity, Management, Operation and Maintenance (CMOM). Though the regulations are yet to be formally adopted by the EPA, some municipalities are anticipating the adoption and have proactively moved forward with implementation. In addition, EPA has used these proposed regulations as de facto standards when auditing wastewater treatment plants, including some in Washington State. CMOM focuses on the failure of collection systems to have a program for long-term finance and repair. This failure has resulted in sanitary sewer overflows (SSO) that EPA feels it can legally address under the federal Clean Water Act. It is expected that portions of CMOM could be incorporated into future NPDES permit requirements.

In general, the requirements can be summarized through the following tenets:

1. General performance standards including system maps, information management, and odor control.

2. Program documentation including the goals, organizational, and legal authority of the organization operating the collection system.

3. An overflow response plan which requires response in less than 1 hour and is demonstrated to have sufficient and adequate personnel and equipment, etc. Estimated volumes and duration of overflows must be accurately measured and reported to the regulatory agency.

4. System evaluation requires that the entire system be cleaned on a scheduled basis (for example, once every 5 years), be regularly inspected through TV work, and that a program for short- and long-term rehabilitation replacement be generated.

5. A capacity assurance plan that will use flow meters to model I/I, ensure pump stations are properly operated and maintained, and that source control is maintained.

6. A program for self-audit to evaluate and adjust performance.

7. A communication program to communicate problems, costs, and improvements to the public and decision-makers.

EPA is considering some changes in design standards for collection systems including requiring that sanitary sewer overflows not occur except in extreme storms. They have also decided that they will not predefine what that type of storm is, leaving that decision to the design engineer.

FEDERAL ENDANGERED SPECIES ACT (ESA)

The Endangered Species Act (ESA) was adopted in 1972 to protect the ecosystems which endangered and threatened species depend on. In Clallam County, the U.S. Fish & Wildlife Service has listed the bull trout, marbled murrelet, northern spotted owl, and the short-tailed albatross as Threatened. Dolly Varden trout is proposed for listing under the similarity of appearance clause of the ESA for its resemblance to bull trout. Critical habitat has been established in Clallam County for bull trout, marbled murrelets, and the northern spotted owl. Listed species in Clallam County under the jurisdiction of the National Marine Fisheries Service (NMFS) include Puget Sound chinook salmon, Hood Canal summer chum, and Puget Sound steelhead, all of which are listed as “Threatened.” NMFS has also listed the Southern Resident Pod of the killer whale as “Endangered” and reconfirmed this listing on March 17, 2011, as part of their 5-year review for this species. Critical Habitat has been established for each of these species, except Puget Sound steelhead, for which Critical Habitat is under development. Endangered Species Act consultation with the U.S. Fish & Wildlife Service and the National Marine Fisheries Service is required for any project that receives federal funding (including Washington State Revolving Fund projects) and/or a federal permit; most often a Clean Water Act, Section 404, or Rivers and Harbors Act Section 10 permit from the U.S. Army Corps of Engineers. The ESA consultation process can take from 6 months to more than 1 year to complete.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

The National Environmental Policy Act was established in 1969 and requires federal agencies to determine environmental impacts on all projects requiring federal permits or funding. Federally delegated activities such as NPDES permits or Section 401 certification are considered state actions and do not require NEPA compliance. If a project involves federal action (through, for example, an Army Corps of Engineers Section 404 permit), and is determined to be environmentally insignificant, a Finding of No Significant Impact (FONSI) is issued, otherwise an Environmental Impact Statement (EIS) is required. NEPA is not applicable to projects that do not include a federal component.

FEDERAL CLEAN AIR ACT (CAA)

The Federal Clean Air Act requires all wastewater facilities to plan to meet the air quality limitations of the region. Carlsborg and Sequim fall under the jurisdiction of the Olympic Region Clean Air Authority.

STATE STATUTES, REGULATIONS, AND PERMITS

STATE ENVIRONMENTAL POLICY ACT (SEPA)

The WAC 173-240-050 requires a statement in all wastewater comprehensive plans regarding compliance of proposed projects with SEPA, if applicable. The capital improvements proposed in this Plan will fall under SEPA regulations, and a SEPA checklist is included in Appendix E. In most cases, a determination of non-significance (DNS) or mitigated determination of non-significance (MDNS) is issued; however, if a project will have a probable significant adverse environmental impact, an Environmental Impact Statement (EIS) will be required. It is not anticipated that an EIS will be required for any recommended projects in this Amendment.

SHORELINE MANAGEMENT ACT (SMA)

The Shoreline Management Act of 1971 (RCW 90.58) establishes a broad policy giving preference to shoreline uses that protect water quality and the natural environment, depend on proximity to the water, and preserve or enhance public access to the water. The SMA jurisdiction extends to lakes or reservoirs greater than 20 acres, streams with a mean annual flow of greater than or equal to 20 cubic feet per second, marine waters, and an area inland 200 feet from the ordinary high-water mark. The Sequim WRF and portions of the collection system are located within shoreline areas. If the Sequim Alternative is implemented, a Shoreline Substantial Development Permit (or an exemption) and a Hydraulic Project Approval, described below, will be required for crossing the Dungeness River; this permit (or exemption) would be issued by the County

and should be straightforward. A shoreline permit would likely not be required if the Carlsborg Alternative is implemented.

HYDRAULIC PROJECT APPROVAL

Under the Washington State Hydraulic Code (WAC 220-110), the Washington State Department of Fish and Wildlife (WDFW) requires a Hydraulic Project Approval (HPA) for activities that will "use, divert, obstruct, or change the natural flow or bed" of any waters of the state. For activities such as pipeline crossings of streams and rivers, including the crossing of the Dungeness River under the Sequim Alternative, an HPA will be required, and will include provisions necessary to minimize project-specific and cumulative impacts to fish. Given the plan to hang the Dungeness River crossing on the Highway 101 bridge for the Sequim Alternative, obtaining an HPA for the crossing should be straightforward. An HPA would likely not be required if the Carlsborg Alternative is implemented.

STATE WATER POLLUTION CONTROL ACT

The intent of the state Water Pollution Control Act is to "maintain the highest possible control standards to ensure the purity of all waters of the state consistent with public health and the enjoyment…the propagation and protection of wildlife, birds, game, fish and other aquatic life, and the industrial development of the state." Ecology issues permits for wastewater treatment facilities under the Revised Code of Washington (RCW) 90.48 and the Washington Administrative Code (WAC) 173-240, and land application of wastewater under WAC 246-271.

Submission of Plans/Reports for Construction of Wastewater Facilities, WAC 173-240

Prior to construction or modification of domestic wastewater facilities, engineering reports, plans, and specifications must be submitted to and approved by Ecology.

Key provisions of WAC 173-240 state that:

1. An engineering report for a wastewater facility project must contain everything required for a general sewer plan unless an up-to-date general sewer plan is on file with Ecology.

2. An engineering report shall be sufficiently complete so that plans and specifications can be developed from it without substantial changes.

3. A wastewater facility engineering report must be prepared under the supervision of a professional engineer.

Criteria for Sewage Works Design, Washington State Department of Ecology

Ecology has published design criteria for collection systems and wastewater treatment plants. While these criteria are not legally binding, their use is strongly encouraged by Ecology since the criteria are used by the agency to review engineering reports for upgrading wastewater treatment systems. The latest official version of these design criteria, commonly referred to as the "Orange Book," was issued in 2008. The design of a new Carlsborg WRF or any expansion or modification of the City of Sequim WRF will require consideration of Ecology Orange Book criteria.

Certification of Operators of Wastewater Treatment Plants, WAC 173-230

Wastewater treatment plant operators are certified by the state water and wastewater operator's certification board. The operator assigned overall responsibility for operation of a wastewater treatment plant is defined by WAC 173-230 as the "operator in responsible charge." This individual must have state certification at or above the classification rating of the plant.

The City of Sequim WRF is currently assigned a Class III rating and the operations staff assigned to the plant possess the required certification. Specifically, two of the operators have Class III certification, while two others have Class II certification.

ACCREDITATION OF ENVIRONMENTAL LABORATORIES (WAC 173-050)

The State of Washington recently established a requirement that all laboratories reporting data to comply with NPDES permits must be generated by an accredited laboratory. This accreditation program establishes specific tasks for quality control and quality assurance (QA/QC) that are intended to ensure the integrity of laboratory procedures. Accreditation requirements must be met for any on-site laboratory or outside laboratory used to analyze samples. Only accredited commercial laboratories may be used for analyses reported for compliance with NPDES permits. In planning for an on-site laboratory, staffing must be sufficient to allow for QA/QC procedures to be performed.

SURFACE WATER QUALITY STANDARDS (WAC 173-201A)

WAC 173-201A establishes water quality standards within the State of Washington. The state adopted revised water quality standards in 2003. The standards are based on two objectives: protection of public health and enjoyment, and protection of fish, shellfish, and wildlife. For each surface water body in the state, the standards assign specific uses, such as aquatic life, recreation, or water supply. Water quality standards have been developed for each use, for parameters such as fecal coliform, dissolved oxygen, temperature, pH, turbidity, and toxic, radioactive, deleterious substances. The water uses that are defined in the standards for marine waters include:

Aquatic Life Uses:

- Extraordinary Quality
- Excellent Quality
- Good Quality
- Fair Quality

Shellfish Harvesting and Recreational Uses:

- Primary Contact Recreation
- Secondary Contact Recreation

Miscellaneous Uses:

- Wildlife Habitat
- Harvesting
- Commerce and Navigation
- Boating
- Aesthetics

Anti-Degradation

The anti-degradation policy aims to maintain the highest possible quality of water in the state by preventing the deterioration of water bodies that currently have higher quality than the water quality standards require. The revised water quality standards define three tiers of waters in the anti-degradation policy:

- Tier I water bodies are those with violations of water quality standards from natural or human-caused conditions. The focus of water quality management is on maintaining or improving current uses and preventing any further human-caused degradation.

- Tier II water bodies are those of higher quality than required by the water quality standards. The focus of the policy is on preventing degradation of the water quality and to preserve the excellent natural qualities of the water body. New or expanded actions are not allowed to cause a "measurable change" in the water quality unless they are demonstrated to be "necessary and in the overriding public interest."

STANDARDS FOR SOLID WASTE HANDLING (WAC 173-304)

Grit and screenings are not subject to the sludge regulations in WAC 173-308, but their disposal is regulated under the state solid waste regulations, WAC 173-304. Waste placed in a municipal solid waste landfill must not contain free liquids, nor exhibit any of

the criteria of a hazardous waste as defined by WAC 173-303. To be placed in a municipal solid waste landfill, grit and screenings must pass the paint filter test, which determines the amount of free liquids associated with the solids, and the toxic characteristics leachate procedure (TCLP) test, which determines if the waste has hazardous characteristics.

In 2003, Sequim's WRF upgraded the FKC simultaneous pasteurization/lime stabilization facility to treat biosolids produced through the wastewater treatment process. This process allows Sequim to produce Class A Exceptional Quality Biosolids, which are either land applied or donated to City residents. Unlike the grit and screenings mentioned above, these biosolids are governed under WAC 173-308. The City does not currently have a means to distribute biosolids to the public, but is interested in developing an approved method to do so.

WETLANDS

Dredging and Filling Activities in Natural Wetlands (Section 404 of the Federal Water Pollution Control Act)

A Corps permit is required when locating a structure, excavating, or discharging dredged or fill material in waters of the United States or transporting dredged material for the purpose of dumping it into ocean waters. Typical projects requiring these permits include the construction and maintenance of piers, wharves, dolphins, breakwaters, bulkheads, jetties, mooring buoys, and boat ramps.

If wetland fill activities cannot be avoided, negative impacts can be mitigated by creating new wetland habitat in upland areas, and if other federal agencies agree, the Corps will generally issue a permit.

Wetlands Executive Order 11990

This order directs federal agencies to minimize degradation of wetlands and enhance and protect the natural and beneficial values of wetlands. The order also mandates avoidance and mitigation of impacts to wetlands, and must be considered before an NPDES permit is issued. Assurances must be provided that the natural and beneficial values of wetlands will be protected and enhanced by the discharge.

RECLAIMED WATER STANDARDS

The state legislation authorizing water reuse, RCW 90.46 – Reclaimed Water Use, was passed in 1992 and amended in 2006. "Reclaimed water" is defined in RCW 90.46.010 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." Use of reclaimed water is an alternative to effluent disposal. In

the State of Washington, any type of direct beneficial reuse of municipal wastewater is defined as water reuse or reclamation. The State's *Water Reuse and Reclamation Standards* have been issued jointly by the Departments of Health and Ecology. This discussion is based on standards dated September 1997, which are adopted by reference in RCW Chapter 90.46, Reclaimed Water Use.

The *Water Reclamation and Reuse Standards* define the water quality standards for reclaimed water. The Class A reclaimed water standards applicable to the existing City of Sequim WRF and/or a new Carlsborg WRF treatment process includes the four minimum requirements described below:

1. **Continuously Oxidized –** Wastewater that at all times has been stabilized such that the monthly average BOD_5 and TSS are less than 30 mg/L, is non-putrescible, and contains dissolved oxygen. The monthly average total nitrogen (as N) must be less than 10 mg/L, with a maximum sample value of 15 mg/L.

2. **Continuously Coagulated –** Oxidized wastewater that at all times has been treated by a chemical or equally effective method to destabilize and agglomerate colloidal and finely suspended matter prior to filtration.

3. **Continuously Filtered –** Oxidized and coagulated wastewater that at all times has been passed through a filtering media so that the turbidity of the filtered effluent does not exceed an average of 2 nephelometric turbidity units (NTU), determined monthly, and does not exceed 5 NTU at any time.

4. **Continuously Disinfected –** Oxidized, coagulated, and filtered wastewater that at all times has been disinfected to destroy or inactivate pathogenic organisms. A group of indicator microorganisms, coliform bacteria, are used as to measure the effectiveness of the disinfection process. The Class A reclaimed water standard is a total coliform density of 2.2 per 100 milliliters (ml) for the median of the last 7 days of samples, with no sample having a density greater than 23 per 100 ml.

Reclaimed water may be used to recharge groundwater by surface percolation or through direct injection as long as the quality of the reclaimed water meets groundwater recharge criteria which are defined in the Reuse Standards. Groundwater recharge projects must also be in compliance with the state's groundwater regulations listed in WAC 173-200. This regulation contains groundwater quality criteria that are to be met in the saturated zone. Recharge of groundwater with reclaimed water would require a State Waste Discharge Permit issued by Ecology. Ecology may also require the development of a groundwater monitoring program to ensure degradation does not occur.

Discharge of reclaimed water for the purpose of stream flow augmentation, fish and wildlife habitat, irrigation supply, or water right replenishment or transfer must comply with WAC Chapter 173-201A. A beneficial use of the reclaimed water must be established for the project to be accepted as a stream flow augmentation project.

Short-term storage or an alternative disposal system (e.g., an outfall) must be provided for situations where the reclaimed water cannot be used due to bad weather, reduced demand, etc. Provisions must also be made for storage or disposal of water that does not meet the treatment and water quality criteria, perhaps due to a treatment upset or equipment failure.

The Reuse Standards require reliability for individual treatment units such as biological treatment, secondary clarification, coagulation, filtration, and disinfection. Generally, if long-term storage or an alternative disposal method is not available, the facility must have redundant units each capable of treating the entire flow, or short-term storage with standby replacement equipment provided. Furthermore, coagulation and chlorination unit processes must have standby chemical feed equipment provided, regardless of storage and disposal options, to ensure uninterrupted chemical feed.

Groundwater Quality

The State of Washington recognizes the potential benefit of replenishing groundwater with reclaimed water; thus, groundwater recharge is allowed under current state regulations. The Groundwater Quality Standards apply to all groundwater of the state that occur in the saturated zone beneath the land surface. While groundwater may support a number of beneficial uses, the overriding basis for the regulations is to protect all groundwater as a potential drinking water source. Accordingly, the groundwater quality criteria in WAC 173-200 are human health-based standards, which for many parameters, are equivalent to the DOH Drinking Water Standards.

Parameters of Concern

According to the regulations, the reclaimed water must be applied in a manner that "will not cause pollution of any groundwater below the root zone." Compared to surface water, groundwater is relatively immobile and once reaching an underground aquifer the physical and chemical characteristics of water change slowly.

The parameters of major concern with the recharge of reclaimed municipal wastewater are nitrogen and pathogens. The Reuse Standards require treatment equivalent to Class A reclaimed water for groundwater recharge by surface percolation. This treatment level is expected to ensure that pathogen levels in the groundwater will not exceed drinking water standards (<1 total coliform/100 ml), and that nitrate nitrogen (NO_3-N) does not exceed the current drinking water standard of 10 mg/L. Reduction of total nitrogen (TN) to less than 10 mg/L prior to land application is required if application rates exceed agronomic requirements. The Sequim WRF's NPDES permit limits the total effluent

nitrogen concentration to 10 mg/L, and a similar limit would be expected for a new Carlsborg WRF.

Water Rights

RCW 90.46.120 states that "the Owner of a wastewater treatment facility that is reclaiming water with a permit issued under this chapter has the exclusive right to any reclaimed water generated by the wastewater treatment facility."

However, guidance from Department of Ecology indicates that the reclaimed water should normally be retained and utilized in the general use area or basin from which the water originated and for which the original water right was issued. The Reuse Standards require proponents of groundwater recharge projects to provide information on the intended water rights status (i.e., artificial storage or abandonment, of the reclaimed water). RCW 90.46.120 further states that when proposed uses of reclaimed water are intended to augment or replace potable water supplies, such uses must be reflected in the potable water purveyor's water comprehensive plan.

The City of Sequim holds the water rights for most of the water being transported to the WRF, and as the producer of the reclaimed water, retains the water rights over it. It is not anticipated at this time that holding the rights to the reclaimed water will impact the potable water rights currently held by the City. However, the City will need to perform a Water Rights Impairment Analysis for any new uses of its reclaimed water. This analysis is required by the Water Reclamation and Reuse Standards to ensure that any diversions that occur due to new reclaimed water uses will not impair the previous uses of the water or infringe on the City's rights to the water. This issue will be of particular concern in evaluating groundwater recharge and stream flow augmentation projects because the City does not desire to surrender any rights to its reclaimed water.

Compliance with Reclaimed Water Rule

Washington State began a rulemaking process in 2006 to update and to convert the 1997 Water Reclamation and Reuse Standards (Washington State Department of Ecology, 1997) into a regulation, the Reclaimed Water Rule, Chapter 173-219, Washington Administrative Code (Washington State Department of Ecology, 2010). The rule is intended to provide a consistent and efficient regulatory process as well as to be sufficiently adaptable in order to govern reclaimed water production over a long time period.

The rule refers to a Reclaimed Water Facilities Manual, a.k.a., the "Purple Book," for supplemental guidance on implementing the rule. Gray & Osborne was retained by the Washington Coalition for Clean Water and the Washington State Department of Ecology to assist in development of the manual, which has been released for review by stakeholders. Rule adoption and publication of the Purple Book are anticipated in 2014.

Some facets of the new regulations that might impact the production and use of reclaimed water under both the Sequim and Carlsborg Alternatives include the following:

1. Reclaimed water use and management plans would be required every 6 years. This information could be encompassed by a General Sewer Plan or other similar type of document.

2. New quality requirements will be placed on reclaimed water use. Enforceable limits based on both the drinking water and groundwater quality standards. Limits must consider potential to be present in reclaimed water, existing groundwater quality, existing or proposed uses of groundwater, and compliance points.

3. Reclaimed water must maintain a chlorine residual (free chlorine) of greater than 0.2 mg/L at the point of use.

4. Additional restrictions are proposed for the use of reclaimed water in an agronomic setting.

5. New requirements for inactivation (control) of pathogens to generate "essentially pathogen-free water" must be met. Sequim's disinfection system is in compliance with the most significant new disinfection requirements (5-log virus removal), but may need to perform additional monitoring and testing.

DUNGENESS WATER RULE

The Dungeness Water Rule was established in 2013 by Ecology (working with Clallam County, the Jameston S'Klallam Tribe, and the Dungeness Water Users Association) to manage scarce water resources in the Dungeness River and adjacent drainages (from Bagley Creek on the west to Bell Creek on the east). The goal of the rule is to maintain in-stream flows in surface water bodies in the watershed and provide for the current and future demands of the population, agriculture, and wildlife.

The Dungeness Water Rule's key elements are as follows:

1. Set in-stream flows and close surface waters to new diversions.

2. Require mitigation for all new consumptive uses of water, including permit-exempt wells.

3. Establish reserves of water for future domestic use.

4. Establish maximum depletion amounts for the Dungeness River and smaller streams.

5. Set maximum allocation of the Dungeness River during the open period.

6. Allow storage projects.

7. Require measuring all new water uses.

8. Require new users to first request service from a public water supply.

The rule sets in-stream flow levels for the main stem Dungeness River and its tributary Matriotti Creek, and seven smaller streams: Bagley Creek, Siebert Creek, McDonald Creek, Meadowbrook Creek, Cassalery Creek, Gierin Creek, and Bell Creek. In addition to the in-stream flow levels, small amounts of water are set aside in each subbasin listed above for in-house domestic use.

The rule establishes a minimum in-stream flow that is certificated as a water right making future water diversions junior to the flow in the water body. This makes water rights established after the effective date of the rule interruptible if the in-stream flow requirements are not met. Any new surface or groundwater uses must measure withdrawals with an Ecology-approved water meter according to WAC 173-518-060. The only exception is water use from the collection of rainwater.

Under the rule, any new water use must be mitigated or offset by "mitigation credits," such as those sold by the Dungeness Water Exchange. The exchange is a place for people who have senior water rights to sell or lease all or a portion of their water rights. New water use must be mitigated by a purchase from the exchange or mitigated by an individual plan that is submitted to and approved by the Department of Ecology. The only exceptions to water mitigation are if the new development is part of a group domestic system established 5 years prior to the effective date of the rule, if one can demonstrate that their water use does not cause an impact on any of the tributaries previously mentioned, or if the development receives water from a public water supplier such as the City of Sequim or Clallam County PUD.

Additional information regarding the Dungeness Water Rule can be found in Chapter 6.

CHAPTER 4

WASTEWATER COLLECTION AND CONVEYANCE SYSTEM EVALUATION

INTRODUCTION

This chapter provides predesign information and a preliminary project cost estimate for the initial (2030) and buildout gravity collection system alignments to serve the CUGA for the two treatment alternatives discussed in this Amendment. In addition, this chapter evaluates the facilities required to convey the wastewater collected in the CUGA to the City of Sequim for treatment at the Sequim WRF (Sequim Alternative). Preliminary cost estimates for the conveyance system to Sequim to accommodate flows up to the projected 2050 growth are also provided.

The 2012 *Sewer Facilities Plan* evaluated the use of gravity sewers, small-diameter pressure sewers including septic tank effluent pump (STEP) systems and grinder pumps, and vacuum collection systems to collect and transport wastewater to the proposed Carlsborg WRF site or central lift station. The use of a gravity system for the initial collection system was selected as the most feasible option for the CUGA in the 2012 *Sewer Facilities Plan*. This decision is not reevaluated in this Amendment.

LOCAL COLLECTION SYSTEM

The local collection system evaluated in this Amendment includes installation of a main gravity sewer on Hooker Road and Carlsborg Road beginning at Harrison Road on the south and continuing north to either the lift station that will pump the wastewater to the City of Sequim WRF (Sequim Alternative), or to the Carlsborg WRF located in the northern portion of the CUGA (Carlsborg Alternative).

The preferred location for the main lift station or Carlsborg WRF is in the north portion of the CUGA since the topography of the CUGA slopes to the north towards the Strait of Juan de Fuca. Locating a main lift station or the Carlsborg WRF near the north end of the CUGA maximizes the potential for gravity collection in the CUGA.

A preliminary review of sites for the main lift station included properties on the east side of Carlsborg Road in the vicinity of the Carlsborg Business Park. These sites were privately owned or owned by the PUD and would require property acquisition. County staff recommended installing the main lift station in the Olympic Discovery Trail right-of-way to the west of Carlsborg Road. The County owned right-of-way is 100 feet wide and has sufficient room to accommodate the lift station and the existing use as a non-motorized vehicle and pedestrian trail. The evaluation of routing alternatives for the

conveyance system from the main lift station site in the Olympic Discovery Trail right-of-way to the City of Sequim (Sequim Alternative) is discussed later in this chapter.

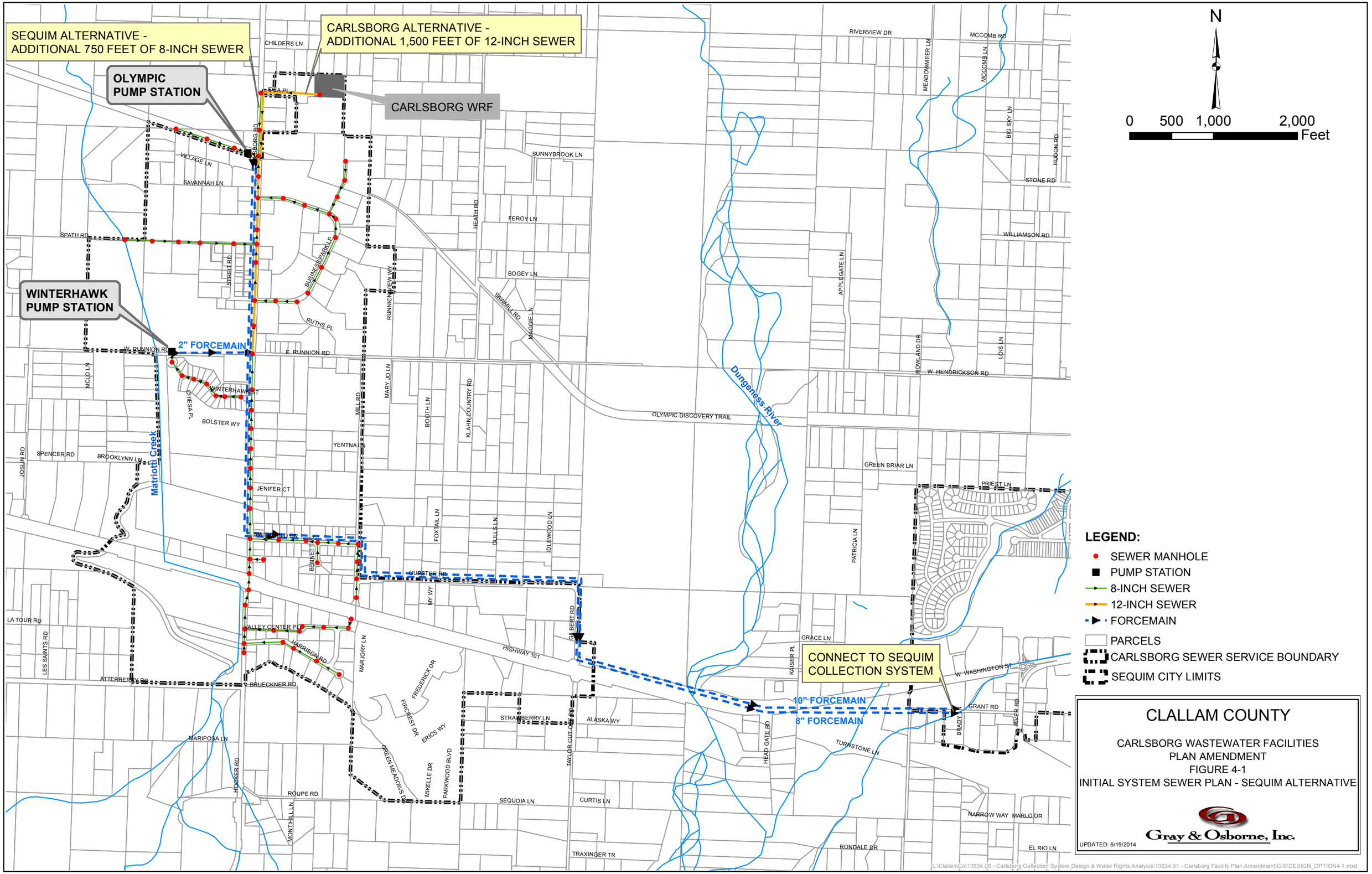
The proposed site in this Amendment for a Carlsborg WRF is a 5.5-acre parcel directly east of the PUD Idea Place operations center. The 2012 *Sewer Facilities Plan* assumed the WRF would be located at the PUD Idea Place operations center; however, this location is no longer available.

Figure 4-1 shows the layout for an initial collection system designed to provide service to the Carlsborg Industrial Park and the main corridor of businesses and residences along Carlsborg Road, Highway 101 and Hooker Road. Figure 4-2 shows the proposed sewer system layout for buildout of the CUGA. The collection system layout for the Sequim Alternative and the Carlsborg Alternative are the same, with the exception of the approximately 800 feet of Carlsborg Road north of the Olympic Discovery Trail. In the Sequim Alternative, this portion of the collection system would include an 8-inch diameter sewer that would discharge to the lift station located at the Olympic Discovery Trail. In the Carlsborg Alternative, this portion of the collection system would include 12-inch diameter sewer that would follow Carlsborg Road to Idea Place and proceed east on Idea Place approximately 700 feet to the Carlsborg WRF.

The collection system will include 8-inch and 12-inch diameter sewers. Flow projections for sizing the collection system were included in Chapter 2. The proposed main interceptor along Carlsborg Road generally ranges between 8 and 12 feet deep, gradually deepening as the interceptor extends north to the Olympic Lift Station. The proposed layout closely follows the proposed system shown in the 2012 *Sewer Facilities Plan* with slight deviations to discharge to the Olympic Lift Station rather than a Carlsborg WRF. The depth of the sewers will be set low enough to allow gravity side sewer connections for the majority of connections. Individual grinder pumps may be required for side sewers in situations where the lot slopes away from the road, a structure has plumbing connections in a basement, or a structure is located too low to allow gravity connection to the sewer without considerably increasing the depth of the sewer. Sewer connections to the school and fire district offices would require use of grinder pumps to discharge to the main gravity sewer along Carlsborg Road due to the low finished floor elevations of the structures and the distance to the road.

Eighty initial connections, generally located along the Carlsborg Road corridor, have been assumed for initial planning. The initial system includes a lift station located at the west end of Winterhawk Street. An 8-inch diameter gravity system on Winterhawk Street will discharge to the Winterhawk Lift Station which will pump through two 2-inch diameter force mains to the main sewer trunk in Carlsborg Road.

The buildout system includes an additional lift station on Gupster Road. Wastewater from a collection area bounded by Mill Road on the west, Gupster Road on the north, Gilbert Road on the east and Highway 101 on the south will discharge by gravity to the Gupster Road Lift Station. In addition, it is anticipated that the CUGA south of


SEQUIM ALTERNATIVE -
ADDITIONAL 750 FEET OF 8-INCH SEWER
CARLSBORG ALTERNATIVE -
ADDITIONAL 1,500 FEET OF 12-INCH SEWER
OLYMPIC PUMP STATION
CARLSBORG WRF
WINTERHAWK PUMP STATION
2" FORCEMAIN
CONNECT TO SEQUIM COLLECTION SYSTEM
10" FORCEMAIN
8" FORCEMAIN
Dungeness River
Matriotti Creek
N
0 500 1,000 2,000 Feet
LEGEND:
SEWER MANHOLE
PUMP STATION
8-INCH SEWER
12-INCH SEWER
FORCEMAIN
PARCELS
CARLSBORG SEWER SERVICE BOUNDARY
SEQUIM CITY LIMITS
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 4-1
INITIAL SYSTEM SEWER PLAN - SEQUIM ALTERNATIVE
Gray & Osborne, Inc.
UPDATED: 6/19/2014
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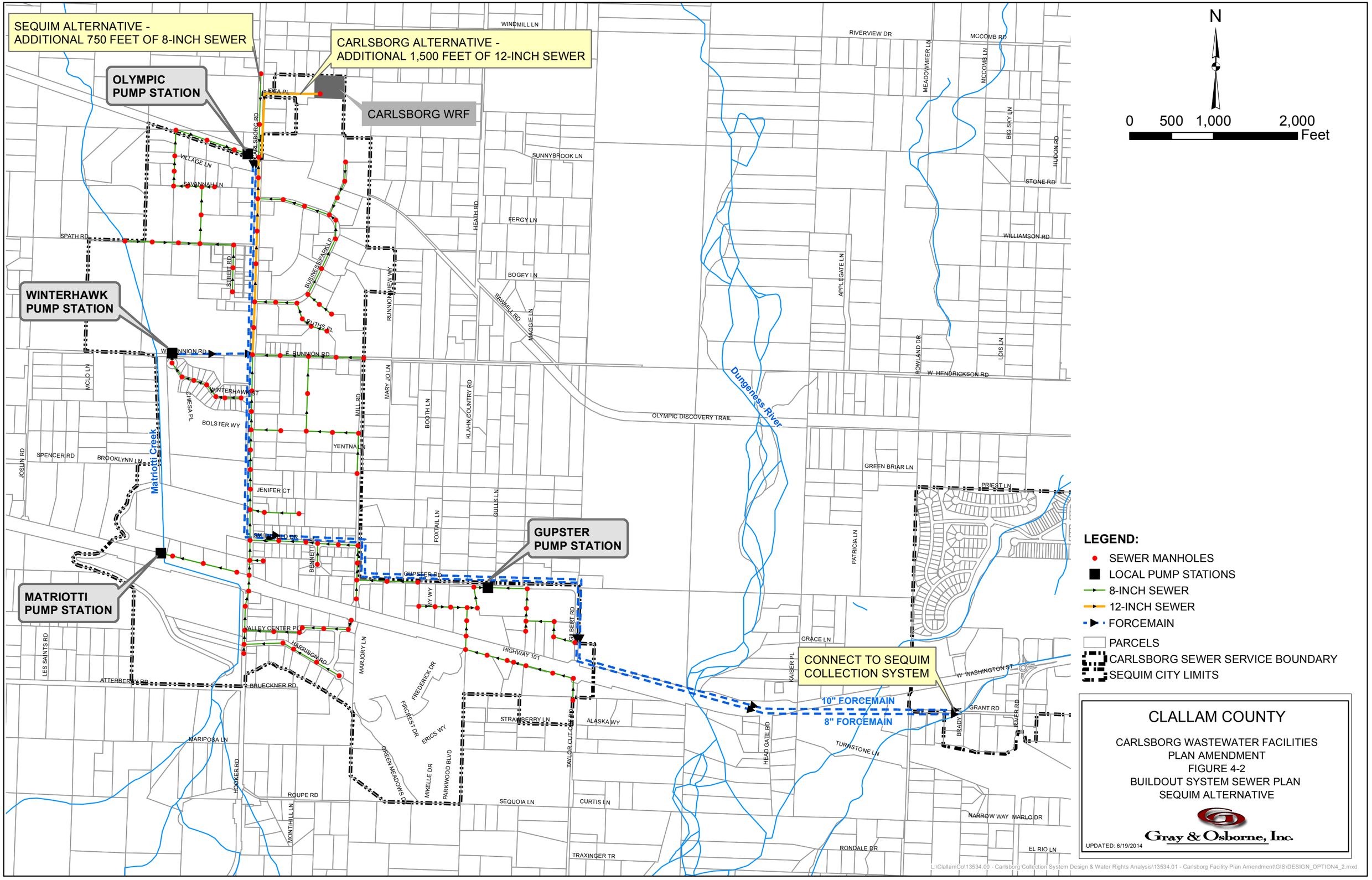
SEQUIM ALTERNATIVE -
ADDITIONAL 750 FEET OF 8-INCH SEWER
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ADDITIONAL 1,500 FEET OF 12-INCH SEWER
OLYMPIC PUMP STATION
CARLSBORG WRF
WINTERHAWK PUMP STATION
GUPSTER PUMP STATION
MATRIOTTI PUMP STATION
CONNECT TO SEQUIM COLLECTION SYSTEM
10" FORCEMAIN
8" FORCEMAIN
Dungeness River
Matriotti Creek
N
0 500 1,000 2,000 Feet
LEGEND:
SEWER MANHOLES
LOCAL PUMP STATIONS
8-INCH SEWER
12-INCH SEWER
FORCEMAIN
PARCELS
CARLSBORG SEWER SERVICE BOUNDARY
SEQUIM CITY LIMITS
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 4-2
BUILDOUT SYSTEM SEWER PLAN
SEQUIM ALTERNATIVE
Gray & Osborne, Inc.
UPDATED: 6/19/2014
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Highway 101 and east of the Parkwood Mobile Home Park will discharge by gravity, via a boring under Highway 101, to the Gupster Lift Station. Wastewater collected in the Gupster Lift Station will be pumped to the main sewer trunk in Carlsborg Road.

Other assumptions for the design of the sewer collection system include:

- Side sewers are 6-inch PVC pipe and extend from the proposed sewer main to a cleanout at the edge of the right-of-way.
- Side sewer stub-outs will be provided for future connection at all properties along the alignment.
- Property owners will extend side sewers from the cleanout at the right-of-way line to the point of connection with the building sewer.
- Property owners will be responsible for abandoning the existing septic system.
- Road restoration is limited to trench patching.
- The Winterhawk Lift Station will be constructed as part of the initial system to accommodate peak hour buildout flows for the area tributary to the station.
- The Winterhawk Lift Station will be a duplex prefabricated station. A force main will be dedicated to each pump to provide redundancy and ensure that flushing velocity is maintained in the force main.
- The Winterhawk Lift Station will be provided with 1-hour storage capacity at peak buildout flow and a connection for a portable auxiliary generator.
- The Gupster Lift Station is assumed to come online in 2030. The station will accommodate peak hour buildout flows for the area tributary to the station.
- The Gupster Lift Station will be a tri-plex prefabricated station. A force main will be dedicated to each pump to provide redundancy and ensure that flushing velocity is maintained in the force main.
- The Gupster Lift Station will be provided with a standby generator.

The design criteria of the proposed collection system for each alternative are shown in Table 4-1.

TABLE 4-1

Collection System Design Criteria

Parameter	Type	Quantity
Collection System – Sequim Alternative Initial System		
Sewer Pipe	8-inch diameter	14,085 feet
Sewer Pipe	12-inch diameter	3,225 feet
Collection System – Carlsborg Alternative Initial System		
Sewer Pipe	8-inch diameter	13,285 feet
Sewer Pipe	12-inch diameter	4,725 feet
Winterhawk Lift Station – Sequim and Carlsborg Initial System		
Peak Hour Design Flow		32 gpm
Force Main	Two – 2-inch diameter	950 feet
TDH		46 feet
Pumps	Two – submersible grinder	3 hp
Emergency Generator	Connection for portable	1
Collection System – Sequim Alternative Buildout System		
Sewer Pipe	8-inch diameter	32,050 feet
Sewer Pipe	12-inch diameter	3,225 feet
Collection System – Carlsborg Alternative Buildout System		
Sewer Pipe	8-inch diameter	31,250 feet
Sewer Pipe	12-inch diameter	4,725 feet
Gupster Lift Station Sequim and Carlsborg Buildout System		
Peak Hour Design Flow		140 gpm
Force Main	Three – 3-inch diameter, one per each pump	1,200 feet each
TDH		47 feet
Pumps	Three – submersible grinder	3 hp
Emergency Generator	Permanent	25 kW

The estimated construction costs for the Sequim Alternative initial collection system, including the Winterhawk Lift Station and the buildout system which also includes the Gupster Lift Station, are included in Table 4-2. Detailed cost estimates are provided in Appendix F. The cost estimates include 8 percent mobilization, a 15 percent contingency to account for the preliminary level of the design, 8.4 percent Washington State sales tax, 12 percent construction management fees for the initial project facilities, and 25 percent design, permitting, and construction management fees for additional facilities needed for buildout. The design services for the initial project have already been contracted.

TABLE 4-2

Sewer Collection System – Sequim Alternative Project Cost Estimate for Initial and Buildout Scenarios (in 2014 Dollars)

Component	Initial Project Cost(1)	Buildout Project Cost(2)
Sewer Collection System	$5,040,000	$8,368,800
Winterhawk Lift Station	$ 284,500	$ 284,500
Gupster Lift Station	Not Included	$ 471,300
Total	**$5,324,500**	**$9,124,600**

(1) Assumes 80 initial connections. See Figures 4-1 and 4-2 for proposed alignments.
(2) Includes initial system project costs.

The estimated construction costs for providing the Carlsborg Alternative initial collection system, including the Winterhawk Lift Station and the buildout system, which also includes the Gupster Lift Station, are shown in Table 4-3. Detailed cost estimates are provided in Appendix F. The cost estimates include 8 percent mobilization, a 15 percent contingency to account for the preliminary level of the design, 8.4 percent Washington State sales tax, 12 percent construction management fee for the initial project facilities, and 25 percent design, permitting, and construction management fees for the additional facilities needed for buildout.

TABLE 4-3

Carlsborg Sewer Collection System – Carlsborg Alternative Project Cost Estimate for Initial and Buildout Scenarios (in 2014 Dollars)

Component	Initial Project Cost(1)	Buildout Project Cost(2)
Sewer Collection System	$5,110,600	$8,439,400
Winterhawk Lift Station	$ 284,500	$ 284,500
Gupster Lift Station	Not Included	$ 471,300
Total	**$5,395,100**	**$9,195,200**

(1) Assumes 80 initial connections. See Figures 4-6 and 4-7 for proposed alignment.
(2) Includes initial system project costs.

CONVEYANCE TO THE CITY OF SEQUIM

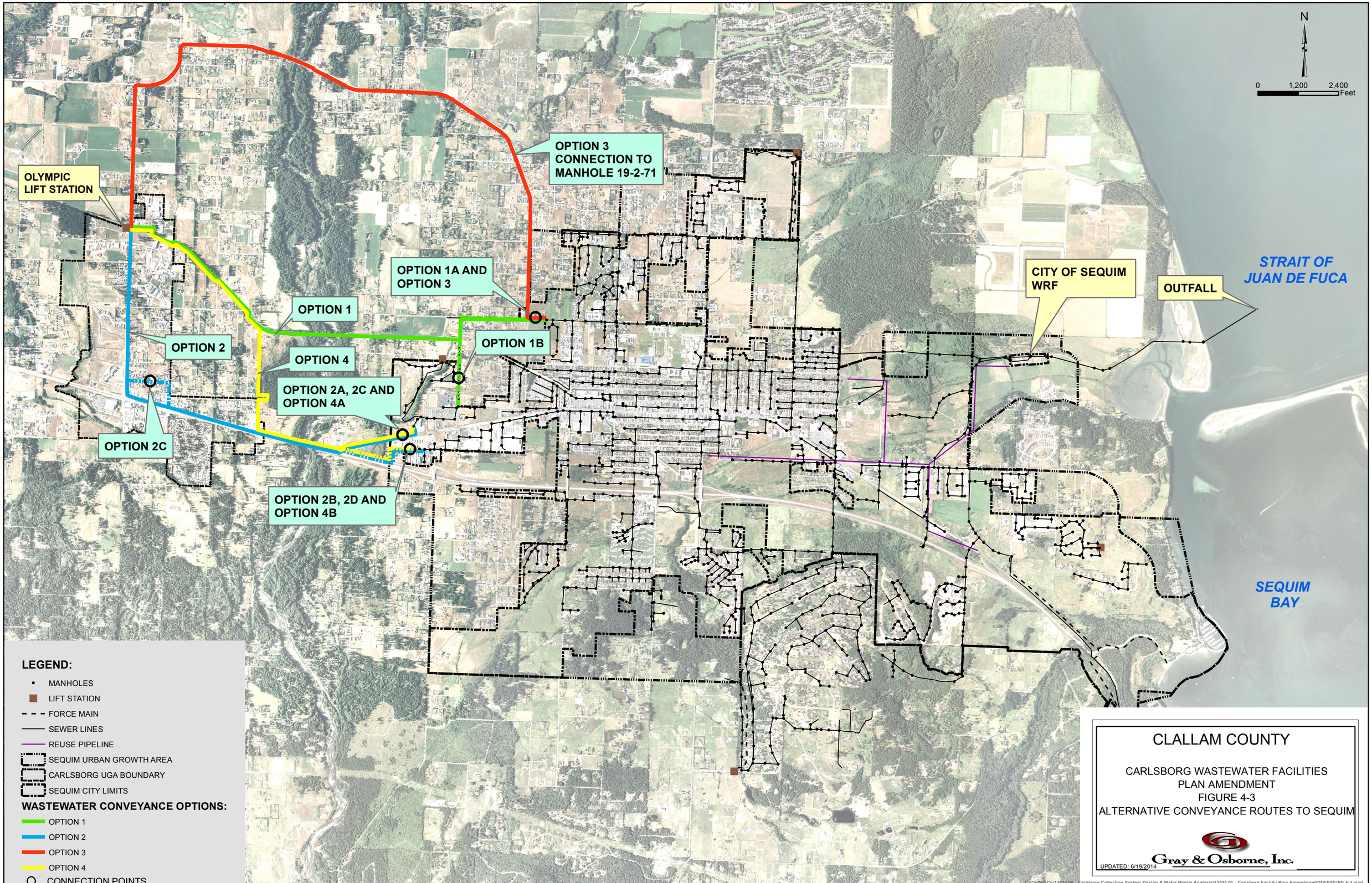
The Sequim Alternative assumes wastewater collected in the CUGA will be pumped to the City of Sequim for treatment. As discussed earlier in this chapter, the proposed location of the main lift station is within the County owned Olympic Discovery Trail right-of-way adjacent to Carlsborg Road. The lift station is named the Olympic Lift Station since it is adjacent to the Olympic Discovery Trail. The Olympic Lift Station will be designed to pump 2050 peak hour flows with capacity to be expanded in the future if

additional capacity is required. Initially, the station will be a duplex submersible station. A third pump would be required in the future to provide sufficient capacity for buildout flows.

A preliminary review of route alternatives to convey wastewater from the CUGA to the City of Sequim WRF was included in the *Carlsborg Wastewater Conveyance, Treatment and Capital Cost Feasibility Study* prepared for the City of Sequim by Gray & Osborne (November 2011)

The County further evaluated the recommended routing for the force main from the CUGA to the City of Sequim collection system in the 2013 *Carlsborg Sewer Conveyance System Feasibility Review Technical Memorandum* (2013 *Technical Memorandum*) (Zenovic & Associates, September 2013). The 2013 *Technical Memorandum* is included as Appendix G. The analysis in the 2013 *Technical Memorandum* compared the cost and potential risk of several alternative alignments to convey wastewater collected in the CUGA to the City of Sequim. In addition to construction costs, the cost and/or feasibility of obtaining easements, franchise requirements, permitting issues, property issues and working within the busy Highway 101 corridor were evaluated for each alignment.

The alternative routes reviewed in the 2013 *Technical Memorandum* included the four options identified in Table 4-4. Several of these options have alternative routes. The 2013 *Technical Memorandum* assumed the wastewater was collected in the north portion of the CUGA at a main lift station located to the east of Carlsborg Road within the Olympic Discovery Trail right-of-way. The route options and alternatives are shown in Figure 4-3. The 2013 *Technical Memorandum* identified the potential costs and risks for each of the alternative alignments. The risk ranking and project cost of the alternatives are included in Table 4-4. The highest risk alignments were determined to be those that required the need to obtain permission to cross the Railroad Park Bridge (Option 1 – Alt. A and B). The next highest risk alignments were those that crossed private land (Option 4 – Alt. A and B). The least amount of risk was assessed to the alignments that only required approval from the Washington State Department of Transportation (WSDOT) (Option 2 – Alt. A, B, C, and D) or the County (Option 3).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OPTION 3
CONNECTION TO
MANHOLE 19-2-71
OLYMPIC
LIFT STATION
OPTION 1A AND
OPTION 3
OPTION 1
OPTION 2
OPTION 4
OPTION 1B
OPTION 2A, 2C AND
OPTION 4A
OPTION 2C
OPTION 2B, 2D AND
OPTION 4B
CITY OF SEQUIM
WRF
OUTFALL
STRAIT OF
JUAN DE FUCA
SEQUIM
BAY
LEGEND:
MANHOLES
LIFT STATION
FORCE MAIN
SEWER LINES
REUSE PIPELINE
SEQUIM URBAN GROWTH AREA
CARLSBORG UGA BOUNDARY
SEQUIM CITY LIMITS
WASTEWATER CONVEYANCE OPTIONS:
OPTION 1
OPTION 2
OPTION 3
OPTION 4
CONNECTION POINTS
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 4-3
ALTERNATIVE CONVEYANCE ROUTES TO SEQUIM
Gray & Osborne, Inc.
UPDATED: 6/19/2014

TABLE 4-4

Carlsborg Sewer Conveyance System Alternatives
(Technical Memorandum, Zenovic & Assoc., 2013)

Route Alternative	Description	Total Distance – Lift Station to Discharge Point	Estimated Project Costs and Cost Rank(2)	Risk Ranking(1)
Option 1 – Alt. A(3)	This route generally extends east in the Olympic Discovery Trail right-of-way and crosses the Dungeness River at Railroad Bridge Park on the Railroad Park Bridge. The route would discharge to the existing City of Sequim manhole on Hendrickson Road approximately 550 feet east of Kendall Road.	14,575 feet	$3,813,262 Rank – 8	9
Option 1 – Alt. B(3)	This route varies from the route described in Option 1 – Alt. A in that at Priest Road the route turns south to discharge in an existing City of Sequim manhole at Brackett Road.	13,340 feet	$3,602,335 Rank – 7	8
Option 2 – Alt. A(3)	This route extends south on Carlsborg Road, turns east to parallel the Highway 101 alignment, and crosses the Dungeness River at the Highway 101 bridge. The route extends northeasterly on West Washington Street to a point of discharge at an existing City of Sequim manhole in the vicinity of the Riverbend Center.	14,010 feet	$3,123,733 Rank – 5	4

TABLE 4-4 (continued)

Carlsborg Sewer Conveyance System Alternatives
(Technical Memorandum, Zenovic & Assoc., 2013)

Route Alternative	Description	Total Distance – Lift Station to Discharge Point	Estimated Project Costs and Cost Rank(2)	Risk Ranking(1)
Option 2 – Alt. B(4)	This route varies from the route described in Option 2 – Alt. A in that the route continues in the Highway 101 right-of-way to the east of the highway bridge to Grant Road, and then proceeds north and east along Grant Road to a point of discharge at an existing City of Sequim manhole in Grant Road.	14,255 feet	$3,027,383 Rank – 2	5
Option 2 – Alt. C(4)	This route varies from the Option 2 – Alt. A route in that the route turns east from Carlsborg Road at Smithfield Road and continues east to Mill Road before entering the Highway 101 right-of-way.	14,360 feet	$3,231,237 Rank – 6	2
Option 2 – Alt. D(4)	This route varies from Option 2 – Alt. C in that the route stays within the Highway 101 right-of-way until it reaches Grant Road and follows the alignment discussed in Option 2 – Alt. B.	14,490 feet	$3,057,143 Rank – 3	3

TABLE 4-4 (continued)

Carlsborg Sewer Conveyance System Alternatives
(Technical Memorandum, Zenovic & Assoc., 2013)

Route Alternative	Description	Total Distance – Lift Station to Discharge Point	Estimated Project Costs and Cost Rank(2)	Risk Ranking(1)
Option 3	This route follows Carlsborg Road north and turns east on Old Olympic Highway and follows Old Olympic Highway north, east, and south to Kendall Road, south on Kendall Road to Hendrickson, and discharges in an existing City of Sequim manhole approximately 550 feet east of Kendall Road. The alignment crosses the Dungeness River at the Burlingame Bridge.	22,960 feet	$5,275,479 Rank – 9	1
Option 4 – Alt. A(4)	This route follows the Olympic Discovery Trail east to the west end of Railroad Bridge Park and then turns south along the section centerline of the east half of Section 23, Township 30 North, Range 4 West to Gilbert Road, south on Gilbert Road to the Highway 101 right-of-way, across the Highway 101 bridge, and east on Washington Street to discharge in an existing City of Sequim manhole in the Riverbend Center.	14,060 feet	$3,118,389 Rank – 4	6

TABLE 4-4 (continued)

Carlsborg Sewer Conveyance System Alternatives
(Technical Memorandum, Zenovic & Assoc., 2013)

Route Alternative	Description	Total Distance – Lift Station to Discharge Point	Estimated Project Costs and Cost Rank(2)	Risk Ranking(1)
Option 4 – Alt. B(4)	This route follows Option 4 – Alt. A until it crosses the Highway 101 bridge. This route continues within the Highway 101 right-of-way to Grant Road, and then turns north on Grant Road to a point of discharge at an existing City of Sequim manhole in Grant Road.	14,300 feet	$2,844,901 Rank – 1	7

(1) Risk ranking from least risk (1) to highest risk (9).
(2) Project costs include 35 percent construction contingency and 35 percent soft costs (engineering and administrative fees, Washington State sales tax, permitting costs). Cost ranking from least cost (1) to highest cost (9).
(3) The Olympic Discovery Trail Route through Railroad Bridge Park is Trust Land under the control of the Jamestown S'Klallam Tribe.
(4) Highway 101 is a controlled-access zone east of the Dungeness River Bridge. Work in this area will require WSDOT Headquarters approval.

The primary challenge of conveying wastewater from the CUGA to the City of Sequim is the crossing of the Dungeness River. The alternatives included in the 2013 *Technical Memorandum* included the three existing bridge crossings in the Carlsborg vicinity. Crossing via the Railroad Park Bridge is the highest risk alignment since the wood truss style bridge may not be sufficiently structurally sound to accept the additional load of the force mains, and the bridge is listed in the National Register of Historic Places since it is one of the last timber truss railroad bridges remaining in Washington. Crossing the Railroad Park Bridge would require permission from the Jamestown S'Klallam Tribe.

A river crossing on either the Highway 101 Bridge or the Burlingame Bridge (Old Olympic Highway) is feasible. Both concrete decked bridges are supported by concrete girders. The abutment and interior support walls of both bridges have penetrations for utility infrastructure.

Installation of the force main in the Highway 101 right-of-way will require a franchise from WSDOT. Work in the controlled access zone to the east of the highway bridge will require approval from WSDOT Headquarters.

Directional boring under the Dungeness River is a potential alternative method for crossing the river. The riverbed is meandering and wide and shallow in the Carlsborg vicinity. The river bed soils include sand, gravel, cobbles and boulders. The presence of cobbles and boulders would make directional boring challenging. In addition, easements across private property would most likely be required to access the river.

The options that included the least amount of risk, crossing at the Highway 101 bridge or at the Burlingame Bridge, were evaluated based on cost. The Highway 101 route is approximately 8,600 feet shorter than the Old Olympic Highway alternative. Although the 2013 *Technical Memorandum* cost and risk analysis would indicate that Option 2 – Alt. D was the least cost and least risk, this Amendment recommends the alignment described as Option 2 – Alt. C for conveying wastewater from the CUGA to the City of Sequim for treatment due to the desire to minimize work in the WSDOT right-of-way to the greatest possible extent.

This Amendment modifies the recommended force main alignment slightly in two respects: (1) the Olympic Lift Station will be located adjacent to of Carlsborg Road in the Olympic Discovery Trail right-of-way, and (2) the force main alignment from the east end of the Highway 101 bridge will follow West Washington Street to Grant Road and a point of connection with the City of Sequim collection system at Manhole 24-3-06. The length of this route has been determined from aerial mapping to be 15,400 feet.

The installed conveyance system is assumed to consist of a dual pipe force main consisting of an 8-inch diameter force main and a 10-inch diameter force main in order to maintain scouring velocities and minimize chemical costs for odor control. The 8-inch diameter force main will be used initially. The Olympic Lift Station will be sized initially to pump 480 gpm, which will provide adequate capacity through approximately 2040 and will ensure flushing velocity in the 8-inch force main. When flows exceed approximately 480 gpm the discharge from the Olympic Lift Station will be directed to the 10-inch diameter force main. When flows exceed approximately 725 gpm both the 8-inch and 10-inch diameter force mains will be utilized. The valve vault will include piping and valving to allow the pumped discharge to be directed to either the 8-inch diameter force main, the 10-inch diameter force main or both force mains to provide operational flexibility and reliability.

The preliminary design concept for the Olympic Lift Station includes a wet well that will accommodate three pumps; however, initially two 480 gpm pumps will be installed. This amount of pumping capacity should be sufficient to serve the CUGA until approximately 2040. The County will have the flexibility to install a third, similarly sized pump to accommodate future flows or upsize one or more of the pumps to accommodate the actual growth and flow characteristics of the sewer service area.

The Olympic Lift Station will be provided with a standby generator sized to operate the pumps and ancillary station loads.

Odor control will be important in the force main from Carlsborg to Sequim. Hydrogen sulfide (H_2S) is the most common source of odors and corrosion in force mains. H_2S is produced in the anaerobic (oxygen-depleted) conditions that occur within force mains with long detention times (low flow conditions). H_2S is produced by bacteria that grow in a "slime layer" that coats the sewer's wetted perimeter, using sulfate as an electron acceptor. These facultative bacteria will preferentially use oxygen as an electron acceptor if it is available; as an alternative, they will preferentially use nitrate over sulfate. If nitrate is not available in wastewater, bacteria will consume sulfate after depleting elemental oxygen, forming H_2S, which will be present both in dissolved form and as a gas. Atmospheric (gaseous) H_2S combined with moisture converts to sulfuric acid and directly attacks and corrodes concrete and steel. Nitrate, when present, is biologically removed under low oxygen conditions in sewer lines, a process referred to as denitrification, with nitrogen gas as a byproduct. Manipulating the electron acceptor available to bacteria, by introducing nitrate chemicals as an alternative electron acceptor to sulfate, favors the growth of denitrifying bacteria and typically greatly decreases the biological reduction of sulfate, and formation of sulfide. Introduction of oxygen and/or nitrate is the most common means to control sulfide odors. Alternatively, or in addition, H_2S gas that forms can be exhausted and treated.

The station will be designed to feed oxygen or nitrate into the wastewater for odor control. The preliminary evaluation of hydrogen sulfide potential in the force main indicates that chemical costs for nitrate addition will be significant as the volume of flow increases. Alternatively, oxygen injection facilities could be installed at the lift station to mitigate chemical costs to the maximum extent possible. Therefore, a cost estimate for supplemental oxygen injection facilities to mitigate chemical costs to the maximum extent possible is included in the lift station costs, pending a detailed evaluation. A preliminary site plan of the Olympic Lift Station is shown on Figure 4-4.

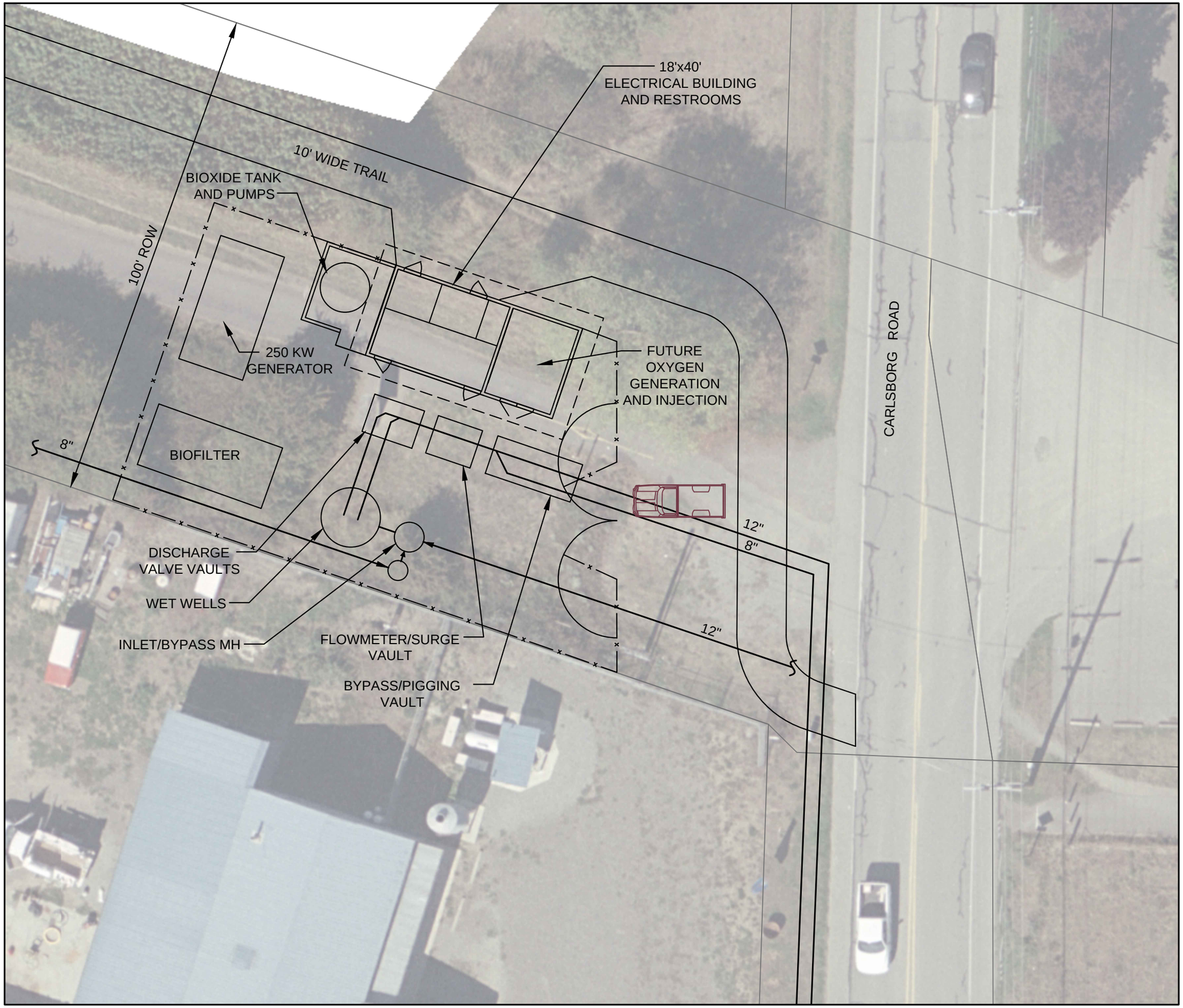
The design criteria of the Olympic Lift Station and conveyance force mains are shown in Table 4-5.

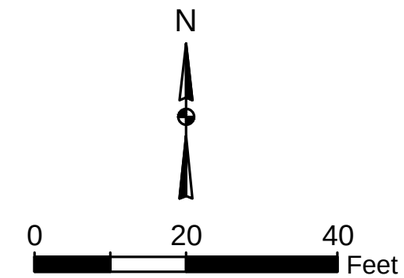
TABLE 4-5

Olympic Lift Station and Conveyance to City of Sequim Design Criteria

Parameter	Type	Quantity
Olympic Lift Station		
Peak Hour Design Flow per Pump	—	480 gpm(1)
TDH	—	244 feet
Pumps	2 – submersible (provide space for third pump)	90 hp
Emergency Generator	permanent	250 kW
Force Main	8-inch diameter 10-inch diameter	15,400 feet, each

(1) Flow required to maintain scouring velocity in 8-inch force main.





CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 4-4
OLYMPIC LIFT STATION LAYOUT

Gray & Osborne, Inc.

The estimated construction costs for providing the Olympic Lift Station and conveyance force mains to the City of Sequim are included in Table 4-6. Detailed cost estimates are provided in Appendix F. The cost estimates include 8 percent mobilization, a 15 percent contingency to account for the preliminary level of the design, 8.4 percent Washington State sales tax, 12 percent construction management fee for the initial project facilities, and 25 percent design, permitting, and construction management for the additional facilities needed for buildout.

TABLE 4-6

Olympic Lift Station and Conveyance Force Mains to the City of Sequim Project Cost Estimate (in 2014 Dollars)

Component	Initial Project Cost	Buildout Project Cost(1)
Olympic Lift Station	$2,711,600	$3,958,300
Force Mains	$3,313,000	$3,313,000
Total	**$6,024,600**	**$7,271,300**

(1) Includes initial project cost.

Estimated operation and maintenance costs for the sewer collection system and lift station and conveyance elements are included in Table 4-7. Operation and maintenance costs include sewer cleaning, electrical costs, water use, odor control chemicals, generator diesel fuel, and routine pump, and generator and electrical equipment maintenance. In addition, the estimated operation and maintenance costs include a 1 percent capital equipment maintenance and replacement investment allotment. A detailed estimate of the annual operation and maintenance costs are included in Appendix F.

TABLE 4-7

Estimated Collection System Operation and Maintenance Costs (in 2014 Dollars)

Item	Estimated Average Annual Cost
Power	$ 6,310
Water	$ 3,865
Communications	$ 1,800
Odor Control Chemicals	$ 20,000
Generator Fuel	$ 9,400
Contracted Maintenance	$ 19,900
In-House Maintenance (including 0.25 FTE)	$ 29,500
Capital Equipment Maintenance and Replacement Investment (1%/year)	$ 26,600
Sewer Cleaning	$ 10,000
Total	**$127,375**

IMPACT OF CUGA FLOWS ON THE CITY OF SEQUIM CONVEYANCE SYSTEM

The City of Sequim 2013 *General Sewer Plan* (2013 *Sequim Sewer Plan*) evaluated the impact of the conveyance of wastewater from the CUGA on the City's sewer system. The hydraulic model prepared for the 2013 *Sequim Sewer Plan* was used to evaluate the capacity of the Sequim collection system for conveying peak hour flows for Sequim only scenario and for the combined flows for Sequim and the CUGA. The hydraulic model is based on the City's GIS inventory of the sewer system. The modeling scenarios included 2030 projected peak hour flow for Sequim and the estimated initial pumping rate of 480 gpm for the CUGA, and buildout projected peak hour flow for Sequim and buildout pumping rate of 1,481 gpm for the CUGA. The assumed point of discharge for wastewater from the CUGA was on Grant Road at Manhole 24-3-06. The wastewater flow from the CUGA would be conveyed east on Grant Road to West Washington Street, south on South 5th Avenue, east on West Bell Street and Etta Street, north on South Sunnyside Avenue and the alignment that parallels North Sunnyside Avenue, east on East Fir Street, north on North Brown Road, east in the East Willow Street Alley, north on North Blake Avenue and east to the WRF from the intersection of East Oak Street and North Blake Avenue. This alignment is identified as the "Shared Alignment" for this Amendment and is shown on Figure 4-5.

The hydraulic analysis identified sections of the Shared Alignment that would be at or near capacity during peak hour flow conditions at the modeled design years. Table 4-8 identifies the sewer sections that would be at or near capacity for predicted Sequim only peak hour flows and the additional capacity impacts due to the discharge of pumped wastewater from the CUGA. The sections of pipe in which the depth of flow (d) is greater than 85 percent of the total depth (height) of the pipe (D), $d/D \geq 0.85$, are identified as exceeding hydraulic capacity. Surcharged manholes are noted when the depth of surcharge over the inlet/outlet pipes exceeds 1 foot. Pipe segments that exceed the hydraulic capacity **and** have a surcharged manhole immediately upstream are noted as requiring replacement. The pipe segments that are identified in the model as having estimated flow exceeding hydraulic capacity are included in Table 4-8. The percentage of the pipe capacity attributable to the wastewater from the CUGA is also shown in Table 4-8.

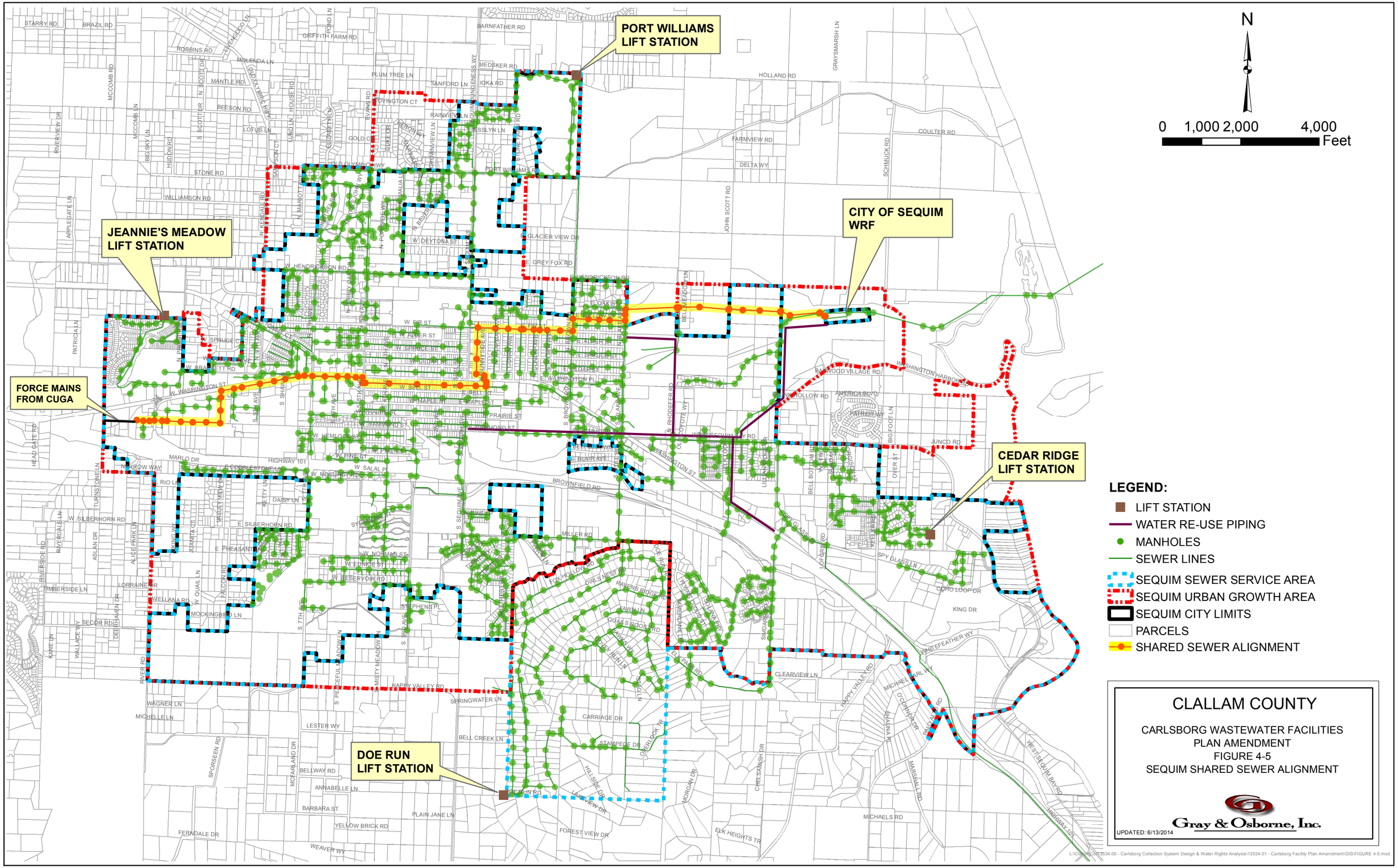

PORT WILLIAMS LIFT STATION
CITY OF SEQUIM WRF
JEANNIE'S MEADOW LIFT STATION
FORCE MAINS FROM CUGA
CEDAR RIDGE LIFT STATION
DOE RUN LIFT STATION
N
0 1,000 2,000 4,000
Feet
LEGEND:
LIFT STATION
WATER RE-USE PIPING
MANHOLES
SEWER LINES
SEQUIM SEWER SERVICE AREA
SEQUIM URBAN GROWTH AREA
SEQUIM CITY LIMITS
PARCELS
SHARED SEWER ALIGNMENT
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 4-5
SEQUIM SHARED SEWER ALIGNMENT
Gray & Osborne, Inc.
UPDATED: 6/13/2014

TABLE 4-8

Shared Alignment – Hydraulically Deficient Gravity Sewers[1]

Location	Sequim Peak Hour Flow (gpm)	CUGA Pumped Flow (gpm)	Manholes (upstream/ downstream)	Pipe Length (feet)	Current Pipe Dia. (inch)	Replacement Pipe Dia. (inch)	Surcharged Upstream Manhole	Triggered by Sequim Flows Only	Triggered by Combined Sequim and CUGA Flows	% Flow Attributed to CUGA
Through ~2040 (CUGA pumped flows 480 gpm)										
West Washington Street	41	480	24-4-03/24-4-02, 19-3-11/19-3-10, 19-3-09, 19-3-08	1,050	8	12	No	No	Yes	92.1
West Washington Street	79	480	19-3-04/19-3-37	**796**	8	12	Yes	No	Yes	92.1
North Sunnyside Avenue	894	480	20-2-40/20-2-39	**383**	12	18	Yes	No	Yes	35.3
South 5th Avenue	79	480	19-3-01/19-4-05	69	8	12	No	No	Yes	85.9
Alley West Bell Street	79	480	19-3-01/19-4-04	607	8	12	No	No	Yes	85.9
Etta Street	79	480	20-3-02/20-3-03, 20-2-40/20-2-39	231	8	12	No	No	Yes	85.9
South/North Sunnyside Avenue	894	480	20-3-01/20-2-42	88	12	18	No	No	Yes	35.3
North Blake Avenue	2,461	480	20-1-19/20-1-07	**283**	15	18	Yes	No	Yes	16.3
West of WRF	2,486	480	21-2-06/21-1-01	791	18	24	No	No	Yes	16.3
Required Replacement[2]				**1,462**						

TABLE 4-8 (continued)

Shared Alignment – Hydraulically Deficient Gravity Sewers(1)

Location	Sequim Peak Hour Flow (gpm)	CUGA Pumped Flow (gpm)	Manholes (upstream/ downstream)	Pipe Length (feet)	Current Pipe Dia. (inch)	Replacement Pipe Dia. (inch)	Surcharged Upstream Manhole	Triggered by Sequim Flows Only	Triggered by Combined Sequim and CUGA Flows	% Flow Attributed to CUGA
Buildout (CUGA pumped flows 1,481 gpm)										
West Washington Street	41	1,481	24-4-03/19-3-02	3,345	8	12	Yes	No	Yes	97.3
South 5th Avenue	79	1,481	19-3-02/19-3-01	139	8	12	Yes	No	Yes	95
Alley West Bell Street	79	1,481	19-3-01/19-4-01	2,895	8	12	Yes	No	Yes	95
Etta Street	79	1,481	20-3-02/20-3-03	231	8	12	Yes	No	Yes	95
South Sunnyside Avenue	888	1,481	20-3-04/20-3-01	110	12	18	Yes	Yes	Yes	62
North Sunnyside Avenue	907	1,481	20-2-42/20-2-38	1,577	12	18	Yes	No	Yes	62
East Fir Street	1,288	1,481	20-2-38/20-2/05	1,902	15	18	Yes	No	Yes	53.5
North Brown Road	1,401	1,481	20-2-05/20-2-04	312	15	18	Yes	No	Yes	51.4
East Willow Street	2,084	1,481	20-2-04/20-1-19	790	15	18	Yes	No	Yes	41.5
North Blake Avenue	2,490	1,481	20-1-19/20-1-07	283	15	18	Yes	Yes	Yes	37.3
West of WRF	2,514	1,481	21-2-03/21-1-02	1,669	18	24	Yes	No	Yes	37.1
Required Replacement Buildout(2)				**13,253**						

(1) Hydraulic model based on pipe length, slope, and diameter contained in the City of Sequim GIS inventory.

(2) "Required Replacement" includes only the pipe segments identified in the model as under capacity and where the pipe run is immediately preceded by a surcharged manhole.

The City of Sequim Capital Improvement Plan includes future projects to replace several of the pipe sections to increase capacity, rehabilitate deteriorating pipes, or relocate existing pipes to City right-of-way along the Shared Alignment that are identified as exceeding hydraulic capacity with the inclusion of CUGA pumped flow including:

- Etta Street Sewer Rehabilitation
- Sunnyside Street Sewer Improvements
- North Blake Street Sewer Improvements
- East Fir Street Sewer Improvements

It is assumed the Carlsborg utility will share in a proportionate share of the capital improvement projects along the Shared Alignment.

Estimates of the project costs required to replace the pipe runs identified in Table 4-8 for the initial CUGA pumped flow rate, and Buildout wastewater flows are provided are Table 4-9. The cost estimates are included in Appendix F. The estimated CUGA share of the project costs are based on a determination of the percent of the wastewater flow in the pipe segments that is attributable to Carlsborg. The costs of pipe replacement at each of the time periods are cumulative.

The project costs presented in Table 4-9 include 8.7 percent Washington State sales tax (the current tax rate in the City), 25 percent contingency due to the preliminary nature of the estimates, and 25 percent engineering and administrative services costs.

TABLE 4-9

Estimated Pipe Replacement in the City of Sequim Required to Accommodate Initial and Buildout Sequim and Pumped Carlsborg Flows (in 2014 Dollars)

CUGA Pumped Flow Rate (gpm)	Pipe Replacement (ft)	Estimated Project Cost	Percentage of Overall Capacity Attributable to CUGA (peak hour)	Estimated CUGA Share of the Project Cost
480(1)	1,462	$ 319,000	61%	$ 194,600
Buildout	13,253	$4,250,000	69%	$2,932,500

(1) The 480 gpm pumped flow rate is adequate through 2040. After 2040, the pumped flow rate is 1,481 gpm.

COMPARISON TO 2012 SEWER FACILITIES PLAN

The following list summarizes the construction cost assumptions made in the 2012 *Sewer Facilities Plan* for the initial sewer collection system. These include:

- About 100 to 150 connections within initial year of operation,
- Three local pump stations all priced at the same cost ($200,000),
- Contingency = 20 percent,
- Mobilization = 12 percent,
- Tax = 8.4 percent, and
- Project costs (survey, geotechnical, design, property acquisition, permitting, interim financing, construction administration, O&M Manual, sewer rate and use ordinances, PUD and County Administration, and 10 percent project contingencies) = 21 percent.

A comparison of the 2012 *Sewer Facilities Plan* estimated initial and buildout collection system construction costs and the initial and buildout collection system costs and costs for facilities necessary to convey the CUGA wastewater to the City of Sequim collection system (up to the projected 2050 flows) developed in this chapter are provided in Table 4-10.

TABLE 4-10

Comparison of the 2012 Sewer Facilities Plan Collection System Project Cost Estimate and the Facilities Plan Amendment Collection System Cost Estimate

Construction Element	Initial	Additional Necessary for Buildout	Buildout Total
2012 Sewer Facilities Plan			
Sewer Collection System(1)	$5,249,000	$4,500,000	$ 9,749,000
Mobilization (12%)	$ 630,000	$ 540,000	$ 1,170,000
Tax (8.4%)	$ 494,000	$ 424,000	$ 918,000
Contingency (20%)	$1,275,000	$1,093,000	$ 2,368,000
Total in 2010 dollars(1)	**$7,648,000**	**$6,557,000**	**$14,205,000**
Total in 2013 dollars(2) (escalated)	**$8,171,000**	**$7,006,000**	**$15,177,000**
Facilities Plan Amendment			
Sewer Collection System Project Cost Estimate – Sequim Alternative(3)	$5,324,500	$3,800,100	$ 9,124,600
Sewer Collection System Project Cost Estimate – Carlsborg Alternative(4)	$5,395,100	$3,800,100	$ 9,195,200

(1) 2012 *Sewer Facilities Plan* construction cost estimates were in 2010 dollars. Initial system costs from Table 6-1. Buildout additional costs from page 6-4.
(2) Escalation rate of 6.84 percent (2010 to 2013) according to the Bureau of Labor and Statistics.
(3) Estimate from Table 4-2.
(4) Estimate from Table 4-3.

The estimated initial and buildout project costs for the Olympic Lift Station and force main to convey wastewater from the CUGA to the City of Sequim and the estimated share of upgrades to the Sequim collection system developed in this chapter are provided in Table 4-11.

TABLE 4-11

Estimated Project Costs – Olympic Lift Station, Conveyance to the City of Sequim and Upgrades to the City of Sequim Collection System – Sequim Alternative (2014 Dollars)

Construction Element	Initial	Additional Necessary for Buildout	Buildout Total
Conveyance System to Sequim(1)	$6,024,600	$1,247,700	$ 7,291,300
Conveyance System Upgrades in Sequim(2)	$ 194,600	$2,932,500	$ 2,932,500
Total in 2014 Dollars – Sequim Alternative	**$6,024,600**	**$3,722,700**	**$10,203,800**

(1) Estimate from Table 4-6; Olympic Lift Station and force mains.
(2) Estimate from Table 4-9. Cost for required pipe replacement through buildout.

CHAPTER 5

WASTEWATER TREATMENT EVALUATION

Chapter 5 provides an evaluation of wastewater treatment alternatives for the Carlsborg UGA. The chapter begins with a summary of updated design wastewater flows and loadings for the Carlsborg UGA. Following this summary, conceptual designs are developed and evaluated for both the Carlsborg and Sequim Alternatives. The Carlsborg Alternative consists of constructing a Class A water reclamation facility at the Carlsborg UGA. The Sequim Alternative consists of treating wastewater collected by the Carlsborg sewer system at the existing Sequim Water Reclamation Facility. The water reuse and groundwater recharge options for each alternative are described in Chapter 6.

The Carlsborg and Sequim Alternatives are fully compared in Chapter 7, incorporating collection system and groundwater recharge and mitigation, in addition to wastewater treatment, on a capital cost, operating cost, life cycle cost and non-monetary factor basis.

DESIGN FLOW AND LOADING RATES

The wastewater treatment alternatives will be evaluated based on the projected flow and loading rates developed in Chapter 2 and summarized in Table 5-1 below.

TABLE 5-1

Projected Wastewater Flow and Loading Rates for the Carlsborg Sewer System

Flow Rate	Projected 2030 Flow Rate (gpd)	Projected 2050 Flow Rate (gpd)	Projected Buildout Flow (gpd)
Average Day Flow	82,100	309,800	638,700
Maximum Month Flow	97,700	337,800	675,100
Peak Day Flow	179,300	484,000	865,500
Peak Hour Flow	326,800	1,113,000	2,133,600
Wastewater Loading Rate	**Projected 2030 Loading Rate (lb/day)**	**Projected 2050 Loading Rate (lb/day)**	**Projected Buildout Loading Rate (lb/day)**
Annual Average BOD_5	228	930	1,963
Maximum Month BOD_5	296	1,208	2,552
Annual Average TSS	257	1,046	2,209
Maximum Month TSS	333	1,360	2,871
Annual Average TKN (1)	41	169	357
Maximum Month TKN (1)	54	220	464

(1) Influent wastewater Total Kjeldahl Nitrogen (TKN) loading is estimated as 18.2 percent of the BOD_5 loading based on typical domestic wastewater.

CARLSBORG ALTERNATIVE – NEW WATER RECLAMATION FACILITY AT CARLSBORG

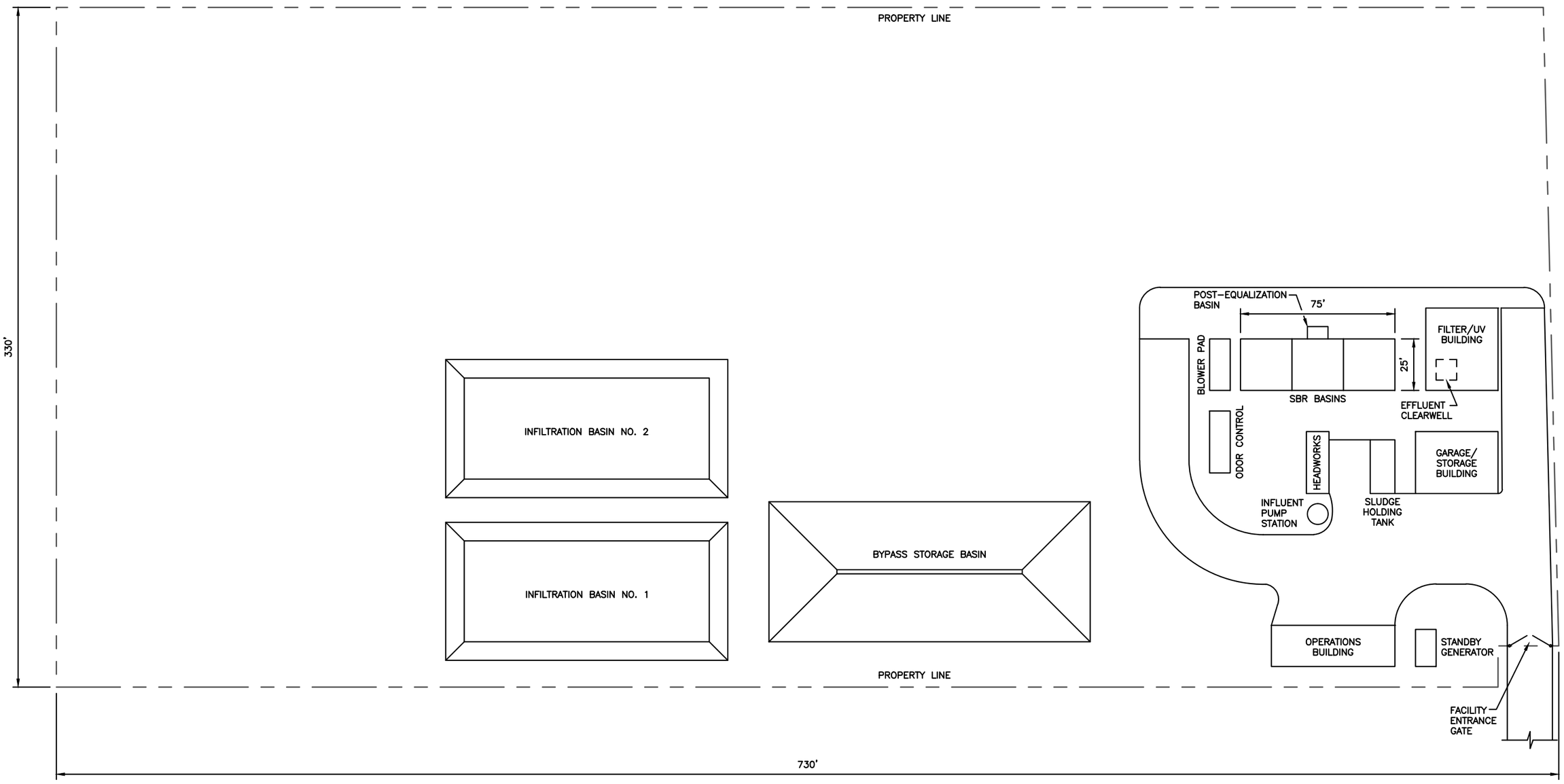
In this alternative, a Class A water reclamation facility (WRF) would be constructed at the Carlsborg UGA, initially consisting of a sequencing batch reactor (SBR) and an effluent filter, with capacity for the projected 2030 flow and loading rates. The SBR tanks would be designed to allow for future expansion and conversion to a membrane bioreactor (MBR) with capacity for the projected 2050 and buildout flow and loading rates. The WRF could be constructed on a 5.5 acre parcel of land directly east of the PUD Idea Place operations center. The proposed site plan for an SBR water reclamation facility designed for the projected 2030 flow and loading rates is shown in Figure 5-1. Figure 5-2 shows a process flow diagram for this facility, and Figure 5-3 provides a conceptual hydraulic flow profile.

The *2012 Sewer Facilities Plan* evaluated several treatment process options for a water reclamation facility in Carlsborg and selected the SBR process as the most advantageous for the 2030 design year, with conversion to an MBR process for the 2050 and buildout loading rates. This Plan updates the design criteria and costs of the *2012 Sewer Facilities Plan* to account for the revised flow and loading projections in Table 5-1.

The Carlsborg WRF would be designed to produce Class A reclaimed water in accordance with the Washington State *Water Reclamation and Reuse Standards* (Ecology, 1997) and *Criteria for Sewage Works Design* (Ecology 2008). The raw wastewater from the Carlsborg sewer system would be pumped to the headworks structure by an influent pump station. Three SBR tanks would provide secondary treatment and nitrogen removal. The SBR system would be followed by coagulation, flocculation, filtration and ultraviolet disinfection systems to produce Class A reclaimed water. Waste sludge produced by the SBR would be stored in an aerated holding tank until transfer by the utility to another facility for treatment.

An SBR is a fill-and-draw activated sludge secondary treatment process. Unlike the conventional activated sludge process, which requires separate units for aeration and solids separation, the SBR utilizes a single unit to accomplish both processes in sequence. The five steps of an SBR system are as follows:

1. Fill
2. React (aeration)
3. Settle (sedimentation/clarification)
4. Draw (decant)
5. Idle (sludge wasting)



SCALE: 1'=50'

CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 5-1
CARLSBORG WRF
SBR SITE PLAN (DESIGN YEAR 2030)

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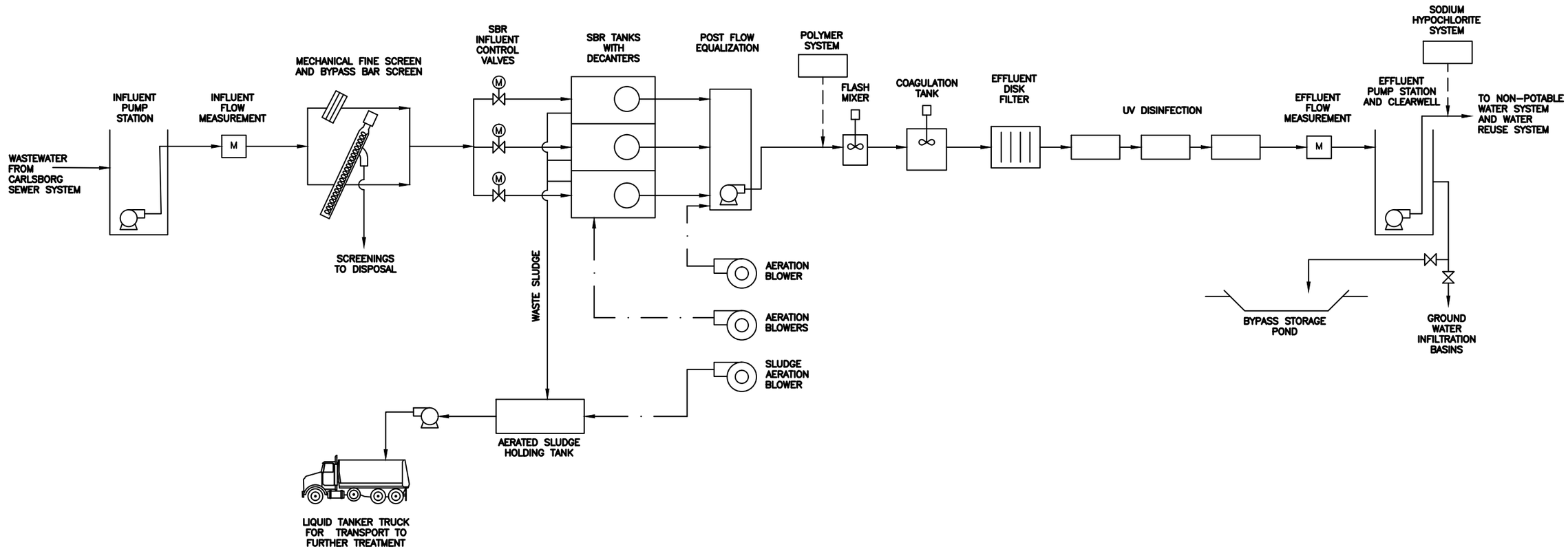
L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\FIG.5-1.dwg, 4/4/2014 5:38:21 PM, mnagel



CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 5-2
CARLSBORG WRF
SBR PROCESS FLOW DIAGRAM

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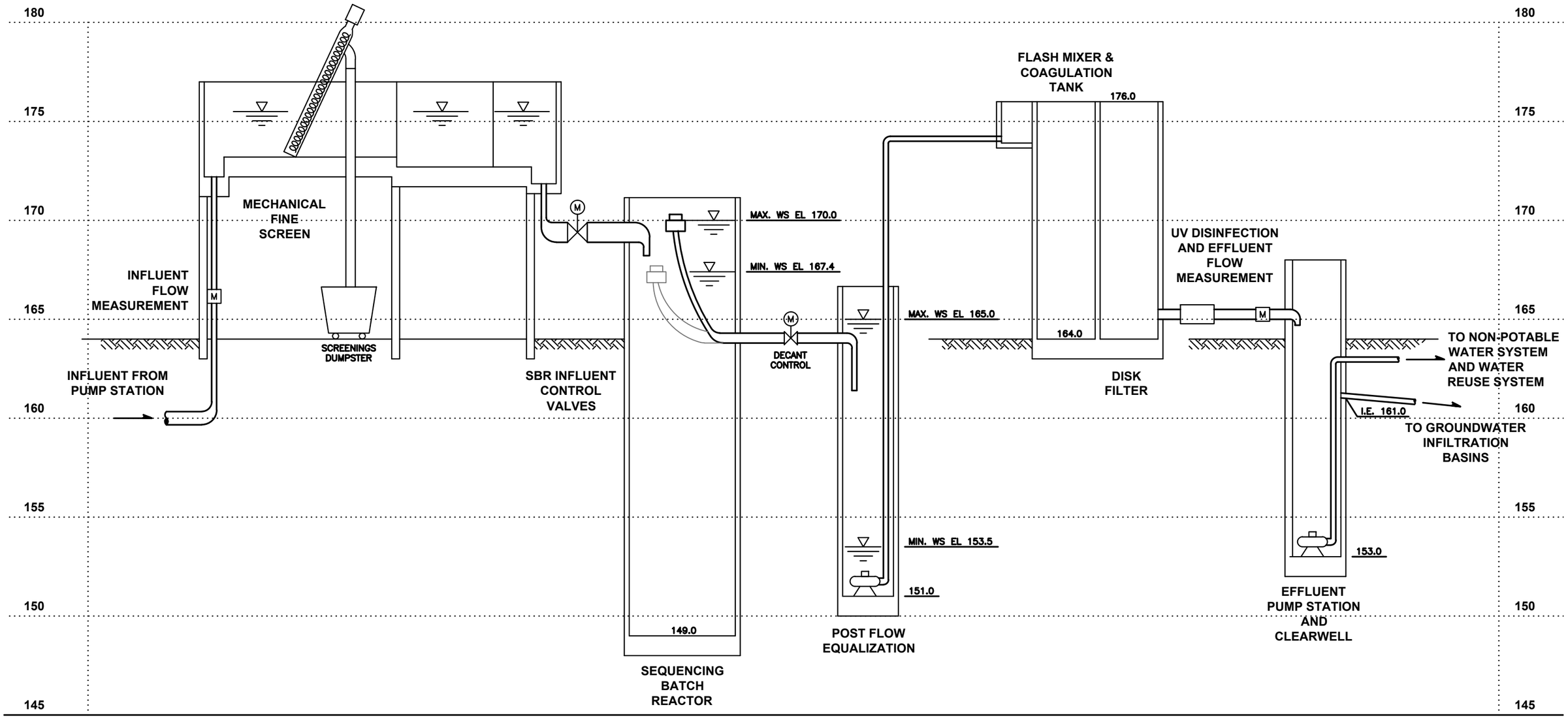
L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\FIG.5-2.dwg, 6/19/2014 2:56:02 PM, mnagel



CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 5-3
CARLSBORG WRF
SBR HYDRAULIC PROFILE

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L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\FIG.5-3.dwg, 6/19/2014 3:16:53 PM, mnagel

A summary of the advantages and disadvantages of the SBR treatment process is presented below in Table 5-2.

TABLE 5-2

Advantages and Disadvantages of Sequencing Batch Reactors (SBR)

Advantages	Disadvantages
• Eliminates possibility of short circuiting • Provides a high quality effluent • Clarifiers and sludge return pumps not required • Process can be designed to remove nitrogen • Good for small communities where land area is limited	• Scum accumulation and carry-over • Requires a sludge pump for each basin • Relies on computer-controlled cycle times, valve actuators and mechanical equipment • Operational complexity • High decant flow requires equalization or larger disinfection system

SBR FACILITIES DESCRIPTION FOR DESIGN YEAR 2030

The components of the SBR water reclamation facility designed for projected 2030 flow and loading rates are described below.

Influent Pump Station

An influent pump station would be constructed at the WRF site to lift the raw wastewater up to the headworks and SBR basins. The pumps would be sized for the projected 2030 peak hour flow rate of 327,000 gpd, with two variable-speed submersible centrifugal pumps (one duty, one standby). The pump station wet well would be oversized for buildout flow rates, and to allow for the installation of three larger submersible pumps in the future. An influent composite sampler would draw influent samples from the influent wet well.

Headworks/Preliminary Treatment

A headworks structure would be constructed to provide preliminary treatment prior to the SBR tanks. The influent flow rate would be measured by a magnetic flow meter installed on the discharge pipe from the influent pump station. The headworks would be equipped with a mechanical fine screen and a bypass bar screen. The mechanical fine screen would have 1/4-inch orifices. Screenings from the mechanical fine screen would be discharged from the headworks structure to a dumpster located on a concrete pad on grade below the headworks structure. Electrically-actuated valves and magnetic flow meters would be provided on the pipe from the headworks to each SBR basin.

Sequencing Batch Reactors

Three concrete SBR basins would be constructed to provide secondary treatment and nitrogen removal. In order to treat peak day flows, each basin would be required to have a capacity of 98,000 gallons, assuming 5 cycles per day (4.8-hour cycle time) in each tank and a conservative decant depth of 12 percent of the side water depth. Each SBR basin would have inside dimensions of 25 feet by 25 feet, with a maximum side water depth of 21 feet. The maximum month operational parameters for the SBR basin cycles are presented below in Table 5-3.

TABLE 5-3

Proposed Sequencing Batch Reactor (SBR) Cycle Times

Operating Cycle per Basin	Time, hrs
Fill	0.8
React/Fill	0.8
React	1.7
Settle	0.5
Decant	1.0

The effective total SRT at maximum month with the above operating parameters and a MLSS concentration of 4,000 mg/L would be 30 days, and the typical decant rate would be 199 gpm up to a potential maximum of 560 gpm.

Each SBR basin would be equipped with fine bubble diffusers, a floating mixer, a floating decanter, a submersible sludge pump, instrumentation, and control valves. The submersible sludge pumps would pump WAS to the aerated sludge holding tank. Clarified secondary effluent would flow from the SBR decanters to the post-equalization basin. A programmable logic controller (PLC) would be used to control the SBR process operations.

Three positive displacement blowers would be provided to aerate the SBR basins. Each of these blowers would be capable of supplying sufficient air to one of the SBR tanks for aeration and mixing. The third blower would provide redundancy, as it is not expected that all three tanks would be in aeration cycle simultaneously. The aeration blower motors would be 10 horsepower units. A separate 2-horsepower positive displacement blower would be provided to aerate the post-equalization basin. The blowers would be provided with weatherproof acoustical enclosures and installed on a concrete pad adjacent to the SBR basins.

A 6,000-gallon post-equalization basin would be constructed adjacent to the SBR to receive and dampen decant flows to reduce the hydraulic loading on the downstream

facilities. The equalization basin would be aerated with coarse-bubble diffusers and a 2-horsepower positive displacement blower. The basin would be equipped with two submersible pumps (one duty, one standby) to lift the secondary effluent to the coagulation and filtration system.

Effluent Coagulation and Filtration

In order to ensure that the final effluent meets the Class A water reclamation turbidity limits, the secondary effluent would be coagulated and filtered. The coagulation and filtration steps consist of a chemical injection system, a flash mixing unit, a flocculation tank, and an effluent filter.

The secondary effluent would be pumped from the post-equalization basin to a flash mixer, with a chemical coagulant injected to aid in the agglomeration of suspended particles and thereby increase the performance of the effluent filter. The chemical feed system would utilize a premixed liquid solution of polymer and a small chemical metering pump (a second metering pump will be available as a standby) that would inject the solution into a pipe ahead of the flash mixer. The capacity of the polymer feed system would be 5.5 lbs of polymer per day, in order to be able to feed 2.0 mg/L polymer at peak hour flow. It is proposed that the flash mixer would be a 55-gallon tank. A 1.5-horsepower vertical drum mixer would be sufficient to provide the recommended velocity gradient of 2,000/sec.

The effluent would overflow by gravity from the flash mixer into a larger flocculation tank. The flocculation tank would allow the coagulated suspended particles to form flocs and, therefore, become easier to filter out during the filtration step. Flocculation occurs under gentle mixing, with detention times typically in the range of 10 to 30 minutes. If a detention time of 30 minutes at maximum month flow is selected, a flocculation tank volume of 2,000 gallons would result. A 1/20th horsepower mixer will provide the recommended velocity gradient of 60/sec.

The chemical feed pumps, polymer storage area, flash mixer and flocculation tank would be located in the Filter Building.

Effluent Filter

A fabric disk media filter tank would be located in the Filter Building. The filter system would be comprised of a steel tank, four fabric media covered disks, a backwash system, sludge removal system, and disk drive assembly. An adequate supply of spare parts would be kept on hand in order to meet the reliability criteria of the *Water Reclamation and Reuse Standards*.

Gravity flow through the filtration system would be maintained by a head differential that is no less than two inches but is not allowed to exceed 12 inches. A filter backwash cycle would be initiated either based on time or on water level in the tank. The disk drive

assembly would rotate the filter disks during the backwash operation. The solids would be sucked through the suction manifold and pumped to the sludge/backwash drain connected to the plant drain pump station.

The filter effluent would be monitored continuously with a turbidimeter to ensure compliance with the Class A reclaimed water standards (<2 NTU average and <5 NTU at any given time). A violation of these standards would trigger bypass of effluent to the bypass storage pond.

Effluent Disinfection

An ultraviolet (UV) light disinfection system would provide disinfection of the effluent to meet Class A reclamation standards. The UV disinfection system would be located in the Filter Building. It would be an in-vessel low-pressure, high-intensity UV system comprised of three vessels in series. The system would be designed to deliver a design dose of 100 mJ/cm^2 at a UV transmittance of 55 percent at peak hour flow, with one vessel out of service. At this dose the UV disinfection system would be sufficient to produce a monthly median coliform count less than 2.2 per 100 mL.

An effluent magnetic flow meter will follow the UV disinfection system.

Effluent Clear Well

The final effluent from the filter and UV system would flow into an effluent clear well. An effluent composite sampler would draw sample from the effluent clear well. Final effluent would flow by gravity to the groundwater infiltration basins. Piping tees and automated valves would be provided to divert the final effluent to the emergency bypass storage pond, in case Class A reclaimed water standards are not met.

Water reuse pumps would draw from the effluent clear well. Reclaimed water would be pumped off site for irrigation or other uses, and, after passing through a backflow preventer, would also be available for on-site use as process water. The non-potable water system would also include a hydro-pneumatic pressure tank and a basket strainer. The non-potable water system would supply process water to the influent screen spray bar and a number of yard hydrants located around the reclamation facility for wash down.

Bypass Storage Pond

In order to meet reliability criteria of the *Water Reclamation and Reuse Standards*, a short-term bypass storage pond would be provided. When plant upsets or equipment failure occurs and Class A water reclamation standards are not met, flows would be automatically diverted to the bypass storage pond and an alarm activated. In accordance with the *Water Reclamation and Reuse Standards,* a detention time of 24 hours at the maximum day flow would be provided (180,000 gal). A lined basin of this size would be constructed with a maximum liquid depth of 9 feet, freeboard of 2 feet and a 3 horizontal

to 1 vertical side slope. The short-term storage basin would be lined with a geomembrane to prevent the inadequately treated wastewater from infiltrating to groundwater. The pond contents would be returned to the headworks by the plant drain pump station.

Plant Drain Pump Station

A submersible plant drain pump station would be provided to collect process and tank drains, including the bypass storage pond, and return the plant drainage to the headworks for screening. The pump station design would be similar to the influent pump station design, although the wet well would be deeper in order to fully drain the SBR tanks and bypass storage pond.

Aerated Sludge Holding Tank

The *2012 Sewer Facilities Plan* considered several sludge treatment alternatives, and recommended aerated sludge storage for the initial phase (2030 design). Waste activated sludge from the SBR basins would be hauled off-site in a tanker truck for further treatment and disposal by another agency. As the sludge production rate increases, sludge digestion and dewatering would be added in future expansion phases.

The WRF designed for projected 2030 flow and loading rates would be provided with a rectangular concrete aerated sludge holding tank, designed to provide 2 weeks of storage at maximum month conditions with partial digestion. Waste activated sludge (WAS) would be pumped from the SBR tanks to the aerobic sludge holding tank via a submersible sludge pump in each SBR tank.

A coarse bubble diffuser system would be installed in the aerobic sludge holding tank for mixing and aeration, supplied by a 7.5-horsepower positive displacement blower. The holding tank would be equipped with a telescoping decanter to allow gravity thickening of the sludge to 1.5 percent solids. At the maximum month projected 2030 condition, the sludge production from the sludge holding tank would be 1,650 gallons per day at 1.5 percent solids. An external sludge pump would be provided for transfer of the sludge into a tanker truck. It is anticipated that the utility would purchase a tanker truck, and a storage garage would be constructed at the WRF site.

Filter Building

A filter building would be constructed to house the coagulation, flocculation, filtration, UV disinfection, effluent clear well and non-potable water systems. The building would be approximately 35 feet by 45 feet.

Operations Building

An operations building would be constructed to accommodate the staff needed to operate the WRF and house the electrical equipment and motor control centers. The new control building would be approximately 20 feet by 60 feet and would contain an electrical room, a laboratory, an office, a locker room with shower and toilets, and a mechanical room. The new laboratory would be equipped with the analytical instruments necessary to perform in-plant testing.

Standby Generator

A new diesel generator would be installed to provide standby power to the WRF.

Groundwater Infiltration Basin

The *2012 Sewer Facilities Plan* included a hydrogeological report of the potential Idea Place WRF site (in Appendix C). Seepage tests resulted in an observed groundwater infiltration rate of 12.4 inches/hour. Using a standard approach that estimates a long term infiltration as 10 percent of short-term actual (observed) rate, the estimated limiting long-term infiltration rate is 1.24 inches/hr (19 gpd/ft^2).

The infiltration basin would be sized for the projected 2030 maximum day flow of 179,300 gpd at a minimum. Eight equally-sized infiltration basins were planned for infiltration of the buildout flow rate. Two of these basins, each with approximate dimensions of 50 feet by 120 feet, are sufficient for the projected 2030 maximum day flow. The basins would be excavated 3 feet below ground level with 3:1 horizontal to vertical slopes.

Summary of Design Data

Table 5-4 provides a summary of the proposed design data for the SBR water reclamation facility designed for projected 2030 Carlsborg flow and loading rates.

TABLE 5-4

Carlsborg SBR WRF Design Data (Design Year 2030)

Parameter	Design Data
Influent Pump Station	
Quantity Of Pumps	2 (1 Duty, 1 Standby)
Type	Submersible Centrifugal
Capacity	230 gpm @ 30' TDH
Motor Size	5 hp ea. with VFDs

TABLE 5-4 – (continued)

Carlsborg SBR WRF Design Data (Design Year 2030)

Parameter	Design Data
Influent Screening	
Quantity Of Mechanical Screens	1
Type Of Screen	Mechanical Perforated Plate Screen
Screen Perforation Size	1/4 inch
Quantity Of Manual Screens (Backup)	1
Type Of Screen	Manual Bar Rack
Sequencing Batch Reactor (SBR) Basins	
Quantity	3
Volume, Per Basin	98,000 Gal
Qty. Of Cycles Per Day, Per Basin	5
Cycle Duration	4.8 Hrs
Maximum Water Depth	21 Ft
Minimum Water Depth (After Decant)	18.4 Ft
Estimated Net Sludge Yield	0.85 Lbs TS/Lb BOD_5
Design Total SRT	30 Days
Design Mixed Liquor Suspended Solids Concentration	4,000 Mg/L (At Min. Water Depth)
Aeration Type	Fine Bubble Diffusers
Mixers	
Mixer Type	Floating Direct Drive
Quantity, Total	3
Mixer Motor Size, Each	3 Hp
Decanters	
Type	Floating Decanter
Quantity, Total	3
Decant Flow Rate, Typical	199 gpm
Decant Flow Rate, Maximum	560 gpm
WAS Pumps	
Type	Submersible Centrifugal Pumps
Quantity, Total	3 (1 Per Basin)
Capacity, Each	20 gpm
Motor Size, Each	2.4 hp
SBR Aeration Blowers	
Blower Type	Positive Displacement Blower
Quantity Of Blowers	3 (1 Standby)
Blower Capacity, Each	93 Scfm @ 9.5 psi
Blower Motor Size, Each	10 hp

TABLE 5-4 – (continued)

Carlsborg SBR WRF Design Data (Design Year 2030)

Parameter	Design Data
Post-Equalization Basin	
Quantity	1
Volume	6,000 Gal
Maximum Side Water Depth	14 Feet
Equalization Basin Aeration	
Aeration Type	Coarse Bubble Diffusers
Blower Type	Positive Displacement Blower
Quantity Of Blowers	1
Blower Motor Size	2 hp
Equalization Basin Pumps	
Type	Submersible Centrifugal
Quantity	2 (1 Duty, 1 Standby)
Capacity, Each	230 gpm @ 30' TDH
Motor Size, Each	5 hp ea. with VFDs
Coagulation Chemical Feed System	
Quantity Of Chemical Feed Pumps	2
Type Of Chemical	Liquid Polymer
Feed Pump Capacity	0.003-0.03 gph
Flash Mixer	
Quantity Of Tanks	1
Volume	55 Gal
Mixer Motor Size	1.5 hp
Detention Time At PHF	15 Sec
Velocity Gradient At 10°C	2,000 Sec^{-1}
Flocculation Tank	
Quantity Of Tanks	1
Volume	2,000 Gal
Mixer Motor Size	1/20 hp
Detention Time At MMF	30 Min
Velocity Gradient At 10°C	60 Sec^{-1}
Effluent Filter	
Filter Type	Fabric Disk Filter
Quantity Of Tanks	1
Quantity Of Disks	4
Hydraulic Loading Rate At Peak Hour Flow	5.3 gpm/Ft2

TABLE 5-4 – (continued)

Carlsborg SBR WRF Design Data (Design Year 2030)

Parameter	Design Data
Effluent Disinfection	
Disinfection Type	In-Vessel Low-Pressure, High-Intensity UV Lamps
Quantity Of Vessels	3 (2 Duty, 1 Standby)
UV Transmittance	55%
UV Dose At Peak Hour Flow, With 1 Vessel Out Of Service	100 mJ/cm^2
Disinfection Standard, Monthly Median Value	2.2 Fecal Coliform/100 Ml
Bypass Storage Basin	
Basin Type	Geomembrane-Lined Basin With 3:1 Side Slope
Volume	180,000 Gal
Maximum Side Water Depth	9 Feet
Groundwater Infiltration Basin	
Basin Type	Unlined Basin With 3:1 Side Slope
Design Long-Term Infiltration Rate	19 gpd/Ft^2
Infiltration Area	11,660 Ft^2
Quantity Of Basins	2
Basin Depth	3 Feet
Plant Drain Pump Station	
Type	Submersible Centrifugal
Quantity	2 (1 Duty, 1 Standby)
Capacity, Each	230 gpm @ 40' TDH
Motor Size, Each	5 Hp
Aerated Sludge Holding Tank	
WAS Sludge Production	250 Lbs/Day @ 1.0% Solids
Detention Time At Maximum Month Loading	14 Days
Tank Volume, Gal	28,000
Liquid Depth, Feet	12
Target Solids Concentration After Decanting	1.5%
Sludge Production	217 lbs/Day @ 1.5% Solids (1,650 Gal/Day)
Aeration Type	Coarse Bubble Diffuser

TABLE 5-4 – (continued)

Carlsborg SBR WRF Design Data (Design Year 2030)

Parameter	Design Data
Aerated Sludge Holding Blower	
Blower Type	Positive Displacement Blower
Quantity Of Blowers	1
Blower Capacity	113 Scfm @ 7 psi
Blower Motor Size	7.5 hp

Carlsborg SBR WRF Capital and O&M Costs

The estimated capital and operation and maintenance costs for the Carlsborg WRF for the design 2030 flow and loading rates are presented in Tables 5-5 and 5-6, respectively.

TABLE 5-5

Carlsborg WRF Preliminary Project Cost Estimate (Design Year 2030)

No.	Item	Quantity	Unit Price	Amount
1.	Mobilization/Demobilization	1 LS	$520,000	$520,000
2.	Sitework and Excavation	1 LS	$390,000	$390,000
3.	Access Road	1 LS	$150,000	$150,000
4.	12-Inch Influent Sewer	1,400 LF	$190	$266,000
5.	Influent Pump Station	1 LS	$50,000	$50,000
6.	Headworks Structure	1 LS	$80,000	$80,000
7.	Mechanical Fine Screen	1 LS	$86,000	$86,000
8.	SBR and Equalization Tanks	275 CY	$800	$220,000
9.	SBR and Post Equalization Equipment	1 LS	$625,000	$625,000
10.	Coagulation/Flocculation Systems	1 LS	$75,000	$75,000
11.	Effluent Filter Equipment	1 LS	$188,000	$188,000
12.	UV Disinfection System	1 LS	$250,000	$250,000
13.	Composite Samplers	2 EA	$5,000	$10,000
14.	Non-Potable Water System	1 LS	$25,000	$25,000
15.	Reclaimed Water Pumps	2 EA	$20,000	$40,000
16.	Filter Building	1,575 SF	$250	$394,000
17.	Operations Building	1,200 SF	$250	$300,000
18.	Plant Drain Pump Station	1 LS	$50,000	$50,000
19.	Bypass Storage Basin Geomembrane Liner	1,200 SY	$10	$12,000
20.	Bypass Storage Basin Excavation and Haul	1,675 CY	$16	$27,000

TABLE 5-5 – (continued)

Carlsborg WRF Preliminary Project Cost Estimate (Design Year 2030)

No.	Item	Quantity	Unit Price	Amount
21.	Sludge Holding Tank	60 CY	$800	$48,000
22.	Sludge Holding Tank Equipment	1 LS	$45,000	$45,000
23.	Truck Garage and Storage Building	1,200 SF	$150	$180,000
24.	Sludge Tanker Truck	1 LS	$200,000	$200,000
25.	Groundwater Infiltration Basin Excavation	1,670 CY	$10	$17,000
26.	Painting	1 LS	$30,000	$30,000
27.	Misc. Metals	1 LS	$65,000	$65,000
28.	Odor Control System	1 LS	$100,000	$100,000
29.	Fencing	1 LS	$80,000	$80,000
30.	Landscaping	1 LS	$18,000	$18,000
31.	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$520,000	$520,000
32.	Electrical & Instrumentation	1 LS	$1,425,000	$1,425,000

Subtotal ..... $ 6,486,000
Construction Contingency (20%) ..... $ 1,297,000
Subtotal ..... $ 7,783,000
Washington State Sales Tax (8.7%) ..... $ 615,000
Total Estimated Construction Cost ..... $ 8,398,000
Engineering, Administrative & Legal Services (25%) ..... $ 2,100,000
Hydrogeological Study and Groundwater Monitoring Wells ..... $ 150,000
TOTAL ESTIMATED PROJECT COST $10,650,000
Note: Costs are in 2014 dollars.

TABLE 5-6

Carlsborg WRF (SBR) Estimated Annual O&M Costs (Design Year 2030)

Item	Quantity		Unit Price	Cost
Labor	1.5	FTE	$100,000	$150,000
Electrical Power	254,836	kWh	$0.097	$25,000
Maintenance and Repair	$7,783,000	Constr. Cost	1.0%	$78,000
Miscellaneous (Lab, Chlorine, etc.)	1	LS	$20,000	$20,000
Groundwater Monitoring	1	LS	$10,000	$10,000
Sludge Hauling	155	Trips	$16	$2,000
Sludge Treatment and Disposal	465,000	Gal	$0.06	$28,000
Administration and Permitting	1	LS	$10,000	$10,000
Total				**$323,000**

Note: Costs are in 2014 dollars.

CARLSBORG WRF CONVERSION TO AN MBR FOR DESIGN YEAR 2050

The *2012 Sewer Facilities Plan* recommended that when the capacity of the WRF constructed for design year 2030 is met, the facility capacity be expanded by converting the SBR process into a membrane bioreactor (MBR) process. The new MBR process would be designed to produce Class A reclaimed water for the design year 2050.

Activated sludge with membrane filtration, which is commonly referred to as the MBR process, involves the use of an activated sludge aeration basin with submerged membrane filtration units in the aeration tanks. Typically, a permeate pump draws the mixed liquor through the micropores of the membrane filter, resulting in a very high quality filtrate (permeate). Fouling of the filtration units is controlled by air injection around the membranes and by chemical cleaning. The use of membrane filtration eliminates the need for secondary clarifiers and allows for the mixed liquor suspended solids (MLSS) level in the aeration basin to be maintained at 8,000 mg/L or greater, thereby reducing the aeration basin volume required when compared with the conventional activated sludge or SBR processes, which typically operate below 4,000 mg/L MLSS. Membrane filtration processes typically require influent flow equalization to reduce the quantity of membrane units. A summary of the advantages and disadvantages of this treatment process is presented below in Table 5-7.

TABLE 5-7

Advantages and Disadvantages of Membrane Bioreactors (MBR)

Advantages	Disadvantages
• Secondary clarifiers not required • Process can be designed to remove nitrogen • Produces high quality effluent suitable for Class A reuse without further filtration • High operational MLSS results in smaller aeration basin volume • Smaller land area requirement • Highest quality effluent	• Relies on computer-controlled cleaning and pumping operations • Cleaning of membrane filters required • Greater aeration requirements required for air scouring of membranes • High membrane capital and replacement costs • High operating costs/high membrane replacement costs • Influent Equalization basin required

At the Carlsborg WRF, the SBR basins can be converted to the MBR process and provide sufficient treatment capacity through 2050. Instead of three SBR basins in parallel, the tankage would be converted into a single train of tanks in series. One SBR basin would be converted into an anoxic/equalization basin. With the liquid level typically low, the basin would provide some initial anoxic volume for nitrogen removal. The anoxic/equalization basin provides storage volume for when the influent flow exceeds the

membrane capacity (set at peak day flow). Mixed liquor would be pumped to the anoxic basin and then flow through the aeration basin into one of four membrane tanks. One membrane tank would be redundant. Permeate pumps pull clean permeate out of the membrane cassettes in the membrane tanks. A new Membrane Equipment Building would be constructed to house the permeate pumps and other equipment associated with the MBR system. The UV disinfection system in the Filter Building would be replaced with a larger system designed for the 2050 flow rates. Other mechanical equipment at the WRF would be replaced, as the expected 20 year life would be met by the time of conversion to an MBR process.

The volume of sludge produced would be much greater with the design 2050 flow and loading rates than the initial WRF. In accordance with the *2012 Plan*, it is proposed to construct a 40-day SRT aerobic digester in the WRF expansion. Due to limitations and cost of disposal of Class B biosolids in the vicinity, a Class A lime-heat biosolids treatment process by FKC) is recommended, which would produce dewatered Class A biosolids for free distribution to the community.

An additional bypass storage pond and three additional groundwater infiltration basins would be constructed to provide capacity for the design 2050 flow rates.

Figure 5-4 provides a site plan for an MBR process at the Carlsborg water reclamation facility.

The estimated capital and operation and maintenance costs for the Carlsborg membrane bioreactor WRF for the design 2050 flow and loading rates are presented in Tables 5-8 and 5-9, respectively.

TABLE 5-8

Carlsborg WRF (MBR) Preliminary Project Cost Estimate (Design Year 2050)

No.	Item	Quantity	Unit Price	Amount
1.	Mobilization/Demobilization	1 LS	$670,000	$670,000
2.	Sitework and Excavation	1 LS	$250,000	$250,000
3.	New Influent Pumps	3 EA	$25,000	$75,000
4.	New Headworks Structure	1 LS	$50,000	$50,000
5.	Rotary Drum Screen System	1 LS	$350,000	$350,000
6.	Convert SBR Tanks to MBR Tanks	1 LS	$84,000	$84,000
7.	Anoxic Mixers	1 LS	$42,000	$42,000
8.	Mixed Liquor Pump Station	1 LS	$100,000	$100,000
9.	Aeration Basin Diffusers	1 LS	$15,000	$15,000
10.	Process Air Blowers	2 EA	$40,000	$80,000
11.	Membrane Bioreactor Equipment	1 LS	$1,102,000	$1,102,000

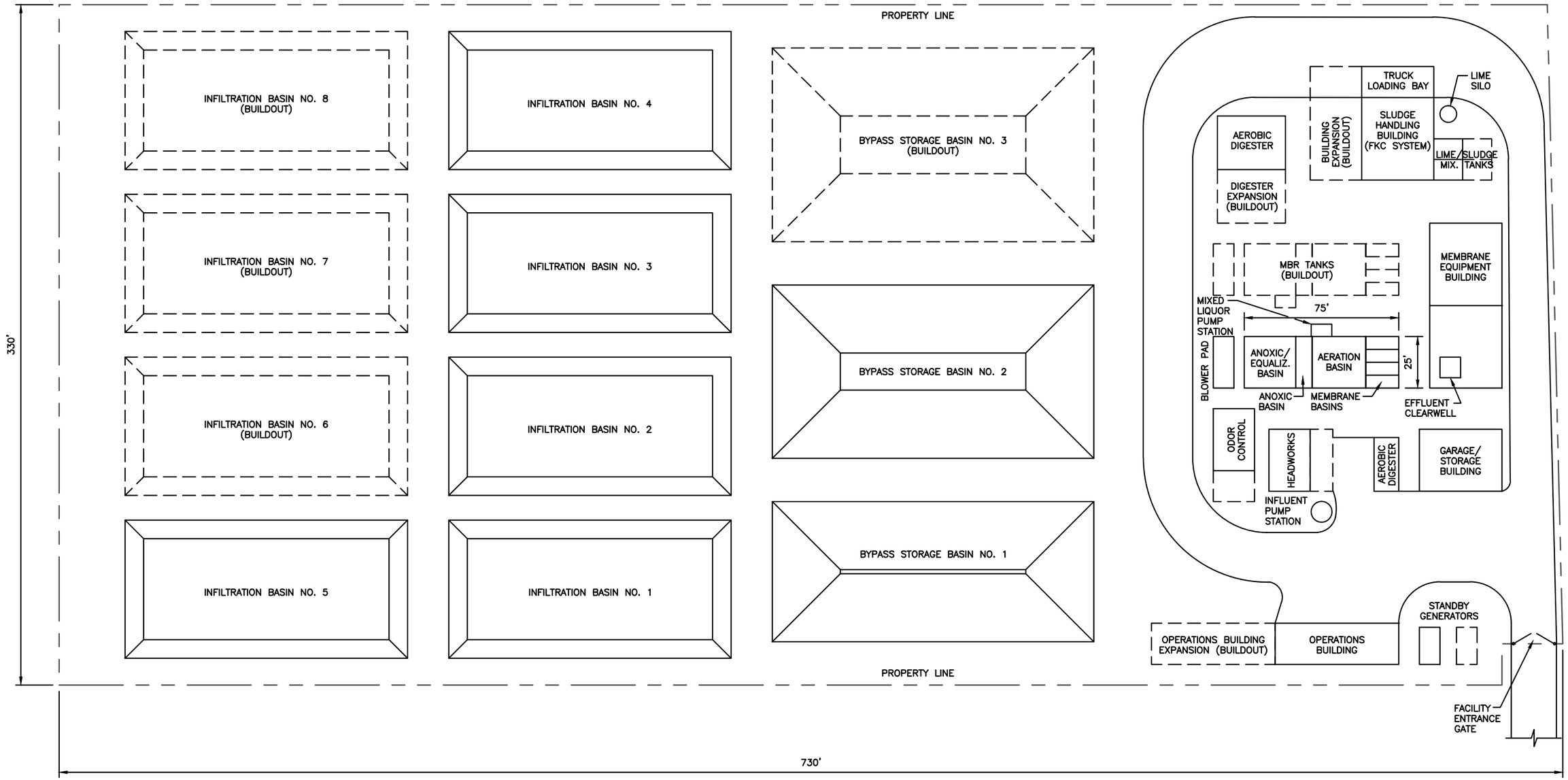
TABLE 5-8 – (continued)

Carlsborg WRF (MBR) Preliminary Project Cost Estimate (Design Year 2050)

No.	Item	Quantity	Unit Price	Amount
12.	UV Disinfection System	1 LS	$320,000	$320,000
13.	Composite Samplers	2 EA	$5,000	$10,000
14.	Non-Potable Water System Upgrade	1 LS	$40,000	$40,000
15.	New Reclaimed Water Pumps	2 EA	$20,000	$40,000
16.	New Plant Drain Pumps	1 LS	$35,000	$35,000
17.	Membrane Equipment Building	1,575 SF	$250	$394,000
18.	Aerobic Digester Tanks	175 CY	$800	$140,000
19.	Aerobic Digester Equipment	1 LS	$136,000	$136,000
20.	Sludge/Lime Mix Tanks	58 CY	$800	$47,000
21.	Sludge/Lime Mix Tank Mixers	2 EA	$18,000	$36,000
22.	Class A FKC Lime Biosolids System	1 LS	$791,000	$791,000
23.	Sludge Handling Building	1,925 SF	$250	$482,000
24.	Replace Liner on Existing Bypass Basin	1,200 SY	$10	$12,000
25.	Geomembrane Liner for New Bypass Basin	1,450 SY	$10	$15,000
26.	Excavation and Haul for New Bypass Basin	2,485 CY	$16	$40,000
27.	New Groundwater Infiltration Basin Excavation	2,500 CY	$10	$25,000
28.	Painting	1 LS	$50,000	$50,000
29.	Misc. Metals	1 LS	$80,000	$80,000
30.	Odor Control System Expansion	1 LS	$150,000	$150,000
31.	Sludge Dump Truck	1 LS	$200,000	$200,000
32.	Landscaping	1 LS	$25,000	$25,000
33.	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$670,000	$670,000
34.	Electrical and Instrumentation	1 LS	$1,850,000	$1,850,000

Subtotal ..... $ 8,406,000
Construction Contingency (20%) ..... $ 1,681,000
Subtotal $10,087,000
Washington State Sales Tax (8.7%) ..... $ 797,000
Total Estimated Construction Cost $10,884,000
Engineering, Administrative & Legal Services (25%) ..... $ 2,721,000
TOTAL ESTIMATED PROJECT COST $13,610,000

Note: Costs are in 2014 dollars.



CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES PLAN AMENDMENT
FIGURE 5-4
CARLSBORG WRF
MBR SITE PLAN (DESIGN YEAR 2050)

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\FIG.5-4.dwg, 4/4/2014 5:35:55 PM, mnagel

TABLE 5-9

Carlsborg WRF (MBR) Estimated Annual O&M Costs (Design Year 2050)

Item	Quantity		Unit Price	Cost
Labor	2	FTE	$100,000	$200,000
Electrical Power	1,547,043	kWh	$0.097	$150,000
Maintenance and Repair	$10,087,000	Constr. Cost	1.0%	$101,000
Membrane Replacement Reserves	1/20	year	$194,000	$10,000
Miscellaneous (Lab, Chlorine, etc.)	1	LS	$30,000	$30,000
Groundwater Monitoring	1	LS	$10,000	$10,000
Lime for Biosolids Treatment	42,400	lbs	$1.35	$57,000
Administration and Permitting	1	LS	$15,000	$573,000
Total				**$548,000**

Note: Costs are in 2014 dollars.

CARLSBORG WRF EXPANSION FOR BUILDOUT

The *2012 Sewer Facilities Plan* recommended further expanding the capacity of the membrane bioreactor WRF for the projected buildout flow and loading rates once the capacity for design year 2050 is met. The expanded MBR reclamation facility would be designed to continue producing Class A reclaimed water for water reuse and groundwater infiltration.

The projected buildout flow and loading rates are approximately double those projected for 2050. The capacity of buildout can be provided by constructing new parallel channels, tanks and equipment. The headworks would be expanded to include a third rotary drum screen, and a new parallel membrane aeration basin train would be constructed. The Filter Building from the initial SBR reclamation facility would be utilized to house the membrane equipment associated with the new treatment train. The UV disinfection system would be replaced with a higher capacity system. One new bypass storage pond (for a total of three in service) and three new groundwater infiltration basins (for a total of eight in service) would be constructed.

Figure 5-4 shows the additional structures to be added for the buildout WRF expansion in dashed lines. The 5.5 acres site that is east of the PUD Idea Place operations center is sufficient for the buildout capacity.

The estimated capital and operation and maintenance costs for the Carlsborg membrane bioreactor WRF for the buildout design flow and loading rates are presented in Tables 5-10 and 5-11, respectively.

TABLE 5-10

Carlsborg WRF (MBR) Preliminary Project Cost Estimate (Buildout Design Year)

No.	Item	Quantity	Unit Price	Amount
1.	Mobilization/Demobilization	1 LS	$1,035,000	$1,035,000
2.	Sitework and Excavation	1 LS	$390,000	$390,000
3.	New Influent Pumps	3 EA	$26,600	$80,000
4.	Parallel New Headworks Structure	1 LS	$100,000	$100,000
5.	New Rotary Drum Screen System	1 LS	$525,000	$525,000
6.	New MBR Tanks	275 CY	$800	$220,000
7.	Anoxic Mixers	1 LS	$84,000	$84,000
8.	Mixed Liquor Pump Station	1 LS	$200,000	$200,000
9.	Aeration Basin Diffusers	1 LS	$30,000	$30,000
10.	Process Air Blowers	4 EA	$40,000	$160,000
11.	Membrane Bioreactor Equipment	1 LS	$1,969,000	$1,969,000
12.	UV Disinfection System	1 LS	$488,000	$488,000
13.	Composite Samplers	2 EA	$5,000	$10,000
14.	Non-Potable Water System Upgrade	1 LS	$60,000	$60,000
15.	New Reclaimed Water Pumps	2 EA	$20,000	$40,000
16.	New Plant Drain Pumps	1 LS	$75,000	$75,000
17.	New Aerobic Digester Tanks	210 CY	$800	$168,000
18.	Aerobic Digester Equipment	1 LS	$273,000	$273,000
19.	Sludge/Lime Mix Tanks	58 CY	$800	$47,000
20.	Sludge/Lime Mix Tank Mixers	4 EA	$18,000	$72,000
21.	Class A FKC Lime Biosolids System	1 LS	$1,582,000	$1,582,000
22.	Sludge Handling Building Expansion	1,375 SF	$250	$344,000
23.	Replace Liner on Existing Bypass Basins	2,650 SY	$10	$27,000
24.	Geomembrane Liner for New Bypass Basin	1,630 SY	$10	$17,000
25.	Excavation and Haul for New Bypass Basin	3,000 CY	$16	$48,000
26.	Operations Building Expansion	1,200 SF	$250	$300,000
27.	New Groundwater Infiltration Basin Excavation	2500 CY	$10	$25,000
28.	Painting	1 LS	$50,000	$50,000
29.	Misc. Metals	1 LS	$130,000	$130,000
30.	Odor Control System Expansion	1 LS	$300,000	$300,000
31.	Replace Sludge Dump Truck	1 LS	$200,000	$200,000
32.	Landscaping	1 LS	$35,000	$35,000
33.	Mechanical/Yard Piping/Vaults/Etc.	1 LS	$1,035,000	$1,035,000
34.	Electrical and Instrumentation	1 LS	$2,850,000	$2,850,000

Subtotal.....$12,969,000
Construction Contingency (20%).....$ 2,594,000
Subtotal.....$15,563,000
Washington State Sales Tax (8.7%).....$ 1,229,000
Total Estimated Construction Cost.....$16,792,000
Engineering, Administrative & Legal Services (25%).....$ 4,198,000
TOTAL ESTIMATED PROJECT COST.....$20,990,000
Note: Costs are in 2014 dollars.

TABLE 5-11

Carlsborg WRF (MBR) Estimated Annual O&M Costs (Buildout Design Year)

Item	Quantity		Unit Price	Cost
Labor	3.5	FTE	$100,000	$350,000
Electrical Power	2,912,924	kWh	$0.097	$283,000
Maintenance and Repair	$15,563,000	Constr. Cost	1.0%	$156,000
Membrane Replacement Reserves	1/20	year	$388,000	$19,000
Miscellaneous (Lab, Chlorine, etc.)	1	LS	$35,000	$35,000
Groundwater Monitoring	1	LS	$10,000	$10,000
Lime for Biosolids Treatment	89,040	lbs	$1.35	$120,000
Administration and Permitting	1	LS	$20,000	$20,000
Total				**$993,000**

Note: Costs are in 2014 dollars.

SEQUIM ALTERNATIVE

In this section, treatment of Carlsborg wastewater under the Sequim Alternative is evaluated. With implementation of the Sequim Alternative, Carlsborg wastewater would be conveyed to the Sequim collection system (as discussed in Chapter 4), and the wastewater treated to reclaimed water standards at Sequim's Water Reclamation Facility (WRF). This section includes a description of the existing WRF and an evaluation of its performance in meeting NPDES permit requirements. Current and projected influent flows and loadings to the City of Sequim WRF from Sequim and Carlsborg are discussed relative to permitted WRF capacity. Carlsborg's financial responsibility for WRF improvements is estimated based on share of equivalent residential units (ERUs). Planned WRF improvements and planning-level cost estimates are described, based on the City of Sequim *Draft General Sewer Plan* (Gray & Osborne, 2014).

SEQUIM WRF DESCRIPTION

Sequim WRF History

A wastewater treatment facility was constructed at the current site of the City's Water Reclamation Facility (WRF) in 1966, and further expanded in 1983. In September 1994, the City of Sequim signed a Settlement Agreement with the Departments of Ecology and Fish and Wildlife, ending several years of contention over extension of the City's wastewater effluent outfall and the closure of valuable shellfish beds decertified by the outfall. As part of that agreement, the City agreed to upgrade its secondary treatment facility to a one that is capable of producing Class A reclaimed water. The City also agreed to investigate alternatives for reuse of the reclaimed water.

Construction of the treatment facility upgrade was initiated in the spring of 1997. This upgrade included the addition of a coagulation/filtration process as well as conversion of the disinfection system to ultraviolet light. As a result of this and subsequent upgrades, the facility is now producing Class A reclaimed water. The Class A WRF was completed and began full operation in April 1998.

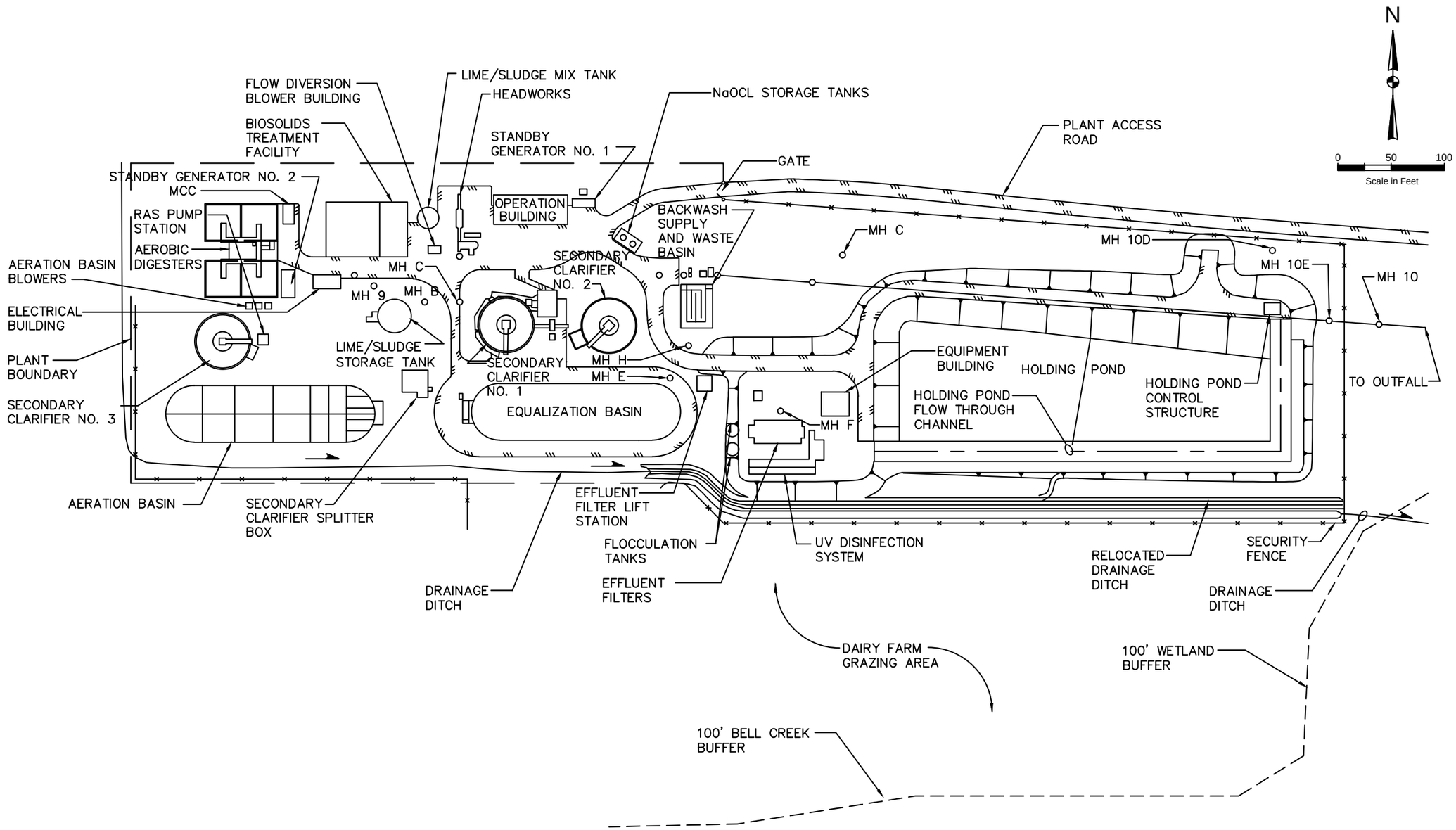
In April 1997, the Washington State Legislature provided a special funding appropriation for five water reuse "demonstration" projects. The City of Sequim received $3.4 million of this appropriation to implement its water reuse program. The legislation required the City to develop a program that accomplished several goals. The City was required to complete construction of its WRF, and to make progress towards 100 percent reuse of reclaimed water produced at the WRF. The legislation also required the water reuse program to improve streamflows in the Dungeness River and provide a sustainable water supply for irrigation purposes.

As part of the water reuse program, a Reuse Demonstration Site was developed on a 29-acre parcel of land located directly north of Carrie Blake Park in eastern Sequim. Reclaimed water is used at the demonstration site with four types of landscape irrigation, for streamflow augmentation to Bell Creek or the irrigation diversion, and for toilet flushing in the Interpretive Center. The irrigation systems demonstrate the effect of reclaimed water on a variety of irrigation equipment and plant types. Reclaimed water from the WRF is provided to two yard hydrants at the Sequim WRF site, to the City Shops facility for truck filling or local use, and to a landscape irrigation system along Sequim Avenue.

By 2007 the WRF was nearing its loading capacity, and planning began for a capacity expansion, as recommended in the 2007 *WRF Expansion Engineering Report*. The 2009 WRF expansion project increased the maximum month Class A water reclamation capacity from 0.80 mgd to 1.67 mgd. The existing oxidation ditch was converted to a new equalization basin, an existing equalization basin was converted into a new aeration basin, a new secondary clarifier was constructed and new disc filtration and ultraviolet disinfection systems were provided. Due to the upgrades in reliability and pathogen removal provided by the WRF expansion, the Washington State Department of Health concluded that the existing shellfish closure zone would not require enlargement, despite a doubling of flow capacity.

Sequim WRF Description

A site plan showing the existing Sequim WRF is shown in Figure 5-5. Figure 5-6 shows the existing process schematic for the WRF, while Figure 5-7 shows the current hydraulic profile. The WRF liquid stream treatment processes include influent screening, grit removal, biological treatment, secondary settling, coagulation, filtration, and ultraviolet disinfection. Solids treatment facilities to generate Class A biosolids using alkaline stabilization and a heated screw press were constructed in 2003. These individual process components are discussed below.



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CARLSBORG WASTEWATER FACILITIES
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FIGURE 5-5
EXISTING SEQUIM WRF SITE PLAN

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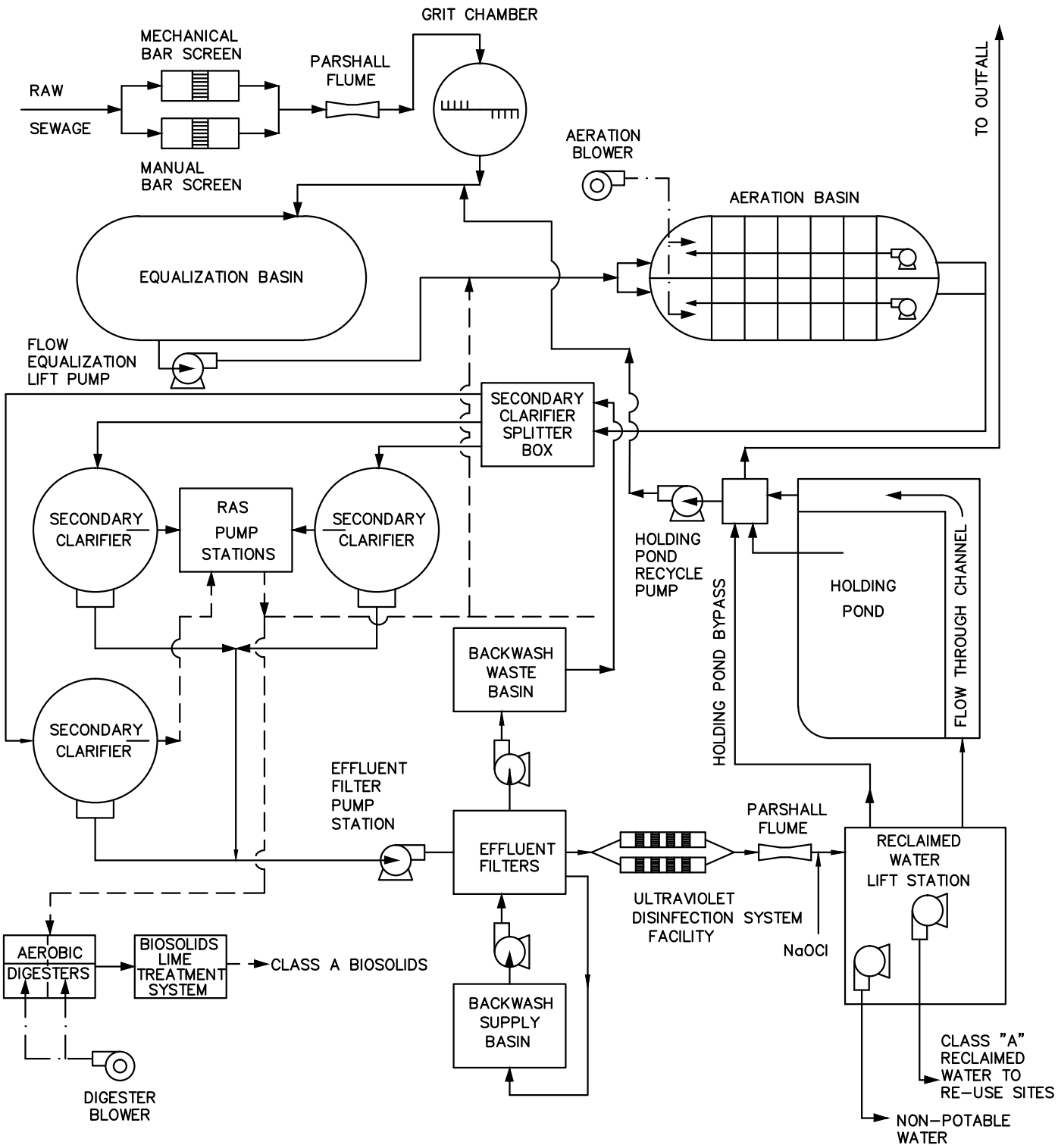
L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\Figure 5-5 - Ex Site Plan.dwg, 6/20/2014 9:04:45 AM, mnagel



LEGEND:

LIQUID PROCESS STREAM

SOLIDS PROCESS STREAM

AIR STREAM

CLALLAM COUNTY

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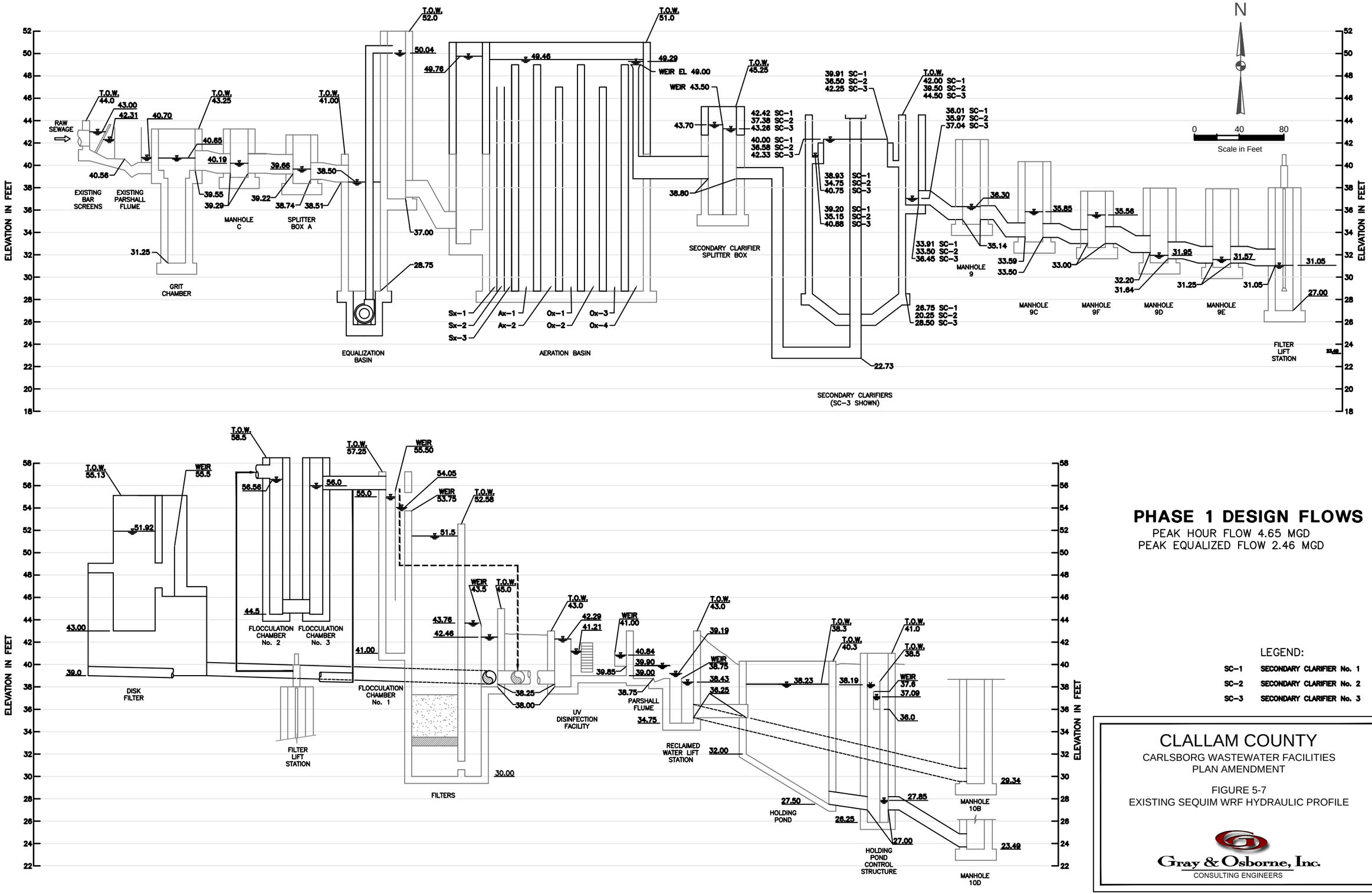
FIGURE 5-6
EXISTING SEQUIM WRF PROCESS SCHEMATIC

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\Figure 5-6 - Process Schematic.dwg, 6/19/2014 3:54:24 PM, mnagel



PHASE 1 DESIGN FLOWS

PEAK HOUR FLOW 4.65 MGD
PEAK EQUALIZED FLOW 2.46 MGD

LEGEND:

SC-1	SECONDARY CLARIFIER No. 1
SC-2	SECONDARY CLARIFIER No. 2
SC-3	SECONDARY CLARIFIER No. 3

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FIGURE 5-7
EXISTING SEQUIM WRF HYDRAULIC PROFILE

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L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\FIGURES\Figure 5-7 - Hydraulic Profile.dwg, 6/19/2014 3:56:53 PM, mnagel

Headworks

The existing headworks equipment includes a mechanical fine screen and grit removal facilities. The screen is a rotary screw type with 1/4-inch openings and an integrated washer/compactor with a rated peak capacity of 5.3 mgd. This screen removes and washes screenings with good performance and minimal maintenance. Once every 1 to 2 weeks, debris must be removed from the sump upstream of the screen. The headworks also contains an overflow gate to control flow into bypass screening channel equipped with a mechanically-cleaned bar rack with 3/4-inch openings.

An influent Parshall flume for flow measurement and an influent composite sampler are located at the headworks.

The grit removal facilities include a single vortex unit (Pistagrit-style) with an airlift grit pump, blower and a grit classifier tank. The grit removal facilities have a rated peak hour flow capacity of 4.8 mgd.

Equalization Basin (EQB)

In the 2009 WRF Expansion, an oxidation ditch was converted into an equalization basin. The new EQB provides approximately 700,000 gallons of storage and serves to attenuate changes in flow to the plant for a peak equalized flow rate of 2.46 mgd. Equalized flow is pumped from the EQB to the EQB outlet box by two 20-hp submersible pumps. An 18-inch pipe connects the EQB outlet box and the aeration basin influent box.

To maintain solids in suspension, the equalization basin uses two 7.5-hp floating/aspirating submersible mixers (one out-in-service in 2014), and two 10-hp floating brush aerators.

Aeration Basin

In the 2009 WRF Expansion, the former equalization basin was converted into an aeration basin with a volume of 1,350,000 gallons. The basin consists of two trains, each with three selector zones, two anoxic zones, and four aerobic zones in series. The aeration basin operates in a Modified Ludzack-Ettinger (MLE) configuration for biological nitrogen removal. Suspended microbial growth in the two parallel trains removes organic pollutants, ammonia nitrogen, and nitrate nitrogen from the wastewater. The treatment trains are designed to nitrify (biologically oxidize ammonia to nitrate) in the aerobic zones and denitrify (biologically reduce nitrate to nitrogen gas) in the anoxic zones, by utilizing internal recycle pumps to transfer nitrates produced in the aerobic zones back to the anoxic zones.

Influent wastewater is combined with return activated sludge (RAS) to create the mixed liquor that enters the aeration basin. Mixed liquor entering each treatment train first passes through the selector zones, which promote the development of a floc with good settling characteristics. Mixing of the selector zones is accomplished with coarse bubble diffusers while the anoxic zones are mixed using submersible mechanical mixers. Aeration of the aerobic zones is accomplished using an air distribution system consisting of four aeration blowers and submerged fine bubble diffusers. Submersible propeller pumps recirculate nitrified mixed liquor from the aerobic zones back to the selectors and anoxic zones to achieve denitrification.

Secondary Clarifiers

Mixed liquor from the aeration basin flows to the secondary clarifier splitter box. The splitter box directs flow to any of the three existing secondary clarifiers, and is designed to accommodate a fourth clarifier in the future. The splitter box is mixed with a vertical, slow speed mixer to prevent solids settling.

The WRF has three secondary clarifiers. Clarifier 1 has a diameter of 50 feet and a sidewater depth of 13 feet. Clarifier 2 has a diameter of 50 feet and a sidewater depth of 16.3 feet. Clarifier 3, constructed during the 2009 WRF Expansion, has a diameter of 50 feet and a sidewater depth of 14 feet. Per State reliability standards for water reclamation, the facility was designed to treat the design flow with one clarifier out of service.

RAS/WAS Pump Stations

Return activated sludge (RAS) is recycled from the bottom of the secondary clarifiers to the aeration basin splitter box by the RAS/WAS pumps, located at the RAS/WAS Pump Stations. There are six existing RAS/WAS pumps which convey RAS to the aeration basin, and WAS to the digester.

RAS/WAS Pump Station No. 1 serves Clarifiers No. 1 and No. 2, and utilizes two 5-hp self-priming pumps. RAS/WAS Pump Station No. 2, constructed in the 2009 WRF Expansion, serves Clarifier No. 3, and uses two 7.5-hp self-priming pumps.

Coagulation and Filtration Facilities

Two filtration systems are provided to remove additional suspended solids following secondary clarification. The original effluent filter, installed in 1998, consists of four cells containing 5-foot depth of anthracite media. The capacity of each cell is 0.62 mgd, so there is sufficient capacity to filter a peak equalized flow of 1.86 mgd with one cell out of service.

A fabric filter provides additional capacity beyond the 1.86 mgd that is provided by the anthracite filter. Four filter disks provide an additional capacity of 1.24 mgd (4 x 0.31 mgd) peak hour equalized flow. With one gravity anthracite cell offline, the nominal capacity is 3.10 mgd (1.24 mgd plus 1.86 mgd). With the 4-disc fabric filter offline, the capacity is 2.48 mgd.

The effluent filter pump station houses three 15-hp vertical turbine, variable speed pumps (two duty, one standby), with sufficient firm capacity to convey the peak equalized flow from the clarifiers to the filters (2.46 mgd).

Ultraviolet Disinfection System

The ultraviolet light (UV) disinfection system for the Sequim WRF was upgraded in the 2009 WRF Expansion in accordance with the National Water Research Institute/American Water Works Research Foundation (NWRI/AwwaRF) Guidelines for Drinking Water and Reuse (2003 edition), per Department of Health policy for Class A water reclamation.

The UV disinfection system includes six banks of 30 low-pressure high-intensity horizontal lamps each, in two open channels. One bank in each channel is redundant at the peak equalized flow of 2.46 mgd. At lower flows, fewer banks are needed, and the system can be operated with proportionately fewer banks energized. Operation with a single channel is possible during maintenance of the other channel. There is a Parshall flume for effluent flow measurement located downstream of the disinfection system.

Reclaimed Water Lift Station

A portion of the Class A reclaimed water is pumped into the City's reclaimed water distribution system, for transport to the Reuse Demonstration Site, the City Shops, and other use sites. The water is pumped from a wet-well downstream of the UV disinfection facilities by two 50-hp vertical turbine booster pumps with variable frequency drives.

If the reuse pump station is in use and an alarm condition occurs indicating that Class A standards are not being met (e.g., high turbidity), then the control system shuts down the pumps to prevent non-spec water from reaching the water reuse sites.

The City is in the process of developing additional reuse sites, and therefore, additional reuse pumping capacity will be necessary in the future. The reuse pumping capacity will be expanded when additional reuse sites are developed.

Water Reuse Facilities and Conveyance System

Reclaimed water is provided to the City Shops facility, to a landscape irrigation system along Sequim Avenue, Lofgrin Road and Washington Harbor Loop Road, and to the

Reuse Demonstration Site. The water reuse pipeline consists of a 2.54 mile trunk pipeline the runs from the WRF to the City Shop, a 0.46-mile branch line to the City's Reuse Demonstration Site and a 0.96-mile branch line to the U.S. 101 Highway Rest Area.

At the City Shop, reclaimed water is supplied to a fire hydrant for truck filling or local use, and can be stored in the City Shop detention pond.

The Reuse Demonstration Site is a 29-acre parcel of land located directly north of Carrie Blake Park, on the eastern edge of the City of Sequim. Reclaimed water is used at the demonstration site for landscape irrigation in four separate systems, streamflow augmentation to Bell Creek, and for toilet flushing in the Reuse Interpretive Center.

Outfall

Class A reclaimed water not pumped to the reuse system flows into the flow-through channel, which provides detention under plug flow conditions prior to discharge to the outfall. The City's NPDES permit allows discharge of Class A reclaimed water to two locations – the City's marine outfall in the Strait of Juan de Fuca and Bell Creek, in addition to other upland uses. The City's marine outfall consists of 18-inch concrete pipe terminating in a diffuser. The City's outfall was extended approximately 1,400 feet in 1997 to a total of 1,900 feet. The City's permitted outfall in Bell Creek is incorporated in the City's Reuse Demonstration Site, which is discussed below. A portion of the outfall pipe is in poor condition and needs to be replaced.

Holding Pond

The WRF includes a holding pond to store effluent that fails to meet permit limits. The pond includes the flow-through channel described above with a volume of 533,000 gallons and has a total volume of 2,680,000 gallons.

In the event an alarm condition occurs indicating that Class A standards are not being met (e.g., high turbidity), alarms will alert WRF operators to close the gate to the outfall at the end of the holding pond flow-through channel. Once this effluent gate is closed, the effluent is diverted into the holding pond which provides several days of storage. Once the alarm condition is resolved the effluent is again discharged to the outfall and the holding pond contents are pumped back to the head of the treatment plant. A constant-speed submersible recycle pump returns out-of-specification effluent to the headworks of the WRF.

Solids Treatment Digesters

Waste activated sludge (WAS) produced at the WRF are pumped to the aerobic digester by the RAS/WAS pumps. Digester sludge is then treated with the FKC lime stabilization/pasteurization/dewatering system to produce Class A biosolids.

The SunLand Water District delivers an average of 180 lb/day (1,400 gallons at 1.5 percent total solids) of WAS from the SunLand WRF for biosolids treatment at the Sequim WRF aerobic digesters.

Sludge is wasted from the secondary clarifiers to Digester Cells No. 1, No. 3 and No. 4. Each of the four aerobic digester cells is 100,000 gallons and contains a 25-hp floating mechanical surface aerator/mixer (one of the cells is equipped with two 15-hp aerator/mixers). These three cells may be decanted, in which the sludge is allowed to settle and clear supernatant is conveyed by gravity to the EQB. The remaining sludge is pumped to Cell No. 2 for additional digestion. Waste activated sludge is typically 1.0 to 1.2 percent solids entering the digester and 1.4 to 1.8 percent solids leaving the digester.

The digester is currently used to partially stabilize sludge, and is not operated with the intent of generating Class B biosolids. The digester does not have enough volume and aeration capacity to produce Class B biosolids for projected year 2030 sludge production. If the FKC Class A biosolids system is out of service for any extended period of time, the City would produce non-Class B biosolids, which would require the facility to haul liquid secondary waste sludge offsite for further treatment and disposal or reuse. The City's options are limited and costly when disposing of waste sludge that does not meet Class A regulatory criteria.

To provide redundancy and increased flexibility in long-term biosolids management, it is recommended that aerobic digestion system be upgraded to produce Class B biosolids upstream of the existing FKC process. The recommended upgrades include the installation of aeration blowers and diffusers in all digester cells for aeration and mixing, installation of a sludge thickener and constructing new aerobic sludge digester cells.

The digester upgrades will be implemented in at least two phases. In the first phase, scheduled for 2015, fine bubble diffusers, blowers, variable frequency drives and instrumentation will be installed to improve energy efficiency and aeration capacity. In the second phase, a third aeration blower, a rotary sludge thickener (for thickening WAS to 3.5 to 4.0 percent solids) and additional digester cells will be added. An additional 192,000 gallons will be provided in order to provide 60 day detention at 15 degrees C and meet Class B criteria. (It is recommended that two additional 100,000-gallon cells be constructed adjacent to two of the existing cells to match existing cell volumes.)

Class A Biosolids Treatment System

The Class A system, provided by FKC, Inc., provides mechanical sludge dewatering, lime stabilization and heat pasteurization to achieve Class A pathogen reduction requirements and vector attraction requirements (Exceptional Quality biosolids). The biosolids are considered a safe soil amendment and can be given away to the public and/or land-applied with limited restrictions. The Class A biosolids are hauled approximately 5 miles for beneficial use at a farm near Blyn.

The partially digested sludge from the digester is transferred to the 40,000-gallon lime/sludge mix tank and into the sludge storage tank. Next, the sludge is pumped through a flocculation tank and on to the Rotary Screen Thickener. Polymer is added to the sludge just prior to entering the flocculation tank to agglomerate or flocculate the sludge so it can be thickened and mechanically dewatered. From the top of the flocculation tank, the sludge flows by gravity into the rotary screen thickener and then into the screw press where simultaneous dewatering and pasteurization occurs.

The City has modifications to the FKC system planned to improve performance.

Based on current production and future biosolids projections (including the sludge the City receives from SunLand), it is anticipated the City will need to add additional capacity for the FKC system by 2025. It is also anticipated that this expansion will include a second FKC system in a mirror image configuration with a second Screw Press, Rotary Screen Thickener, flocculation tank, boiler system, addition to the existing building, and ancillary equipment. Since the sludge would be thickened upstream of the digesters, new lime-sludge mix tanks would not be required, and the existing lime silo could be used.

Sequim WRF Permit

The City's NPDES /Reclaimed Water permit, No. WA0022349 was updated in 2013 and is attached as Appendix B. The City's current NPDES permit effluent limits are summarized in Table 5-12. The City's permit requires the treatment plant effluent to meet Class A reclaimed water treatment standards regardless of whether it is discharged to the outfall or pumped to the City's reuse facilities. The City is authorized to discharge to Bell Creek in Carrie Blake Park, the Strait of Juan de Fuca or to reuse sites. In case of extreme flow events (48 hours of flow greater than the maximum day flow) or catastrophic system failure (earthquake, lightning strike), the City is authorized to discharge secondary effluent-quality water through the marine outfall. Effluent not meeting Class A reclaimed water standards may not be pumped to the City's reuse facilities or discharged into Bell Creek under any conditions. Condition S.4. of the City's NPDES permit requires plan and schedule preparation to maintain adequate capacity when flows and loads to the WRF exceed 85 percent of design capacity.

TABLE 5-12

Sequim WRF NPDES Permit Limits

NPDES Permit Requirements		
Parameter	**Average Monthly**	**Average Weekly**
5-day Biochemical Oxygen Demand (BOD_5), Monthly average	30 mg/L[(1)] (200 lbs/day) or ≥ 85% Removal	45 mg/L (300 lbs/day)
Total Suspended Solids (TSS), Monthly average	30 mg/L[(1)] (200 lbs/day) or ≥ 85% Removal	45 mg/L (300 lbs/day)
pH	-	6.0 – 9.0
Parameter	**Average Monthly**	**Average Weekly**
Turbidity	2 NTU	5 NTU
Parameter	**7-day Median**	**Sample Maximum**
Total Coliform	2.2 MPN/100 mL	23 MPN/100 mL
Parameter	**Average Monthly**	**Sample Maximum**
Ammonia (as N)	3.3 mg/L avg. monthly	5.7 mg/L sample max.
Total Nitrogen, average monthly	10 mg/L	-
Dissolved Oxygen	-	Measurably Present
Criteria for Prevention of Facility Overloading		
Average Flow for the Maximum Month[(2)]	1.67 mgd	
Influent BOD_5 Loading for Maximum Month[(2)]	4,036 lb/day	
Influent TSS Loading for Maximum Month[(2)]	3,855 lb/day	

(1) Or 15 percent of the respective monthly average concentrations, whichever is more stringent.
(2) Limits in draft revised permit.

Sequim WRF Performance

Figures 5-8, 5-9 and 5-10 summarize WRF performance with regard to removal of Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), Ammonia Nitrogen and Total Nitrogen.

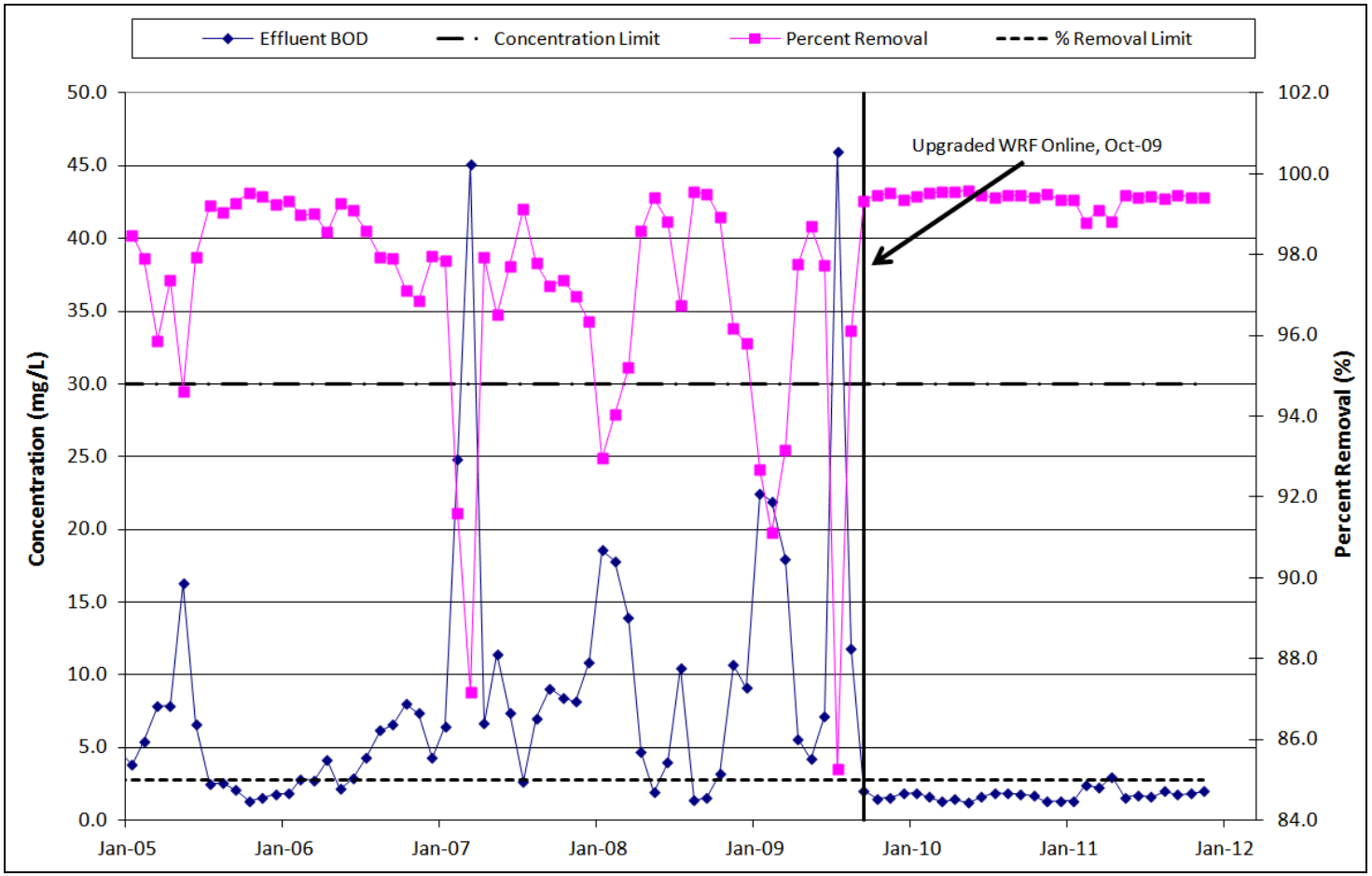


FIGURE 5-8

Sequim WRF Effluent BOD_5 Concentrations and Percent Removal

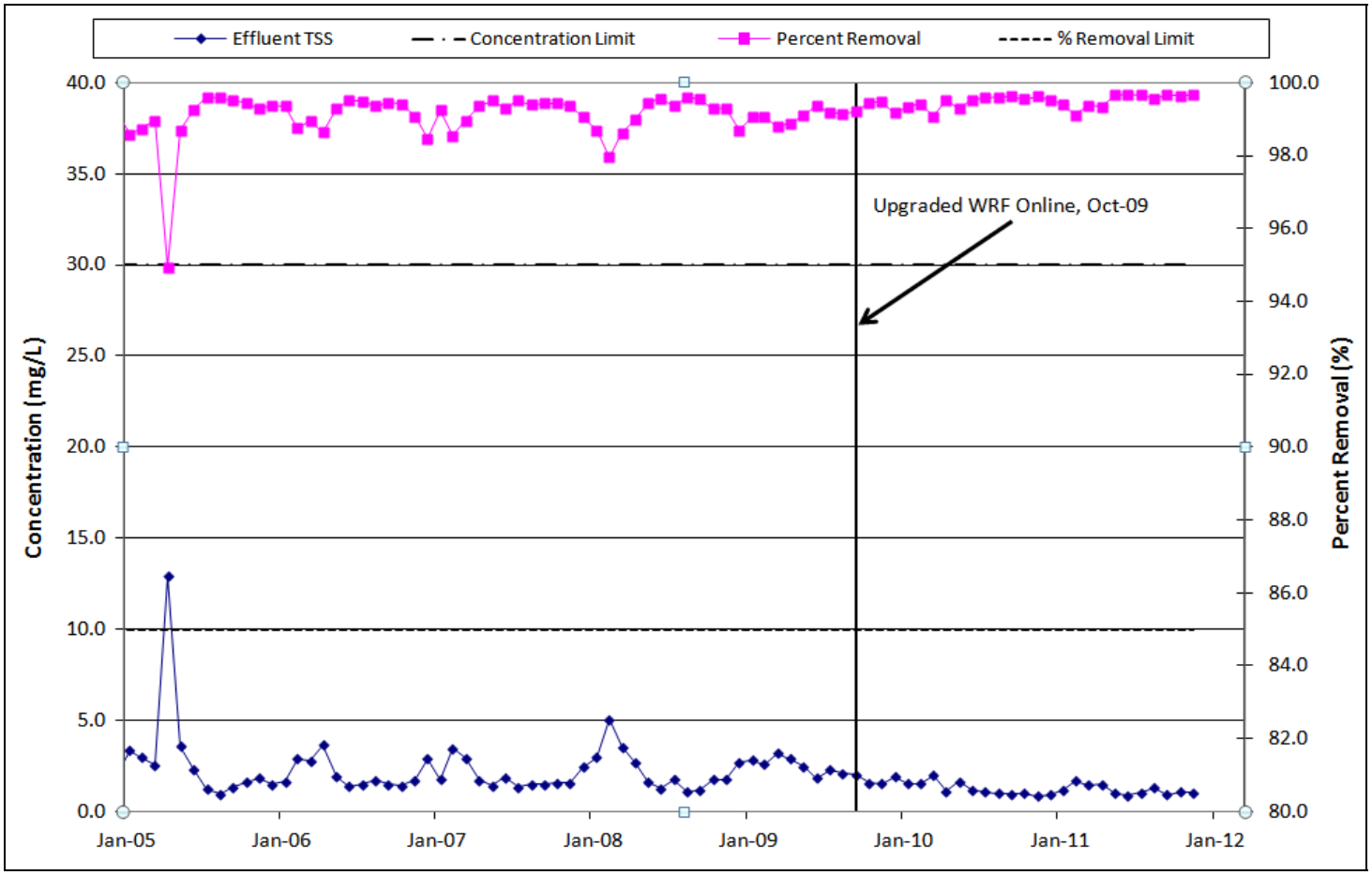


FIGURE 5-9

Sequim WRF Effluent TSS Concentrations and Percent Removal

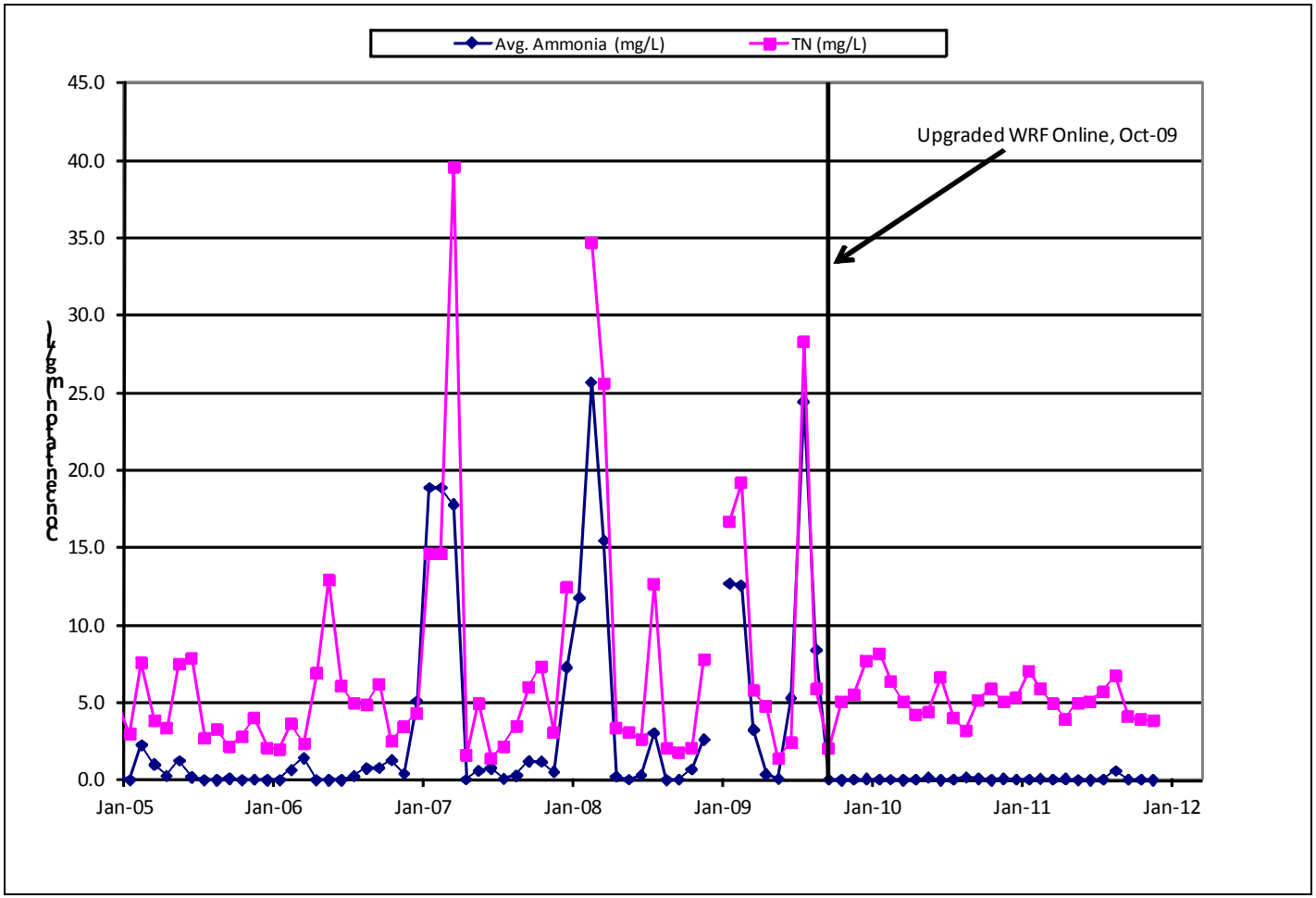


FIGURE 5-10

Sequim WRF Effluent Ammonia-N and Total Nitrogen Concentrations

As shown in these figures, removal of these constituents improved dramatically with the increase in WRF capacity provided by the 2009 WRF expansion. Although there were some violations prior to the completion of WRF expansion in October 2009, the WRF performance since that time has been excellent. The City of Sequim Water Reclamation Facility received the 2011 and 2012 "Wastewater Treatment Plant Outstanding Performance" award from Ecology for its track record of compliance.

CAPACITY OF SEQUIM WRF FOR CARLSBORG WASTEWATER

2030 Projections

For the 2030 planning period, Table 5-13 summarizes current and projected flow and loading rates from the Sequim sewer system and the proposed Carlsborg sewer system relative to current Sequim WRF NPDES-permitted capacity and design criteria. The Sequim flow and loading projections and WRF capital improvement plans are from the City of Sequim 2014*Draft General Sewer Plan*. The 20-year planning period for the *General Sewer Plan* was through 2032; projections were interpolated to estimate projected flow and loading rates for 2030.

TABLE 5-13

Current and Projected 2030 Sequim WRF and Carlsborg Sewer Flow and Loading Rates

Parameter	Sequim 2012	Sequim 2030	Carlsborg 2030	Sequim 2012 + Carlsborg 2030	Sequim 2030 + Carlsborg 2030	NPDES Permit Limitations and/or WRF Design Criteria
Annual Average Flow (mgd)	0.66	1.16	0.08	0.74	1.24	-
Maximum Month Flow (mgd)	0.86	1.39	0.10	0.95	1.49	1.67
Peak Day Flow (mgd)(1)	1.44	2.07	0.18	1.62	2.25	2.46
Peak Hour Flow (mgd)(1)	2.70	3.64	0.33	3.03	3.96	4.65
Maximum Month BOD_5 Loading (lb/day)	2,109	3,624	296	2,405	3,920	4,036
Maximum Month TSS Loading (lb/day)	1,949	3,349	333	2,282	3,682	3,855

(1) The WRF must equalize and fully treat peak hour flows for continuous compliance with reclaimed water standards. The historical peak day flow of 1.89 mgd, 30 percent higher than any other daily flow from 2007-2011, was rejected as an outlier.

Figures 5-11 and 5-12 show the projected growth in maximum month influent flow and BOD with Carlsborg flows included. As shown in Table 5-13, the Sequim WRF currently has sufficient capacity for the projected 2030 Carlsborg wastewater in addition

to the projected 2030 Sequim wastewater. However, the Sequim WRF is projected to exceed 85 percent of the NPDES-permitted flow and loading criteria prior 2030. The NPDES permit requires that when actual monthly average influent flow or loading to the WWTF exceed 85 percent of design criteria for 3 consecutive months, or if the City has projected increases in wastewater flow or loading that would cause exceedance of design capacity within 5 years, the City of Sequim must submit a plan and schedule to maintain adequate capacity to Ecology. The City may need to submit an additional plan and schedule to maintain adequate capacity to Ecology prior to 2032.

A financial plan addressing the Carlsborg capacity fee for connection to the Sequim sewer system for treatment at the Sequim WRF is addressed in Appendix H and summarized in Chapter 8. A capital improvement plan (CIP) for the years 2016 through 2030 is listed later in this chapter.

2050 Projections

Table 5-14 summarizes projected 2050 flow and loading rates from the Sequim sewer system and the proposed Carlsborg sewer system relative to current Sequim WRF NPDES-permitted capacity and design criteria. The Sequim 2050 flow projections are from the 2014 City of Sequim *Draft General Sewer Plan*. The Sequim 2050 loading projections were calculated using the projected equivalent residential units (ERUs) in the *General Sewer Plan* and the loading criteria from the *General Sewer Plan*: 0.3854 lbs BOD_5/day/ERU and 0.3562 lbs TSS/day/ERU.

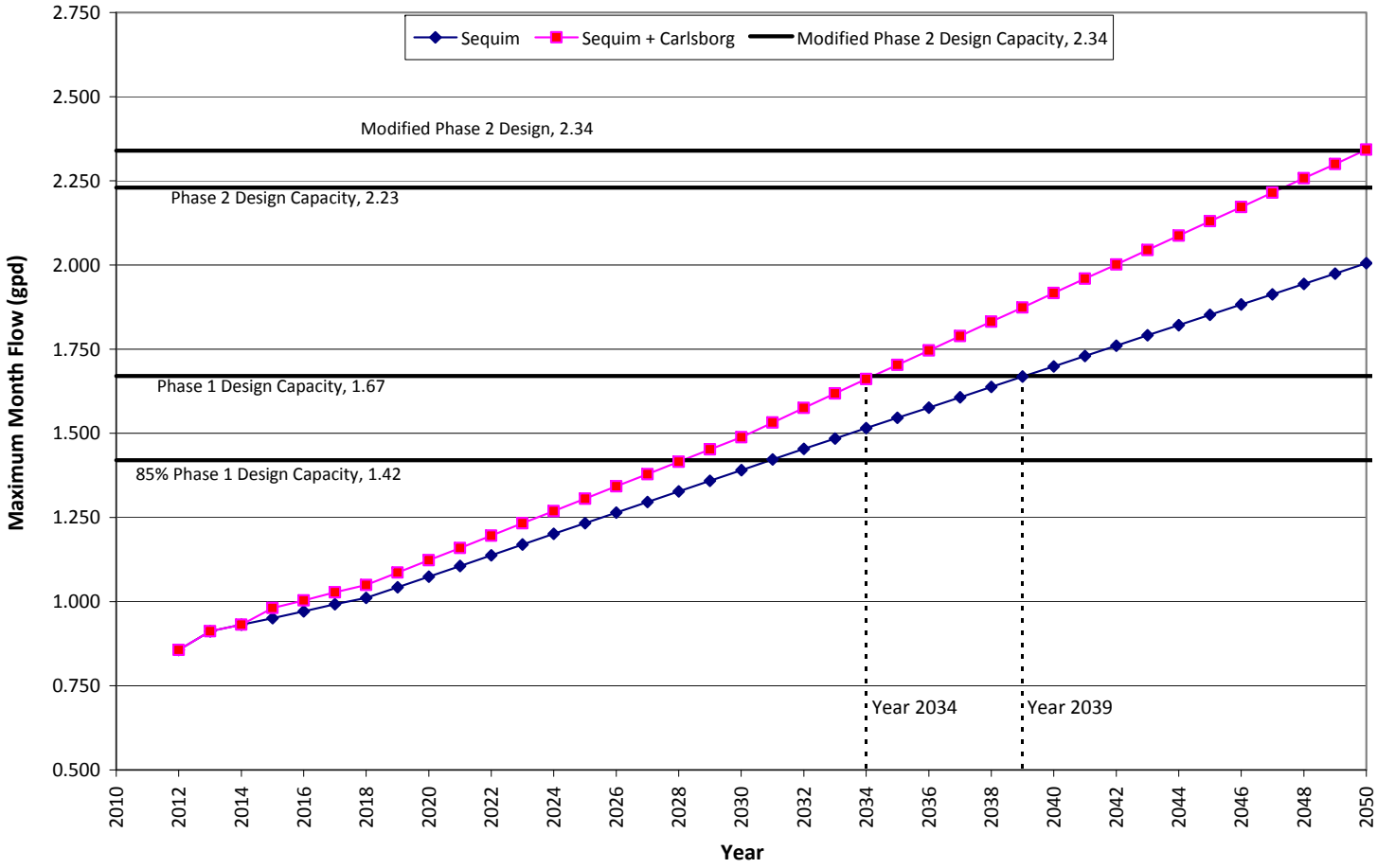


FIGURE 5-11

Effect of Carlsborg on Sequim WRF Maximum Month Flow Capacity

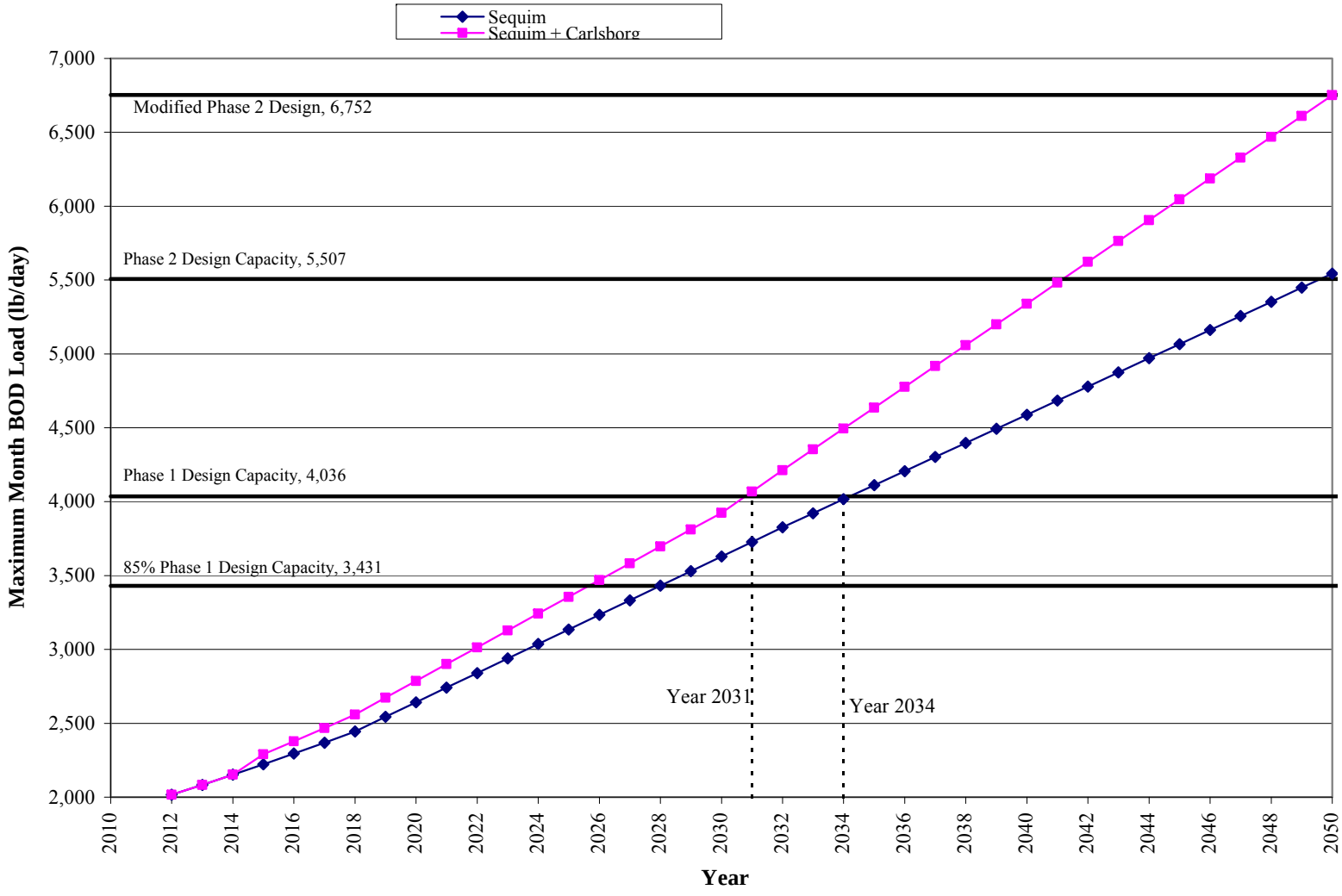


FIGURE 5-12

Effect of Carlsborg on Sequim WRF Maximum Month BOD_5 Loading Capacity

TABLE 5-14

Projected 2050 Sequim WRF and Carlsborg Sewer Flow and Loading Rates

Parameter	Sequim 2050	Carlsborg 2050	Sequim 2050 + Carlsborg 2050	NPDES Permit Limitations and/or WRF Design Criteria	WRF Design Criteria - Phase II Upgrade
Annual Average Flow (mgd)	1.73	0.31	2.04	-	2.033
Maximum Month Flow (mgd)	2.01	0.34	2.34	1.67	2.234
Peak Day Flow (mgd)(1)	3.43	0.48	3.92	2.46	3.158
Peak Hour Flow (mgd)(1)	4.73	1.11	5.84	4.65	5.77
Maximum Month BOD_5 Loading (lb/day)	5,544	1,208	6,752	4,036	5,507
Maximum Month TSS Loading (lb/day)	5,124	1,360	6,484	3,855	5,261

As shown in Table 5-14, the Sequim WRF does not currently have sufficient capacity for the projected 2050 Sequim wastewater, with or without addition of the projected 2050 Carlsborg wastewater. The *General Sewer Plan* describes a WRF Phase 2 Expansion that the City of Sequim would construct after 2032; the proposed design criteria are provided in Table 5-14 for comparison. The Phase 2 Expansion would be sufficient for the projected 2050 Sequim wastewater, but a larger expansion would be required to accommodate the projected 2050 Carlsborg wastewater, particularly for peak day flow, and BOD_5 and TSS loading rates.

The Sequim WRF Phase 2 Expansion described in the 2007 *Water Reclamation Facility Expansion Engineering Report* and the 2014 *Draft General Sewer Plan* would be modified to accommodate Carlsborg projected 2050 flow and loading rates. The components of the Modified WRF Phase 2 Expansion are summarized below. Figure 5-13 provides a site plan of the Sequim WRF including the Phase 2 Expansion components.

Headworks Improvements

Both of the existing mechanical fine screen channels will be required for the design peak hour flow rate. A third headworks screening channel must be constructed to house a bypass manual screen, for backup use in case either mechanical screen is out of service.

A second vortex grit removal chamber would be constructed to provide sufficient grit removal capacity at the design peak hour flow.

Convert the EQB into an Aeration Basin with an MLE Configuration

The existing equalization basin (EQB) will be converted to an aeration basin with an MLE configuration during Phase 2. A wall will be constructed down the center of the basin to create two treatment trains and each train will be equipped with submersible mixers and fine bubble diffusers to provide an additional treatment volume of 1.2 million gallons. The two parallel aeration basins will have a total volume of 2.55 million gallons, which is sufficient for treatment of the combined 2050 flow and loading rates. An aerobic SRT of 9.4 days at a mixed liquor suspended solids (MLSS) concentration of 4,000 mg/L will provide sufficient treatment capacity for nitrification, and anoxic zones totaling 340,000 gallons will provide sufficient volume for denitrification.

Install Aeration Blowers

It will be necessary to install two additional aeration blowers (one per train). There will be a total of five aeration blowers, each with a capacity of 850 scfm. Four blowers will provide sufficient aeration to treat the projected flows and loadings, and one blower will be redundant to fulfill Class I Reliability standards.

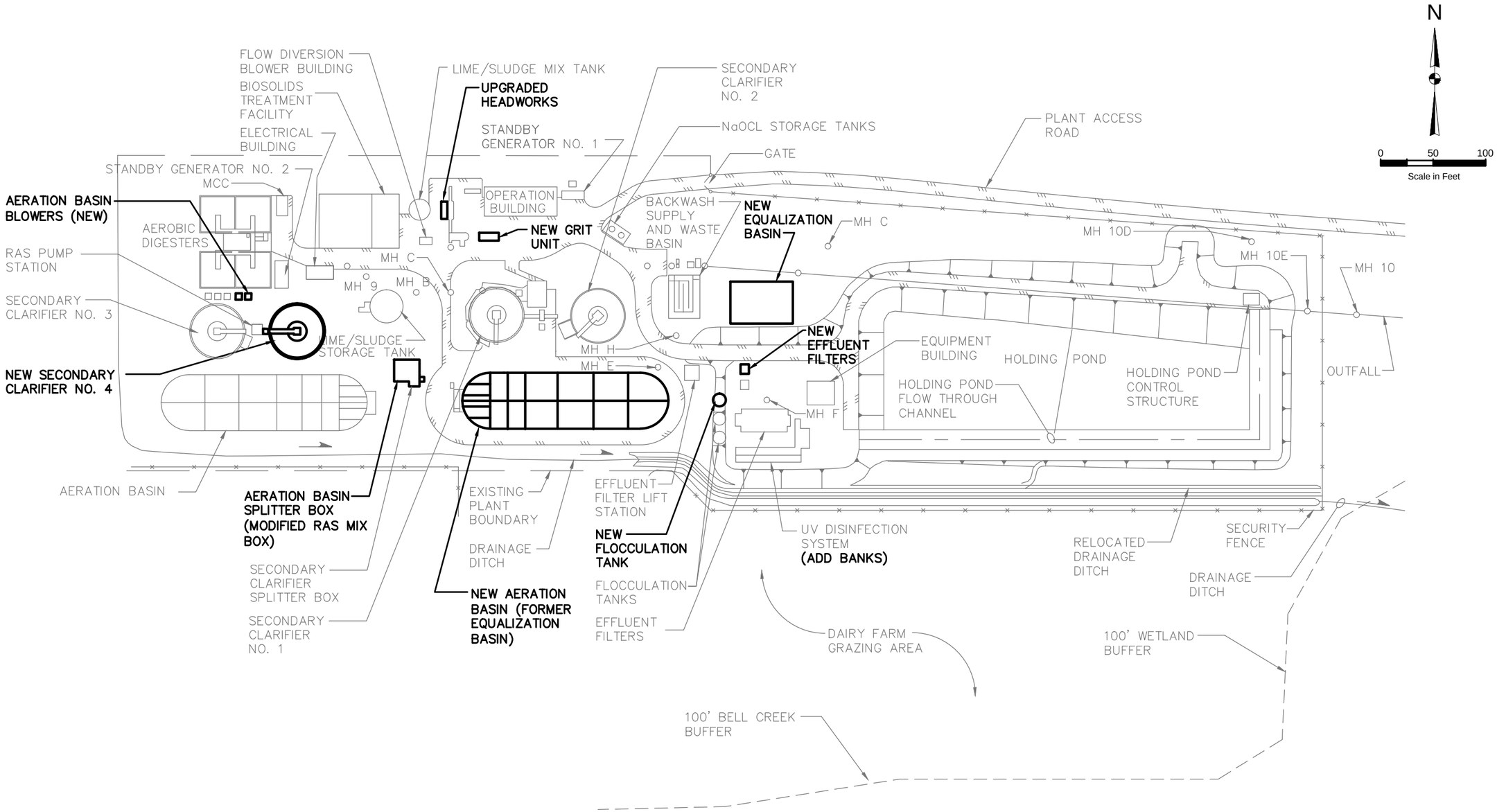
Construct a New EQB

The equalization basin would be converted to an aeration basin with an MLE configuration in Phase 2 to accommodate biological treatment of maximum month flows. As a result, a new equalization basin must be constructed. The new equalization basin constructed in Phase 2 would be designed to accommodate all flows in excess of the peak day flow. The volume of the new EQB would be 420,000 gallons. Assuming a mixing requirement of 0.04 hp per 1,000 gallons of storage (*Metcalf and Eddy, Fourth Edition, 2003*), the mixer motor size requirement for the total volume of the new EQB is 17 hp. Floating surface aerators would be provided to accommodate the variable water surface level; two 10-hp aerators would be installed. The energy requirement will be sufficient to prevent deposition of solids and maintain aerobic conditions.

It will be necessary to pump influent flow from the new EQB to the aeration basins. An equalization pump station will be constructed to accommodate the combined 2050 peak day flow rate (flows in excess of peak day flow would be stored in the EQB). Three 20-hp pumps would be provided (two duty; one standby).

Construct a New 50-Foot-Diameter Clarifier

A fourth 50-foot-diameter clarifier will be constructed in Phase 2 to accommodate projected buildout flows and loadings. Clarifier No. 4 will have a side water depth of 14 feet, and a total volume of 206,000 gallons and will be located directly east of Clarifier No. 3.



CLALLAM COUNTY

CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT

FIGURE 5-13
SEQUIM WRF SITE PLAN
MODIFIED PHASE 2 EXPANSION

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.03 - Carlsborg Collection System Design\Figures\Figure 5-13 - Expansion Plan.dwg, 4/24/2014 2:54:47 PM, pmarshall

Increase Effluent Filtration, Flocculation and UV Disinfection Capacity

Additional filter disks will be installed to provide sufficient capacity for the modified Phase 2 flows. One eight disk cloth filter will be installed (equipped initially with four disks) and one additional 12-foot-diameter circular flocculation tank will be installed to provide 20 minutes detention time for a maximum month design flow of 2.34 mgd. Additional banks of low pressure, high intensity lamps will be provided.

Solids Treatment

The digester and Class A biosolids treatment expansion projects included in the Sequim WRF for the 2016 to 2030 time frame will provide sufficient capacity for the projected 2050 Sequim and Carlsborg wastewater.

The estimated capital costs for the Sequim Modified WRF Phase 2 Expansion are presented in Tables 5-15. The financial plan in Appendix H and summarized in Chapter 8 summarizes future costs for the County for wastewater treatment and reclaimed water generation and use in Sequim, based on future projected flows and cost partitioning.

TABLE 5-15

Sequim Modified WRF Phase 2 Expansion Preliminary Project Cost Estimate

No.	Item	Quantity	Unit Price	Amount
1	Mobilization/Demobilization (8%)	1 LS	$570,000	$570,000
2	Bypass Screening Channel with Manual Bar Screen	1 LS	$50,000	$50,000
3	Grit Removal System	1 LS	$300,000	$300,000
4	Convert Existing EQB to AB	1 LS	$603,600	$604,000
5	Equalization Pump Station	1 LS	$210,000	$210,000
6	Construct a New EQB	1 LS	$200,000	$200,000
7	Aeration Diffusers	1 LS	$150,000	$150,000
8	Submersible Mixers	6 EA	$24,000	$144,000
9	Blower	2 EA	$54,000	$108,000
10	Construct New 50-Foot Dia. Sec Clarifier	1 LS	$600,000	$600,000
11	Internal Recycle Pumps	2 EA	$44,400	$89,000
12	RAS/WAS Pump Station	1 EA	$216,000	$216,000
13	Additional UV Lamp Banks	1 LS	$150,000	$150,000
14	Coagulation/Flocculation System	1 LS	$60,000	$60,000
15	Additional Filters	1 LS	$450,000	$450,000
16	Dewatering	1 LS	$90,000	$90,000
17	Site Work	1 LS	$345,000	$345,000

TABLE 5-15 – (continued)

Sequim Modified WRF Phase 2 Expansion Preliminary Project Cost Estimate

No.	Item	Quantity	Unit Price	Amount
18	Miscellaneous Metals	1 LS	$138,000	$138,000
19	Painting	1 LS	$207,000	$207,000
20	Mechanical/Yard Piping	1 LS	$850,000	$850,000
21	Electrical	1 LS	$1,560,000	$1,560,000

Subtotal .....$ 7,091,000
Construction Contingency (20%).....$ 1,418,000
Subtotal .....$ 8,509,000
Washington State Sales Tax (8.7%).....$ 732,000
Total Estimated Construction Cost .....$ 9,241,000
Engineering, Administrative and Legal Services.....$ 2,310,000
TOTAL ESTIMATED PROJECT COST $11,551,000
Note: 2014 Dollars.

Buildout Projections

Table 5-16 summarizes projected buildout flow and loading rates from the Sequim sewer system and the proposed Carlsborg sewer system relative to the Modified Phase 2 WRF Expansion project described above. The Sequim buildout flow and loading rate projections are from the 2014 City of Sequim *Draft General Sewer Plan*.

TABLE 5-16

Projected Buildout Sequim WRF and Carlsborg Sewer Flow and Loading Rates

Parameter	Sequim Buildout	Carlsborg Buildout	Sequim + Carlsborg Buildout	WRF Design Criteria - Modified Phase 2 Expansion
Annual Average Flow (mgd)	2.84	0.64	3.476	2.043
Maximum Month Flow (mgd)	3.04	0.68	3.713	2.343
Peak Day Flow (mgd)(1)	3.96	0.87	4.829	3.917
Peak Hour Flow (mgd)(1)	6.89	2.13	9.024	5.843
Maximum Month BOD_5 Loading (lb/day)	7,661	2,552	10,213	6,752
Maximum Month TSS Loading (lb/day)	7,080	2,871	9,951	6,484
Maximum Month TKN Loading (lb/day)	1,473	464	1,937	1,286

As shown in Table 5-16, the Sequim WRF after the modified Phase 2 expansion would not currently have sufficient capacity for the projected buildout Sequim wastewater, with or without addition of the projected buildout Carlsborg wastewater. The *General Sewer Plan* describes a buildout expansion project that would construct primary clarifiers and an anaerobic digestion system. With Carlsborg wastewater added to the sewer system, a higher capacity Sequim WRF Buildout Expansion project would be required after 2050.

The Sequim WRF Modified Buildout Expansion described in the 2014 Draft *General Sewer Plan* would be modified to accommodate Carlsborg projected buildout flow and loading rates. The Modified WRF Buildout Expansion is summarized below.

Additional WRF capacity beyond that provided in the Phase 2 expansion could be realized by construction of primary clarifiers and anaerobic digesters. Two circular primary clarifiers could be installed to remove settleable solids and grit from the screened wastewater, reducing solids and organic loading to the existing aeration basins. In the proposed anaerobic digesters, the organic material in mixtures of settled primary and waste activated sludge is converted biologically in the absence of oxygen to a variety of end products including methane (CH_4) and carbon dioxide (CO_2). The process is carried out in a heated, mixed, airtight reactor which receives primary sludge from the primary clarifiers and waste activated sludge from the secondary clarifiers. Sludge, introduced continuously or intermittently, is retained in the reactor for varying periods of time. Converting from the current aerobic digestion process to anaerobic digestion would reduce the amount of solids loading to the FKC biosolids treatment system; typical volatile solids reduction of 40 to 50 percent is achievable in anaerobic digesters. The stabilized sludge, withdrawn continuously or intermittently from the digester reactor, is reduced in organic and pathogen content, non-putrescible, and amenable for further treatment with the FKC lime stabilization-heat pasteurization process into a desirable Class A product. Biogas generated from the anaerobic digester could then be utilized as a potential heat source for the FKC boiler, or even a potential source of electricity through cogeneration.

The 2014 Draft *General Sewer Plan* provided an estimated cost for the WRF Buildout Expansion of $7 million (2011 dollars). The size and therefore cost of the new facilities is proportional to sludge loading. Per Table 5-16, the combined buildout BOD_5 loading rate from Sequim and Carlsborg is 33 percent greater that the rate from Sequim alone. The preliminary estimated project cost of the Modified WRF Buildout Expansion, in 2014 dollars, is $10,785,000.

RECOMMENDED SEQUIM WRF IMPROVEMENTS: 2016 TO 2030 PROJECTS

The following Sequim WRF projects are recommended for completion in the period from 2016 to 2030 in the 2014 City of Sequim *General Sewer Plan*.

Purchase Land Near WRF (W-6)
Estimated Cost: $195,000
Proposed Year: 2016

This project includes the purchase of land at the west and east ends of the existing WRF to provide space for future WRF expansion as well as a new biosolids handling and distribution center listed in Project W-8.

Class A Biosolids Distribution Center (W-7)
Estimated Cost: $1,320,000
Proposed Year: 2016 - 2019

This project will include construction of new facilities to increase public access to the Class A biosolids produced at the WRF. Facilities will include a large, covered area for biosolids storage, smaller holding areas for biosolids and various amendments, and a small area for public access and biosolids loading. Facilities will be designed to minimize odors and will include appropriate stormwater controls.

Aerobic Digester Capacity Upgrades (W-8)
Estimated Cost: $1,950,000
Proposed Year: 2016 (design)

This project will increase the capacity of the existing aerobic digestion system by adding additional tank space. It is anticipated that two new 100,000-gallon cells will be constructed with additional blowers and diffusers for aeration, and a rotary screen thickener will be provided to thicken WAS upstream of the digester.

WRF Headworks Modifications #2 (W-9)
Estimated Cost: $285,000
Proposed Year: 2019

This project will replace the existing HYCOR mechanical fine screen at the WRF headworks. The existing screen was installed in 1999 and will be nearing the end of its useful life. The unit will be replaced in kind with a new mechanical fine screen with integrated washer/compactor. Following its installation, this new screen will serve as the primary headworks screen.

Class A Biosolids Treatment System Capacity Upgrade (W-10)
Estimated Cost: $1,650,000
Proposed Year: 2025

This project includes installation of a second FKC system in a mirror image configuration with a second Screw Press, Rotary Screen Thickener, flocculation tank, boiler system, expansion of the existing building and ancillary equipment. Since the sludge would be

thickened upstream of the digesters, new lime-sludge mix tanks would not be required, and the existing lime silo could be used.

The following Sequim water reuse system capital improvement projects are recommended for 2016 through 2030 in the City of Sequim *Draft Reclaimed Water Plan*, (Skillings Connolly, 2011). The cost estimates presented in the *2011Reclaimed Water Plan* developed in December 2010 (ENR Construction Cost Index – 8,952) have been updated to April 2014 dollars (ENR Construction Cost Index – 10,145).

Rapid Infiltration Basin Improvements (RW-2)
Estimated Cost: $1,321,000
Proposed Year: 2019

This project consists of the construction of infiltration basins, flow control and distribution improvements, relocation of the existing storage/fish pond and miscellaneous site work at the Carrie Blake Park Reuse Demonstration Site. Two alternative distribution system methodologies were proposed. Alternative 1 would use low-pressure nozzles to distribute reclaimed water to the infiltration basins. The estimated cost of this project alternative is $1,114,000. Alternative 2 would use slotted/perforated pipe to distribute reclaimed water to the infiltration basins. The estimated cost of this project alternative is $1,321,000. The cost for Alternative 2 will be used in the development of the CIP and financing alternatives.

High Pressure Zone Expansion (RW-3)
Estimated Cost: $1,131,000
Proposed Year: 2019

This project consists of refurbishing the existing reservoir, construction of a booster pump station at the City Shops and installation of approximately 7,700 LF of 8-inch-diameter distribution system piping from the City Shop to the refurbished reservoir.

Overall Network Expansion (RW-4)
Estimated Cost: $2,732,000
Proposed Year: 2019+

This project consists of expansion of the current reclaimed water pipe network. The complete project would install approximately 23,100 LF of 6-inch and 13,600 LF of 8-inch distribution system piping to serve the following areas:

- South Blake Avenue Pipeline and East Maple Street Loop;
- North 2nd Avenue – North Sequim Avenue Pipeline;
- North 2nd Avenue – North 5th Avenue Pipeline;
- South 7th Avenue – Silberhorn Road Pipeline;
- South 7th Avenue – West Washington Street Pipeline;

- South 7th Avenue – South 9th Avenue Pipeline);
- West Washington Street – Priest Road Pipeline; and
- West Hemlock Street and West Maple Street.

WRF Reclaimed Water Pumping Facility Improvements (RW-5)
Estimated Cost: $582,000
Proposed Year: 2018-19

This project would continue the work performed in RW-1 and would reconfigure the reclaimed water pumping system at the WRF to utilize the potential storage of the existing flow through channel.

The financial plan in Appendix H and summarized in Chapter 8 presents the County's share of future costs for these improvements, based on the projected split in future flows.

RECOMMENDED SEQUIM WRF IMPROVEMENTS: 2031 TO 2050 PROJECTS

The Modified WRF Phase 2 Expansion project is recommended for completion in the period from 2031 to 2050. No other capital improvement plan projects have been identified for this period.

Modified WRF Phase 2 Expansion (W-11)
Estimated Cost: $11,551,000
Proposed Year: 2031

The Modified WRF Phase 2 Expansion project will expand the Sequim WRF to provide capacity for the projected 2050 wastewater from Sequim and Carlsborg. Detailed description and cost estimate are provided earlier in this chapter. The main components include a new equalization basin, conversion of the equalization basin into a second aeration basin, a fourth secondary clarifier and expanded filtration and disinfection facilities.

Future costs for the County for these improvements will depend on the future flow amounts relative to Sequim. The financial plan in Appendix H and summarized in Chapter 8 presents the County's share of future costs for these improvements, based on the projected split in future flows and cost partitioning assumptions.

RECOMMENDED SEQUIM WRF IMPROVEMENTS: PROJECTS AFTER 2050

The Modified WRF Buildout Expansion project is recommended for completion in the period after 2050. No other capital improvement plan projects have been identified for this period.

Modified WRF Buildout Expansion (W-12)
Estimated Cost: $10,785,000
Proposed Year: 2051

The Modified WRF Buildout Expansion would construct primary clarifiers and an anaerobic digestion system to expand the WRF capacity for treatment of Sequim and Carlsborg projected buildout flow and loading rates.

Future costs for the County for these improvements will depend on the future flow amounts relative to Sequim and cost partitioning assumptions.

REFERENCES

1. *Ultraviolet Disinfection Guidelines for Drinking Water and Reuse*, National Water Research Institute/American Water Works Research Foundation (NWRI/AwwaRF), 2003.

2. *City of Sequim Water Reclamation Facility Expansion Engineering Report*, Gray & Osborne, 2007.

3. *City of Sequim Draft Reclaimed Water Engineering Plan for Aquifer Recharge and Distribution System Expansion*, Skillings Connolly, April 2011.

4. *Carlsborg Wastewater Conveyance, Treatment, and Capital Cost Feasibility Study*, Gray & Osborne, 2011.

5. *City of Sequim Draft General Sewer Plan*, Gray & Osborne, 2014

CHAPTER 6

FUTURE WATER RIGHTS MITIGATION

In this chapter, the impact to water resources within the CUGA from the implementation of the Carlsborg Sewer Project (Sequim or Carlsborg Alternatives) and accompanying increased development within the CUGA is evaluated. This evaluation includes estimation of streamflow depletion caused by the increased development, and examining the role that reclaimed water could play in mitigating impacts to allow the future water needs for the CUGA to be met. Completion of this task will ensure a thorough evaluation of all costs for providing wastewater treatment for the CUGA.

The Clallam County PUD, the water purveyor for the CUGA, has determined that additional water rights will be needed to provide potable water service to the buildout populations for the entire CUGA. The PUD's original plan for providing sewer service to the CUGA included reuse of the reclaimed water generated at a WRF within the CUGA for irrigation and outdoor water use along Carlsborg Road, fire training and infiltration in percolation ponds. Treatment and reuse of the CUGA wastewater at the Sequim WRF, the Sequim Alternative, will have an impact on the potential for reuse of the reclaimed water in the CUGA.

An evaluation of the impacts to groundwater of reuse/disposal of treated effluent for both the Sequim and Carlsborg Alternatives is particularly relevant for this Amendment to achieve compliance with the March 2013 Interlocal Agreement between the PUD and the County. The Interlocal Agreement included a requirement for the County to address future water supply needs and evaluate the future water right mitigation costs that may be incurred to supply future water customers in the CUGA through full-buildout. This chapter evaluates whether routing the wastewater to Sequim for possible reclamation outside of the Carlsborg area would result in increased costs associated with securing additional water rights to meet buildout water demands in the CUGA.

Pacific Groundwater Group (PGG) has prepared several Technical Memoranda which estimate the amount of additional water rights that may be required for buildout demand in Carlsborg and present potential mitigation requirements and remedies. The Technical Memoranda, included in Appendix A, include the following:

- Task 2A Technical Memorandum, Carlsborg Water Demand and Future Water Rights, February 24, 2014;

- Task 2B Technical Memorandum, Identification of Possible Mitigation Approaches for Future Carlsborg Water Rights, February 28, 2014; and

- Draft Task 2D Technical Memorandum, Mitigation for New Carlsborg Water Rights and Representative Scenarios for Due Diligence Cost Analysis, June 17, 2014.

The information provided in this chapter is taken directly from the PGG Technical Memoranda.

Ecology's adoption of WAC 173.518, the Dungeness Water Rule, and the Dungeness River management program means that there will be mitigation costs associated with any proposal to secure additional water rights. Mitigation can come from a variety of sources such as the acquisition and subsequent donation of existing water rights into the State's Trust Water Program, purchase of mitigation credits from the Dungeness Water Bank (DWB) and the infiltration of reclaimed water for the purpose of instream flow enhancement. Since removing a potential source of recharge (reclaimed water) could complicate mitigation options for the PUD's future water supply, it is important to assess the mitigation options and relative costs.

CURRENT WATER RIGHTS

The PUD currently holds water rights in the amount of 467.6 acre-feet and 461 gpm for three sources of supply – the main Carlsborg well and two wells associated with Sequim Valley Tracts. The depth of the wells range from 163 feet to 298 feet. The wells are considered to be in the middle aquifer. The current water rights are adequate to supply approximately 2,228 equivalent residential units (ERSs) based on the annual allocation (Qa) of 467.6 acre-feet and an average day demand (ADD) of 186 gallons per day per ERU (gpd/ERU).

CURRENT AND PROJECTED FUTURE WATER USE

The PUD water system currently supplies 379 ERUs (residential and non-residential) and used approximately 67 acre-feet in 2012. The limiting factor for the number of connections this system can supply appears to be due to infrastructure limitations, specifically well production capacity and storage capacity. It appears that existing infrastructure can only satisfy the demand of 669 ERUs (approximately 139 acre-feet/year) which is 30 percent of its maximum annual water right capacity. The existing water rights are adequate to supply approximately 2,343 ERUs based on the annual allocation (Qa) of 467.6 acre-feet and an ADD of 178 gpd/ERU. The instantaneous allocation (Qi) of 461 gpm associated with these rights reduces the number of connections that can be supplied to 1,239 ERUs based on a MDD of 536 gpd/ERU (2010 *Water System Plan*).

Future water demand forecasts were generated for both the existing service area, limited to a portion of the CUGA, and for an expanded service area which would supply the full CUGA.

Approximately one-half of the expanded service area discussed above falls outside of the PUD's current local utility district water service area but within the UGA. There are currently four moderately sized private water system located in this area – Parkland, Green Acres Mobile, KEVCA and Carlsborg Mobile. The combined water systems serve approximately 250 homes and for the most part hold water rights that are adequate for their needs. The combined water rights of the four private water systems is 95.2 acre-feet. It is assumed that the full-build out service area includes these water systems and the service to these locations would include a transfer of water rights to the PUD.

Estimated future water demand was extracted from the PUD's 2010 *Water System Plan* and from growth information provided in the Carlsborg Sewer Feasibility Study. Approximately 110 ERUs at full-buildout are assumed to have existing wells. This analysis assumes that their permit exempt water rights can be consolidated into the PUD's new water right. In addition, this analysis does not include the ERUs served by the four private water systems discussed above. Future ERU, ADD and annual allocation estimates are shown in Table 6-1.

TABLE 6-1

Carlsborg Water System Demand Forecast
(Table 1, PGG Task 2A Technical Memorandum, Appendix A)

	Year				
Existing Service Area	**2010**	**2016**	**2030**	**Full Buildout w/o Sewer**	**Full Buildout w/Sewer**
Equivalent Residential Units (ERUs)	387	440	592	980	2,928
Average Day Demand (ADD) gpd	68,886	78,320	105,376	174,440	521,184
Annual Water Use (AF/Yr)	77.22	87.80	118.13	195.55	584.24
Existing Water Right (AF/Yr)	467.60	467.60	467.60	467.60	467.60
Additional PUD Water Rights Required (AF/Yr)	None	None	None	None	116.64
Expanded System with Full UGA					
Equivalent Residential Units (ERUs)	651	1,230	2,116	NR	4,618
Average Day Demand (ADD) gpd	115,878	218,898	376,662	NR	822,004
Annual Water Use (AF/Yr)	129.81	245.38	422.23	NR	921.46
Existing Water Right (AF/Yr)	467.60	467.60	467.60	NR	467.60
Additional PUD Water Rights Required – assuming Private Well Consolidation (AF/Yr)	None	None	None	NR	416.86

NR – Not Relevant

The PUD's existing annual water right allocation is adequate to meet full buildout in the existing service (based on ADD), and is adequate to meet the projected water demand for the expanded service area beyond 2030. However, the PUD's existing annual water rights could only meet approximately 50 percent of the ADD in the expanded service area at full buildout.

STREAMFLOW DEPLETION AND MITIGATION REQUIREMENT

A new groundwater right in the Carlsborg vicinity will likely require construction of a new production well. The WRIA 18 Water Resources Management Program (WAC 173-518) requires that new consumptive water rights be mitigated so they are water-budget neutral.

The impact of additional water rights for the CUGA will depend on the location of withdrawal and the aquifer the water is taken from. PGG reviewed geologic logs for the PUD's current Carlsborg (LUD #10) supply well, the Idea Place Deep Monitoring Well (0.4 mile to the north) and a hydrogeologic cross section constructed by the USGS that runs north-south through this vicinity. PGG's review suggests that all three major aquifers (shallow, middle, and deep) are likely to occur in the Carlsborg vicinity. PGG assessed the impact of additional water withdrawal on local water bodies assuming water was withdrawn from either the middle or deep aquifer.

As noted in the 2012 *Sewer Facilities Plan*, the soil stratigraphs underlying Carlsborg and the Dungeness River valley are found with varying unit thicknesses, elevations, and permeabilities and consist of multiple strata with varying permeability. Groundwater is able to move up and down from one aquifer to another through the various aquitards at varying rates. Likewise, some stretches of the Dungeness River gain water inflow from the Unit 1 surface aquifer while other river stretches lose water into the aquifer. Matriotti Creek behaves similarly. Seasonal variations also occur as the groundwater levels rise and fall.

Streamflow depletion associated with pumping from a new groundwater right sourced from the middle or deep aquifer in the Carlsborg area appears to present an achievable mitigation requirement based on simulations with the 2008 Dungeness Model (PGG, 2008) and reasonable assumptions about water use and water treatment efficiency. The 2008 Dungeness Model is a tool to quantify and simulate groundwater movement through the basin and subbasins at a regional scale. The Dungeness groundwater model simulates the groundwater conditions in the Dungeness River basin and is used to predict the depletion to surface waters caused by withdrawal for the middle and deep aquifers as well as predict the impact of groundwater recharge on instream flows.

The estimated mitigation profile appears achievable because: (1) the available quantity of the primary mitigation resource (reclaimed water) exceeds the predicted streamflow depletion volume; (2) the relatively steady, year-round availability of reclaimed water is

a good match for the low seasonal variability of streamflow depletion predicted by the model; and (3) the predicted distribution of depletion among streams is also reasonably achievable (with some caveats for very small impacts to distant streams). These three components of the mitigation requirement (quantity, timing and distribution) are discussed in more detail below.

QUANTITY OF STREAMFLOW DEPLETION

The 2008 Dungeness Model predicts that the streams protected under WAC 173-518 would be depleted by 60.4 percent of the average pumping rate for a well located in the Carlsborg area completed in the middle aquifer and 24.6 percent of pumping rate for a well completed in the deep aquifer.

The impact of pumping from the middle or deep aquifer, and the efficacy of mitigation at specific locations, within the Sequim/Carlsborg area is dependent upon the connectivity of the major aquifers in the area. Three major aquifers occur within the Sequim/Carlsborg area: (1) the upper (water table) aquifer; (2) middle (upper artesian) aquifer; and (3) a deep (lower artesian) aquifer. Perched seasonal aquifers are also known to occur due to local irrigation practices.

Upper Aquifer

The thickness of the upper (water table) aquifer ranges from 50 to 200 feet. The aquifer is generally unconfined but does exhibit localized confinement beneath fine-grained sediments. The general flow direction of this aquifer is towards the north and northeast (PGG, 2009).

Middle Aquifer

The middle (upper artesian) aquifer ranges from 10 to 70 feet thick and contains pre-Vashon glacial outwash deposits of sand and gravel and coarse-grained interglacial deposits. This confined aquifer contains fewer wells than the upper aquifer and flow generally fans out radially beneath the Sequim-Dungeness Peninsula with northeasterly flow in the vicinity of the City.

The middle aquifer is overlain by an upper confining bed, composed of quaternary silts and clays, which varies in thickness from 25 feet in the southeast to 150 feet below Sequim Bay. The middle aquifer is not continuous throughout the entire area. It varies in thickness from “several feet” to more than 120 feet. Little is understood about its flow characteristics. It is believed that, like the water table aquifer, the general direction of flow is toward the northeast, but flows are not affected by area surface waters as much as they are with the upper aquifer.

Deep Aquifer

The deep (lower artesian) aquifer is overlain by a lower confining bed that is discontinuous, but ranges in depth from 10 to 180 feet. Little is known about the deep aquifer, however, lateral groundwater movement is thought to be similar to the upper aquifers and it has been postulated that upward movement through the lower confining bed occurs. Groundwater in the lower aquifer is confined.

Connection between Surface Water and Groundwater

Studies by the USGS have determined a connection exists between surface water and groundwater in the Sequim area (PGG, 2009). Groundwater recharge to the upper aquifer was estimated to be from precipitation and irrigation seepage. Recharge to the upper aquifer was not specifically quantified in this report, but the average aquifer recharge was 5.4 inches per year, while recharge due to irrigation sources (unused water combined with seepage from leaky ditches) was estimated at an annual average of 23.7 cubic feet per second. This equates to a total estimated recharge of 18,500 acre-feet per year (26.2 cfs).

PGG also employed the Deep Percolation Model, originally developed by the USGS in 1983, to estimate long-term trends in precipitation recharge. The model predicts the 25-year long-term average precipitation recharge to be equal to 12 inches per year, which is significantly higher than the current estimation of 5.4 inches per year for the study area. Groundwater recharge directly due to precipitation was shown to be less than either irrigation system or river leakage.

Model estimates for the deep aquifer tend to show significantly smaller depletion values for streams close to the pumping center and slightly larger depletion values for streams distant from the pumping center. Pumping from the deep aquifer tends to produce a more geographically extensive cone of depression, which increases impacts on more distant streams. However, its hydraulic insulation from the upper aquifer causes a lower impact to streams overall.

Table 6-2 illustrates the depletion distribution, predicted by the 2008 Dungeness Model, for the streams protected under WAC 173-518 assuming the amount of water required to meet the buildout growth water needs in the Carlsborg area is withdrawn from a well in either the middle aquifer or deep aquifer well in Carlsborg.

TABLE 6-2

Depletion Distribution among Streams
(Table 2, PGG Task 2B Technical Memorandum, Appendix A)

Stream	Middle Aquifer	Deep Aquifer
Bagley	0.00%	0.01%
McDonald	0.45%	0.22%
Matriotti	1.40%	0.39%
Meadowbrook	0.47%	0.48%
Cassalery	2.27%	2.27%
Gierin & Graysmarsh	2.57%	3.12%
Bell	0.45%	0.87%
Johnson	0.00%	0.00%
Dungeness	52.76%	17.23%
Morse	0.00%	0.00%
Siebert	0.03%	0.03%
All Streams	*60.39%*	*24.61%*

POTENTIAL MITIGATION APPROACHES

Eighteen mitigation scenarios were developed in the Task 2D Technical Memorandum initial screening of mitigation scenarios. The initial mitigation scenarios were reduced to four preferred scenarios. The PGG analysis suggests that for the Carlsborg Alternative, either middle aquifer or deep aquifer groundwater pumping can be mitigated with local infiltration of the projected flow of CUGA reclaimed water plus small amounts of supplemental mitigation east of the Dungeness River. For the Sequim Alternative, mitigation is more easily accomplished for pumping from the deep aquifer assuming there is sufficient productivity in this aquifer in the Carlsborg vicinity. In this case, mitigation can be achieved by infiltrating small amounts of CUGA sources of reclaimed water in the City of Sequim's anticipated network of perforated pipes or at dedicated infiltration facilities along with minor supplemental mitigation west of the Dungeness River. If the Sequim Alternative were associated with middle aquifer pumping, higher infiltration rates or additional measures would be needed to meet the CUGA water right mitigation requirement. In all cases, some degree of over mitigation is unavoidable due to the inherent inefficiency of attempting to match the calculated mitigation profile distributed among the eleven regulated streams in WRIA 18 using upper aquifer infiltration. PGG's Task 2B Technical Memorandum identified the following approaches as potential methods for water-right mitigation.

1. Infiltration of reclaimed water to augment stream flows;

2. Mitigation with non-reclaimed water, either by entering into water-banking agreements to purchase and/or trade mitigation credits with the Dungeness Water Exchange (DWE) or by acquiring existing water rights;

3. Pump-and-dump streamflow augmentation from either groundwater or surface water sources; and

4. Use of out-of-kind mitigation such as stream and habitat enhancement projects.

Infiltration of reclaimed water was identified as the primary mitigation resource, to be supplemented by other approaches as needed. Reclaimed wastewater from the Carlsborg area constitutes the primary resource for mitigation. Table 6-3 shows PGG's estimate of the quantity of reclaimed water available for mitigation.

TABLE 6-3

Reclaimed Water Available for Mitigation at Full Buildout
(Table 2, PGG Draft Task 2D Technical Memorandum, Appendix A)

Item	Unit
638,700	gpd average daily sewer flow with I/I (G&O, 2014 – Table 9)
443.5	gpm average daily sewer flow with I/I
5%	Losses due to leaks, evaporation, solids (Swift, 2014)
421.4	gpm average daily available reclaimed water
4908	ERUs at full buildout (G&O, 2014 – Table 9
1004	Current ERUs (Swift, 2014)
80%	Portion of reclaimed water resource associated with new ERUs
335.2	gpm portion of reclaimed water available for mitigation
For Carlsborg Option Only:	
10%	Portion of reclaimed water assumed used for irrigation (5 mo/yr)
321.2	gpm annual average daily flow available for infiltration

The quantity of water required for mitigation, if water is pumped from the middle aquifer, is 60.4 percent of the pumping rate (56.1 gpm), as shown in Table 6-2. If water is pumped from the deep aquifer, the quantity of water required for mitigation is 24.6 percent of the pumping rate (63.6 gpm) as shown in Table 6-2. According to PGG's analysis, the quantity of reclaimed water available for mitigation, assuming an additional water right of 417 AF/yr, exceeds the 24.6 percent/60.4 percent requirement In addition, while mitigation will be required for the new PUD water right, reclaimed water from the inchoate (unperfected) portion of the existing water right (381 AF Qa) is also available to mitigate for the new water right, leading to a surplus of mitigation water.

Potential Mitigation Schemes

However, depending on where the reclaimed water is infiltrated, some streams may be over-mitigated and other streams under-mitigated. The degree to which streamflow augmentation via infiltration can match the streamflow depletion profile associated with a proposed new water right will determine the minimum amount of infiltration needed to meet the mitigation requirement.

Streamflow augmentation associated with infiltration was estimated with the 2008 Dungeness Model at constant and uniform rates within generalized areas rather than at unique specific locations. Three generalized infiltration-location scenarios were evaluated:

- Carlsborg Alternative: PGG simulated infiltration spread evenly across the permeable areas of the CUGA north of SR101 combined with minor supplemental infiltration east of the Dungeness River. It is assumed that all of the CUGA reclaimed water would need to be infiltrated in the Carlsborg vicinity, and supplemental mitigation east of the river using reclaimed water would require arrangements with (and possible compensation to) the DWE or the City of Sequim.

- Sequim Alternative No. 1: One of PGG's scenarios assumed broad-scale shallow-aquifer infiltration within the permeable portions of the City's urban growth area. This is consistent with the City's current interest in infiltrating reclaimed water via perforated pipes buried within transportation right of ways.

- Sequim Alternative No. 2: Additional PGG scenarios attempted to optimize the effectiveness of mitigation by selecting among six generalized infiltration areas east of the Dungeness River. The areas included existing facilities (City of Sequim Demonstration Site), sites previously investigated for infiltration (Sequim City Shop), and open areas within and surrounding the Sequim City limits (Figure 6-1).

For each of these three infiltration scenarios, PGG used results from the 2008 Dungeness Model to estimate the infiltration rates required to meet the streamflow capture profile associated with pumping the new water right as shown in Table 6-2.

Table 6-4 includes the PGG recommended reclaimed water infiltration schemes.

TABLE 6-4

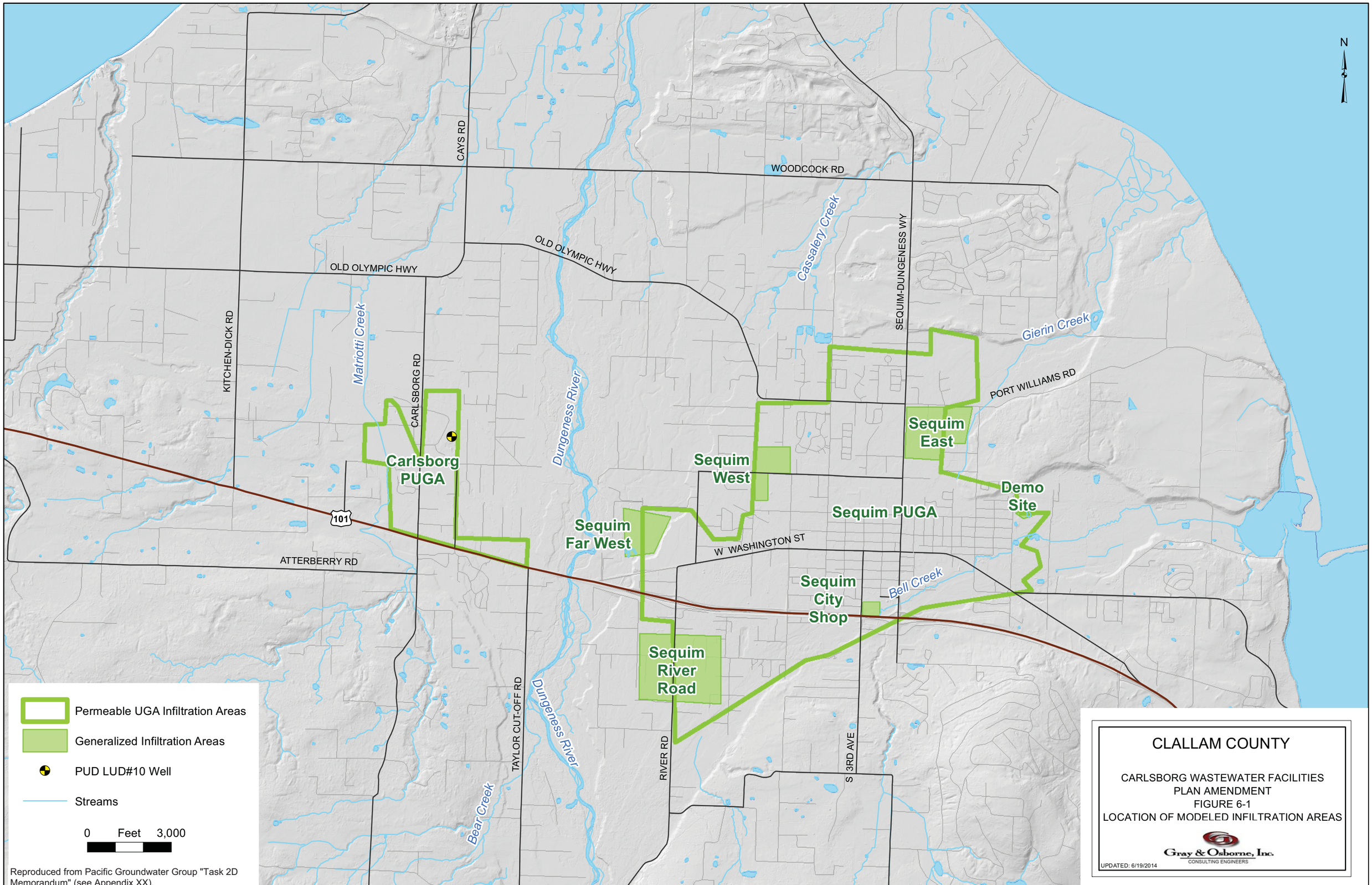
Recommended Pumping/Mitigation Scenarios
(Table 4, Task 2B Memorandum, PGG, Appendix A)

Scenario	Treatment Location	Generalized Infiltration Location	Groundwater Source Aquifer
A	Carlsborg	Carlsborg permeable UGA plus supplemental infiltration east of the Dungeness River	Middle
B	Carlsborg	Carlsborg permeable UGA plus supplemental infiltration east of the Dungeness River	Deep
C	Sequim	Single or multiple general sites east of Dungeness River	Middle
D	Sequim	Single or multiple general sites east of Dungeness River	Deep
E	Sequim	Sequim permeable UGA	Middle
F	Sequim	Sequim permeable UGA	Deep

Additional mitigation approaches may be recommended to address deficits with the preference to the most reliable, affordable and achievable methods such as pump-n-dump from existing water rights, purchase of mitigation credits from DWE or small –scale reclaimed water infiltration basins a supplemental locations meant to target specific streams based on mitigation requirement depletion profile.

Where the preferred methods cannot meet the full mitigation profile, other methods such as direct water purchase, water-rights transfers or habitat restoration, will be considered.

Under the Carlsborg Alternative (scenarios A and B), it should be noted that *all* the reclaimed water generated from the CUGA must be locally infiltrated (with the exception of reclaimed water used for irrigation). Where model predictions suggested that local Carlsborg infiltration of the available mitigation resource (321.2 gpm) did not fully offset pumping impacts to streams east of the Dungeness River, PGG evaluated how infiltrating a small amount of reclaimed water from the City of Sequim or purchase of mitigation credits from the DWE might be used to offset these residual streamflow impacts. PGG's analysis assumed that a small portion of the City's reclaimed water could be purchased and infiltrated locally, *or* that the City could make a small portion of the mitigation credits developed by their own infiltration activities available to the County for achieving CUGA mitigation. The County could similarly make a small portion of the excess


N
WOODCOCK RD
CAYS RD
OLD OLYMPIC HWY
OLD OLYMPIC HWY
KITCHEN-DICK RD
CARLSBORG RD
SEQUIM-DUNGENESS WY
PORT WILLIAMS RD
W WASHINGTON ST
ATTERBERRY RD
TAYLOR CUT-OFF RD
RIVER RD
S 3RD AVE
101
Matriotti Creek
Dungeness River
Cassalery Creek
Gierin Creek
Bell Creek
Bear Creek
Carlsborg PUGA
Sequim West
Sequim East
Demo Site
Sequim PUGA
Sequim Far West
Sequim City Shop
Sequim River Road
Permeable UGA Infiltration Areas
Generalized Infiltration Areas
PUD LUD#10 Well
Streams
0 Feet 3,000
Reproduced from Pacific Groundwater Group "Task 2D Memorandum" (see Appendix XX).
CLALLAM COUNTY
CARLSBORG WASTEWATER FACILITIES
PLAN AMENDMENT
FIGURE 6-1
LOCATION OF MODELED INFILTRATION AREAS
Gray & Osborne, Inc.
CONSULTING ENGINEERS
UPDATED: 6/19/2014

mitigation credits associated with local CUGA infiltration available to the City to meet their future mitigation needs. A similar exchange could potentially be arranged between the County and the DWE.

Under the Sequim Alternatives, reclaimed-water infiltration was assumed to be limited to areas east of the Dungeness River, and only the portion of the available (321.2 gpm) reclaimed water required to meet mitigation targets was assumed to be infiltrated. Under Scenarios C and D, PGG attempted to optimize the combination of general infiltration areas using the following approach:

- No more than two of the infiltration facilities shown on Figure 6-1 would be used to meet the CUGA infiltration requirements. Only one of these facilities can be newly constructed. The second must make use of existing infrastructure (e.g., Sequim Demonstration Site).

- Optimization was attempted to identify the minimum combined infiltration rate needed to reach the mitigation requirements from CUGA water right pumping.

By selecting infiltration areas with combined augmentation profiles that best meet the required mitigation profile and adjusting infiltration rates for these areas, PGG was able to develop reasonable approximations of future infiltration activities that could be developed to meet the mitigation requirements for a new CUGA water right permit. Under Scenarios E and F, where modeled infiltration was spread evenly over a large portion of the Sequim UGA, PGG's optimization involved adjusting infiltration rates only. For all four Sequim mitigation scenarios, small residual impacts were predicted in streams west of the Dungeness River. Because reclaimed water would not be delivered across the river under the Sequim Alternatives, other means of mitigation would be needed to meet these west-side residual streamflow impacts.

Table 6-5 summarizes the results of PGG's analysis. More detailed results are presented in the Task 2D Technical Memorandum, Appendix A. The table shows sixteen combinations of infiltration areas and infiltration rates optimized to meet the mitigation profiles associated with new pumping. The table summarizes which generalized areas are used for infiltration, how much infiltration was simulated for each area, residual impacts in streams with insufficient mitigation, total under-mitigation and the number of streams affected, and total over-mitigation in streams where augmentation exceeds pumping impact. Assuming mitigation targets are broadly met, over-mitigation is unavoidable on some streams if infiltration is restricted to a limited number of facilities or (in the case of the Carlsborg Alternative) when it is necessary to infiltrate *all* available reclaimed water despite the fact that estimated streamflow augmentation exceeds the mitigation requirement. While over-mitigation can be reduced by infiltrating at multiple sites, for the purpose of this analysis, PGG considered development of more than two infiltration sites to be unrealistic.

Among the sixteen infiltration combinations shown on Table 6-5, four are identified as those preferred for Scenarios A-F. The following findings are derived from PGG's analysis:

1. For the Carlsborg Alternative, pumping from the deep aquifer does not offer a significant advantage to pumping from the middle aquifer for meeting the CUGA mitigation requirements. While streamflow impacts are overall smaller for pumping from the deep aquifer (Table 6-2), impacts to distant streams are predicted to be slightly larger because the deep-aquifer drawdown cone is more widespread. Supplemental infiltration required east of the Dungeness River to addresses residual impacts to distant streams is predicted to be slightly higher under deep-aquifer pumping. However, the fact that deep-aquifer pumping results in more over-mitigation than middle-aquifer pumping could be significant if associated (over)mitigation credits can be sold or traded.

2. For the Carlsborg Alternative, infiltration combination "C-M" is the preferred mitigation scheme for middle-aquifer pumping. Along with infiltrating *all* the CUGA reclaimed water in the Carlsborg vicinity, this combination requires purchase of 11.6 gpm (18.7 AF) of mitigation credits from the DWE. Alternatively, under combination #3, the City of Sequim could allocate 28 gpm of reclaimed water infiltrated within the City's "leaky pipe" network to the CUGA mitigation.

3. Deep-aquifer pumping may be worth considering under the Carlsborg Alternative if the value of increased over-mitigation pays for the deeper well and a slight increase in infiltration of reclaimed water purchased from the City of Sequim. In this case, combination "C-D" is preferred, which assumes that the County would purchase 14.2 gpm (22.9 AF) of mitigation credits from the DWE. Alternatively, under combination #6 the City would allocate 33 gpm of reclaimed water infiltrated within their "leaky pipe" network to the CUGA mitigation.

4. For the Sequim Alternatives, pumping from the deep aquifer offers more of a direct advantage than with the Carlsborg Alternative. This is shown by comparing the estimated mitigation infiltration quantities between middle aquifer pumping scenarios (combinations 7-9) and deep aquifer pumping scenarios (combinations 13-15). Only one of the three middle aquifer pumping combinations was able to provide sufficient mitigation within the available 321.2 gpm of reclaimed water for mitigation (combination #8 employs a recharge facility in the "Sequim Far West" area). Infiltration distributed throughout the City's "leaky pipe" network (combination #9) would require purchase of supplemental reclaimed water from the City and would create significant over-mitigation relative to

predicted streamflow capture. In comparison, for deep aquifer pumping, all three combinations were capable of meeting the mitigation profile within the available 321.2 gpm mitigation resource, with optimized infiltration rates ranging from 71 to 157 gpm.

5. For the Sequim Alternative using deep-aquifer pumping, the highest mitigation efficiency can be achieved by infiltrating in distinct areas rather than using distributed infiltration over the City's anticipated "leaky pipe" network. Model results predict that full mitigation of east-side streams can be achieved either by infiltrating 69 gpm in the "Sequim Far West" area along with just 2 gpm at the City's Demonstration Site (combination #14), or by infiltrating 157 gpm among the City's "leaky pipes" (combination #15). However, given that the City's costs for treating Carlsborg's reclaimed water include anticipated infiltration via the leaky pipe system, combination #15 is likely to be preferred for the Sequim Alternative.

6. For the Sequim Alternatives, all simulated infiltration combinations resulted in predicted under-mitigation of several small streams, predominantly west of the Dungeness River (Meadowbrook, McDonald, and Siebert Creeks). Residual impacts on these streams are relatively minor and would need to be addressed using other mitigation methods.

7. The productivity of the deep aquifer has not yet been established in the Carlsborg vicinity. Under the Sequim Alternatives, if middle aquifer pumping were required, increased mitigation efficiency could be achieved if the Dungeness Water User's Association (DWUA) were willing to sell a portion of their irrigation water rights and leave them instream. Although we have no indication that this is a reliable possibility, it is considered in combinations 10-12. Infiltration quantities east of the Dungeness River can be substantially reduced if mitigation requirements for just the small streams are addressed, and the mitigation requirement on the Dungeness River is addressed through a water right purchase. Given that DWUA's water rights are restricted to the irrigation season (April 15 – September 15), mitigation for year-round impacts would need to be performed during this irrigation season (or concentrated during the Dungeness River critical period (August 15 – September 15)). Either of these approaches would result in over-mitigation of Dungeness River impacts during the critical period and under-mitigation during the rest of the year. This temporal variation of mitigation is permitted by Ecology under WAC 173-518. Table 6-5 shows that water right quantities ranging from 36 to 132 AF/yr would need to be purchased from DWUA (compared to the new CUGA water right of 417 AF/yr). Of the four combinations for middle aquifer pumping and mitigation in Sequim, #12-Alt is preferred because it employs the City's "leaky pipe" network to

infiltrate the maximum amount of reclaimed water applicable to the CUGA mitigation and limits the potential DWUA water right purchase to only 75 AF/yr[1].

Assuming reasonable groundwater production from the deep aquifer in the Carlsborg vicinity, the PGG analysis suggests that the Carlsborg Alternative should focus on either middle aquifer pumping (combination #C-M) or deep aquifer pumping (combination #C-D), depending on the value of associated over-mitigation. The Sequim Alternative should likely focus on deep aquifer pumping coupled with infiltration from the City's leaky pipe network. Whereas only 157 gpm of leaky-pipe infiltration is required under combination #15, value could be added if mitigation credits could be derived by infiltrating the entire 321.2 gpm via the City's leaky pipe network. If middle aquifer pumping is required under the Sequim Alternative, the preferred mitigation scenario is #12-Alt.

Both the Carlsborg and the Sequim Alternatives involve over-mitigation on selected streams. Net over-mitigation for all streams combined is summarized on Table 6-5 and over-mitigation on individual streams is reported in Appendix A. Technical Memorandum 2D contains a discussion on over- and under-mitigation for the small streams and information regarding potential mitigation solutions.

[1] Table 4 shows that mitigating middle-aquifer pumping via "leaky-pipe" infiltration across the Sequim PUGA could be reduced from 480 to 200 gpm if 132 af/yr were purchased from the DWUA. If the entire 321.2 gpm of mitigation water were infiltrated via leaky pipes, only a 75 af/yr purchase would be required from DWUA (with similar impacts to small streams as combination #12).

TABLE 6-5

Summary of Reclaimed Water Infiltration Mitigation Combination

Combination	Preferred for Scenario	Treatment Alternative	Pumping Aquifer	Approach	Reclaimed Water Infiltration Rates							Supplemental Mitigations Needed (gpm)					Total Under-Mitigation (#)	Total Over-Mitigation	Dungeness Supplement from DWUA (AF)	Notes
					Carlsborg PUGA	Sequim PUGA	Sequim Far West	Sequim West	Sequim East	Sequim Demo Site	Total Infiltration	Cassalery	Meadow-brook	McDonald	Siebert	Dungeness & Matriotti				
#1		Carlsborg	Middle	Supplement Carlsborg PUGA with existing east-side site	321	n/a	---	---	---	22	343	3.8	---	---	---	---	3.8 (1)	147	n/a	Cassalery impact can be zero'd out by increasing Demo Site infiltration to 135 gpm.
#2		Carlsborg	Middle	Supplement Carlsborg PUGA with existing east-side site	321	n/a	---	---	29	2	352	---	---	---	---	---	0.0 (0)	153	n/a	---
#3		Carlsborg	Middle	Supplement Carlsborg PUGA with leaky-pipe infiltration on east-side	321	28	---	---	---	---	349	---	---	---	---	---	0.0 (0)	150	n/a	---
C-M	**A**	Carlsborg	Middle	Supplement Carlsborg PUGA by purchasing mitigation credits from DWE	321	n/a	n/a	n/a	n/a	n/a	321	4.5	0.2	---	---	---	11.6 (4)	135	n/a	---
#4		Carlsborg	Deep	Supplement Carlsborg PUGA with existing east-side site	321	n/a	---	---	---	28	349	3.5	---	---	---	---	3.5 (1)	245	n/a	Cassalery impact can be zero'd out by increasing Demo Site infiltration to 165 gpm.
#5		Carlsborg	Deep	Supplement Carlsborg PUGA with existing east-side site	321	n/a	---	---	34	3	358	---	---	---	---	---	0.0 (0)	251	n/a	---
#6		Carlsborg	Deep	Supplement Carlsborg PUGA with leaky-pipe infiltration on east-side	321	33	---	---	---	---	354	---	---	---	---	---	0.0 (0)	206	n/a	---
C-D	**B**	Carlsborg	Deep	Supplement Carlsborg PUGA by purchasing mitigation credits from DWE	321	n/a	n/a	n/a	n/a	n/a	321	4.5	0.2	---	---	---	14.2 (4)	230	n/a	---
#7		Sequim	Middle	New and existing infiltration site east of Dungeness River	n/a	n/a	- -	377	- -	0	377	---	---	1.1	0.1	---	1.2 (2)	202	n/a	No mitigation needed from existing (Demo) site.
#8	**C**	Sequim	Middle	New and existing infiltration site east of Dungeness River	n/a	n/a	210	---	---	0	210	- -	0.5	1.1	0.1	---	1.7 (3)	47.8	n/a	No mitigation needed from existing (Demo) site. Meadowbrook impact could be zero'd out by increasing River Rd infiltration to 350 gpm, but cheaper ways likely exist.
#9	**E**	Sequim	Middle	Infiltration across Sequim PUGA using leaky-pipe network.	n/a	480	---	---	---	- -	480	---	---	1.1	0.1		1.2 (2)	305.4	n/a	Total infiltrated amount exceeds total Carlsborg reclaimed water. Unlikely scenario.
#10		Sequim	Middle	Combination #7 (above) + water-right purchase from DWUA & offseason undermitigation on Dungeness	n/a	n/a	- -	166	---	0	166	---	---	1.2	0.1	77.8*	1.2 (2)**	80.3^	126	---

TABLE 6-5 – (continued)

Summary of Reclaimed Water Infiltration Mitigation Combination

Combination	Preferred for Scenario	Treatment Alternative	Pumping Aquifer	Approach	Reclaimed Water Infiltration Rates							Supplemental Mitigations Needed (gpm)					Total Under-Mitigation (#)	Total Over-Mitigation	Dungeness Supplement from DWUA (AF)	Notes
					Carlsborg PUGA	Sequim PUGA	Sequim Far West	Sequim West	Sequim East	Sequim Demo Site	Total Infiltration	Cassalery	Meadow-brook	McDonald	Siebert	Dungeness & Matriotti				
#11		Sequim	Middle	Combination #8 (above) + water-right purchase from DWUA & offseason undermitigation on Dungeness	n/a	n/a	160	---	---	0	160	---	0.7	1.2	0.1	22.6*	1.9 (3)**	19.8^	36	Meadowbrook impact can be zero'd out by increasing Far West infiltration to 350 gpm or by infiltrating 110 gpm at Sequim City Shop, but cheaper ways likely exist.
#12		Sequim	Middle	Combination #9 (above) + water-right purchase from DWUA & offseason undermitigation on Dungeness	n/a	200	---	---	---	---	200	---	---	1.2	0.1	81.6*	1.2 (2)**	117.2^	132	If the entire 321.2 gpm of available mitigation water were infiltrated, only 75 af/yr would be required from DWUA (with similar impacts to small streams).
#12-Alt	**E**	Sequim	Middle	Combination #12 (above) + entire 312.2 gpm reclaimed mitigation water credited	n/a	321	---	---	---	---	321	---	---	1.1	0.1	46.3	47.5*	197.2^	75	
#13		Sequim	Deep	New and existing infiltration site east of Dungeness River	n/a	n/a	- -	150	---	---	150	---	---	0.6	0.1	---	0.6 (2)	80.1	n/a	No mitigation needed from existing (Demo) site.
#14	**D**	Sequim	Deep	New and existing infiltration site east of Dungeness River	n/a	n/a	69	---	---	2	71	---	1.0	0.6	0.1	---	1.6 (3)	7.4	n/a	Meadowbrook impact can be zero'd out by increasing River Rd infiltration to 350 gpm, but cheaper ways likely exist.
#15	**F**	Sequim	Deep	Infiltration across Sequim PUGA using leaky-pipe network.	n/a	157	---	---	---	---	157	- -	0.3	0.6	0.1	---	0.9 (3)	87.7	n/a	Impact at Meadowbrook (0.3 gpm) can be eliminated by increasing total infiltration amount from 157 to 200 gpm. At 321.2 gpm infiltration, over-mitigation goes to 242 gpm and residuals reduce to 0.5 gpm on McDonald and 0.1 gpm on Siebert.

DWUA = Dungeness Water User's Association, PUGA = permeable portion of UGA assumed for infiltration.
All values are in gpm. Unless otherwise stated, impacts to Matriotti Creek flows balanced out by over mitigation to Dungeness River.
* Under scenarios 10-12, amount of water purchased from DWUA during irrigation season would mitigate year-round combined Dungeness + Matriotti streamflow capture.
** Undermitigation does not include Dungeness/Matriotti, which would be mitigated by DWUA water-right purchase.
^ Overmitigation does not included seasonal over-mitigation on Dungeness River via water rights purchase.
See Task 2D Technical Memorandum, Appendix A, for detailed accounting of mitigation results.

MITIGATION SCENARIO COST IMPACTS

COMPARISON OF MITIGATION COSTS

PGG and Gray & Osborne developed and compared cost estimates for the four preferred mitigation scenarios. The assumptions employed in the cost analysis include:

1. The mitigation cost comparisons do not consider the costs of wastewater treatment and reclaimed water infiltration. These activities are addressed in the project costs presented in Chapters 5 and 7. The mitigation cost comparison addresses mitigation actions required to offset residual impacts that remain after designed infiltration of the treated wastewater.

2. The cost of purchasing supplemental mitigation on small streams is based on the purchase price of mitigation credits offered by the DWE. Under the DWE mitigation plan (WWT, 2012), DWE offers stream flow augmentation credits to new residential water users at $3,000 for a 0.14 AF/yr impact ($21,429 per annual AF). In a recent agreement with the PUD to provide mitigation for the new "Bluffs Well," DWE provided 2.57 AF/yr mitigation credits for $53,370 ($20,767 per annual AF). This analysis assumes a purchase cost of $21,429/AF.

3. The value of selling over-mitigation (augmentation credits on small streams is assumed to be 50 percent of the DWE cost to new water users (i.e., $10,715/AF). PGG assumed the value of over-mitigation credits would be reduced by 50 percent of the DWE cost because the mitigation profile created by the project's reclaimed water infiltration may not perfectly match the distribution among stream required by the DWE or other potential buyers. In addition, if purchased by the DWE, additional costs would be incurred by the organization to manage the mitigation resource.

4. No more than 70 gpm of augmentation to small streams (113 AF/yr) could be sold on the open market. Even though the Sequim infiltration alternative is estimated to create between 87 to 197 gpm over-mitigation to small streams, not all of this stream flow augmentation is expected to be saleable on the open market. Based on the DWE Mitigation Plan and results from the 2008 Dungeness Model, PGG estimates that the DWE might require between 60 to 80 gpm of augmentation to small streams east of the Dungeness River on an annualized basis to mitigate projected residential development.

5. The selling value of over-mitigation to the Dungeness River is estimated based on the purchase value of irrigation water rights from the river.

Washington Water Trust (WWT) recently purchased 175 AF of irrigation water rights from the Dungeness Water Users Association (DWUA) for stream flow augmentation and water right mitigation at $2,000/AF. Only 42 percent (5/12) of the predicted year-round augmentation is considered saleable due to the 5-month irrigation season. Although the nearly constant flow augmentation predicted for this project is optimal for mitigating year-round pumping impacts, the relatively high rates of stream flow augmentation predicted for the Dungeness River under the Carlsborg alternatives are unlikely to be purchased at the higher prices associated with mitigation credits on small streams.

6. This analysis assumes under-mitigation on the Dungeness is offset by purchase of water rights from DWUA; the estimated purchase cost is $2,000/AF. The purchased water would be left in-stream to offset stream flow capture.

7. All costs used in this analysis are estimated in 2014 dollars. Although costs are likely to change between 2014 and full buildout of the CUGA, this analysis assumes that costs will grow similarly for both the Carlsborg and the Sequim Alternatives.

Table 6-6 summarizes the cost estimates for the four preferred mitigation alternatives.

TABLE 6-6

Comparative Cost Estimates for Representative Mitigation Scenarios(1) (Table 6, Task 2D Technical Memorandum, PGG, Appendix A)

	Middle Aquifer Pumping		Deep Aquifer Pumping	
	Carlsborg ("C-M")	**Sequim (#12-Alt)**	**Carlsborg ("C-D")**	**Sequim (#15)**
Total Under-Mitigation (gpm)	11.6	47.5	14.2	0.9
Under-Mitigation on Dungeness & Matriotti (gpm)	0	46.3	0	0
DWUA Dungeness River Water Right Purchase (AF)	0.0	75.0	0.0	0.0
DWUA Dungeness River Water Right Purchase Cost	NA	$150,000	NA	NA
Under-Mitigation Small Streams (gpm)	11.6	1.2	14.2	0.9
DWE Supplemental Mitigation Purchase Cost	$401,257	$41,509	$491,195	$31,132
Over-Mitigation on Dungeness (gpm)(2)	127	0.0	218.9	1.2
Over-Mitigation on Dungeness (AF During Irrigation Season)(2)	85.9	0.0	148.0	0.8
Dungeness Over-Mitigation Credit	($171,751)	NA	($296,033)	NA
Over-Mitigation on Small Streams (gpm)(3)	0.3	197.2	0.9	86.5
Small Stream Over-Mitigation Credit(3)	($5,189)	($1,210,691)	($15,566)	($1,210,691)
Net Mitigation Expenditure (w/o Small Stream Credit)	$229,507	$191,509	$195,161	$31,132
Net Mitigation Expenditure (w/Small Stream Credit)	$224,318	($1,019,181)	$179,595	($1,179,559)

(1) Positive costs represent projected expenditures. Negative costs, shown in parentheses, represent projected income:
- Purchase cost and (selling) market value for over-mitigation on Dungeness River = $2,000 per irrigation-season AF (irrigation season limited to 153 days).
- Purchase cost for additional mitigation water from DWE = $21,429 per annual AF = $34,591 per annualized gpm.
- Market value for selling over-mitigation on small stream = $10,715 per annual AF = $17,296 per annualized gpm.

(2) Dungeness over-mitigation numbers do not include Matriotti Creek (see Technical Memorandum 2D, Appendix A).

(3) Small stream over-mitigation credit subject to 70 gpm cap.

The conclusion drawn from the cost analysis presented in the Task 2D Technical Memorandum is that for both the middle aquifer and deep aquifer pumping scenarios, supplemental mitigation for the Sequim Alternative is estimated to be less expensive than for the Carlsborg Alternative. Since the marketability of augmentation credits on small streams is considered to be the most uncertain element of this cost comparison the net mitigation costs were compared in two ways: (1) the saleable value of augmentation

credits on the small streams were ignored, and (2) the saleable value of the small streams was capped at 70 gpm. The Sequim Alternative was estimated to be less costly under both assessments. Where mitigation credits on small streams were included in the valuation, the Sequim Alternative yielded net profits (negative costs) associated with mitigation.

One option considered for the Sequim Alternative is to return reclaimed water from Sequim to Carlsborg for infiltration and reuse within Carlsborg. The estimated cost to construct a line sized to convey the buildout Carlsborg flow as reclaimed water back to Carlsborg is $5 to $6 million. In developing this cost estimate, it was assumed that (1) the 16-inch pipeline would run over 20,000 feet from the Sequim City Shop facility to Idea Place, (2) the pipeline would not be constructed in a common trench with the force main carrying wastewater to Carlsborg, due to the Department of Ecology's requirements for 10-foot horizontal separation of wastewater and reclaimed water lines, and (3) construction of the line would require significant pavement restoration. Based on the analysis of water rights/mitigation in this chapter and Appendix A, it is not anticipated that construction of this reclaimed waterline is necessary, as the east side of the Dungeness River is the most cost-effective and beneficial primary location for reclaimed water infiltration. Thus, construction of the reclaimed water return line to Carlsborg is not recommended.

REFERENCES

The following references were consulted in the preparation of this chapter:

1. *Hydrogeologic Assessment of the Sequim-Dungeness Area, Clallam County, Washington*, USGS, Thomas, B., Goodman, L., and Olsen, T., 1999.

2. *Water Reclamation Facility Expansion Engineering Report*, City of Sequim, Gray & Osborne, September 2007.

3. *Carlsborg Wastewater Feasibility Study*, City of Sequim, Gray & Osborne, August 2011.

4. *Sewer Feasibility Study for the Carlsborg UGA*, Clallam County PUD No. 1, BHC Consultants LLC, July 2007.

5. *Sewer Facilities Plan for Carlsborg UGA*, Clallam County PUD No. 1, BHC Consultants LLC, 2012.

6. *City of Sequim 2008 Hydrologic Monitoring Report*, City of Sequim, Pacific Groundwater Group, December 2009.

CHAPTER 7

COMPARISON AND SELECTION OF ALTERNATIVES

In this chapter, the Sequim Alternative and the Carlsborg Alternative are compared with regard to capital, operating and life cycle costs, and non-monetary factors including local control, risk, environmental benefits, and public/siting/aesthetic concerns. Recommendations are provided at the end of the chapter.

COST COMPARISON

The costs of the initial system and upgrades required in 2030 to provide capacity through the year 2050 for the Sequim Alternative and the Carlsborg Alternative presented in this summary are provided in Table 7-1. These costs were developed in Chapters 4 and 5 and Appendix H.

TABLE 7-1

Comparison of Sequim Alternative and Carlsborg Alternative Collection and O&M Costs

Facility	Sequim Alternative	Carlsborg Alternative
Initial System (2016-2030)		
Carlsborg Collection System	$5,324,500	$5,395,000
Lift Station, Conveyance, WRF Capacity, Sequim CIP	$7,060,800	--
Carlsborg WRF	--	$10,650,000
Average Annual O&M (2016-2030)	$323,000	$379,000
15-year Life Cycle Cost – Initial System	**$17,230,300**	**$21,730,000**
Additional System to Serve 2050 Flows		
Carlsborg Collection System	$3,800,000	$3,800,000
WRF Capacity, Sequim CIP, Sequim Collection System Improvements	$6,692,200	--
Carlsborg WRF	--	$13,610,000
Annual O&M (2030-2050)	$675,000	$748,000
20-Year Life Cycle Cost – 2030-2050 System	**$23,992,200**	**$32,370,000**
TOTAL COSTS (2015 to 2050)	**$41,222,500**	**$54,100,000**

(1) Costs are total project costs in 2014 dollars, inclusive of future design, construction management, tax and contingency.

As shown in Table 7-1, the Sequim Alternative is projected to have substantially lower capital and operating costs, and save over $13 million in life-cycle costs over the next 35 years, compared to the Carlsborg Alternative. The cost differential is consistent with the axiom within the wastewater treatment industry that there usually is an economy of scale in treating larger flows, as there are significant relatively fixed costs that do not

scale up with increasing flows. With increasing ERUs and wastewater volume treated, the cost per ERU or per volume treated is reduced. This is a major driver toward regionalization in Washington State.

Not included in Table 7-1 are costs and benefits from the water rights/mitigation analysis. As discussed in Chapter 6, for the four scenarios considered most practicable, the cost advantage of the Sequim Alternative over the Carlsborg Alternative ranged from $28,000 to $1.4 million. When added to the cost advantage calculated in Table 7-1, the total cost advantage for the Sequim Alternative would be $13 to $14 million. Due to uncertainties in predicting the future valuation of water through the Dungeness Water Exchange and other sources, the potential financial benefit of additional water rights has not been included in Table 7-1. In addition, Table 7-1 does not include the estimated cost ($5 to $6 million) to construct a pipeline to return reclaimed water from Sequim to Carlsborg with the Sequim Alternative, as the analysis summarized in Chapter 6 indicates that such a line will not be necessary as mitigation under the Dungeness Water Rule.

NON-MONETARY COMPARISON

In this section, the Carlsborg and Sequim Alternatives are compared with regard to non-monetary considerations, including Treatment Process Quality/Adaptability, Public/Siting/Aesthetic Concerns Local Control, Risk and Environmental Benefits.

TREATMENT PROCESS QUALITY/ADAPTABILITY

When comparing the Carlsborg and Sequim Alternatives for treatment process quality, emerging trends and drivers within the wastewater treatment industry that could affect wastewater management for the Carlsborg UGA should be considered. Although it is impossible to predict future wastewater treatment needs and regulations, it is expected that the following trends/drivers observed over recent years will increasingly influence wastewater treatment in upcoming years:

- Increasing Levels of Treatment for Contaminant and Pathogen Removal

  Consistent with the goals of the National Pollutant Discharge Elimination System (NPDES), discharge limits for contaminants and pathogens have become more stringent over time. For water reclamation facilities, new guidelines published by the National Water Research Institute (NWRI) and the AWWA Water Research Foundation (AWWA-WRF) are emerging as de facto standards for control of pathogens to generate “essentially pathogen free” water. In addition, research continues regarding the environmental significance and fate of ultra-trace levels of organic compounds such as pesticides and pharmaceuticals, often found in parts per billion or trillion in treated effluent. Finally, the State is in the process of updating both its reclaimed/ground water and surface water

standards, which may result in more stringent limits for discharges, including regulating pollutants down to the parts per *billion* or even (for PCBs and other toxics chemicals) parts per *trillion* levels.

- Energy Conservation

  Wastewater treatment plants and water reclamation facilities are increasingly designed with energy conservation as a major consideration. Energy conservation efforts have been boosted by significant national and state funding. It is expected that this trend will continue as energy costs increase in the future.

- Climate Change (reducing contributions to climate change and protection from its effects)

  Climate change is expected to have a significant impact on water resources, and thus human activities/consumption/waste disposal patterns in the coming century. In Washington State, these impacts are expected to include increasing ambient temperatures, reductions in snowpack and some streamflows, lower pH in oceans, and higher sea levels.

  In Clallam County, shifting seasonal precipitation patterns may lead to wetter winters and drier summers, and reduced winter snowpack and earlier spring snowmelt is expected to result in increasing spring streamflows and decreasing summer and fall flows (Jamestown S'Klallam Tribe Climate Vulnerability Assessment and Adaptation Plan, Jamestown S'Klallam Tribe and Adaptation International, 2013). These impacts of climate change are expected to further challenge water resources in the Greater Dungeness Region, particularly during critical summer and fall periods. Sea levels in the Greater Dungeness Region are expected to rise 1 to 2 feet by the middle of the century and 2 to 5 feet by 2100 (Jamestown S'Klallam Tribe, 2013).

  Increasingly, consideration is provided to minimizing greenhouse gas emissions and the "carbon footprint" that contribute to climate change from wastewater treatment. This consideration often involves efforts to reduce carbon dioxide emissions (including through energy minimization). In addition, consideration is given to reducing emissions of methane (25 times more potent greenhouse gas than carbon dioxide) and nitrous oxide (30 times more potent greenhouse gas than carbon dioxide), primarily through the control of gas from anaerobic processes at treatment plants.

- Resource Recovery

  Consistent with the goals of minimizing energy consumption and carbon footprint, plants are increasingly designed for maximal recovery of useful products – not only reclaimed water and fertilizer (biosolids), but also, in some cases, nitrogen and phosphorus.

Sequim's WRF provides the highest quality of reclaimed water (Class A) and biosolids (Class A, Exceptional Quality) denoted in the State. Resource recovery is provided through reuse of the high quality effluent and biosolids. Energy conservation is provided through the use of high efficiency blowers, fine bubble diffusers, variable frequency drives, and the use of recycle to anoxic zones to reduce oxygen consumption. The facility was designed not only for current standards for pathogen removal/inactivation, but also the emerging NWRI/AWWA/WRF standards that are being incorporated into the upcoming State *Reclaimed Water Facility Manual* to ensure the production of "essentially pathogen-free water." The Sequim WRF's processes can relatively easily be adapted to meet new standards.

A new Carlsborg WRF, as described in Chapter 5, would certainly be designed to meet the same objectives as the Sequim WRF, including resource recovery, energy efficiency and high quality effluent. Thus, neither alternative has a significant advantage in meeting these criteria.

PUBLIC/SITING/AESTHETIC CONCERNS

Proposals for siting new wastewater treatment plants or water reclamation facilities near existing land uses often results in the "NIMBY response" ("Not In My Back Yard"), opposition from adjacent landowners due to concerns about odors, noise and traffic, etc. The location of the Carlsborg WRF proposed in the *2012 Sewer Facilities Plan* engendered significant opposition from neighbors. At significant cost, measures can be implemented to mitigate for siting/aesthetic concerns at the new proposed site; however, there still will likely be some opposition and inevitable impacts to neighbors. These concerns are not significant for the Sequim Alternative, as Sequim's WRF has been operating at the same location for 50 years, and has been upgraded within the last 5 years.

LOCAL CONTROL

With the Carlsborg Alternative, the County will have control over current and future decisions regarding conveyance and treatment. In addition, the County will have control over the means of financing the costs associated with future operations and capital expenditures. (It should be noted, however, that due to the economies of scale, these costs will be higher per ERU than for the Sequim Alternative.) With the Carlsborg Alternative, the County will be able to direct where reclaimed water is reused, including for possible reuse within the CUGA for infiltration and/or industrial reuse.

A key means to mitigate the reduction in local control with the implementation of the Sequim Alternative is through the Interlocal Agreement with Sequim. The Interlocal Agreement should be crafted to ensure that costs are fairly distributed, the County has input, and that the Carlsborg's future needs for water rights mitigation are met.

RISK

Construction and operation of wastewater treatment facilities is an important and necessary aspect of modern society, but entails significant risks, including the risk of construction cost overruns, future operating/capital cost increases, and regulatory/operations risk. These risks are significantly higher with the Carlsborg Alternative.

- Potential for Cost Over-Runs for Construction of WRF

  Like any large construction project, building new sewer line and/or a new WRF has the potential for cost overruns. The inclusion of a significant contingency fund and the completion of appropriate geotechnical and archeological studies can reduce the potential; however, as has been observed with construction of other treatment facilities (Brightwater, Belfair, etc.), unforeseen costs for treatment plants can exceed contingencies and raise project costs and rates. The risk of cost overruns is more substantial for the Carlsborg Alternative.

- Risk of Future Cost Increases

  As energy prices increase and discharge standards become more stringent, the need for more highly trained operators and overall costs for wastewater treatment increase. Finding economies of scale through regionalization is a key approach to mitigating future costs, and is often favored by funding agencies and regulators. Many communities in Washington have decided to regionalize, including in the last two years, Raymond –South Bend and Ridgefield – Clark County/Salmon Creek.

- Regulatory, Operations Risk

  There is significant legal and financial risk to operating a WRF. If a Carlsborg WRF is constructed, the County could be subject to fines and third-party lawsuits for NPDES Permit violations. Dozens of facilities within Washington State have been sued by third-party groups for such violations, resulting in expensive legal bills, settlements and additional costs.

  Sequim's staff has over sixty years of combined wastewater treatment

experience. This level of professional expertise is important in reducing the risks for NPDES violations and accompanying legal concerns, as well as meeting new challenges as new regulations are implemented.

In addition to a holding pond, the Sequim WRF has a back-up surface water discharge location in the Strait of Juan de Fuca for, upset, unusual and emergency conditions that cause lower (non-reuse) quality effluent to be generated. This is not something that would be able to be provided with a Carlsborg WRF. Although a Carlsborg WRF would be designed with a holding pond to hold low quality effluent under these sorts of conditions, if the upset lasts long enough, the County may have to discharge.

ENVIRONMENTAL BENEFITS

Implementation of either alternative will have significant environmental benefits to the region. Significant sources (septic systems) of nitrate loading to Carlsborg groundwater will be eliminated. Compliance with the Dungeness Water Rule (WRIA 18 Water Resources Management Program WAC 173-518) will ensure that impacts to the area's streams are mitigated no matter which alternative is chosen. However, based on the analysis presented in Appendix A and summarized in Chapter 6, implementing the Sequim Alternative will result in additional benefits to streams, reduced mitigation requirements, and reduced costs.

Climate change is expected to result in increasing temperatures, reductions in snowpack and some streamflows, and lower pH in oceans and higher sea levels. It is difficult to predict whether these changes will favor the Sequim or Carlsborg Alternatives. WRF locations for both options are not expected to be impacted by rising sea levels. The more favorable impact to area streams from implementing the Sequim Alternative may be of benefit in the face of future reductions to streamflows from the impacts to climate change. Since both alternatives utilize variations on the activated sludge process, neither is expected to have a significant advantage with regard to the production of greenhouse gases and causing additional climate change.

SUMMARY AND RECOMMENDATIONS

Table 7-2 summarizes the evaluation of the Sequim and Carlsborg Alternatives. For each alternative, a score is provided in the matrix, with 3 being the highest (best) score and 1 being the lowest (worst) score.

TABLE 7-2

Comparison of Sequim Alternative and Carlsborg Alternative

Criteria	Sequim Alternative	Carlsborg Alternative
Capital Costs	3	2
Operating Costs	3	2
Treatment Quality	3	3
Public/Siting/Aesthetic Concerns	3	1
Local Control	1	3
Risk	3	1
Environmental Benefits	3	2
TOTAL	**19**	**14**

(1) 3 is the highest (best) score and 1 is the lowest (worst) score.

Based on the evaluation in this Amendment, summarized in this chapter, the Sequim Alternative is recommended. The Sequim Alternative has been found to have lower projected capital, operating and life cycle costs, and advantages based on non-monetary criteria, including reduced risk to the County, reduced public/aesthetic concerns, and increased environmental benefits.

REFERENCES

1. *Sea Level Rise in Coastal Waters of Washington State*, University of Washington and Washington Department of Ecology, 2008.

2. *The Washington Climate Change Impacts Assessment Evaluating Washington's Future in a Changing Climate*, University of Washington, Climate Impacts Group, 2009.

3. *Preparing for a Changing Climate Washington State's Integrated Climate Response Strategy*, Department of Ecology, 2012.

4. *Jamestown S'Klallam Tribe Climate Vulnerability Assessment and Adaptation Plan*, Jamestown S'Klallam Tribe and Adaptation International, 2013.

CHAPTER 8

FINANCIAL PLAN

INTRODUCTION

This chapter presents a financial plan to support the Carlsborg project recommendations identified in Chapter 7. Additional financial information is provided in the *Carlsborg Sewer Draft Financial Plan* (FCS Group, June 6, 2014) in Appendix H. The assumptions that support the *Financial Plan* recommendations are summarized in this chapter. The long-range goal for the project is that the Carlsborg sewer system will be a new financially independent utility that is owned by Clallam County as an enterprise fund that will be self-sustaining.

This *Financial Plan* provides answers to the following questions:

- How much would the system need to generate in revenues in order to support a prudent level of expenditures and reserves?
- How much would customers have to pay in monthly rates?
- In order to achieve this level of monthly rates, how much will Clallam County need to subsidize the Carlsborg sewer system from other funding sources, and for how long?
- What decisions can the County make that would maximize the Carlsborg sewer system's ability to develop into a sustainable self-supporting utility over the long run?
- How much should new customers have to pay in connection charges, and what connection requirements should property owners face once sewer service is available?
- If the County were to offer loan financing to property owners, how much would that cost the County, and how much would repayment cost property owners?

FINANCIAL PLAN ASSUMPTIONS

The assumptions relevant to the *Financial Plan* are divided into the groups described below.

BASIC ASSUMPTIONS

1. The utility will be self-sustaining; however, initially the County may provide subsidies to successfully launch the utility.

2. The *Financial Plan* forecast assumes the Sequim Alternative will be implemented. A copy of the Interlocal Agreement between Clallam County and Sequim is included in Appendix I.

3. The County will offer property owners some choice about whether and when individual properties will connect to the system. The connection policy will be consistent with the financial health of the new utility and fairness toward those property owners who connect to the system as soon as sewer lines are available.

4. The *Financial Plan* assumes that construction of the initial system would take place in 2015 and that the County would designate an initial connection period of 2 years after sewer service is available to any given property. If a property connects during the initial connection period, connection charges incentives would apply.

5. The requirements and incentives in the connection policies will apply to properties with existing septic systems for which any part of the property is within 200 feet of the initial collection system, with the exception of the Parkwood Mobile Estates. The properties within 200 feet of the initial collection system are included in the area designated as the Initial Connection Area.

COSTS PAID TO THE CITY OF SEQUIM

1. The Carlsborg utility will pay per gallon treatment operating costs for wastewater treatment and a percentage of use for a portion of the operating costs for wastewater conveyance. This analysis assumes the wastewater BOD and TSS concentrations are similar to domestic wastewater. Additional treatment costs may need to be applied to high strength discharges.

2. The Carlsborg utility will pay an out-of-City multiplier of 1.15 to Sequim for service charges, which is reduced from the City's policy of applying a 2.0 multiplier to out-of-City customers, and will pay the 8 percent utility tax on operating cost charges.

3. Capital cost sharing for Sequim projects constructed after January 1, 2016, will be done on a pay-as-you-go basis as they are incurred. The Carlsborg percentage of capital project costs would depend on whether the project is

for the WRF or the collection system, and if the latter, which part of the collection system.

4. The Carlsborg utility will pay an up-front capacity charge that recognizes the net book value of the City's past investment in its treatment assets. The capacity charge will apply only to pre-2016 assets since City capital costs after January 2016 will be paid on a cost share on a pay-as-you-go basis.

CARLSBORG CAPITAL AND OPERATION AND MAINTENANCE COSTS

1. Initial construction of the Carlsborg system, including the capacity charge for treatment at the Sequim WRF, will be funded from a $10 million Public Works Trust Fund (PWTF) loan and County funds.

2. Annual operation and maintenance (O&M) costs include power, water, communications, chemicals, pump station contracted maintenance, sewer cleaning, and administrative and billing costs, as well as the payment to Sequim for wastewater treatment and conveyance.

COUNTY SUBSIDY

Subsidies the County may institute include the following:

1. An initial construction subsidy which includes County repayment of the PWTF loan and a pledge of an additional $4.3 million in County funds for construction and startup.

2. An initial operating subsidy will be needed during the first 3 years as part of a "rate-smoothing" strategy. During the initial connection period, the fixed annual costs must be paid even though the number of ERUs will not be sufficient to avoid very high rates. An initial operating subsidy will be used to level the monthly rates.

3. A "Get Connected" loan program to assist existing septic owners with the cost of the private lateral installation and septic system decommissioning.

GROWTH AND FLOW ASSUMPTIONS

As described in the *Financial Plan*, the long-term growth assumptions used to determine sewer and lift station sizing and capacity requirements at the Sequim WRF are not driving considerations for determining the financial viability of a new utility. The financial analysis is concerned with how many of the potential initial ERUs, those properties with septic tanks within the Initial Connection Area, will connect during the

first 2 years of the utility. An estimated 484 ERUs, 78 residential and 406 commercial, are located within the Initial Connection Area.

The financial analysis assumes the base case scenario which includes 75 percent of the potential initial ERUs will either choose to connect during the initial connection period or will be required to connect based on the age or condition of their septic system. The base case scenario also assumes that the remainder of the existing septic properties in the Initial Connection Area will be connected over the next 18 years resulting in all existing septic systems being decommissioned by 2035. The base case scenario assumes new development will connect to the system at an annual growth rate of 2.15 percent.

Financial outcomes are sensitive to growth assumptions; therefore the *Financial Plan* evaluated the impacts to rates developed for the base case of an additional three growth scenarios. The scenarios included the following:

1. **Slower Growth:** In this scenario, only 50 percent of the potential initial ERUs connect during the initial connection period. The rate of connection for the remaining existing septic properties is assumed to be 1.5 percent per year. A connection rate of 1.5 percent per year is also assumed for new development.

2. **Faster Growth:** In this scenario, 90 percent of the potential initial ERUs connect during the initial connection period. From the group of existing septic properties, growth occurs at a 2 percent per year pace, and growth from new development occurs at a 3 percent annual rate.

3. **Very Slow Growth:** In this scenario, 35 percent of the potential initial ERUs connect during the first 2 years. Growth from the group of existing septic properties proceeds at a rate of 1.5 percent per year, and growth from new development is 1 percent per year.

FINANCIAL POLICIES

1. The new Carlsborg utility will maintain an operating reserve of 45 to 60 days of operating expenses.

2. The utility will maintain a capital contingency of 1 percent of asset value.

3. Rate-funded capital reinvestment will gradually increase over the life of the economic forecast. Initially, the rate-funded capital reinvestment amount would be 5 percent of depreciation of the capital assets and would increase to 10 percent of deprecation in 2021, 15 percent in 2026 and 20 percent in 2031. By 2035, rate-funded capital would be about $74,000 per year.

ECONOMIC ASSUMPTIONS

The following assumptions were used in the *Financial Plan* to account for economic conditions.

1. General Inflation (CPI): 2.5 percent CPI;
2. Construction Inflation (ENR): 3.5 percent;
3. Future Debt: 20-year term, 4.75 percent rate; and
4. Initial $10 Million PWTF Loan: 20-year payoff schedule, 0.25 percent rate

ESTIMATED MONTHLY RATES AND CONNECTION CHARGES

Exhibits 8, 9, and 10 in the *Financial Plan* in Appendix H summarize the capital financing strategy, the annual revenue requirement forecast, and the project fund balances for the Carlsborg utility assuming the base case connection scenario. Table 8-1 is a summary of Exhibit 11, Summary of Forecast Results, and Exhibit 15, Schedule of Recommended Connection Charges. The recommended total monthly charge is $70/month/ERU in 2016 and escalates to $119/month/ERU in 2035. The recommended connection charge is $7,976 in 2016 escalating to $9,863 in 2025, and is predicted to be adequate to fund the operation and maintenance and future capital needs of the utility.

TABLE 8-1

Estimated Monthly Rates and Connection Charges (Exhibits 11 and 15 in *Financial Plan* in Appendix H)

	2016	2017	2018	2019	2020	2025	2035
ERUs							
ERU Forecast (cumulative)	91	272	377	391	405	483	677
Percentage Growth in ERUs (2016 and 2017 ERU figures are mid-year averages)	Initial Operation	198.9%	38.6%	3.7%	3.6%	3.6%	3.4%
County Funds							
County Subsidy – Debt Service on PWTF Loan	$513,229	$513,229	$523,229	$513,229	$513,229	$513,229	
County Subsidy – Get Connected Loan Program	$300,366	$300,366	$0	$0	$0	$0	$0
County Subsidy – Additional Project Costs	(1)	(1)	(1)	(1)	(1)	(1)	(1)
County Subsidy – Operating Subsidy	$135,676	$56,438	$11,134	$0	$0	$0	$0
Monthly Rates							
Volume Rate (per ccf winter average)	$8.66	$7.58	$7.32	$7.29	$7.26	$7.11	$6.84
Monthly Base Charge per ERU	$26.00	$31.48	$32.79	$33.92	$33.54	$33.98	$84.45
Average Volume Charge/ERU (125 gpd winter average)	$44.00	$38.52	$37.21	$37.05	$36.90	$36.14	$34.76
Total Monthly Charge/ERU (125 gpd winter average)	$70.00	$70.00	$70.00	$70.97	$70.43	$70.12	$119.22
Increase/(Decrease) in Monthly Rate	NA	0.0%	0.0%	1.4%	-0.8%	-0.7%	2.2%
Total Monthly Charge/ERU (constant 2014 dollars)	$66.63	$65.00	$63.42	$62.42	$62.73	$53.44	$70.98
Flat Rate for Properties on Wells (@150 gpd)	$78.80	$77.70	$77.44	$78.38	$77.81	$77.34	$126.17
Connection Charges							
Get Connected Subsidy	$500	$500	$0	$0	$0	$0	$0
Non-Subsidized	**$8,147**	**$8,322**	**$8,501**	**$8,683**	**$8,869**	**$9,863**	**$11,983**(2)

(1) Not known at this time.
(2) Assumed annual escalation rate for 2025 to 2035 is 2.15 percent.

The *Financial Plan* includes a summary of the sensitivity of the rates to the three additional growth scenarios discussed previously. The most important variable that drives the level of rates is the number of ERUs that connect to the sewer. Table 8-2 presents the rate sensitivity analysis.

TABLE 8-2

Summary of Rate Sensitivity Analysis
(Exhibit 13 in *Financial Plan* in Appendix H)

Rate Sensitivity Analysis		2016	2017	2018	2019	2020	2025	2035
Total Monthly Charge per ERU								
Base Case		**$70.00**	**$70.00**	**$70.00**	**$70.97**	**$70.43**	**$70.12**	**$119.22**
% Connected in First 2 Years	75%							
Converted ERUs – Annual Growth	1.61%							
New Development – Annual Growth	2.15%							
Slower Growth		**$89.00**	**$89.00**	**$89.00**	**$89.49**	**$88.98**	**$90.45**	**$179.09**
% Connected in First 2 Years	50%							
Converted ERUs – Annual Growth	1.50%							
New Development – Annual Growth	1.50%							
Faster Growth		**$63.00**	**$63.00**	**$63.00**	**$64.17**	**$63.35**	**$62.40**	**$107.52**
% Connected in First 2 Years	90%							
Converted ERUs – Annual Growth	2.00%							
New Development – Annual Growth	3.00%							
Very Slow Growth		**$113.00**	**$113.00**	**$113.00**	**$113.01**	**$112.58**	**$115.76**	**$256.54**
% Connected in First 2 Years	35%							
Converted ERUs – Annual Growth	1.50%							
New Development – Annual Growth	1.00%							

COMPARISON WITH SEQUIM RATES

The monthly rates have a significant volume-related component. ERUs that use less water will pay a lower monthly rate. The $70/month/ERU Carlsborg sewer charge assumes 5.08 ccf/month water use in the winter. The Sequim in-City rates, assuming low volume water use (<8 ccf/month winter average), is projected to be $62.25 in 2016. The Carlsborg projected monthly rate includes operation and maintenance of the Olympic Lift Station and force main as well as the collection system, and a 1.15 percent multiplier on the Sequim operation and maintenance charges. The Sequim in-City connection charge in 2016 is projected to be $8,550 or approximately $400 higher than the proposed Carlsborg connection charge.

APPENDIX A

WATER RIGHTS/MITIGATION ANALYSIS (PGG)

Task 2A Technical Memorandum

To: Tom Martin, Bob Martin and Paul Haines

From: Jill Van Hulle, Peter Schwartzman

Re: Carlsborg Water Demand and Future Water Rights

Date: February 24, 2014

1.0 INTRODUCTION

This memorandum addresses Task 2A of Pacific Groundwater Group's (PGG's) sub-consultant work order for Clallam County. PGG has reviewed the water rights held by the Clallam County PUD ("PUD") for the Carlsborg Water System. We have verified allocated quantities (Qi and Qa), as well as assessed general status of the rights. Our primary goal was to compare existing PUD water rights and system capacities to predicted future demand to identify required future water rights. We have also identified several means that could be used to by the PUD to allow full use of existing water rights and to potentially increase allocations without purchasing new water rights.

PGG reviewed the PUD/County interlocal agreement, and briefly discussed the ramifications of the agreement with both Tom Martin at the PUD and Bob Martin at the County. Gray & Osborne estimated water demand and population growth through full buildout in a recent technical memorandum submitted to the County (G&O, 2014). PGG compared existing water rights to water demand projections (under sewered conditions) to assess the timing and quantity of new water rights needed to meet future demand through the build-out condition.

An earlier version of this memorandum served as a starting point for discussion regarding future water-supply and water-rights options for the Carlsborg UGA at a meeting held on October 1, 2013 attended by select project stakeholders (Clallam County and its consulting team, PUD, and City of Sequim). This memorandum has been revised based on discussions of the stakeholder group to reflect further refinements of the future demand projections (also reflected in G&O's technical memorandum). The numbers presented in this memo will be used as a basis to define the most likely future water-right requirements for which mitigation approaches will be assessed under the due diligence cost comparison (Task 2E). A subsequent memorandum will be prepared to discuss mitigation options based on PGG's assessment and associated discussion at a meeting attended by a broader group of stakeholders (as above plus the Washington Water Trust, Jamestown S'Klallam Tribe, Department of Ecology).

2.0 BACKGROUND

The PUD provides water service to approximately half of the Carlsborg UGA and some properties outside of the UGA. The remainder of the UGA is served by private wells and several smaller private purveyors. About 110 individual lots within the Carlsborg UGA are served by private wells. Some of these parcels are residential, and others are commercial properties. A map showing the PUD's Carlsborg water service area is included as **Attachment A**.

Clallam County would like the PUD to expand its water service area to include the entire UGA, and the PUD is interested in doing so provided that expanding service does not have an adverse impact on their existing water rights or ability to secure additional water rights.

2.1 INTERLOCAL AGREEMENT

In March 2013 Clallam County and the PUD entered into an Interlocal Agreement that addressed future water-supply planning, responsibilities for acquisition of additional water rights and associated water-rights mitigation[1].

The agreement provides that:

1. The PUD shall provide information on future water supply needs for the Carlsborg UGA to be used by the County to evaluate future water-right mitigation costs to supply future water customers in the UGA through full-build out (Inter-local Agreement Section 3.2).

2. The County will engage a consultant to evaluate the effect that wastewater reclamation and reuse outside the UGA would have on water-right mitigation costs to supply future water customers in the UGA at full buildout (Section 4.2).

3. In the event that the County proceeds with the Sequim Alternative and water-use mitigation costs to future water customers in the UGA are adversely affected by treatment and infiltration of water in Sequim vs. Carlsborg, the County will purchase or otherwise procure for the PUD additional existing water rights to <u>supply water for full buildout of the area outside the PUD's current local utility district water service area but within the UGA</u>, in a quantity sufficient to offset any adverse effects (Section 4.5).

In order to meet the intent of the interlocal agreement it is understood that the County will need to determine how much additional water is needed to supply the UGA <u>and</u> to calculate whether routing the wastewater to Sequim for possible reclamation outside of the Carlsborg area would result in increased costs associated with securing additional water rights.

[1] The interlocal agreement can be found on the County's website for the Carlsborg sewer project: http://www.clallam.net/PublicWorks/CarlsborgSewer.html

As will be discussed in this memorandum, Ecology's adoption of WAC 173-518 and the Dungeness River management program means that there will be mitigation costs associated with *any* proposal to secure additional water rights. Mitigation can come from a variety of sources such as the acquisition and subsequent donation of existing water rights into the State's Trust Water Program, purchase of mitigation credits from the Dungeness Water Bank, and the infiltration of reclaimed water for the purpose of instream flow enhancement. Since removing a potential source of recharge (reclaimed water) could complicate mitigation options for the PUD's future water supply, it is important to assess the mitigation options and relative costs.

2.2 BASIC ASSUMPTIONS

PGG's analysis of future water-supply and water-right requirements assumes the following:

- The County understands that acquiring mitigation water for future water rights may be required from other sources if mitigation water cannot be derived from local (i.e. in the Carlsborg area) infiltration of reclaimed wastewater return flows.

- In preparing the 2010 Water System Plan, the PUD has demonstrated its intent to ultimately supply the full UGA.

- Both parties agree that existing water rights for the PUD are adequate for some expansion; though additional water rights are needed for the entire UGA to become developed at urban densities.

- The PUD has indicated that they view the goal of this analysis as determining the mitigation requirements needed at full buildout and the County's required contribution to such mitigation.

- The County assumes that the PUD will make every effort to maximize the use of their existing water rights both within the current and future service areas. This includes any needed modifications to existing water rights, source redevelopment and storage.

- Given that water-rights mitigation would be needed for reclaimed water infiltration under both the "Carlsborg" and "Sequim" options, the County interprets the interlocal agreement such that they would be responsible for developing the difference in mitigation between the two alternatives for that <u>area outside the PUD's current local utility district water service area but within the UGA, not including the areas that are served by other private water systems (Section 3.3)</u>. **Attachment A** (Figure 2-7 Revised Final Facility Plan, BHC 2010) shows both the Carlsborg UGA and service area for the PUD.

- The Department of Ecology bases the issuance of additional primary water rights (additional acre-feet) on projected Average Daily Demand (ADD) adjusted for reasonable

conservation assumptions. The issuance of additional acre-feet would be subject to the mitigation requirement provisions in WAC 173-518.

- Ecology *may* consider water right applications that are intended for additional instantaneous withdrawals only – such as what might be needed to meet future Maximum Daily Demand (MDD) requirements. The issuance of additional Qi may not necessarily be subject to the mitigation requirements outlined in WAC 173-518 in the same manner as additional annual withdrawals.

- Ecology generally prefers to allocate water to meet future demand for 20-year planning horizons. Ecology will consider application for longer-range water demands; however, the applicant has a greater burden to demonstrate that the request is not speculative.

3.0 CARLSBORG WATER SUPPLY

The Carlsborg Water System is located in eastern Clallam County, approximately 2 miles west of the western boundary of the City of Sequim within Sections 14, 15, 21, 22, and 27 of Township 30, North, Range 4 West. The system provides water service to portions of the Carlsborg UGA and also serves areas outside the UGA (**Attachment B**).

3.1 CURRENT WATER RIGHTS & ACTUAL SOURCE CAPACITIES

The PUD currently holds water rights in the amount of 467.6 acre-feet and 461 gpm. These rights are for three sources of supply – the main Carlsborg well and two wells associated with Sequim Valley Tracts.

The main Carlsborg production well is authorized by water right certificate G2-27681 for instantaneous pumping of 341 gpm and annual use of 395.6 acre-feet. The source is currently equipped to produce 260 gpm. The well is located in the SE ¼ SE ¼ of Section 15, Township 30, Range 4 W.W.M. Based on its completion depth (of 177 feet) and site elevation (185 feet msl), the well is considered to be completed in the middle aquifer.

Sequim Valley Tract Wells 1 and 2 are authorized by GWC 5855 and G2-22899 for total instantaneous withdrawals of 120 gpm and annual use of 72 acre-feet. A Superseding Certificate has been issued to the PUD adding the main Carlsborg well as an additional point of withdrawal. The Sequim Valley wells are currently equipped to produce 110 gpm but are reserved for emergency use. The wells have completion depths of 163 and 298 feet respectively. Based on their site elevation (240 feet msl), they are considered by the PUD to be completed in the middle aquifer, but that has not been verified by a hydrogeological assessment.

In 2006, the PUD filed pending application G2-30364 to withdraw an additional 510 gpm and 215 acre-feet for a population of 1,400 people. The proposed source appears to be the existing Carlsborg and Sequim Valley Tract wells along with a possible fourth well to be constructed into a deeper aquifer. Ecology has no immediate plans to process this application and it is unclear

how an additional permit would be structured given that the PUD already has adequate rights to meet a population growth of that magnitude. The current wells may not be capable of producing an additional 510 gpm, and Ecology generally will not allow for a single permit to authorize wells in multiple aquifers, so the PUD would likely need to reapply for a new permit for a deeper source.

Based on the annual allocation (Qa) of 467.6 acre-feet and an ADD of 178 gallons per day per ERU (Gray & Osborn, 2014), the PUD's current rights could actually serve approximately 2,343 connections. The instantaneous allocation (Qi) of 461 gpm associated with these rights reduces the number of connections that can be supplied to 1,239 ERU's based on a peaking factor of 3.01 (cited in the 2010 Water System Plan), which translates the ADD of 178 gpd/ERU to an MDD of 536 gpd/ERU. Currently the limiting factor for the number of connections this system can supply appears to be capacity - both from well production and from storage. The existing infrastructure includes three groundwater sources, a treatment facility, storage tanks, distribution system piping, and a booster pump station. Our calculations suggest that the capacity of the existing Carlsborg well can only satisfy the demand of 669 ERU's (approximately 139 acre-feet/year), which is only 30 percent of its maximum annual water right capacity. If the Sequim Valley Tract wells were also producing at capacity, the combined capacity would satisfy 994 ERU's.

3.2 CURRENT AND PROJECTED FUTURE WATER USE

The PUD's Water Use Efficiency Reports submitted to Washington Department of Health (WDOH) indicated in 2012 the system used approximately 67 acre-feet, and in 2013 only 65 acre-feet. Since 2010, water consumption for this system has shown a declining trend: 159.1 gpd/ERU in 2011 and 147.9 gpd/ERU in 2012 and 2013. Despite the fact that these values are lower than reported in the 2010 Water System Plan, for the purpose of future projections (and to be conservative), PGG will use the reported value of 178 gpd/ERU.

PGG estimated future water demand over-time between 2010 and full buildout. Demand forecasts at full buildout were generated for both the existing service area (which supplies *portions* of the UGA along with areas outside the UGA) and for an extended service area (which would supply the *full* UGA plus the same external areas). ERU's at full buildout were estimated by G&O (2014), and their memorandum should be consulted to access the assumptions underlying these estimates. Growth in the number of ERU's from 2010 through full buildout was assumed proportional to G&O's population projections from 2010 through 2030, 2050 and full buildout[2].

Table 1 (below) presents future demand projections for the Carlsborg water system. Small water systems located within the UGA with existing water rights are not included. PGG assumed that the projected ERU's at full buildout included the roughly 110 residences in the UGA with existing wells. PGG further assumed that these ERU's will ultimately be supplied by the PUD's water system. Therefore, PGG assumed that their permit exempt water rights can be consolidated into the PUD's new water right, thus reducing its annual water requirement by 37 af/yr.

[2] PGG assumed a population growth rate of 2.015% from 2050 through full buildout, consistent with the 2010 Water System Plan.

Table 1 - Carlsborg Water System Demand Forecast					
1a. Existing Service Area	**Year**				
	2010	**2016**	**2030**	**Buildout w/o Sewer**	**Buildout w/ Sewer**
Equivalent Residential Units (ERUs)	387	440	592	980	2,928
Average Day Demand (ADD) in gallons per day	68,886	78,320	105,376	174,440	521,184
Annual Water Use (AF/Yr)	77.22	87.80	118.13	195.55	584.24
Existing Water Right (AF/Yr)				467.60	467.60
Additional PUD Water Rights Required (AF/Yr)				-272.05	116.64
1b. "Remainder" CUGA* (Excluding Small Water Systems)	**Year**				
	2010	**2016**	**2030**	**Buildout w/o Sewer**	**Buildout w/ Sewer**
PUD Service ERUs	264	301	408	NR	1,690
Average Day Demand (ADD) in gallons per day	46,992	53,578	72,624	NR	300,820
Acre-Feet per Year	52.68	60.06	81.41	NR	337.22
Water Rights from Consolidation of Private Wells (AF/Yr)					37.00
Required Water Right at Buildout (AF/Yr)					300.22
1c. Extended Service Area (Excluding Small Water Systems)	**Year**				
	2010	**2016**	**2030**	**Buildout w/o Sewer**	**Buildout w/ Sewer**
Equivalent Residential Units (ERUs)	651	741	1,000	NR	4,618
Average Day Demand (ADD) in gallons per day	115,878	131,898	178,000	NR	822,004
Annual Water Use (AF/Yr)	129.90	147.86	199.54	NR	921.46
Total Required Water Rights Assuming Private Well Consolidation (AF/Yr)				NR	416.86
1d. Same as "1c" Above, but with G&O Growth Projections	**Year**				
	2010	**2030**	**2050**	**Buildout w/o Sewer**	**Buildout w/ Sewer**
Equivalent Residential Units (ERUs)	651	1,230	2,116	NR	4,618
Average Day Demand (ADD) in gallons per day	115,878	218,898	376,662	NR	822,004
Annual Water Use (AF/Yr)	129.90	245.38	422.23	NR	921.46
Total Required Water Rights Assuming Private Well Consolidation (AF/Yr)				NR	416.86
* Remainder CUGA = CUGA minus existing PUD service area.					
Water Use per ERU = 178 gpd					
Tables 1a-1c use growth projections from the 2010 water system plan, whereas					
Table 1d uses population growth projections from G&O 2014 technical memorandum.					

Figures 1 and **2** show the projected growth in ERU's along with associated estimates of ADD and MDD for the expanded service area. Full buildout of 4,618 ERU's is projected to occur in 2086. The PUD has indicated the growth rate may actually be higher (4.5%) based on recent trends which would mean buildout would be reached sooner.

3.3 REQUIREMENTS FOR ADDITIONAL WATER RIGHTS

Current water rights are insufficient to meet build-out requirements, both within the PUD's current service area and within the extended service area. The PUD's current Qa of 467.6 acre-feet per year is 116.6 af/yr short of meeting the build-out ADD for its existing service area and 416.9 af/yr short of meeting the build-out ADD for the extended service area assuming consolidation of existing permit-exempt water rights (**Table 1**). The projected ADA of the extended service area at full buildout (921.5 af/yr), equates to an MDD of 1,719 gpm based on the 3.01 multiplier cited in the 2010 Water System Plan. The PUD's current Qi of 461 gpm is 628 gpm short of meeting the build-out MDD for its existing service area and 1,258 gpm short of meeting the buildout MDD for its expanded service area. Additional water rights will be needed to meet estimated demand prior to full buildout. For combined growth in the PUD's extended service area, **Figure**

1 suggests that additional Qa will be needed in 2054 and **Figure 2** suggests that additional Qi will be needed in 2030. As described in Section 5, some of the required Qi could potentially be obtained via consolidation of existing permit-exempt water rights within the UGA.

It should be noted that the area outside of the PUD's current service area but inside of the UGA includes four moderately sized private water systems– Parkland, Green Acres Mobile, KEVCA and Carlsborg Mobile. These systems currently supply water to approximately 250 homes, and G&O (2014) projects that they will need to supply 495 ERU's (98.8 af/yr) at full buildout. PGG compared projected water demand with the water rights of these four systems and concluded that either: 1) existing water rights should be adequate to meet future needs or 2) projected deficits are insignificant relative to the magnitude of the PUD's new water right requirement for Carlsborg buildout. Therefore, this memo assumes that the new water-right quantities estimated for the PUD to serve the extended Carlsborg service area at full buildout need not consider supplemental supply to these four systems.

Water right authorizations limit the rate of withdrawal from a given source (Qi) and amount of water that can be appropriated over the course of a year (Qa). From the Department of Ecology's perspective, these numbers are not implicitly linked but instead document the installed capacity of a particular well and the amount of water needed to meet a particular demand. When issuing additional primary water rights, Ecology evaluates projected ADD adjusted for reasonable conservation assumptions to allocate Qa. For the purposes of determining how much additional water is needed to supply the UGA at full build out, PGG has similarly focused on annual allocations. As noted above, an additional allocation of 417 af/yr would be needed to supply the PUD's extended service area at full buildout. However the PUD also needs to consider Qi and overall source capacity in future permitting actions.

When assessing Qi, Ecology looks at the capacity of a given well not the system configuration; for that reason it's not uncommon for water rights to be issued with a Qi that is inadequate to meet peak demands within a water system. This is the case with the PUD's current water right, in which the authorized Qa of 467.6 af/yr equates to an ADD of 290 gpm, and the associated MDD of 873 gpm[3] significantly exceeds the 461 gpm Qi. Although a portion of the associated MDD could be provided by constructing additional storage, the PUD would still need to develop a new groundwater source to increase its instantaneous pumping capacity and meet maximum rates of demand. Ecology does allow applicants to seek additional Qi on existing water rights – which means that the water user is allowed to increase its rate of withdrawal without expanding the annual allocations beyond permitted amounts. However, as noted above, to meet the buildout MDD of its extended service area, additional Qi from new water rights would also be needed.

In evaluating requests to increase Qi under an *existing* water right, Ecology looks specifically at the range of impacts that could result from the increased withdrawal rate. Accordingly, it may be possible to secure water rights for additional instantaneous capacity without extensive mitigation requirements provided that the increased withdrawal does not exacerbate conditions in surface water bodies. An example of this might be if the PUD were to file for a new water right permit to develop a new source in the deeper system and shift some of its production away from the

[3] Calculated using the 3.01 multiplier between MDD and ADD, as cited in the 2010 Water System Plan.

shallower wells in favor of deeper supply that had less likelihood of impacting surface water. Under such a scenario Ecology *might* allow for the PUD to increase the withdrawal rate from the deeper source in exchange for reducing the overall use of the shallower wells and possibly some additional mitigation (e.g. on distant streams). The permitting process for requests such as these are evaluated on a case-by-case basis and the specific pumping scenario needs to be carefully reviewed to make sure that no additional undesirable impacts occur. While it might be possible for the PUD to *self-mitigate* using their own underutilized water rights, Ecology may require additional mitigation consistent with new water right applications requesting new annual withdrawals. For that reason we will consider both Qi and Qa as potential limiting factors to reaching full buildout.

Ecology understands the need to be proactive regarding water-right planning and will consider long-term demand, however it may be difficult to secure a new permit for demand that is not anticipated to occur for 60 years. Regardless, PGG's role in this project is to evaluate mitigation requirements and costs for future water rights using currently best available information and assumptions.

4.0 MAKING FULL USE OF EXISTING WATER RIGHTS

This memorandum assumes that the PUD will make reasonable efforts to fully utilize their existing water rights before new water rights are needed. Listed below are suggestions for how the PUD could make use of their full water-right allocation. <u>All of these options are viable under routine Ecology procedures and do not rely on WAC 173-518 specific provisions or require extensive stakeholder buy-in</u>.

1. Under water right G2-27681, expand capacity at Carlsborg well site by drilling a back-up well at the site under a *Showing of Compliance with RCW 90.44.100*. The well would need to be constructed within the same originally published ¼ ¼ section. The process for filing a *Showing of Compliance* is primarily administrative; provided the new well targets the same body of groundwater, there are no risks to the PUD's water rights or Administrative Costs. Since *Showing of Compliances* are filed after the new well is constructed there is no requirement for Ecology to approve or authorize the new well.

2. File an *Application for Change* and add a second point of withdrawal (POW) to the Carlsborg water right (G2-27681) to allow for construction of another well at a site other than what would be allowed under a *Showing of Compliance with RCW 90.44.100.*

   The filing of an *Application for Change* and supporting information would have some moderate administrative costs associated with it. Additionally, for a timely decision, the *Application for Change* may need to be processed through a Cost Reimbursement agreement – which provides an alternate mechanism for expedited water right processing based on contracting for services with outside water right consulting teams.

3. Remove the "emergency use" restriction from the Sequim Valley Wells and put their water rights (GWC 5855 and G2-22899) to use at their existing site. The Sequim Valley water rights allow for 120 gpm and 72 acre-feet per year.

5.0 STRATEGIES TO MAXIMIZE USE OF EXISTING SYSTEM

The above estimates of future water-right requirements could be further revised based on several mechanisms that the PUD could use to increase the number of connections they are approved to serve, thereby reducing the required additional Qa and forestalling the date of new water rights needed.

1. As a variation to Option 4 (above), instead of filing for a change in point of withdrawal, the PUD could place the Sequim Valley Tracts water rights into the State's Trust Water Program for groundwater recharge purposes and leverage a new groundwater right from a deeper well using Trust Water as mitigation tool. The presence of a (more isolated) deeper aquifer would need to be established in the Carlsborg vicinity to allow completion of such a deep well. Average-annual model results suggest that impacts to surface water from pumping a well at the Carlsborg site would be less if the deeper aquifer is encountered locally and used[4].

   The administrative costs are moderate and include preparing an *Application for Trust Donation*, supporting information and a new Application for Water Right Permit. The application could be processed via a Cost Reimbursement agreement or possible in house by Ecology under the priority system established for fully mitigated projects, (WAC 173-518-076 Expedited processing).

2. Pursue Exempt Well Consolidations. Under the provisions of RCW 90.44.105, public water systems that are extending water supply to properties that are currently served by private wells have the option of consolidating those exempt rights with an existing water right. We understand that the County may decide to make sewer access contingent on requiring existing water users to transfer their water right to the PUD for consolidation. While Exempt Well Consolidations only serve to increase a system's annual authorization in small increments, they can be a useful tool to increase the instantaneous withdrawal rate. For example, the consolidation of 110 private exempt wells could increase the PUD's rights by 37 acre-feet per year (assumes Ecology recognizes a per connection water duty of 300 gpd/connection) and 1,100 gallons per minute of instantaneous capacity, (based on the each exempt well having been equipped to produce 10 gpm.) While the increase in annual quantities is of minor benefit to the PUD, the potential increase of

[4] The distribution of impacts associated with using deeper sources over shallower sources would not be the same among streams, and some mitigation or water-banking could still be required. However, such a transfer targeting to the Sequim Valley Tracts water rights could theoretically increase the PUD's total water rights.

withdrawal rate could have significant benefits in the PUD's ability to expand Qi to meet future peaking demand.

3. Acquire Water Supply from City of Sequim. Regionalizing public water systems and developing interties between systems is a goal of the WRIA 18 Watershed Planning process. One source of water could be via direct purchase of water from the City of Sequim; however, there are other mechanisms that could be used to share or "wheel" water between users. The costs for wholesale water would need to be negotiated between parties.

While all three of the suggestions above could reduce the need to acquire (and mitigate) for additional water rights to support PUD water supply at full buildout, PGG's analysis will not assume that such measures will be exercised. The basis of PGG's and G&O's due diligence analysis is presented below.

6.0 VALUE/QUANTITY OF POTENTIAL RECLAIMED WATER

Infiltration of reclaimed water can be a useful tool to mitigate for impacts to surface-water bodies associated with new groundwater rights at Carlsborg. G&O's recent technical memorandum provides an evaluation of how much wastewater and reclaimed water will be generated from the Carlsborg sewer. PGG's upcoming memorandum for project Task 2B will provide a quantitative assessment of the role of infiltrated reclaimed water for mitigation. G&O's sewer flow estimates indicate that infiltration of reclaimed water can provide a significant portion of the total mitigation requirement associated with new water rights at Carlsborg.

7.0 SUMMARY

The analyses presented in this memorandum indicate that the PUD would require additional water rights of about 417 af/yr (Qa) and 1,258 gpm (Qi) to meet the demands of the extended service area at full buildout. Much of the required Qi might be obtained from consolidation of existing permit-exempt water rights within the UGA. This memorandum also suggests additional strategies that could further extend the PUD's existing water rights.

PGG will use the required new annual water-right allocation to evaluate mitigation alternatives under scenarios where wastewater from Carlsborg is treated and infiltrated in the Carlsborg vicinity ("Carlsborg Option") versus the Sequim vicinity ("Sequim Option"). Mitigation for the new water right will likely be required in either case, and the difference in mitigation cost between the two options is a key factor in the County fulfilling the terms of their interlocal agreement with the PUD. PGG will not distinguish between mitigation for buildout within the PUD's service area and mitigation for the remainder of the UGA (as differentiated in the Interlocal Agreement). Given its responsibilities for capital facilities planning for the UGA under the Growth Management Act, and in light of the analyses presented in this memorandum, Clallam County recognizes its role in water supply issues, and the need to work with the PUD to assess water demand for full build out of the CUGA. This Task 2a and the subsequent Task 2b memo evaluate full CUGA demand based on this cooperative working arrangement.

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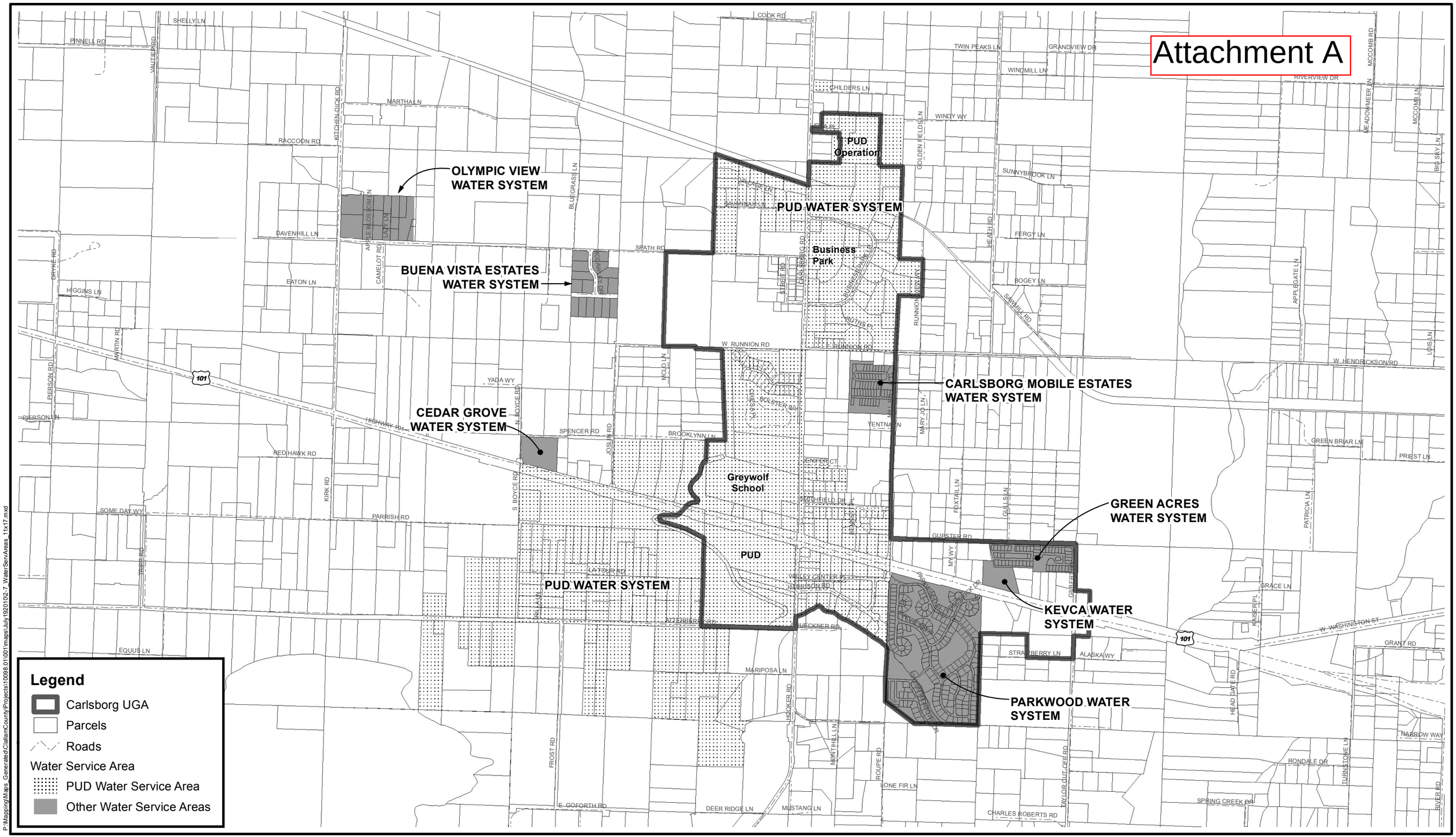

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Data Source: Clallam Co. 2006

This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

MAP DATE: JULY 19 2010

N

0 625 1,250 2,500 Feet

CLALLAM COUNTY PUD Bringing Energy To Life™

Water Service Areas

Sewer Facilities Plan
July 19 2010

Figure

2-7

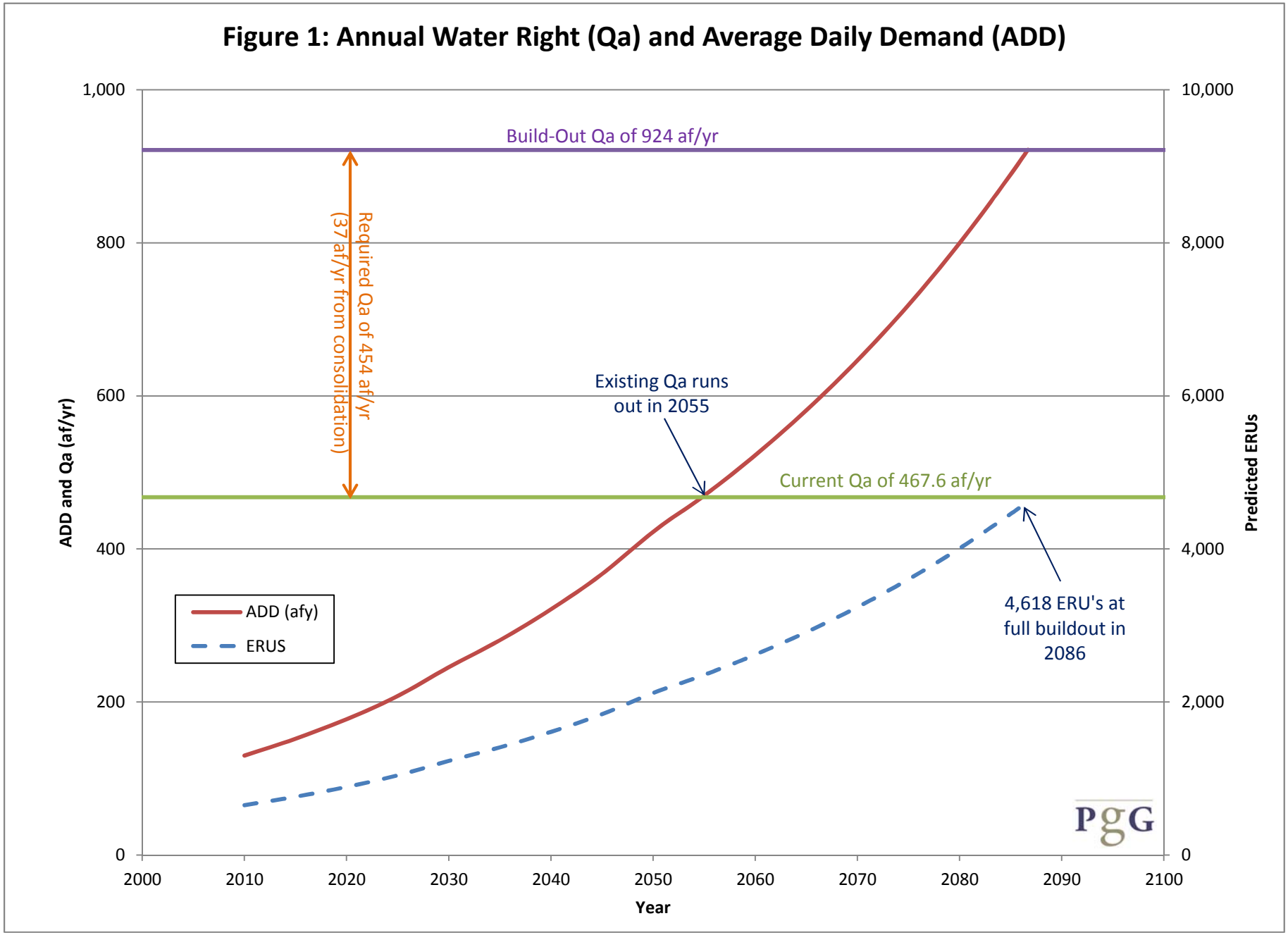


Figure 1: Annual Water Right (Qa) and Average Daily Demand (ADD)
1,000
800
600
400
200
0
10,000
8,000
6,000
4,000
2,000
0
ADD and Qa (af/yr)
Predicted ERUs
Build-Out Qa of 924 af/yr
Required Qa of 454 af/yr
(37 af/yr from consolidation)
Existing Qa runs
out in 2055
Current Qa of 467.6 af/yr
4,618 ERU's at
full buildout in
2086
ADD (afy)
ERUS
PgG
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Year

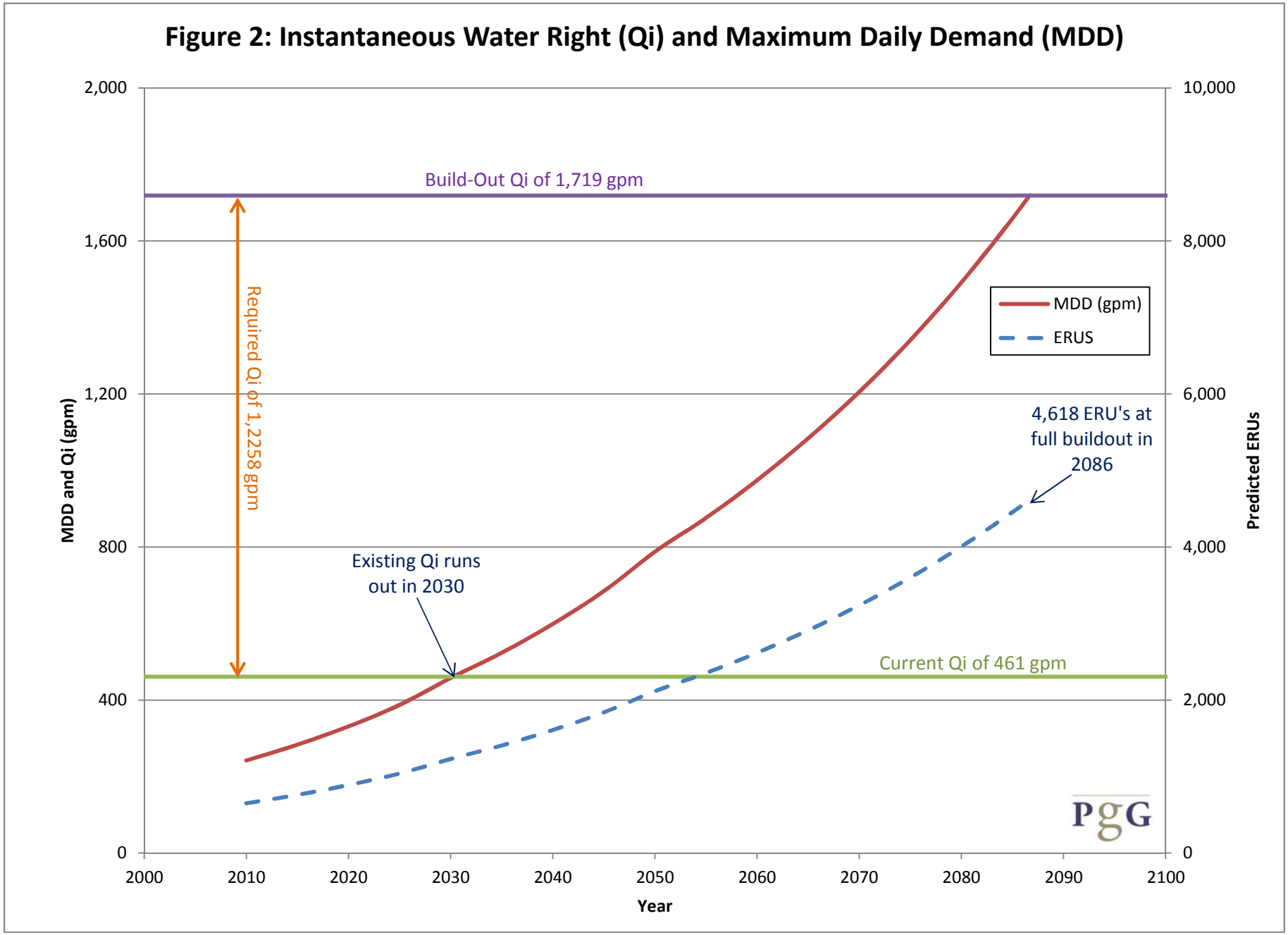


Figure 2: Instantaneous Water Right (Qi) and Maximum Daily Demand (MDD)
2,000
1,600
1,200
800
400
0
10,000
8,000
6,000
4,000
2,000
0
MDD and Qi (gpm)
Predicted ERUs
Build-Out Qi of 1,719 gpm
Required Qi of 1,2258 gpm
MDD (gpm)
ERUS
4,618 ERU's at full buildout in 2086
Existing Qi runs out in 2030
Current Qi of 461 gpm
PgG
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Year

Task 2B Technical Memorandum

To: Bob Martin, Clallam County
Jay Swift & Nancy Lockett, Gray & Osborne (G&O)
Paul Haines (City of Sequim)

From: Jill Van Hulle & Peter Schwartzman, Pacific Groundwater Group (PGG)

Re: Identification of Possible Mitigation Approaches for Future Carlsborg Water Rights

Date: February 28, 2014

1.0 INTRODUCTION

The recently enacted WRIA 18 Water Resources Management Program (WAC 173-518) requires that new consumptive water rights be mitigated so they are water-budget neutral. New water right permits have not been approved yet under this plan, however the Dungeness Water Exchange (DWE) has an approved mitigation plan in place that addresses single domestic water use. While general principles of mitigation are applied state-wide, in practice, acceptable mitigation approaches have varied among Ecology's regions. A future water right, and associated mitigation, will be needed to meet projected water demand in the Carlsborg area once sanitary sewers are constructed. Mitigation approaches will likely differ depending on whether wastewater treatment occurs in Carlsborg or in Sequim. Clallam County and the Clallam PUD have signed an interlocal agreement that addresses water right considerations between the "Sequim Alternative" and the "Carlsborg Alternative". If the "Sequim Alternative" is selected, Clallam County will compensate the Clallam PUD for any *additional* mitigation costs above those associated with the "Carlsborg Alternative".

PGG's role in this process was to develop "representative mitigation schemes" for both the Carlsborg and Sequim alternatives. Each mitigation scheme may employ one or more of the mitigation approaches identified in this memorandum. For the purpose of comparison, the Carlsborg Alternative (in which wastewater is treated in Carlsborg and reclaimed locally) is considered the *baseline* scenario. The representative mitigation scheme(s) developed for Carlsborg will be compared to scheme(s) developed for the Sequim. Due diligence cost comparisons for the various mitigation schemes will be developed by G&O and included in PGG's final mitigation analysis report. G&O will incorporate the mitigation cost comparison in an overall cost comparison for the Carlsborg and Sequim alternatives.

Under Task 2B of our scope of work, PGG hosted a meeting attended by project stakeholders to discuss a range of possible mitigation approaches. The purpose of the meeting was to explore ideas, encourage the exchange of information, and provide reality checks regarding possible mitigation approaches. The meeting was held on December 12, 2013 and attendees included the

G&O/PGG consulting team and representatives from Clallam County, City of Sequim, Clallam PUD, Ecology, Washington Water Trust, Dungeness River Agricultural Water Users Association, Clallam Conservation District and the Jamestown S'Klallam Tribe. Meeting notes and a PDF of the PowerPoint presentation are available on the project website[1]. PGG also conducted follow-up conversations with selected stakeholders to clarify topics discussed at the meeting.

This memorandum presents a matrix of potential mitigation approaches identified by PGG (with input from project stakeholders), estimates of streamflow depletion associated with the future Carlsborg water right, and a preliminary assessment of the mitigation potential of reclaimed water infiltration in both the Carlsborg and Sequim vicinities. A draft version of the memo was circulated among project stakeholders prior to the above-referenced meeting to facilitate informed discussion. This memo also presents PGG's recommendations for developing six refined representative mitigation schemes (Task 2D of the project scope)[2]. Once the combination of mitigation approaches is identified for each scheme, the relative reliance on each approach will be adjusted to take good advantage of its contribution to the overall mitigation target. The four representative mitigation schemes will be selected by Clallam County, who may further consult with potential project cooperators. Under Project Task 2E, PGG will work with G&O to perform the due diligence cost comparison.

2.0 POTENTIAL MITIGATION APPROACHES

Attachment A presents a matrix of various mitigation approaches identified by PGG[3]. For each approach, the matrix lists pros and cons, regulatory requirements and issues, cost factors, data gaps, and critical arrangements that may be required.

PGG assessed the need for additional water rights to serve the Carlsborg UGA in our "Task 2a Memorandum" (PGG, 2014). Based on population projections, additional water rights will not be needed for several decades. However, the County is obligated, through its interlocal agreement with the PUD, to evaluate future water-right mitigation costs now in order to supply future water customers in the Carlsborg UGA through full-build out.

For discussion purposes we have divided the mitigation approaches into five broad categories:

1. Approach 1 uses reclaimed water as a mitigation source. Option 1A is consistent with what was identified as the preferred alternative in the Carlsborg Facility Plan (BHC, 2012) with a reclaimed water infiltration facility and reclaimed water reuse in the Carlsborg UGA. Option 1B assumes that both treatment and infiltration will occur in the Se-

[1] http://www.clallam.net/PublicWorks/CarlsborgSewer.html

[2] While the project scope limited PGG's evaluation to 4 mitigation schemes, PGG will likely perform 6 under this evaluation.

[3] Given the size of the matrix, we recommend it be printed out on poster-size paper or viewed onscreen in Excel using "frozen panes". The matrix is provided as an Excel file on the project website.

quim area, and Option 1C address a hybrid approach with reclaimed water being discharged at sites both east and west of the river.

2. Approach 2 uses non-reclaimed water to mitigate for potential impacts. Option 2A involves entering into water banking agreements to purchase and/or trade with the DWE for mitigation credits, and Option 2B address mitigation by acquiring existing water rights.

3. Approach 3 is specific to pump-and-dumps, with Option 3A using groundwater as a mitigation source and Option 3B using surface water – irrigation rights in particular, as a source of mitigation water.

4. Approach 4 options are based on finding alternate sources of water for direct supply either from the City of Sequim (Option 4A), other water systems (Option 4B), and via water right acquisitions and transfers of existing rights for direct use (Option 4C).

5. Approach 5 uses out-of-kind mitigation such as stream and habitat enhancement projects.

These approaches have been discussed in more detail at the above-referenced stakeholders meeting. PGG provides recommendations for selecting among these approaches in Section 5 of this memorandum.

All of these approaches would require the issuance of numerous permits such as reclaimed water permits, mitigated water right permits and facility approvals; we have not however identified the specific permit pathways.

3.0 STREAMFLOW DEPLETION AND MITIGATION REQUIREMENT

A new groundwater right in the Carlsborg vicinity will require construction of a new production well, and associated groundwater withdrawals will reduce baseflows in streams on the Dungeness Peninsula. PGG reviewed geologic logs for the PUD's current Carlsborg (LUD#10) supply well, the Idea Place Deep Monitoring Well (0.4 miles to the north), and a hydrogeologic cross-section constructed by the USGS that runs north-south through this vicinity. Our review suggests that all three major aquifers (shallow, middle and deep) are likely to occur in the Carlsborg vicinity. A new production well would either be completed in the middle or deep aquifer; therefore, PGG analyzed streamflow depletion and mitigation requirements for both completion aquifers.

Streamflow depletion associated with pumping from a new groundwater right sourced from the middle or deep aquifer in the Carlsborg area appears to present an achievable mitigation requirement based on simulations with the 2008 Dungeness Model (PGG, 2009) and reasonable assumptions about water use and water treatment efficiency. The estimated mitigation profile appears achievable because: 1) available quantity of the primary mitigation resource (reclaimed water) exceeds the predicted streamflow depletion volume, 2) the relatively steady, year-round availability of reclaimed water is a good match for the low seasonal variability of streamflow depletion predicted by the model, and 3) the predicted distribution of depletion among streams is also reasonably achievable (with some caveats for very small impacts to distant streams). These

three components of the mitigation requirement (quantity, timing and distribution) are discussed in more detail below.

3.1 QUANTITY OF STREAMFLOW DEPLETION

The 2008 Dungeness Model predicts that the streams protected under WAC 173-518 would be depleted by 60.4 percent of the average pumping rate for a well completed in the middle aquifer and 24.6 percent of pumping for a well completed in the deep aquifer. Reclaimed wastewater from the Carlsborg area constitutes the primary resource for mitigation. Its availability exceeds the 24.6/60.4 percent depletion, as does its capability to augment streams as predicted by the model. Specifically, the model predicts that infiltration to the shallow aquifer in either the Sequim or Carlsborg vicinities will achieve about 90 percent stream augmentation. In addition, while mitigation will be required for the new PUD water right (projected annual withdrawal (Qa) of 417 AF), reclaimed water from the inchoate portion of the existing water right (381 AF Qa) is also available to mitigate for the new water right, leading to a surplus of mitigation water. The following table summarizes the quantities of mitigation water available and includes reasonable assumptions about consumptive use and distribution losses. It suggests that if all available reclaimed water (from inchoate and new water rights) were infiltrated, a surplus benefit to regulated streams would be available of approximately 362 af/yr (for pumping from the middle aquifer) and 511 af/yr (for pumping from the deep aquifer).

Table 1 – Streamflow Depletion vs. Reclaimed Water Mitigation Resource

Middle Aquifer Pumping	Deep Aquifer Pumping	
417	417	AF Projected New Water Right Requirement
60.4%	24.6%	Model Prediction of Associated Streamflow Depletion
251.8	102.6	AF Mitigation Requirement (water budget neutral)
381	381	AF Inchoate Portion of Existing Water Right
798	798	AF Future Water Use Available to Generate Mitigation Resource
10%	10%	Consumptive Use
5%	5%	Distribution Loss
5%	5%	I&I Gain on Wastewater Conveyance to Treatment Plant
10%	10%	Net Loss Between Pumping and Treatment (Consumption+Loss-Gain)
718.2	718.2	AF Wastewater Generated
5%	5%	Loss of Water in Wastewater Treatment Residuals and Leakage Loss on Conveyance of Reclaimed Water to Infiltration Facilities
682.3	682.3	AF Reclaimed Water Available for Infiltration
90%	90%	Model Prediction of Associated Streamflow Augmentation (Approximate)
614.1	614.1	AF Available Streamflow Augmentation (Approximate)
362.2	511.4	AF *Surplus* Mitigation Water

The above table assumes that current water use (178 gpd/ERU, as discussed in the Task 2a Memorandum) will continue into the future through full build-out of the UGA. Distribution loss will remain at the (recently estimated) value of 5%, and infiltration and inflow ("I&I") will rep-

resent a 5% *gain* as wastewater is conveyed to the treatment plant. Given the currently low water use observed per ERU and the emphasis on conservation for new water rights (i.e. limited or zero outdoor use), PGG assumes that only 10% of water use is consumptive. Our analysis also assumes that loss of water in wastewater treatment residuals and leakage loss on conveyance of reclaimed water to infiltration facilities will be on the order of 5% (based on input from G&O). We recognize that these assumptions are approximate and can be varied within reasonable ranges of uncertainty. However, *for the purpose of comparative analysis*, we believe that effect of uncertainty is relatively small as long as the same assumptions are applied to all four mitigation schemes.

3.2 TIMING OF STREAMFLOW DEPLETION

Pumping for the future Carlsborg water right was assumed to be drawn from the middle aquifer, which is insulated from the shallow aquifer and associated streams by the upper confining unit[4]. This hydraulic insulation dampens the seasonality of the impact of projected pumping on water resources associated with the shallow aquifer. Based on data provided by the PUD, the seasonality of pumping is expected to show a 2:1 ratio between maximum and minimum monthly volumes. **Figure 1** compares the seasonality of pumping to the annual cycle of streamflow depletion predicted by the model for middle-aquifer pumping. Predicted seasonal variation of depletion is predicted to be insignificant for all the small streams, and is predicted to be less than 5 percent of the average annual impact for the Dungeness River. For deep-aquifer pumping, seasonal variation is predicted to be even less significant, with Dungeness River variation less than 0.2 percent of average annual impact (**Figure 1**).

3.3 DEPLETION DISTRIBUTION AMONG STREAMS

The following table shows the distribution of average annual streamflow depletion predicted by the 2008 Dungeness Model for both middle-aquifer and deep-aquifer groundwater withdrawals at the PUD's current Carlsborg well location. Depletion is reported as percent of pumping rate.

The model predicts that depletion of the streams protected in WRIA 18 constitutes about 60.4 percent of pumping from the middle aquifer and 24.6 percent of pumping from the deep aquifer. These percentages, multiplied by the average annual pumping rate associated with the new water right (417 AF/yr, or 258 gpm), constitute the mitigation targets on a stream-by-stream basis.

Model estimates for the deep aquifer tend to show significantly smaller depletion values for streams close to the pumping center and slightly larger depletion values for streams distant from the pumping center. Pumping from the deep aquifer tends to produce a more geographically extensive cone of depression, which therefore increases impacts on more distant streams. However, its hydraulic insulation from the shallow aquifer causes a lower impact to streams overall.

[4] "Insulation" does not imply hydraulic isolation. Leakage still occurs through the aquitard that separates the shallow and middle aquifers.

Table 2 – Depletion Distribution Among Streams

Stream	Middle Aquifer	Deep Aquifer
Bagley	0.00%	0.01%
McDonald	0.45%	0.22%
Matriotti	1.40%	0.39%
Meadowbrook	0.47%	0.48%
Cassalery	2.27%	2.27%
Gierin & Graysmarsh	2.57%	3.12%
Bell	0.45%	0.87%
Johnson	0.00%	0.00%
Dungeness	52.76%	17.23%
Morse	0.00%	0.00%
Siebert	0.03%	0.03%
All Streams	*60.39%*	*24.61%*

4.0 MITIGATION VALUE OF RECLAIMED WATER

Much of this mitigation requirement could be satisfied by infiltration of reclaimed water. Over mitigation is likely for many streams because the available quantity of reclaimed water exceeds the predicted pumping impact. Under mitigation may occur on streams more distant from the infiltration location.

Given that the new water right will not be needed for decades, it is difficult to predict which parcels might be available for future mitigation via infiltration of reclaimed water. Nevertheless, for the purpose of illustration, the following tables show how infiltrating the full quantity of reclaimed water available for mitigation (682 af/yr = 423 gpm) could be used to offset the mitigation requirements associated with pumping from the middle and deep aquifers.

Two arbitrary infiltration locations were considered to develop the tables below: 1) a site 0.8 miles east of the Dungeness River and 0.6 miles south of SR101, and 2) the Olympic Discovery Trail (ODT) Ditch – west of the Dungeness River and just north of Carlsborg. This comparison does not include consideration of actual site availability or site infiltration capacity. The tables present average annual depletion/augmentation of protected streams both as *percentages* of the quantities pumped/infiltrated (predicted by the 2008 Dungeness Model) and the predicted quantities in gallons per minute[5].

[5] Values are reported to the nearest tenth of a gpm (0.04% of the 258 gpm pumping rate).

Table 3a – Mitigation Value of Reclaimed Water Infiltration for Middle Aquifer Pumping

Stream	Carlsborg Middle Aquifer Pumping		Reclaimed Water Infiltrated East of River			Reclaimed Water Infiltrated at ODT		
	Depletion (%)	Depletion (gpm)	Augment-ation (%)	Augment-ation (gpm)	Surplus/ Deficit (gpm)	Augment-ation (%)	Augment-ation (gpm)	Surplus/ Deficit (gpm)
Bagley	0.00%	*0.0*	0.00%	*0.0*	*0.0*	0.00%	*0.0*	*0.0*
McDonald	0.45%	*1.2*	0.01%	*0.0*	*-1.1*	0.38%	*1.6*	*0.4*
Matriotti	1.40%	*3.6*	0.07%	*0.3*	*-3.3*	3.02%	*12.8*	*9.2*
Meadowbrook	0.47%	*1.2*	0.26%	*1.1*	*-0.1*	0.32%	*1.4*	*0.2*
Cassalery	2.27%	*5.9*	7.13%	*30.1*	*24.3*	0.43%	*1.8*	*-4.1*
Gierin & Graysmarsh	2.57%	*6.6*	13.59%	*57.4*	*50.8*	0.21%	*0.9*	*-5.7*
Bell	0.45%	*1.1*	1.25%	*5.3*	*4.1*	0.01%	*0.1*	*-1.1*
Dungeness	52.76%	*136.3*	74.03%	*312.9*	*176.6*	83.12%	*351.3*	*215.0*
Siebert	0.03%	*0.1*	0.00%	*0.0*	*-0.1*	0.01%	*0.0*	*0.0*
All Streams	*60.39%*	*156*	*96.33%*	*407*	*251*	*87.50%*	*370*	*214*
Total Pumping/ Infiltration (gpm)	*258*		*423*			*423*		

Table 3b – Mitigation Value of Reclaimed Water Infiltration for Deep Aquifer Pumping

Stream	Carlsborg Deep Aqui-fer Pumping		Reclaimed Water Infiltrated East of River			Reclaimed Water Infiltrated at ODT		
	Depletion (%)	Depletion (gpm)	Augment-ation (%)	Augment-ation (gpm)	Surplus/ Deficit (gpm)	Augment-ation (%)	Augment-ation (gpm)	Surplus/ Deficit (gpm)
Bagley	0.01%	*0.0*	0.00%	*0.0*	*0.0*	0.00%	*0.0*	*0.0*
McDonald	0.22%	*0.6*	0.01%	*0.0*	*-0.5*	0.38%	*1.6*	*1.0*
Matriotti	0.39%	*1.0*	0.07%	*0.3*	*-0.7*	3.02%	*12.8*	*11.8*
Meadowbrook	0.48%	*1.2*	0.26%	*1.1*	*-0.1*	0.32%	*1.4*	*0.1*
Cassalery	2.27%	*5.9*	7.13%	*30.1*	*24.3*	0.43%	*1.8*	*-4.1*
Gierin & Graysmarsh	3.12%	*8.1*	13.59%	*57.4*	*49.4*	0.21%	*0.9*	*-7.2*
Bell	0.87%	*2.2*	1.25%	*5.3*	*3.0*	0.01%	*0.1*	*-2.2*
Dungeness	17.23%	*44.5*	74.03%	*312.9*	*268.4*	83.12%	*351.3*	*306.8*
Siebert	0.03%	*0.1*	0.00%	*0.0*	*-0.1*	0.01%	*0.0*	*0.0*
All Streams	24.61%	*64*	*96.33%*	*407*	*344*	*87.50%*	*370*	*306*
Total Pumping/ Infiltration (gpm)	*258*		*423*			*423*		

For infiltration east of the river, mitigation surplus or neutrality is predicted for five out of nine protected streams for both middle- and deep-aquifer pumping. Streams with predicted deficits include: McDonald, Matriotti, Siebert and Meadowbrook creeks (along with Bagley Creek for deep aquifer pumping only). All deficits are relatively small (0.1 to 3.3 gpm), and only one deficit occurs east of the Dungeness River (0.1 gpm in Meadowbrook Creek). Mitigation to Matriotti Creek (0.7 to 3.3 gpm) should not be required, as Chapter 173-518 WAC groups Matriotti

Creek with the Dungeness River in viewing allowable depletion (i.e. "maximum depletion amounts". However, if needed, mitigation to Matriotti Creek could be achieved using pump-and-dump from the new PUD water right. If Ecology were willing to accept out-of-kind mitigation for streams depleted by ≤1 gpm (0.002 cfs), in-kind ("wet-water") mitigation would only be required in McDonald Creek (1.2 gpm), which might be achievable with a small Dungeness Water Exchange (DWE) mitigation project and associated exchange of mitigation credits.

For the purpose of this analysis, PGG selected an east-of-river site that provided relatively good match between the mitigation requirements and the mitigation profile. It is worth noting that other east-of-river sites, such as the City of Sequim's Demonstration Site, provide a mitigation profile with less augmentation to the Dungeness River and more augmentation to small streams. If mitigation at these sites (i.e. farther away from the Dungeness River) do not fully meet the mitigation requirement on the Dungeness, it may be possible to augment Dungeness flows during the critical period (i.e. August 15th – September 15th), by purchasing irrigation water rights from the Dungeness River Agricultural Water User's Association and leaving this water in-stream.

For infiltration west of the river, mitigation surplus or neutrality is predicted for six out of nine protected streams (for both middle- and deep-aquifer pumping) and remaining deficits are also fairly small. Streams with predicted deficits are all on the east side of the Dungeness River (Cassalery, Gierin/Graysmarsh and Bell creeks). All deficits are less than 5 gpm, and would need to be offset by a supplemental mitigation project. If the City of Sequim were willing, their reclaimed water management activities (e.g. infiltration at the Demonstration Site and future sites, current direct augmentation to Bell Creek, future direct augmentation to other creeks) could be used to offset deficits. Otherwise, a separate mitigation project would be required east of the river, such as an infiltration facility operated by DWE or another entity.

The comparison above suggests that both hypothetical locations would likely be able to provide mitigation via reclaimed water infiltration with only minor supplements using other mitigation methods. It also shows that the model predicts over-mitigation on the order of 214 and 251 gpm (345 and 405 af/yr) for the middle aquifer and 306 and 344 gpm (494 and 555 af/yr), which could be applied to developing mitigation credits for other pumping impacts (e.g. DWE mitigation of residential pumping or new water rights developed by other purveyors). On a stream-by-stream basis, the magnitude of surplus or deficit will largely depend on the location(s) of infiltration, which cannot be accurately predicted at this time. Reasonable assumptions must be employed to address uncertainties associated with infiltration facility locations.

5.0 PGG RECOMMENDED MITIGATION SCHEMES

Based on this memorandum and further discussions with PGG, G&O and possible project cooperators, Clallam County will work with PGG to select up to six reasonable mitigation schemes developed to offset impacts associated with the Carlsborg and Sequim alternatives. We recommend the following approach to developing the mitigation schemes to be used in the due diligence cost comparison:

1. Separate mitigation schemes will be developed for pumping from the middle and deep aquifers.

2. Reclaimed water infiltration is considered to be the primary mitigation approach with supplemental mitigation using other methods.
3. For the "Carlsborg Alternative", reclaimed water infiltration in the Carlsborg vicinity is considered both a de facto element of the wastewater treatment system *and* a source of mitigation. Because this alternative *requires* local infiltration, associated costs will be counted under project capital expenses and O&M. (The due diligence analysis will assess the full cost difference between the "Sequim" and "Carlsborg" alternatives – totaling the costs for mitigation, capital expenses and O&M). The County/PUD is assumed to receive all the mitigation credits generated from local infiltration. Remaining mitigation deficits will be addressed with either supplemental infiltration facilities or other mitigation methods.
4. For the "Sequim Alternative", reclaimed water infiltration east of the river assumes that the County/PUD will purchase Class A reclaimed water from the City and pay a hired entity (e.g. the City's future wastewater utility or an independent operator) to construct and operate an infiltration facility. In this case, the County/PUD is assumed to receive all the mitigation credits generated from the infiltration.

   PGG will evaluate two geographic distributions of infiltration east of the river:

   a. An "optimized" location expressly selected to provide a good match with the required mitigation profile (likely close to Dungeness River). Such a location could require (costly) extension of the City's reclaimed water distribution system but may better meet the mitigation requirements of the new water right.
   b. A combination of two locations within or adjacent to the City's anticipated future "purple pipe" reclaimed water distribution network representing the range of locations likely available to the City.
5. In order to address uncertainties in available locations and infiltration facility designs (i.e. local infiltration basins vs. more extended "infiltration ditches" or leaky pipes), PGG will distribute infiltration over generalized areas rather than specify particular individual parcels. Selection of generalized mitigation locations will be partly guided by previous preliminary analysis performed by PGG for Clallam County to identify areas likely amenable to infiltration based on soil type, surficial geology and other factors[6]. **Figure 2** illustrates the concept of modeling infiltration over generalized areas while avoiding areas where soil permeability is less than 1 ft/d.
6. Infiltration at the Carlsborg facility will be assumed to vary seasonally based on predictions of reclaimed water reuse published in the Facilities Plan (BHC, 2012). In order to best meet the predicted seasonality of streamflow depletion, infiltration at all other facilities will be assumed constant year-round.

The following six scenarios are currently recommended for consideration by PGG:

[6] The referenced analysis was presented to the County's Technical Advisory Group for Dungeness water resources management, but was not published. Areas were deemed unsuitable for infiltration if soil permeability (K) was <1 ft/d or modeled depth to groundwater was <20 feet). **Figure 2** only shows area with soil K < 1 ft/d.

Table 4 – Recommended Reclaimed Water Infiltration for Mitigation Schemes

Scenario	Treatment Location	Generalized Infiltration Location	Groundwater Source Aquifer
A	Carlsborg	Carlsborg	Middle
B	Carlsborg	Carlsborg	Deep
C	Sequim	East of river, optimized for Carlsborg	Middle
D	Sequim	East of river, optimized for Carlsborg	Deep
E	Sequim	East of river, dictated by Sequim	Middle
F	Sequim	East of river, dictated by Sequim	Deep

7. The 2008 Dungeness Model will be used to estimate the mitigation profile associated with reclaimed water infiltration, thus identifying surpluses and deficits on individual streams.

8. Remaining mitigation approaches shown on **Attachment A** will be used to address deficits, with preference to the most reliable, affordable and achievable methods. Preferred methods include:

    a. Pump-n-dump from existing water rights (including permit exempt wells) using existing or planned distribution networks.

    b. Purchase of mitigation credits from DWE. Mitigation profiles associated with DWE credits will be consistent with those assumed in the DWE's mitigation plan and consultation with DWE regarding the magnitude of generated mitigation credit.

    c. Small-scale reclaimed water infiltration basins at supplemental locations meant to target specific streams based on mitigation requirement depletion profile.

    Where the preferred methods cannot meet the full mitigation profile, other methods (e.g. direct water purchase, water-rights transfers, habitat restoration) will be considered.

9. As noted above, the reclaimed water resource is sufficient to over-mitigate in some of the streams while under-mitigating in others. The degree to which streamflow augmentation via infiltration can match the streamflow depletion profile associated with a proposed new water right will determine the minimum amount of infiltration needed to meet the mitigation requirement. With the exception of the Carlsborg facility (where infiltration rates are set by wastewater generation), PGG will attempt to minimize infiltration rates at all other modeled facilities while best meeting mitigation requirements. PGG's intent is to minimize over mitigation and identify cost effective "realistic mitigation approaches"

10. The following assumptions will be used for cost estimation in the due diligence analysis:

    a. Both the Carlsborg and Sequim alternatives are likely to generate excess mitigation on selected streams. These excess mitigation credits may have economic value on the mitigation market. For excess mitigation credit generated on the Dungeness River, PGG will use value assumptions consistent with the recent purchase of river water for mitigation by the DWE from Sequim-Dungeness Valley

Agricultural. Water Users Association. Assessing value for individual small streams may be difficult, as credits on an isolated stream are not as useful as credits distributed over many streams. PGG/G&O will consult with DWE to assess value of mitigation credits generated on individual small streams.

b. Due diligence cost analysis will estimate both: 1) projected costs from present through full buildout, and 2) annual O&M costs thereafter.

6.0 REFERENCES:

BHC Consultants, 2012. *Sewer Facilities Plan for Carlsborg UGA*. Dated June 2012. http://www.clallampud.net/uploadedFiles/Water/documents/Revised%20Final%20Facil%20Plan%208%20June%202012.pdf

CH2M Hill, 2010. *Public Utility district No. 1 of Clallam County Water System Plan.* Dated October 2010. http://www.clallampud.net/water/WaterSystemPlan/Clallam_WSP_Final_092710.pdf

Gray & Osborne, 2014. *Carlsborg Sewer Technical Memo No. 1 – Carlsborg Urban Growth Area Water and Wastewater Flow Projections*. Technical Memorandum Submitted to Clallam County Dated 2/18/14.

PGG (Pacific Groundwater Group), 2009. *2008 Dungeness groundwater flow model design, construction, calibration and results*. Consultant report submitted to Clallam County dated February 19, 2009.

PGG (Pacific Groundwater Group), 2014. *Carlsborg Water Demand and Future Water Rights.* Technical Memorandum submitted to Clallam County dated February 24, 2014.

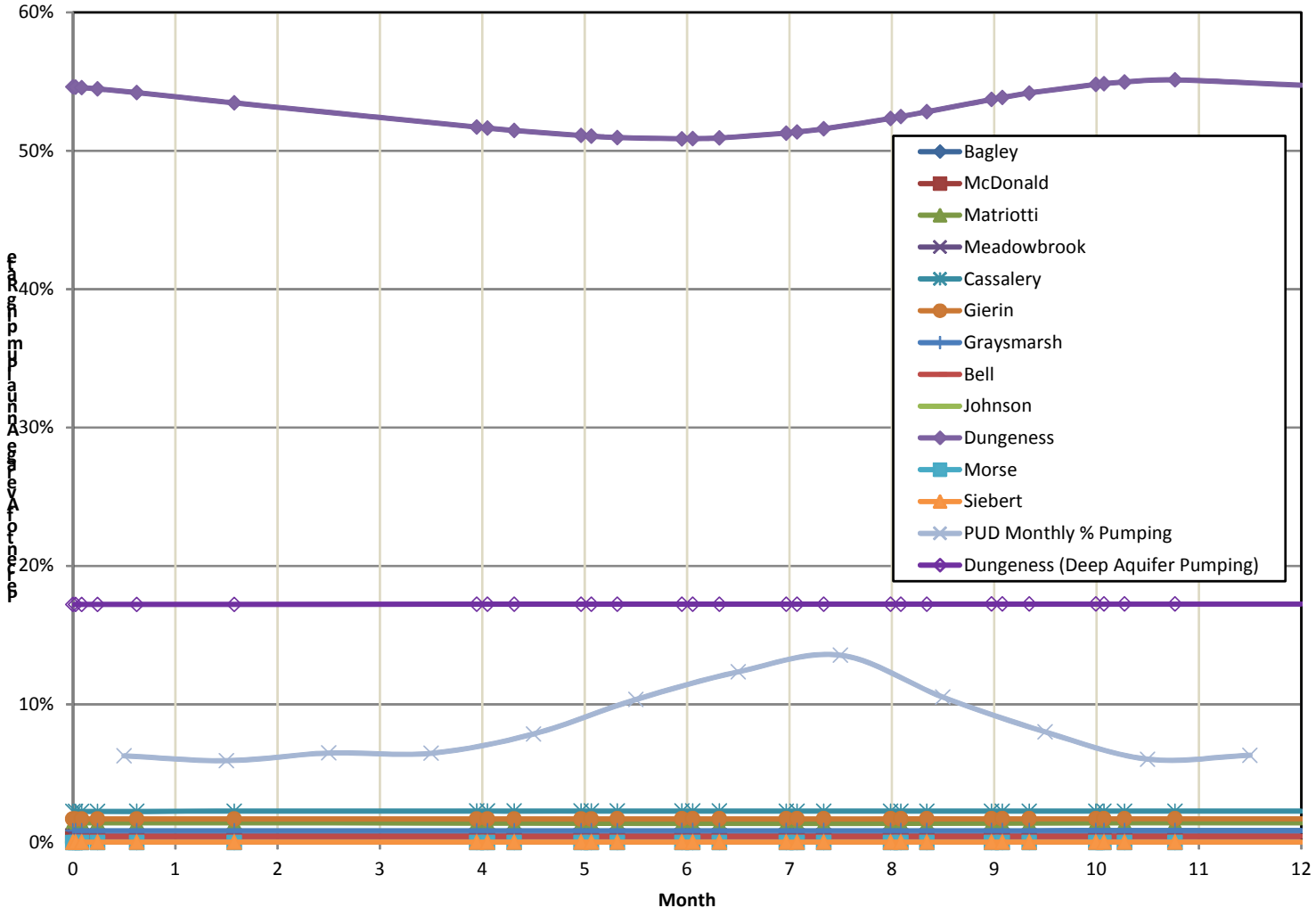
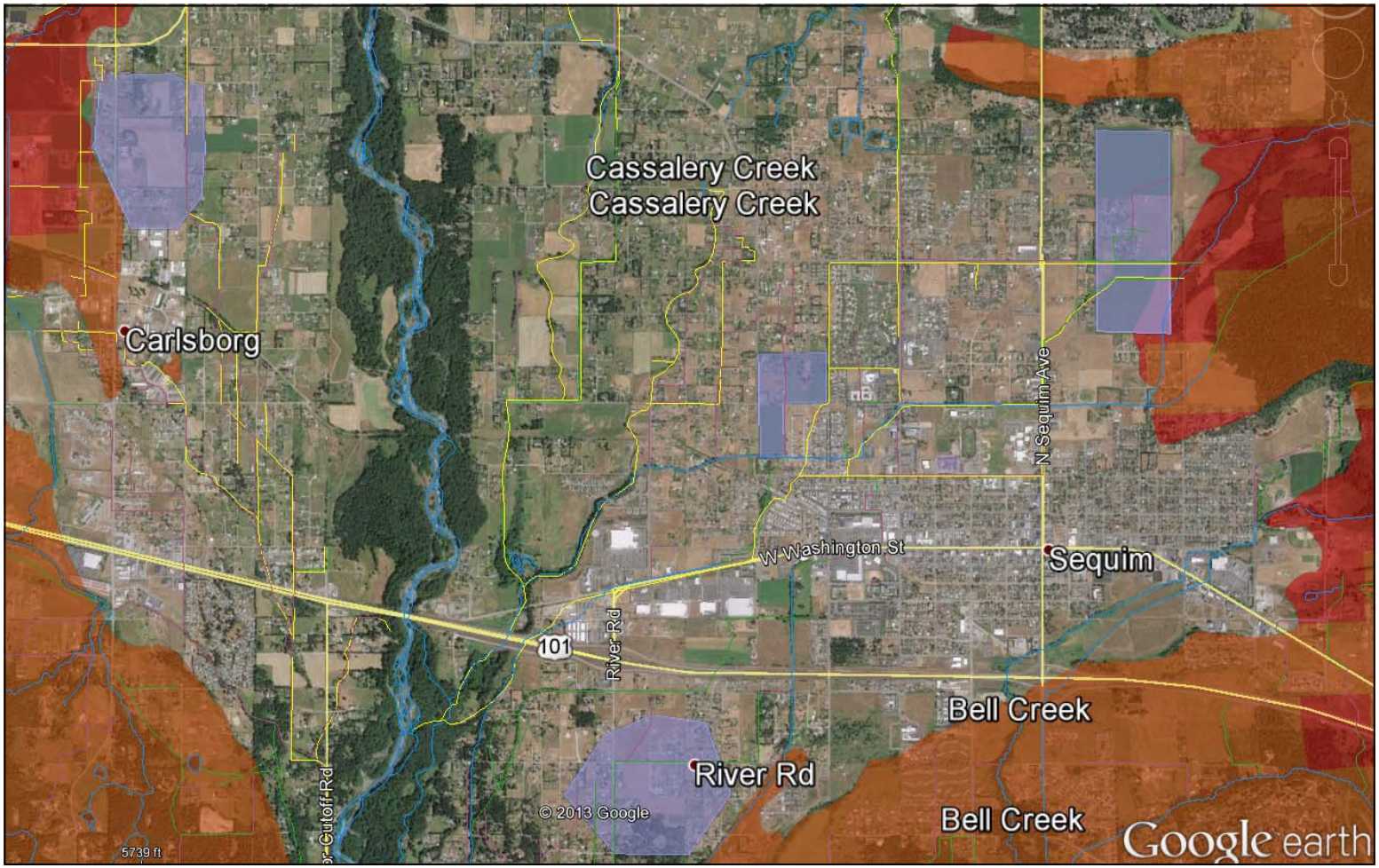


Figure 1
Streamflow Depletion Predicted from PUD Middle Aquifer Well

Clallam County
Carlsborg Sewer Mitigation Analysis

PgG



Notes: Orange and red areas have soil permeability < 1 ft/d. Purple areas illustrate approach to modeling broad areas for infiltration.

Figure 2
Illustrated Approach to Modeling Broad Infiltration Areas

Clallam County
Carlsborg Sewer Mitigation Analysis

PgG

DRAFT Task 2D Technical Memorandum

To: Bob Martin, Clallam County
Jay Swift & Nancy Lockett, Gray & Osborne (G&O)

From: Jill Van Hulle & Peter Schwartzman, Pacific Groundwater Group (PGG)

Re: Mitigation for New Carlsborg Water Rights
Representative Scenarios for Due Diligence Cost Analysis

Date: June 17, 2014 (DRAFT)

1.0 INTRODUCTION

The recently enacted WRIA 18 Water Resources Management Program (WAC 173-518) requires that new consumptive water rights be mitigated so they are water-budget neutral. Clallam County retained Pacific Groundwater Group (PGG), under sub-contract to Gray & Osborne (G&O), to evaluate how future water rights required under projected water demand in the Carlsborg UGA (CUGA) might be mitigated under WAC 173-518. Mitigation approaches are expected to differ depending on whether treatment and infiltration of the wastewater generated in the CUGA occurs in the Carlsborg or Sequim vicinities. Based on consideration of the WAC and input from multiple WRIA 18 stakeholders, PGG developed "representative mitigation schemes" for both the Carlsborg and Sequim alternatives. The mitigation schemes typically employ more than one approach to meet the mitigation requirements associated with projected new water rights. Among the mitigation schemes considered, four schemes were selected as most cost effective for the Carlsborg and Sequim alternatives depending on whether the new water rights tap the middle or the deep aquifer. G&O developed cost estimates for the four preferred mitigation schemes and will ultimately incorporate them into an overall cost comparison for the Carlsborg and Sequim alternatives.

Much of the supporting analyses and methodologies for this evaluation have been developed in earlier memoranda developed by PGG. The "*Task 2A Technical Memorandum*" (PGG, 2014a) assessed current water rights, future water demand, and future water-right requirements for the CUGA. The "*Task 2B Technical Memorandum*" (PGG, 2014b) estimates mitigation requirements associated with the future water-right pumping, documents PGG's proposed methodology for developing representative mitigation schemes, and identifies various approaches and resources available to meet mitigation requirements. G&O's memorandum "*Carlsborg Urban Growth Area Water and Wastewater Flow Projections*" (G&O, 2014) estimates wastewater and reclaimed water generated from the proposed Carlsborg sewer system. Together, these memoranda provide the basis for the evaluation presented herein.

This Task 2D Memorandum applies the methodology outlined under Task 2B to develop six mitigation scenarios for consideration under the due diligence cost analysis. Section 2 summarizes the required CUGA water right and associated pumping impacts. Section 3 presents estimates of generation of reclaimed water, which constitutes the primary resource for mitigation. Section 4 develops the representative mitigation scenarios by estimating the amount(s) of reclaimed-water infiltration needed to generate sufficient streamflow augmentation to offset streamflow capture from the new CUGA water right. Section 5 offers guidance on valuing over-mitigation that results from inefficiencies in the mitigation schemes, Section 6 identifies supplemental means for offsetting residual impacts to small streams so that the entire mitigation package is water budget neutral and Section 7 provides a cost comparison among the preferred mitigation schemes.

PGG's analysis suggests that, for the Carlsborg option, either middle-aquifer or deep-aquifer groundwater pumping can be mitigated with local infiltration of the projected flow of CUGA reclaimed water plus small amounts of supplemental mitigation east of the Dungeness River. For the Sequim option, mitigation is more easily accomplished for water-right pumping from the deep aquifer (assuming sufficient productivity in the Carlsborg vicinity). In this case, mitigation can be achieved by infiltrating small amounts of CUGA-sourced reclaimed water in the City of Sequim's anticipated network of perforated pipes (or at dedicated infiltration facilities) along with minor supplemental mitigation west of the Dungeness River. If the Sequim option were associated with middle-aquifer pumping, higher infiltration rates or additional measures (such as a supplemental purchase of irrigation water rights from the Dungeness Water User's Association) would be needed to meet the CUGA water-right mitigation requirement. In all cases, some degree of over-mitigation is unavoidable due to the inherent inefficiency of attempting to match the calculated mitigation profile distributed among the 11 regulated steams in WRIA 18 using shallow-aquifer infiltration. A portion of the cost of over-mitigation is potentially recoverable, as other parties will need mitigation credits to offset future water-resource development in the WRIA.

PGG's work was performed and this memorandum was prepared in accordance with generally accepted hydrogeologic practices at this time and in this area for the exclusive use of G&O and Clallam County. No other warranty, express or implied, is made.

2.0 FUTURE CUGA WATER RIGHT AND ASSOCIATED STREAMFLOW CAPTURE

PGG's Task 2A Technical Memorandum estimates that an annual water-right allocation (Qa) of 417 acre-feet/year (af/yr) will be needed to meet projected full build-out development in the CUGA. An instantaneous allocation (Qi) of 1,258 gallons per minute (gpm) will be needed to meet peak water demand, although this can be reduced through storage, water-right consolidations and other methods (PGG, 2014a).

As specified in WAC 173-518, PGG used the "2008 Dungeness Model" (PGG, 2009) to estimate streamflow capture associated with the new water right. Pumping was assumed to occur in close proximity to the PUD's current (LUD#10) groundwater source from either the middle or the deep aquifer. While review of recent well drilling at "Idea Place" (Erickson, 2011) and USGS hydrogeologic cross-sections (Thomas et al, 1999) suggests that the deep aquifer occurs in the

Carlsborg vicinity (PGG, 2014a), it should be noted that its production capacity has yet to be defined.

The model simulated an annual pumping cycle where the future water right was apportioned into monthly volumes based on current monthly demand ratios provided by the PUD (T. Martin, 2013). Based on data provided by the PUD, the seasonality of pumping is expected to show a 2.15:1 ratio between maximum and minimum monthly volumes. Predicted impacts to all small streams showed insignificant seasonal variation (PGG, 2014b), likely due to such factors as: distance from the pumping center, hydraulic resistance of confining units between the shallow and the pumped aquifers, and the specific yield (storage capacity) of the shallow aquifer. Average annual estimates of streamflow capture with pumping from the middle and deep aquifers are presented below:

Table 1 – Distribution of Capture Among Streams

Stream	Middle Aquifer	Deep Aquifer
Bagley	0.00%	0.01%
McDonald	0.45%	0.22%
Matriotti	1.40%	0.39%
Meadowbrook	0.47%	0.48%
Cassalery	2.27%	2.27%
Gierin & Graysmarsh	2.57%	3.12%
Bell	0.45%	0.87%
Johnson	0.00%	0.00%
Dungeness	52.76%	17.23%
Morse	0.00%	0.00%
Siebert	0.03%	0.03%
All Streams	*60.39%*	*24.61%*

The 2008 Dungeness Model predicts minor seasonal variation of Dungeness River capture (±2.5% of the model-predicted average annual impact) for pumping from the middle aquifer (PGG, 2014b). For deep-aquifer pumping, seasonal variation of Dungeness River capture is predicted to be even less significant at ± 0.1% of average annual impact, and again insignificant for small streams (ibid.).

In order to estimate mitigation requirements associated with a new CUGA water right, PGG used the average annual streamflow capture estimated for small streams for both middle-aquifer and deep-aquifer pumping and for deep-aquifer pumping impacts on the Dungeness River. For middle-aquifer pumping, PGG set the Dungeness River mitigation target at 53.1 percent – the average streamflow capture predicted by the model during the critical period defined by WAC 173-518 (August 15 – September 15).

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3.0 MITIGATION RESOURCES

PGG's Task 2B Technical Memorandum identified the following approaches as potential methods for water-right mitigation.

1. Infiltration of reclaimed water to augment streamflows;
2. Mitigation with non-reclaimed water, either by entering into water-banking agreements to purchase and/or trade mitigation credits with the Dungeness Water Exchange (DWE) or by acquiring existing water rights;
3. Pump-and-dump streamflow augmentation from either groundwater or surface water sources; and,
4. Use of out-of-kind mitigation such as stream and habitat enhancement projects.

Infiltration of reclaimed water was identified as the primary mitigation resource, to be supplemented by other approaches as needed. PGG evaluated the quantity of reclaimed water available for mitigation as follows:

Table 2 – Reclaimed Water Available for Mitigation at Full Buildout

638,700	gpd avg daily sewer flow with I/I (G&O, 2014 - Table 9)
443.5	gpm avg daily sewer flow with I/I
5%	losses due to leaks, evaporation, solids (Swift, 2014)
421.4	gpm avg daily available reclaimed water
4908	ERU's at full buildout (G&O, 2014 – Table 9)
1004	Current ERU's (Swift, 2014)
80%	portion of reclaimed water resource associated with new ERU's
335.2	gpm portion of reclaimed water available for mitigation
For Carlsborg Option Only:	
10%	portion of reclaimed water assumed used for irrigation (5 mo/yr)
321.2	gpm annual avg daily flow available for infiltration

Notes: I/I = infiltration & inflow, ERU = equivalent residential unit, avg = average

The following bullets explain the calculations shown on **Table 2**:

- G&O's estimate of average daily sewer flow (443.5 gpm) was reduced by 5 percent (to 421.4 gpm) in order to account for losses to leaks, evaporation from the treatment facility and moisture exported offsite along with solids.

- For the purposes of quantifying reclaimed water resources, PGG has divided the available supply into three categories: 1) treated waste water from existing users under the PUD's existing water right, 2) treated waste water from new users under the inchoate portion of the PUD's existing water right, and 3) treated waste water from future users under the proposed new water right. As discussed in the Task 2B Technical Memorandum, reclaimed water generated under the inchoate portion of the PUD's existing water right provides a significant resource for future mitigation. Based on discussions with Ecology, this analysis assumes that only the portion of reclaimed water generated from future development (categories 2 and 3,

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above) will be applicable as a mitigation resource. Reclaimed water generated by existing homes that are currently using septic systems is not included. From Ecology's perspective, *existing* equivalent residential units (ERU's) are already recharging the groundwater system via septic discharge. An estimated 1,004 existing ERU's as of January 2014 represents 20 percent of the ERU's projected at full buildout (Swift, 2014). PGG therefore reduced the portion of generated reclaimed water applicable for mitigation by 20 percent (from 421.4 to 335.2 gpm).

- PGG's analysis also includes consideration of the potential use of reclaimed for local irrigation. Portions of the CUGA are already irrigated with Dungeness River water conveyed though ditches managed by local irrigation districts. If the Carlsborg option is selected, some of this irrigation (along with new irrigation) could be potentially served by locally managed reclaimed water. This quantity was assumed to be around 10 percent of reclaimed water availability (B. Martin, 2014) over a 5-month irrigation season similar to agricultural irrigation (April 15 – September 15). In the calculations above, this 10-percent growing season reduction was annualized to a 4.2-percent average annual reduction. The remaining 321.2 gpm would be annually available for mitigation.

For the purpose of this analysis, the flow of reclaimed water available for infiltration and mitigation is assumed to be constant year round. While true for the Sequim option, the Carlsborg option could exhibit ±5 percent variation in infiltration rate under the assumed potential 10 percent irrigation use. Given the unconfined nature of the shallow aquifer, this ±5 percent variation would likely only affect the nearest streams (Dungeness River and Matriotti Creek, which are jointly regulated under WAC 173-518). In addition, variation in augmentation to those nearby streams is expected to be significantly less than ±5 percent due to the aquifer's storage properties (specific yield). Finally, given that local infiltration under the Carlsborg option significantly over-mitigates combined Dungeness/Matriotti stream capture (Section 4), the expected small seasonal variation in augmentation is considered to be insignificant.

4.0 MITIGATION BY RECLAIMED WATER INFILTRATION

Based on comparison of annual demand projections and the PUD's existing water right (Qa), a new CUGA water right will not likely be needed until around 2055 (PGG, 2014a). Because it is difficult to predict the locations of infiltration facilities at such a later date, PGG's analysis of mitigation by reclaimed-water infiltration employed generalized assumptions regarding infiltration locations. Streamflow augmentation associated with infiltration was estimated with the 2008 Dungeness Model at constant and uniform rates within generalized areas (shown on **Figure 1**), rather than at unique specific locations. Three generalized infiltration-location scenarios were evaluated:

- For the Carlsborg option, PGG simulated infiltration spread evenly across the permeable areas of the CUGA north of SR101 combined with minor supplemental infiltration east of the Dungeness River. Given that all of the CUGA reclaimed water would need to be infiltrated in the Carlsborg vicinity, supplemental mitigation east of the river would likely require arrangements (and possible compensation to) either the DWE or the City of Sequim.

- For the Sequim option, one of PGG's scenarios assumed broad-scale shallow-aquifer infiltration within the permeable portions of the City's urban growth area[1]. This is consistent with the City's current interest in infiltrating reclaimed water via perforated pipes buried within transportation right of ways.
- A second Sequim scenario attempted to optimize the effectiveness of mitigation by selecting among 6 generalized infiltration areas east of the Dungeness River. The areas included existing facilities (City of Sequim Demonstration Site), sites previously investigated for infiltration (Sequim City Shop), and open areas within and surrounding the Sequim City limits (**Figure 1**).

For each of these three infiltration scenarios, PGG used results from the 2008 Dungeness Model to estimate the infiltration rates required to meet the streamflow capture profile associated with pumping the new water right (as discussed in Section 2). A more detailed description of the model simulations and associated calculations is provided in **Appendix A**. Given that pumping scenarios were evaluated from both the middle and deep aquifers, a total of six pumping/infiltration scenarios were evaluated:

Table 3 – Pumping/Mitigation Scenarios

Scenario	Treatment Location	Infiltration Location(s)	Source Aquifer
A	Carlsborg	Carlsborg permeable UGA plus supplemental infiltration east of Dungeness River	Middle
B	Carlsborg	Carlsborg permeable UGA plus supplemental infiltration east of Dungeness River	Deep
C	Sequim	Single or multiple general sites east of Dungeness River	Middle
D	Sequim	Single or multiple general sites east of Dungeness River	Deep
E	Sequim	Sequim permeable UGA	Middle
F	Sequim	Sequim permeable UGA	Deep

Under the Carlsborg option (scenarios A and B), it should be noted that *all* the reclaimed water generated from the CUGA must be locally infiltrated (with the exception of reclaimed water irrigation). Where model predictions suggested that local Carlsborg infiltration of the available mitigation resource (321.2 gpm) did not fully offset pumping impacts to streams east of the Dungeness River, PGG evaluated supplemental mitigation by either: 1) infiltrating a small amount of reclaimed water from the City of Sequim, or 2) purchasing mitigation credits from the DWE. In the first case, PGG's analysis assumed that either a small portion of the City's reclaimed water could be purchased and infiltrated locally or that the City could make a small portion of the mitigation credits developed by their own infiltration activities available to the County for achieving CUGA mitigation. The County could similarly make a small portion of the excess mitigation credits associated with local Carlsborg UGA infiltration available to the City to meet their future mitigation needs. A similar exchange could potentially be arranged between the County and the DWE.

[1] Within this document and its attachments, the acronym "PUGA" stands for the permeable portions of the Carlsborg and Sequim UGA's, as estimated on **Figure 1**.

Under the Sequim option, reclaimed-water infiltration was assumed limited to areas east of the Dungeness River, and various portions of the available (321.2 gpm) reclaimed water required to meet mitigation targets was assumed infiltrated. Under Scenarios C and D, PGG attempted to optimize the combination of general infiltration areas using the following approach:

- No more than two of the infiltration facilities shown on **Figure 1** would be used to meet the CUGA infiltration requirements. Only one of these facilities can be newly constructed. The second must make use of existing infrastructure (e.g. Sequim Demonstration Site).
- Optimization attempts to identify the minimum combined infiltration rate needed to reach the mitigation requirements from CUGA water-right pumping.

By selecting infiltration areas with combined augmentation profiles that best meet the required mitigation profile and adjusting infiltration rates for these areas, PGG was able to develop reasonable approximations of future infiltration activities that could be developed to meet the mitigation requirements for a new CUGA water right permit. Under Scenarios E and F, where modeled infiltration was spread evenly over a large portion of the Sequim UGA, PGG's optimization involved adjusting infiltration rates only. For all 4 Sequim mitigation scenarios, small residual impacts were predicted in streams west of the Dungeness River. Because reclaimed water would not be delivered across the river under the Sequim option, other means of mitigation would be needed to meet these west-side residual streamflow impacts (see Section 6).

Table 4 (attached at the end of this memorandum) summarizes the results of PGG's analysis, with more detailed results presented in **Appendix A**. The table shows 16 combinations of infiltration areas and infiltration rates optimized to meet the mitigation profiles associated with new pumping. The table summarizes which generalized areas are used for infiltration, how much infiltration was simulated for each area, residual impacts in streams with insufficient mitigation, total under-mitigation, and total over-mitigation in streams where augmentation exceeds pumping impact. Assuming mitigation targets are broadly met, over-mitigation is unavoidable on some streams if infiltration is restricted to a limited number of facilities or (in the case of the Carlsborg option) when it is necessary to infiltrate *all* available reclaimed water despite the fact that estimated streamflow augmentation exceeds the mitigation requirement. While over-mitigation can be reduced by infiltrating at multiple sites, for the purpose of this analysis, we considered development of more than two infiltration sites to be unrealistic.

Among the 16 infiltration combinations shown on **Table 4**, 6 are identified as those preferred for Scenarios A-F. The following findings are derived from PGG's analysis:

1. For the Carlsborg option, pumping from the deep aquifer does not offer a significant advantage to pumping from the middle aquifer for meeting the CUGA mitigation requirements. While streamflow impacts are overall smaller for pumping from the deep aquifer (**Table 1**), impacts to distant streams are predicted to be slightly larger because the deep-aquifer drawdown cone is more widespread. Supplemental infiltration required east of the Dungeness River to addresses residual impacts to distant streams is predicted to be slightly higher under deep-aquifer pumping. However, the fact that deep-aquifer pumping results in more over-mitigation than middle-aquifer pumping could be significant if associated (over)mitigation credits can be sold or traded.

2. For the Carlsborg option, infiltration combination "C-M" is the preferred mitigation scheme for middle-aquifer pumping. Along with infiltrating *all* the CUGA reclaimed water in the Carlsborg vicinity, it requires purchase of 11.6 gpm (18.7 AF) of mitigation credits from the DWE. Alternatively, under combination #3, the City of Sequim could allocate 28 gpm of reclaimed water infiltrated within their "leaky pipe" network to the CUGA mitigation.

3. Deep-aquifer pumping may be worth considering under the Carlsborg option if the value of increased over-mitigation pays for the deeper well and a slight increase in infiltration of reclaimed water purchased from the City of Sequim. In this case combination "C-D" is preferred, which assumes that the County would purchase 14.2 gpm (22.9 AF) of mitigation credits from DWE. Alternatively, under combination #6, the City would allocate 33 gpm of reclaimed water infiltrated within their "leaky pipe" network to the CUGA mitigation

4. For the Sequim option, pumping from the deep aquifer offers more of a direct advantage than with the Carlsborg option. This is shown by comparing the estimated mitigation infiltration quantities between middle-aquifer pumping scenarios (combinations 7-9) and deep-aquifer pumping scenarios (combinations 13-15). Only 1 of the 3 middle-aquifer pumping combinations was able to provide sufficient mitigation within the available 321.2 gpm of reclaimed water for mitigation (combination #8 employs a recharge facility in the "Sequim Far West" area). Infiltration distributed throughout the City's "leaky pipe" network (combination #9) would require purchase of supplemental reclaimed water from the City and would create significant over-mitigation relative to predicted streamflow capture. In comparison, for deep-aquifer pumping, all 3 combinations were capable of meeting the mitigation profile within the available 321.2 gpm mitigation resource, with optimized infiltration rates ranging from 71-157 gpm.

5. For the Sequim option using deep-aquifer pumping, the highest mitigation efficiency can be achieved by infiltrating in distinct areas rather than using distributed infiltration over the City's anticipated "leaky pipe" network. Model results predict that full mitigation of east-side streams can be achieved either by infiltrating 69 gpm in the "Sequim Far West" area along with just 2 gpm at the City's Demonstration Site (combination #14), or by infiltrating 157 gpm among the City's "leaky pipes" (combination #15). However, given that the City's costs for treating Carlsborg's reclaimed water include anticipated infiltration via the leaky pipe system, combination #15 is preferred for the Sequim option.

6. For the Sequim option, all simulated infiltration combinations resulted in predicted under-mitigation of several small streams, predominantly west of the Dungeness River (Meadowbrook, McDonald, and Siebert Creeks). Residual impacts on these streams are relatively minor and would need to be addressed using other mitigation methods, as discussed in Section 6.

7. As noted in Section 2, the productivity of the deep aquifer has not yet been established in the Carlsborg vicinity. Under the Sequim option, if middle-aquifer pumping were required, increased mitigation efficiency could be achieved if the Dungeness Water User's Association (DWUA) were willing to sell a portion of their irrigation water rights and leave them instream. Although we have no indication that this is a reliable possibility, it is considered in combinations 10-12. Infiltration quantities east of the Dungeness River can be substantially reduced if mitigation requirements for just the small streams are addressed, and the mitigation requirement on the Dungeness River is addressed through a water-right purchase. Given

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that DWUA's water rights are restricted to the irrigation season (April 15 – September 15), mitigation for year-round impacts would need to be performed during this irrigation season (or concentrated during the Dungeness River critical period (August 15 – September 15)). Either of these approaches would result in over-mitigation of Dungeness River impacts during the critical period and under-mitigation during the rest of the year. This temporal variation of mitigation is permitted by Ecology under WAC 173-518. **Table 4** shows that water-right quantities ranging from 36 to 132 af/yr would need to be purchased from DWUA (compared to the new CUGA water right of 417 af/yr). Among these four combinations, #12-Alt is preferred because it employs the City's leaky pipe network to infiltrate the maximum amount of reclaimed water applicable to CUGA mitigation (321.2 gpm), and limits the potential DWUA water-right purchase to only 75 af/yr.

Assuming reasonable groundwater production from the deep aquifer in the Carlsborg vicinity, our analysis suggests that the Carlsborg option should focus on either middle-aquifer pumping (combination #C-M) or deep-aquifer pumping (combination "C-D"), depending on the value of associated over-mitigation. The Sequim option should likely focus on deep-aquifer pumping coupled with infiltration from the City's leaky-pipe network. Whereas only 157 gpm of leaky-pipe infiltration is required under combination #15, value could be added if mitigation credits could be derived by infiltrating the entire 321.2 gpm via the City's leaky-pipe network. If middle-aquifer pumping is required under the Sequim option, we suggest that the County consider purchasing Dungeness River water rights from DWUA under combination "#12-Alt". For the cost comparison presented in Section 7, PGG & G&O compares mitigation costs for these four combinations (preferred scenarios A, B, E and F on **Tables 3** and **4**).

Both the Carlsborg and the Sequim options involve over-mitigation on selected streams. Net over-mitigation for all streams combined is summarized on **Table 4**, and over-mitigation on individual streams is reported in **Appendix A**. The potential use of this over-mitigation is discussed below in Section 5. Under the Sequim option, under-mitigation (primarily on west-side streams) will require supplemental mitigation, as addressed in Section 6.

5.0 ADDRESSING OF OVER-MITIGATION

"Mitigation efficiency" can be defined as the portion of infiltrated water that goes towards actually meeting the project mitigation requirements. The Dungeness groundwater flow system is hydraulically connected to 11 regulated streams. Any new groundwater withdrawal will have a unique mitigation requirement based on the location and depth of the well and corresponding capture from these streams, and water-resource managers in WRIA 18 have recognized that it is nearly impossible to meet this "mitigation profile" with 100 percent efficiency. Furthermore, mitigating a minor impact in a distant stream can be difficult and expensive. A water-banking system was therefore proposed which would increase overall mitigation efficiency by facilitating the purchase and exchange of mitigation credits among streams from projects in different locations across the WRIA. In this manner, a project creating over-mitigation on local streams could perhaps exchange these mitigation credits for credits on distant streams to offset projected under-mitigation. Without this approach, the mitigation requirements specified in WAC 173-518 would become onerous. The Dungeness Water Exchange was created to provide a water-bank to mitigate new groundwater withdrawals on both the residential and public-water-system scales.

The analysis presented above provides various combinations of infiltration locations and rates that *largely* achieve mitigation requirements associated with the future CUGA water right. The due-diligence cost analysis will consider the costs of developing supplemental mitigations on small streams where needed. As all of the combinations evaluated above cause over-mitigation on selected streams, it may also be worthwhile to consider the value of mitigation credits produced from such over-mitigation. **Table 5** presents model predictions of mitigation residuals for each regulated stream for the "preferred" combinations associated with the 6 pumping/mitigation scenarios defined on **Table 3** (results of all scenarios are presented in **Appendix A**). To provide context, **Table 5** also presents Ecology's minimum instream flow requirements corresponding to the month of September (i.e. during summer low flows).

Table 5 – Predicted Mitigation Residuals for Selected Pumping/Infiltration Combinations

Scenario/Combination → Stream ↓	A*/ "C-M"	B*/ "C-D"	C/8	E*/ "12-Alt"	D/14	F*/15	ISF
Bagley	0.0	0.0	0.0	0.0	0.0	0.0	2,682
McDonald	0.3	0.9	-1.1	-1.1	-0.6	-0.6	6,705
Matriotti	7.4	10.0	-3.4	-3.4	-1.0	-0.9	2,235
Meadowbrook	-0.2	-0.2	-0.5	0.7	-1.0	-0.3	2,235
Cassalery	-4.5	-4.5	11.4	52.7	0.8	22.8	894
Gierin & Graysmarsh	-5.8	-7.3	18.1	123.0	5.0	55.3	1,788
Bell	-1.1	-2.2	0.7	20.7	0.1	8.4	1,788
Johnson	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Dungeness	127.0	218.9	17.5	-42.9	1.6	1.2	80,460
Morse	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Siebert	0.0	0.0	-0.1	-0.1	-0.1	-0.1	6,705
Total Over-Mitigation	134.7	229.8	47.8	197.2	7.4	87.7	- -
Total Under-Mitigation	-11.6	-14.2	-1.7	-1.2	-1.6	-0.9	- -

All values in gpm.
**Preferred scenarios considered in mitigation cost comparison analysis (Section 7).*
Total Under-Mitigation does not include Matriotti, which is regulated as combined with Dungeness.
ISF = minimum instream flow requirements in September (summer low flow).

It is further worthwhile to distinguish between over-mitigation on the Dungeness River vs. over-mitigation on small streams. As further discussed in Section 7, valuation of these two categories might differ in the cost analysis as follows

- Increased flows in the Dungeness River might be best valued based on expected purchase values for irrigation water rights, as demonstrated by the DWE's recent purchase of Dungeness River water from the DWUA for the purposes of water-right mitigation and flow augmentation.
- Increased flows on small streams might be best valued based on purchase values for mitigation credits, as offered by the DWE to new property owners and water-system operators. Dungeness River flow increases could also be valued in this manner.

Table 5 shows that the two preferred mitigation approaches for the Carlsborg option (Scenarios A and B) result in significant over-mitigation on the Dungeness River (including its regulatory

counterpart Matriotti Creek) and minor over-mitigation on McDonald Creek (located west of the Dungeness River). Predicted over-mitigation to the Dungeness River ranges from 127 to 219 gpm (205 to 353 af/yr).

For the Sequim option, mitigation inefficiencies increase where infiltration is assumed evenly distributed over the Sequim PUGA (Scenarios E and F) rather than in select, dedicated infiltration facilities (Scenarios C and D), and predicted flow augmentation in the Gierin/Graysmarsh complex is accentuated. Over-mitigation is relatively low to moderate for the deep-aquifer pumping scenarios (D and F), whereas the middle-aquifer pumping scenarios) C and E require more mitigation and thereby cause greater over-mitigation on east-side streams. For the purpose of cost comparison, Scenarios E and F are preferred over scenarios C and D because they employ infiltration via the City's proposed leaky pipe network[2]. Where associated over-mitigation is significant, streamflow augmentation credits might be sold to the DWE or other willing buyers to offset other mitigation costs (see Section 7).

6.0 ADDRESSING RESIDUAL UNDER-MITIGATION

Supplemental mitigation will be required to address small streams where predicted flow augmentation via reclaimed-water infiltration does not offset modeled streamflow capture. As shown on **Table 4**, combined under-mitigation predicted for small streams ranges from zero to 14.2 gpm (22.9 af/yr)[3]. The simplest means of supplying supplemental mitigation is to purchase mitigation credits from DWE, and this method is assumed in the mitigation cost analysis (Section 7). However, in some cases, mitigation residuals are so small (fractions of a gpm), that mitigation might be more economically performed using a "pump-and-dump" technique sourced by the CUGA water right. For example, a small vault could be constructed on property adjacent to a targeted stream and used to supply the stream at a low rate using a solar-powered pump. The vault could be filled monthly using a water truck. A vault servicing a 0.1 gpm residual impact supplied with monthly visits would require 584 ft^3 of storage (e.g. a cube of 8.2 feet per side), whereas a 0.5 gpm residual impact would require 2,920 ft^3 of storage (a cube of 13.9 feet per side).

7.0 COMPARISON OF MITIGATION COSTS

PGG & G&O developed and compared cost estimates for the four preferred mitigation scenarios discussed above (A, B, E and F). Our analysis employed the following assumptions:

1. The mitigation cost comparisons presented below do not consider the costs of wastewater treatment and reclaimed water infiltration. These activities are considered to be "givens" (i.e. inherent to the project design) and are addressed in the overall project cost comparison. The mitigation cost comparison addresses mitigation actions required to offset residual impacts that remain after designed infiltration of the treated wastewater.

[2] Note that infiltration costs are already included in the City's wastewater treatment fees.

[3] These values neglect mitigation residuals on Matriotti Creek, which are mitigated in combination with Dungeness River over-mitigation.

2. The cost of purchasing supplemental mitigation on small streams is based on the purchase price of mitigation credits offered by the DWE. Under their mitigation plan (WWT, 2012), DWE offers streamflow augmentation credits to new residential water users at $3,000 for a 0.14 af/yr impact ($21,429 per annual acre-foot)[4]. In a recent agreement with the PUD to provide mitigation for the new "Bluffs Well", DWE provided 2.57 af/yr mitigation credits for $53,370 ($20,767 per annual acre-foot). Our analysis assumes a purchase cost of $21,429/af.

3. The value of selling over-mitigation (augmentation) credits on small streams is assumed to be 50% of the DWE cost to new water users (i.e. $10,715/af). PGG decided to reduce the value by 50% because the mitigation profile created by project's reclaimed water infiltration may not perfectly match the distribution among streams required by the DWE or other potential buyers. In addition, if purchased by the DWE, additional costs are incurred by the organization to manage the mitigation resource.

4. Whereas the project is estimated to create between 87 to 197 gpm over-mitigation to small streams under the Sequim Option, not all of this streamflow augmentation is expected to be saleable on the open market. Based on numbers in the DWE Mitigation Plan (WWT, 2012) and results from the 2008 Dungeness Model, PGG estimates that the DWE might require between 60 to 80 gpm of augmentation to small streams east of the Dungeness River on an annualized basis to mitigate projected residential development[5]. Additional market demand could be associated with other water users and streamflow augmentation projects for habitat restoration. For the purpose of this analysis, PGG assumed that no more than 70 gpm of augmentation to small streams (113 af/yr) could be sold on the open market.

5. The selling value of over-mitigation (augmentation) to the Dungeness River is estimated based on the purchase value of irrigation water rights from the river. Washington Water Trust (WWT) recently purchased 175 acre-feet of irrigation water rights from the DWUA for streamflow augmentation and water-right mitigation at $2,000/af. Only 42% (5/12) of the predicted year-round augmentation is considered saleable due to the 5-month irrigation season. Although the nearly-constant flow augmentation predicted for this project is optimal for mitigating year-round pumping impacts, the relatively high rates of streamflow augmentation predicted for the Carlsborg option (from 127 to 219 gpm, equal to 205 to 353 af/yr) are unlikely to be purchased at the higher prices associated with mitigation credits on small streams.

6. Where under-mitigation on the Dungeness is to be offset by purchase of water rights from DWUA, the estimated purchase cost is $2,000/af. The purchased water would be left instream to offset streamflow capture and would not require management in DWUA conveyances. It should be noted that the ability to purchase (75 af) irrigation water rights from DWUA is an assumption, no arrangements have been made with the irrigators to date.

[4] Based on "high impact / high water use" scenario where water is pumped from the shallow aquifer and used for indoor use and irrigation of up to 0.13 acres.

[5] It should be noted that these estimates are approximate and subject to differing assumptions between the analyses presented herein and those in the DWE Mitigation Plan regarding the timing of pumping impacts and streamflow augmentation from mitigation.

7. All costs used in this analysis are included at their current values. Although costs are likely to change between 2014 and full buildout of the CUGA, our analysis assumes that costs will grow similarly for both the Carlsborg and the Sequim options. Thus, relative differences suggested by the current-value comparison are representative of future values.

Table 6 summarizes the cost estimates for the four preferred mitigation alternatives:

Table 6 - Comparative Cost Estimates for Representative Mitigation Scenarios

	Middle Aquifer Pumping		Deep Aquifer Pumping	
	Carlsborg (A / "C-M")	Sequim (E / #12-Alt)	Carlsborg (B / "C-D")	Sequim (F / #15)
Total Under Mitigation (gpm)	11.6	47.5	14.2	0.9
Under Mitigation on Dungeness & Matriotti (gpm)	0	46.3	0	0
DWUA Dungeness River Water Right Purchase (AF)	0.0	75.0	0.0	0.0
DWUA Dungeness River Water Right Purchase Cost	$ -	$ 150,000	$ -	$ -
Under Mitigation Small Streams (gpm)	11.6	1.2	14.2	0.9
DWE Supplemental Mitigation Purchase Cost	$ 401,257	$ 41,509	$ 491,195	$ 31,132
Over Mitigation on Dungeness (gpm)**	127	0	218.9	1.2
Over Mitigation on Dungeness (AF During Irrigation Season)**	85.9	0.0	148.0	0.8
Dungeness Over Mitigation Credit	$ (171,751)	$ -	$ (296,033)	$ -
Over Mitigation on Small Streams (gpm)*	0.3	197.2	0.9	86.5
Small Stream Over Mitigation Credit*	$ (5,189)	$ (1,210,691)	$ (15,566)	$ (1,210,691)
Net Mitigation Expenditure (w/o Small Stream Credit)	$ 229,507	$ 191,509	$ 195,161	$ 31,132
Net Mitigation Expenditure (w/ Small Stream Credit)	$ 224,318	$ (1,019,181)	$ 179,595	$ (1,179,559)

NOTES AND ASSUMPTIONS
Positive costs represent projected expenditures whereas negative costs represent projected income.
* Small stream over mitigation credit subject to 70 gpm cap.
** Dungeness over mitigation numbers do not include Matriotti Creek (see per stream values in **Appendix A**)
*** Irrigation season limited to 153 days.
Purchase cost and (selling) market value for over mitigation on Dungeness River = $2000 per irrigation-season AF
Purchase cost for additional mitigation water from DWE = $21,429 per annual AF = $34,591 per annualized gpm
Market value for selling over mitigation on small streams = $10,715 per annual AF = 17,296 per annualized gpm

For both the middle-aquifer and deep-aquifer pumping scenarios, supplemental mitigation for the Sequim option is estimated to be less expensive than for the Carlsborg option. Because the marketability of augmentation credits on small streams is considered to be the most uncertain element of this cost comparison, PGG and G&O compared the net mitigation costs in two fashions: 1) ignoring the saleable value of augmentation credits on small streams, and 2) including this saleable value at the assumed price up to a cap of 70 gpm (113 af/yr). The Sequim option was estimated to be less costly under both assessments. Where mitigation credits on small streams were included in the valuation, the Sequim option yielded net profits (negative costs) associated with mitigation that could potentially offset some of the treatment/infiltration fees charged by the City.

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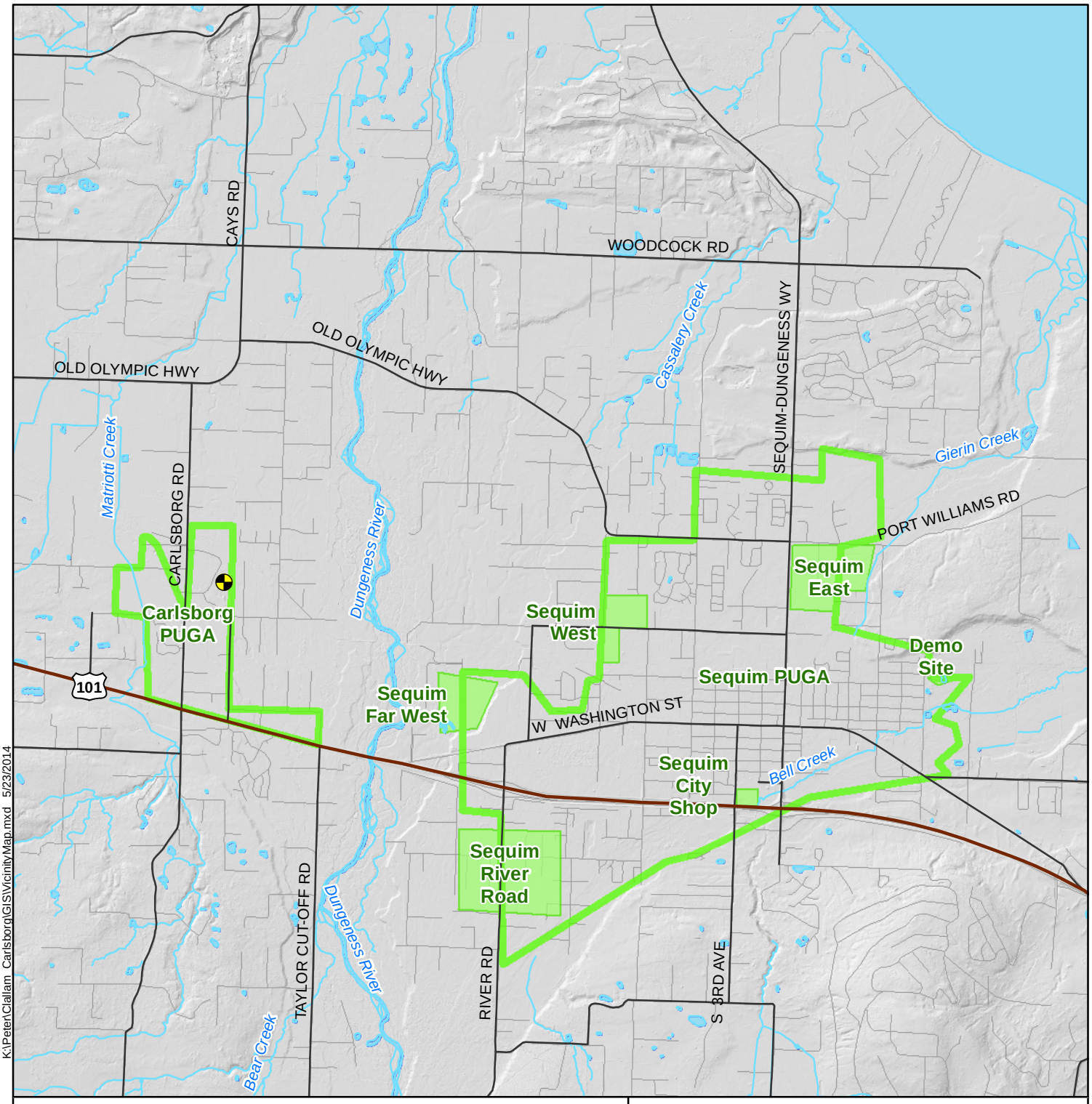
Table 4 - Summary of Reclaimed Water Infiltration Mitigation Combinations

Combi-nation	Preferred for Scenario	Treatment Alternative	Pumping Aquifer	Approach	Reclaimed Water Infiltration Rates							Remaining Residual Impacts (gpm)						Total Under-mitigation gpm (#)	Total Over-Mitigation (gpm)	Dungeness Supplement from DWUA (AF)	Notes
					Carlsborg PUGA	Sequim PUGA	Sequim Far West	Sequim West	Sequim East	Sequim Demo Site	Total Infiltration	Cassalery	Meadow brook	McDonald	Siebert	Gierin-Graysmarsh + Bell	Dungeness & Matriotti				
#1		Carlsborg	Middle	Supplement Carlsborg PUGA with existing east-side site	321	n/a	- - -	- - -	- - -	22	343	3.8	- - -	- - -	- - -	- - -	- - -	3.8 (1)	147	n/a	Cassalery impact can be zero'd out by increasing Demo Site infiltration to 135 gpm.
#2		Carlsborg	Middle	Supplement Carlsborg PUGA with existing east-side site	321	n/a	- - -	- - -	29	2	352	- - -	- - -	- - -	- - -	- - -	- - -	0.0 (0)	153	n/a	- - -
#3		Carlsborg	Middle	Supplement Carlsborg PUGA with leaky-pipe infiltration on east-side	321	28	- - -	- - -	- - -	- - -	349	- - -	- - -	- - -	- - -	- - -	- - -	0.0 (0)	150	n/a	- - -
C-M	**A**	Carlsborg	Middle	Supplement Carlsborg PUGA by purchasing mitigation credits from DWE	321	n/a	n/a	n/a	n/a	n/a	321	4.5	0.2	- - -	- - -	6.9	- - -	11.6 (4)	135	n/a	- - -
#4		Carlsborg	Deep	Supplement Carlsborg PUGA with existing east-side site	321	n/a	- - -	- - -	- - -	28	349	3.5	- - -	- - -	- - -	- - -	- - -	3.5 (1)	245	n/a	Cassalery impact can be zero'd out by increasing Demo Site infiltration to 165 gpm.
#5		Carlsborg	Deep	Supplement Carlsborg PUGA with existing east-side site	321	n/a	- - -	- - -	34	3	358	- - -	- - -	- - -	- - -	- - -	- - -	0.0 (0)	251	n/a	- - -
#6		Carlsborg	Deep	Supplement Carlsborg PUGA with leaky-pipe infiltration on east-side	321	33	- - -	- - -	- - -	- - -	354	- - -	- - -	- - -	- - -	- - -	- - -	0.0 (0)	247	n/a	- - -
C-D	**B**	Carlsborg	Deep	Supplement Carlsborg PUGA by purchasing mitigation credits from DWE	321	n/a	n/a	n/a	n/a	n/a	321	4.5	0.2	- - -	- - -	9.4	- - -	14.2 (4)	230	n/a	- - -
#7		Sequim	Middle	New and existing infiltration site east of Dungeness River	n/a	n/a	- - -	377	- - -	0	377	- - -	- - -	1.1	0.1	- - -	- - -	1.2 (2)	206	n/a	No mitigation needed from existing (Demo) site.
#8	**C**	Sequim	Middle	New and existing infiltration site east of Dungeness River	n/a	n/a	210	- - -	- - -	0	210	- - -	0.5	1.1	0.1	- - -	- - -	1.7 (3)	47.8	n/a	No mitigation needed from existing (Demo) site. Meadowbrook impact could be zero'd out by increasing River Rd infiltration to 350 gpm, but cheaper ways likely exist.
#9		Sequim	Middle	Infiltration across Sequim PUGA using leaky-pipe network.	n/a	480	- - -	- - -	- - -	- - -	480	- - -	- - -	1.1	0.1	- - -		1.2 (2)	305.4	n/a	Total infiltrated amount exceeds total Carlsborg reclaimed water. Unlikely scenario.
#10		Sequim	Middle	Combination #7 (above) + water-right purchase from DWUA & off-season undermitigation on Dungeness	n/a	n/a	- - -	166	- - -	0	166	- - -	- - -	1.2	0.1	- - -	77.8*	1.2 (2)**	80.3^	126	- - -
#11		Sequim	Middle	Combination #8 (above) + water-right purchase from DWUA & off-season undermitigation on Dungeness	n/a	n/a	160	- - -	- - -	0	160	- - -	0.7	1.2	0.1	- - -	22.6*	1.9 (3)**	19.8^	36	Meadowbrook impact can be zero'd out by increasing Far West infiltration to 350 gpm or by infiltrating 110 gpm at Sequim City Shop, but cheaper ways likely exist.
#12		Sequim	Middle	Combination #9 (above) + water-right purchase from DWUA & off-season undermitigation on Dungeness	n/a	200	- - -	- - -	- - -	- - -	200	- - -	- - -	1.2	0.1	- - -	81.6*	1.2 (2)**	117.2^	132	
#12-Alt	**E**	Sequim	Middle	Combination #12 (above) + entire 312.2 gpm reclaimed mitigation water credited	n/a	321	- - -	- - -	- - -	- - -	321	- - -	- - -	1.1	0.1	- - -	46.3	47.5*	197.2^	75	
#13		Sequim	Deep	New and existing infiltration site east of Dungeness River	n/a	n/a	- - -	150	- - -	- - -	150	- - -	- - -	0.6	0.1	- - -	- - -	0.6 (2)	80.1	n/a	No mitigation needed from existing (Demo) site.
#14	**D**	Sequim	Deep	New and existing infiltration site east of Dungeness River	n/a	n/a	69	- - -	- - -	2	71	- - -	1.0	0.6	0.1	- - -	- - -	1.6 (3)	7.4	n/a	Meadowbrook impact can be zero'd out by increasing River Rd infiltration to 350 gpm, but cheaper ways likely exist.
#15	**F**	Sequim	Deep	Infiltration across Sequim PUGA using leaky-pipe network.	n/a	157	- - -	- - -	- - -	- - -	157	- - -	0.3	0.6	0.1	- - -	- - -	0.9 (3)	87.7	n/a	Impact at Meadowbrook (0.3 gpm) can be eliminated by increasing total infiltration amount from 157 to 200 gpm. At 321.2 gpm infiltration, over mitigation goes to 242 gpm and residuals reduce to 0.5 gpm on McDonald and 0.1 gpm on Siebert.

DWUA = Dungeness Water User's Association, PUGA = permeable portion of UGA assumed for infiltration.
All values are in gpm. Unless otherwise stated, impacts to Matriotti Creek flows balanced out by over mitigation to Dungeness River. "Total" values may be affected by roundoff (to the nearest 0.1 gpm).
= number of streams that require supplemental mitigation.
* Under scenarios 10-12, amount of water purchased from DWUA during irrigation season would mitigate year-round combined Dungeness + Matriotti streamflow capture.
** Undermitigation does not include Dungeness/Matriotti, which would be mitigated by DWUA water-right purchase.
^ Overmitigation does not included seasonal over-mitigation on Dungeness River via water rights purchase.
See **Appendix A** for detailed accounting of mitigation residuals.



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Permeable UGA Infiltration Areas

Generalized Infiltration Areas

PUD LUD#10 Well

Streams

N

0 Miles 1

0 Feet 4,000

Figure 1

Location of Modeled Infiltration Areas

Task 2D Memo
Representative Mitigation Scenarios

PgG

APPENDIX A
APPLICATION OF DUNGENESS MODEL TO ESTIMATE STREAMFLOW CAPTURE AND AUGMENTATION FROM INFILTRATION

PGG used the 2008 Dungeness Model (PGG, 2009) to estimate streamflow capture impacts (i.e. mitigation requirements) from pumping a new water right in the Carlsborg UGA from both the middle and deep aquifers, and to estimate streamflow augmentation from reclaimed water infiltration to the shallow aquifer spread evenly over generalized infiltration areas. The model results were then used to optimize infiltration rates at combinations of selected infiltration areas in order to meet mitigation requirements.

Pumping Impacts

The estimated annual water right requirement (417 af/yr) was divided into monthly pumping rates based on data provided by Clallam PUD #1 (PGG, 2014b, Figure 1). Pumping was simulated from the model cell coincident with the PUD's current LUD#10 well. Transient simulations were performed for pumping from both the middle and deep aquifers, with pumping rate varying on a monthly basis. All other boundary conditions in the model (other wells, recharge, stream stage, specified head conditions, etc) were simulated as steady-state. Model results were exported as time-series fluxes for each stream (streams were represented as either drain or river boundary conditions). The time-series fluxes were subtracted from steady-state fluxes calculated without new water-right pumping in order to calculate model estimates of streamflow capture associated with the new water right. Capture rates were then divided by the average annual water-right quantity to obtain capture estimates as a percentage of pumpage. The model is relatively linear, so these results represent superposition of transient pumping on an otherwise steady-state groundwater flow system. Variation in transient streamflow capture was predicted to be insignificant with the exception of middle-aquifer pumping impacts on the Dungeness River, which varied by ±5% (PGG, 2014a). In this case, PGG averaged the predicted transient Dungeness River streamflow capture over the critical period (August 15 – September 15) for use as a mitigation target. Model predictions are summarized on **Table A-1**. Regulated streams on the Dungeness Peninsula are shown on **Figure A-1**.

Streamflow Augmentation from Infiltration

Streamflow augmentation from infiltration was estimated by running the model in steady-state mode because the temporal variation in reclaimed water availability and associated infiltration rates are either minor or insignificant (see main memorandum, Section3). A total infiltration rate of 1 cfs (447 gpm) was distributed over the model cells coincident with each of the generalized infiltration areas shown on **Figure 1** of the main memorandum. Additional infiltration recharge was simulated using the "flux polygon analytic element boundary" feature available in Groundwater Vistas Version 6 (ESI, 2013). Steady state flux values were extracted for model streams both with and without the infiltration recharge and differences were calculated to estimate steady-state streamflow augmentation associated with infiltration. Augmentation was then divided by infiltration rate (1 cfs) to calculate percentage of infiltration augmenting flow in each stream. As the model is relative linearly, these percentages can be multiplied by specified infiltration rates for each generalized infiltration area to estimate associated augmentation rates. Model predictions are summarized in **Table A-1**.

Mitigation Optimization of Infiltration

PGG developed a spreadsheet using Microsoft Excel that compares model-predicted streamflow capture associated with water-right pumping to model-predicted augmentation associated with infiltration and calculates residual impacts associated with combined pumping and infiltration. The spreadsheet can accommodate up to 3 infiltration areas and allows specification of well completion in either the middle or the deep aquifer. Average annual pumping and infiltration rates are specified by the user, and multiplied by the percent capture and percent augmentation values discussed above and shown on **Table A-1**. The spreadsheet calculates net residual impact for each stream and for all streams combined.

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PGG selected combinations of infiltration areas that seemed to best match the required mitigation profile or expected political reality, as described in Section 4 of the main memorandum. For the Carlsborg option simulations, infiltration in the permeable portion of the Carlsborg UGA (Carlsborg PUGA) was fixed at the total reclaimed water amount available for mitigation (312.2 gpm), and supplemental infiltration was simulated from areas east of the Dungeness River. For the Sequim option, infiltration areas were selected east of the Dungeness River and PGG adjusted infiltration rates in the spreadsheet until the mitigation profile was reasonably matched while minimizing the required infiltration of reclaimed water. The combinations of pumping (middle or deep aquifer) and infiltration areas considered in various spreadsheet simulations are summarized on **Table 4** of the main memorandum. The individual spreadsheets optimized for each combination are reproduced at the end of this appendix.

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Table A-1: Critical Period Pumping Impacts & Augmentation

	Pumping		Infiltration (Augmentation)							
	Middle Aquifer Pumping	Deep Aquifer Pumping	Carlsborg UGA (A)	Sequim East (B)	Sequim West (C)	Sequim Demo Site (D)	Sequim City Shop (E)	Sequim River Road (F)	Sequim FarWest (G)	Sequim UGA (H)
Bagley	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
McDonald	0.5%	0.2%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Matriotti	1.4%	0.4%	3.4%	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%
Meadowbrook	0.5%	0.5%	0.3%	0.5%	0.8%	0.1%	0.6%	0.4%	0.3%	0.6%
Cassalery	2.3%	2.3%	0.4%	18.3%	22.8%	3.5%	17.3%	9.5%	8.2%	18.2%
Gierin & Graysmarsh	2.6%	3.1%	0.3%	64.7%	31.6%	26.4%	49.5%	18.1%	11.8%	40.4%
Bell	0.4%	0.9%	0.0%	1.7%	2.1%	58.8%	6.7%	1.7%	0.9%	6.8%
Johnson	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dungeness	**52.8%**	17.2%	82.0%	10.6%	37.4%	3.3%	20.1%	66.7%	73.3%	29.1%
Morse	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Siebert	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL	60.4%	24.6%	86.9%	95.9%	94.8%	92.1%	94.4%	96.5%	94.7%	95.2%

NOTES:

All values expressed in percent of average annual pumping or infiltration rate.

Dungeness middle aquifer pumping impact is 4-week average over critical period from August 15-September 15.

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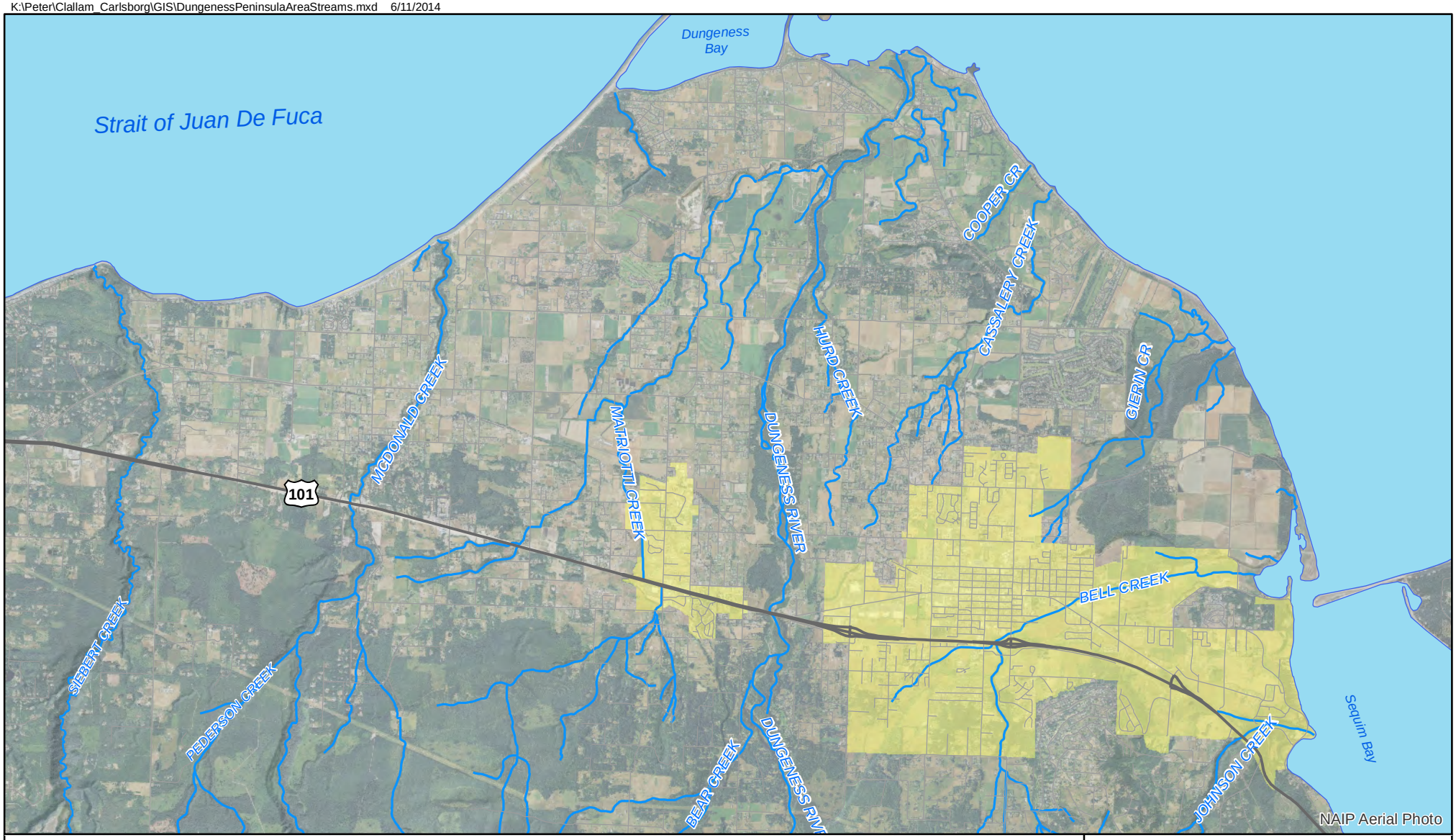

Urban Growth Areas

0 Miles 2

Figure A-1

Dungeness Peninsula Streams

Task 2D Memo
Representative Mitigation Scenarios

PgG

Combination #1: Middle Aquifer Pumping, Infiltration at Carlsborg PUGA & Sequim Demonstration Site

Reach	Stream	Mitigation Target	A. Carlsborg	B. Sequim East	D. Demo Site	Weight	Residual
Total		156.1	321.2	0.0	22.0		143.3
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	1.5	0.0	0.0	1	0.3
D3	Matriotti	3.6	11.0	0.0	0.0	1	7.4
D4	Meadowbrook	1.2	1.0	0.0	0.0	1	-0.2
D5	Cassalery	5.9	1.3	0.0	0.8	1	-3.8
D6	Gierin & Graysmarsh	6.6	0.8	0.0	5.8	1	0.0
D8	Bell	1.2	0.1	0.0	12.9	1	11.9
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	263.4	0.0	0.7	1	127.7
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Note: to have no impact on all streams, would need 135 gpm at demonstration site.

Combination #2: Middle Aquifer Pumping, Infiltration at Carlsborg PUGA, Sequim East and Sequim Demo Site

Reach	Stream	Mitigation Target	A. Carlsborg	B. Sequim East	D. Demo Site	Weight	Residual
Total		156.1	321.2	29.0	2.0		152.7
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	1.5	0.0	0.0	1	0.3
D3	Matriotti	3.6	11.0	0.0	0.0	1	7.4
D4	Meadowbrook	1.2	1.0	0.2	0.0	1	0.0
D5	Cassalery	5.9	1.3	5.3	0.1	1	0.9
D6	Gierin & Graysmarsh	6.6	0.8	18.8	0.5	1	13.5
D8	Bell	1.2	0.1	0.5	1.2	1	0.6
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	263.4	3.1	0.1	1	130.1
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Combination #3: Middle Aquifer Pumping, Infiltration at Carlsborg PUGA & Sequim PUGA

Reach	Stream	Mitigation Target	A. Carlsborg	H. Sequim PUGA	D. Demo Site	Weight	Residual
Total		156.1	321.2	28.0	0.0		149.7
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	1.5	0.0	0.0	1	0.3
D3	Matriotti	3.6	11.0	0.0	0.0	1	7.4
D4	Meadowbrook	1.2	1.0	0.2	0.0	1	0.0
D5	Cassalery	5.9	1.3	5.1	0.0	1	0.6
D6	Gierin & Graysmarsh	6.6	0.8	11.3	0.0	1	5.5
D8	Bell	1.2	0.1	1.9	0.0	1	0.8
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	263.4	8.2	0.0	1	135.1
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Combination #4: Deep Aquifer Pumping, Infiltration at Carlsborg PUGA & Sequim Demonstration Site

Reach	Stream	Mitigation Target	A. Carlsborg	B. Sequim East	D. Demo Site	Weight	Residual
Total		63.6	321.2	0.0	28.0		241.3
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	1.5	0.0	0.0	1	0.9
D3	Matriotti	1.0	11.0	0.0	0.0	1	10.0
D4	Meadowbrook	1.2	1.0	0.0	0.0	1	-0.2
D5	Cassalery	5.9	1.3	0.0	1.0	1	-3.5
D6	Gierin & Graysmarsh	8.1	0.8	0.0	7.4	1	0.1
D8	Bell	2.2	0.1	0.0	16.5	1	14.3
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	263.4	0.0	0.9	1	219.8
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Note: to have no impact on all streams, would need 165 gpm at demonstration site.

Combination #5: Deep Aquifer Pumping, Infiltration at Carlsborg PUGA, Sequim East and Sequim Demo Site

Reach	Stream	Mitigation Target	A. Carlsborg	B. Sequim East	D. Demo Site	Weight	Residual
Total		63.6	321.2	34.0	3.0		250.9
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	1.5	0.0	0.0	1	0.9
D3	Matriotti	1.0	11.0	0.0	0.0	1	10.0
D4	Meadowbrook	1.2	1.0	0.2	0.0	1	0.0
D5	Cassalery	5.9	1.3	6.2	0.1	1	1.8
D6	Gierin & Graysmarsh	8.1	0.8	22.0	0.8	1	15.5
D8	Bell	2.2	0.1	0.6	1.8	1	0.2
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	263.4	3.6	0.1	1	222.6
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Combination #6: Deep Aquifer Pumping, Infiltration at Carlsborg PUGA & Sequim PUGA

Reach	Stream	Mitigation Target	A. Carlsborg	H. Sequim PUGA	n/a	Weight	Residual
Total		63.6	321.2	33.0	0.0		246.7
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	1.5	0.0	0.0	1	0.9
D3	Matriotti	1.0	11.0	0.0	0.0	1	10.0
D4	Meadowbrook	1.2	1.0	0.2	0.0	1	0.0
D5	Cassalery	5.9	1.3	5.7	0.0	1	1.2
D6	Gierin & Graysmarsh	8.1	0.8	16.3	0.0	1	9.1
D8	Bell	2.2	0.1	2.2	0.0	1	0.1
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	263.4	6.6	0.0	1	225.5
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Combination #C-M: Middle Aquifer Pumping, Infiltration at Carlsborg PUGA Only

Reach	Stream	Mitigation Target	A. Carlsborg	H. Sequim PUGA	D. Demo Site	Weight	Residual
Total		156.1	321.2	0.0	0.0		123.1
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	1.5	0.0	0.0	1	0.3
D3	Matriotti	3.6	11.0	0.0	0.0	1	7.4
D4	Meadowbrook	1.2	1.0	0.0	0.0	1	-0.2
D5	Cassalery	5.9	1.3	0.0	0.0	1	-4.5
D6	Gierin & Graysmarsh	6.6	0.8	0.0	0.0	1	-5.8
D8	Bell	1.2	0.1	0.0	0.0	1	-1.1
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	263.4	0.0	0.0	1	127.0
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Combination #C-D: Deep Aquifer Pumping, Infiltration at Carlsborg PUGA Only

Reach	Stream	Mitigation Target	A. Carlsborg	B. Sequim East	D. Demo Site	Weight	Residual
Total		63.6	321.2	0.0	0.0		215.6
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	1.5	0.0	0.0	1	0.9
D3	Matriotti	1.0	11.0	0.0	0.0	1	10.0
D4	Meadowbrook	1.2	1.0	0.0	0.0	1	-0.2
D5	Cassalery	5.9	1.3	0.0	0.0	1	-4.5
D6	Gierin & Graysmarsh	8.1	0.8	0.0	0.0	1	-7.3
D8	Bell	2.2	0.1	0.0	0.0	1	-2.2
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	263.4	0.0	0.0	1	218.9
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	0.0

All values in GPM

Combination #7: Middle Aquifer Pumping, Infiltration at Sequim West & Sequim Demonstration Site

Reach	Stream	Mitigation Target	B. Sequim East	C. Sequim West	D. Demo Site	Weight	Residual
Total		156.1	0.0	377.0	0.0		201.2
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.1
D3	Matriotti	3.6	0.0	0.4	0.0	1	-3.2
D4	Meadowbrook	1.2	0.0	3.1	0.0	1	1.9
D5	Cassalery	5.9	0.0	86.0	0.0	1	80.1
D6	Gierin & Graysmarsh	6.6	0.0	119.3	0.0	1	112.6
D8	Bell	1.2	0.0	7.7	0.0	1	6.6
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	0.0	140.8	0.0	1	4.4
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Note -no benefit to infiltration at Sequim Demonstration Site

Combination #8: Middle Aquifer Pumping, Infiltration at Sequim Far West & Sequim Demonstration Site

Reach	Stream	Mitigation Target	G. Sequim Far West	E. City Shop	D. Demo Site	Weight	Residual
Total		156.1	210.0	0.0	0.0		42.7
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.1
D3	Matriotti	3.6	0.2	0.0	0.0	1	-3.4
D4	Meadowbrook	1.2	0.7	0.0	0.0	1	-0.5
D5	Cassalery	5.9	17.3	0.0	0.0	1	11.4
D6	Gierin & Graysmarsh	6.6	24.8	0.0	0.0	1	18.1
D8	Bell	1.2	1.9	0.0	0.0	1	0.7
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	153.9	0.0	0.0	1	17.5
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Note - No benefit to infiltration at Demo Site. Cannot eliminate Meadowbrook impact reasonably with Demo Site recharge, but can by increasing Sequim Far West to 350 gpm or by infiltrating 80 gpm at Sequim City Shop

Combination #9: Middle Aquifer Pumping, Infiltration at Sequim PUGA

Reach	Stream	Mitigation Target	H. Sequim PUGA	n/a	n/a	Weight	Residual
Total		156.1	480.0	0.0	0.0		300.9
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.1
D3	Matriotti	3.6	0.3	0.0	0.0	1	-3.3
D4	Meadowbrook	1.2	2.9	0.0	0.0	1	1.7
D5	Cassalery	5.9	87.5	0.0	0.0	1	81.7
D6	Gierin & Graysmarsh	6.6	193.8	0.0	0.0	1	187.1
D8	Bell	1.2	32.6	0.0	0.0	1	31.5
D9	Johnson	0.0	0.1	0.0	0.0	1	0.1
R0	Dungeness	136.4	139.8	0.0	0.0	1	3.4
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Combination #10: Middle Aquifer Pumping, Infiltration at Sequim West & Sequim Demonstration Site
Using Only Small Streams as Mitigation Targets

Reach	Stream	Mitigation Target	B. Sequim East	C. Sequim West	D. Demo Site	Weight	Residual
Total		156.1	0.0	166.0	0.0		1.2
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.2
D3	Matriotti	3.6	0.0	0.2	0.0	1	-3.4
D4	Meadowbrook	1.2	0.0	1.4	0.0	1	0.2
D5	Cassalery	5.9	0.0	37.9	0.0	1	32.0
D6	Gierin & Graysmarsh	6.6	0.0	52.5	0.0	1	45.9
D8	Bell	1.2	0.0	3.4	0.0	1	2.3
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	0.0	62.0	0.0	1	-74.4
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Combination #11: Middle Aquifer Pumping, Infiltration at Sequim Far West & Sequim Demonstration Site
Using Only Small Streams as Mitigation Targets

Reach	Stream	Mitigation Target	G. Sequim Far West	E. City Shop	D. Demo Site	Weight	Residual
Total		156.1	160.0	0.0	0.0		-4.7
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.2
D3	Matriotti	3.6	0.1	0.0	0.0	1	-3.5
D4	Meadowbrook	1.2	0.5	0.0	0.0	1	-0.7
D5	Cassalery	5.9	13.2	0.0	0.0	1	7.3
D6	Gierin & Graysmarsh	6.6	18.9	0.0	0.0	1	12.2
D8	Bell	1.2	1.4	0.0	0.0	1	0.3
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	117.3	0.0	0.0	1	-19.1
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM
Note - cannot eliminate Meadowbrook impact reasonably with Demo Site recharge, but can by increasing Sequim Far West to 350 gpm or by infiltrating 110 gpm at Sequim City Shop

Combination #12: Middle Aquifer Pumping, Infiltration at Sequim PUGA
Using Only Small Streams as Mitigation Targets

Reach	Stream	Mitigation Target	H. Sequim PUGA	n/a	n/a	Weight	Residual
Total		156.1	200.0	0.0	0.0		34.3
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.2
D3	Matriotti	3.6	0.1	0.0	0.0	1	-3.5
D4	Meadowbrook	1.2	1.2	0.0	0.0	1	0.0
D5	Cassalery	5.9	36.5	0.0	0.0	1	30.6
D6	Gierin & Graysmarsh	6.6	80.7	0.0	0.0	1	74.1
D8	Bell	1.2	13.6	0.0	0.0	1	12.4
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	58.2	0.0	0.0	1	-78.2
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Combination #12-ALT: Middle Aquifer Pumping, Infiltration at Sequim PUGA using entire available mitigation
Using Only Small Streams as Mitigation Targets

Reach	Stream	Mitigation Target	H. Sequim PUGA	n/a	n/a	Weight	Residual
Total		156.1	321.2	0.0	0.0		149.7
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	1.2	0.0	0.0	0.0	1	-1.1
D3	Matriotti	3.6	0.2	0.0	0.0	1	-3.4
D4	Meadowbrook	1.2	1.9	0.0	0.0	1	0.7
D5	Cassalery	5.9	58.6	0.0	0.0	1	52.7
D6	Gierin & Graysmarsh	6.6	129.7	0.0	0.0	1	123.0
D8	Bell	1.2	21.8	0.0	0.0	1	20.7
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	136.4	93.5	0.0	0.0	1	-42.9
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Combination #13: Deep Aquifer Pumping, Infiltration at Sequim West & Sequim Demonstration Site

Reach	Stream	Mitigation Target	B. Sequim East	C. Sequim West	D. Demo Site	Weight	Residual
Total		63.6	0.0	150.0	0.0		78.6
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	0.0	0.0	0.0	1	-0.6
D3	Matriotti	1.0	0.0	0.2	0.0	1	-0.8
D4	Meadowbrook	1.2	0.0	1.2	0.0	1	0.0
D5	Cassalery	5.9	0.0	34.2	0.0	1	28.4
D6	Gierin & Graysmarsh	8.1	0.0	47.5	0.0	1	39.4
D8	Bell	2.2	0.0	3.1	0.0	1	0.8
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	0.0	56.0	0.0	1	11.5
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Combination #14: Deep Aquifer Pumping, Infiltration at Sequim Far West & Sequim Demonstration Site

Reach	Stream	Mitigation Target	G. Sequim Far West	E. City Shop	D. Demo Site	Weight	Residual
Total		63.6	69.0	0.0	2.0		4.8
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	0.0	0.0	0.0	1	-0.6
D3	Matriotti	1.0	0.1	0.0	0.0	1	-1.0
D4	Meadowbrook	1.2	0.2	0.0	0.0	1	-1.0
D5	Cassalery	5.9	6.6	0.0	0.1	1	0.8
D6	Gierin & Graysmarsh	8.1	12.5	0.0	0.5	1	5.0
D8	Bell	2.2	1.2	0.0	1.2	1	0.1
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	46.0	0.0	0.1	1	1.6
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

In order to mitigate Meadowbrook impact with infiltration, need to infiltrate 170 gpm at City Shop, or increase infiltration at Far West to 370 gpm.

Combination #15: Deep Aquifer Pumping, Infiltration at Sequim PUGA

Reach	Stream	Mitigation Target	H. Sequim PUGA	n/a	n/a	Weight	Residual
Total		63.6	157.0	0.0	0.0		85.9
D1	Bagley	0.0	0.0	0.0	0.0	1	0.0
D2	McDonald	0.6	0.0	0.0	0.0	1	-0.6
D3	Matriotti	1.0	0.1	0.0	0.0	1	-0.9
D4	Meadowbrook	1.2	0.9	0.0	0.0	1	-0.3
D5	Cassalery	5.9	28.6	0.0	0.0	1	22.8
D6	Gierin & Graysmarsh	8.1	63.4	0.0	0.0	1	55.3
D8	Bell	2.2	10.7	0.0	0.0	1	8.4
D9	Johnson	0.0	0.0	0.0	0.0	1	0.0
R0	Dungeness	44.5	45.7	0.0	0.0	1	1.2
R1	Morse	0.0	0.0	0.0	0.0	1	0.0
R2	Siebert	0.1	0.0	0.0	0.0	1	-0.1

All values in GPM

Impact at Meadowbrook (0.3 gpm) can be eliminated by increasing total infiltration amount from 157 to 200 gpm. That is probably worthwhile.

APPENDIX B

SEQUIM NPDES/RECLAIMED WATER PERMIT

DEPARTMENT OF
ECOLOGY
State of Washington

Issuance Date: March 18, 2014
Effective Date: April 1, 2014
Expiration Date: March 31, 2019
Modification Date: June 9, 2014

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE AND RECLAIMED WATER PERMIT NO. WA0022349

State of Washington
DEPARTMENT OF ECOLOGY
Olympia, Washington 98504-7600
Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

In compliance with the provisions of the
State of Washington Reclaimed Water Use Act, Chapter 90.46 Revised Code of Washington
and the
Water Pollution Control Law, Chapter 90.48 Revised Code of Washington, as amended,
and
The Federal Water Pollution Control Act (The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

City of Sequim
152 West Cedar Street
Sequim, WA 98382

is authorized to discharge in accordance with the Special and General Conditions that follow.

Plant Location:	Receiving Water:
247 Schmuck Road Sequim, Washington	Outfall 001 – Strait of Juan de Fuca Outfall 002 – Bell Creek
Treatment Type: Class A Reclaimed Water	

Richard Doenges
Southwest Region Manager
Water Quality Program
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special, Reclaimed Water, and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report	Monthly	May 15, 2014
S3.A	Discharge Monitoring Report	Quarterly	July 15, 2014
S3.A	Discharge Monitoring Report	Annual	January 15, 2016
S3.E & F	Noncompliance Notification	As necessary	
S4.B	Plans for Maintaining Adequate Capacity	As necessary	
S4.D	Notification of New or Altered Sources	As necessary	
S4.E	Infiltration and Inflow Evaluation	Annually	June 30, 2014
S4.F	Wasteload Assessment	Annually	June 30, 2014
S5.F	Bypass Notification	As necessary	
S5.G	Operations and Maintenance Manual Update	As necessary	
S5.G	Operations and Maintenance Manual Update or Review Confirmation Letter	Annually	May 1, 2014, February 1st of the following years thereafter
S6.E	Industrial User Survey Update	Annually	October 1, 2014, June 30th the following years thereafter
S8.	Application for Permit Renewal	1/permit cycle	October 1, 2018 (if needed)
S9.A.1	Bell Creek Temperature Study – Sampling and Quality Assurance Plans	1/permit cycle	November 1, 2016 (if needed)
S9.B.	Amended Water Reuse Plan – Season Beneficial Use at Bell Creek	1/permit cycle	November 1, 2015 (if needed)
S10.A.1	Bell Creek Receiving Water Study – Sampling and Quality Assurance Plans	1/permit cycle	November 1, 2016 (if needed)
S10.J	Bell Creek Receiving Water Study Results	1/permit cycle	April 1, 2018 (if needed)
S11.	Outfall Evaluation	1/permit cycle	October 1, 2018
S12.A	Acute Toxicity Effluent Test Results with Permit Renewal Application	2/permit cycle	Submit with renewal application – October 1, 2018
R1.B	Water Reuse Plan	1/permit cycle	March 31, 2015

Permit Section	Submittal	Frequency	First Submittal Date
R1.B	Water Reuse Plan Update	As necessary	
R1.C	Reclaimed Water Operational Records	As necessary	
R1.C	Cross Connection Control Report	Annually	January 15, 2015
R1.G	Service and Use Area Agreement	As necessary	
R1.I	Irrigation Water Balance	As necessary	
R1.J	Hydraulic Loading Water Balance	As necessary	
G1	Notice of Change in Authorization	As necessary	
G4	Reporting Planned Changes	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G10	Duty to Provide Information	As necessary	
G13	Payment of Fees	As assessed	
G20	Compliance Schedules	As necessary	
G21	Contract Submittal	As necessary	

SPECIAL CONDITIONS

S1. WATER QUALITY LIMITS

A. Reclaimed Water Quality Limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on the effective date of this permit, and lasting through the expiration date, the Permittee may discharge Class A reclaimed water to the Strait of Juan de Fuca and Bell Creek at the permitted locations or use Class A reclaimed water in compliance with all specific conditions and requirements of the Washington State *Water Reclamation and Reuse Standards*, 1997 (Publication No. 97-23) subject to compliance with the following limits:

Reclaimed Water Quality Limits		
Outfall # 001: Latitude 48.091389 Longitude -123.036389 **Outfall # 002: Latitude 48.080278 Longitude -123.084167**		
Parameter	**Daily Maximum**	
Flow to Recharge Basins	0.2 MGD and ≥ 3 feet of unsaturated zone in piezometers, whichever condition is more limiting	
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand, 5-day (BOD_5)	20 mg/L 279 pounds/day (lbs/day) 85 percent removal of influent BOD_5	30 mg/L 419 lbs/day
Total Suspended Solids (TSS)	30 mg/L 418 lbs/day 85 percent removal of influent TSS	45 mg/L 627 lbs/day
Parameter	**Average Monthly**	**Sample Maximum**
Ammonia (as N)	3.3 mg/L	5.7 mg/L
Total Nitrogen (as N) [c]	10 mg/L	15 mg/L
Turbidity	2 NTU	5 NTU
Parameter	**Daily Minimum**	**Daily Maximum**
pH	6.0 Standard Units (SU)	9.0 SU
Parameter	**7-Day Median**	**Sample Maximum**
Total Coliform Bacteria	2.2 CFU/100 mL	23 CFU/100 mL

Reclaimed Water Quality Limits	
Outfall # 001: Latitude 48.091389 Longitude -123.036389 **Outfall # 002: Latitude 48.080278 Longitude -123.084167**	
Parameter	
Dissolved Oxygen	Measurably present in reclaimed water at all times.
Chlorine Residual	No chlorine residual is required for currently approved uses, provided the Permittee complies with the Reclaimed Water Conditions of this permit. The need for a 0.5 mg/L chlorine residual in any new or expanded future reclaimed water uses will be evaluated on a case-by-case basis by the Departments of Health and Ecology.

a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.
b	Average weekly discharge limitation means the highest allowable average of ``daily discharges" over a calendar week, calculated as the sum of all ``daily discharges" measured during a calendar week divided by the number of ``daily discharges" measured during that week.
c	Total Nitrogen is the sum of Total Kjeldahl Nitrogen (TKN) plus nitrite and nitrate.

In the event of an upset condition, defined as those situations when flow exceeds twice the plant's maximum daily hydraulic capacity within a 48-hour period, or when Class A water cannot be achieved due to acts of nature such as earthquakes, lightning, or other such unforeseeable catastrophes (1997 Settlement Agreement), the City is authorized to discharge at Outfall 001 only, subject to the following limitations:

UPSET CONDITION LIMITATIONS		
Parameter	**Average Monthly[a]**	**Average Weekly[a]**
BOD_5	30 mg/L, 200 lbs/day 85% Removal	45 mg/L, 300 lbs/day
TSS	30 mg/L, 200 lbs/day 85% Removal	45 mg/L, 300 lbs/day
Flow	1.67 MGD	
Fecal Coliform Bacteria	200 CFU/100 mL	400 CFU/100 mL
pH	Daily minimum is equal to or greater than 6.0 and the daily maximum is less than or equal to 9.0.	
[a] The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken with the exception of fecal coliform, which is based on the geometric mean. Fecal coliform must be tested for during periods of upset.		

The following groundwater limitations apply at monitoring wells used to monitor groundwater recharge facilities.

Groundwater Quality Limitations:	
Primary Drinking Water Criteria	**Sample Maximum [a]**
Nitrate as N	10 mg/L
Nitrite as N	1 mg/L
Arsenic	10 µg/L
Cadmium	5 µg/L
Chromium	100 µg/L
Fluoride	2 mg/L
Mercury	2 µg/L
Nickel	100 µg/L
Total Trihalomethanes (TTHM)	80 µg/L
Other Groundwater Criteria	**Sample Maximum [a]**
Total Dissolved Solids	500 mg/L
Chloride	250 mg/L
Sulfate	250 mg/L
Copper	1300 µg/L
Lead	15 µg/L
Manganese	50 µg/L
Silver	100 µg/L
Zinc	5000 µg/L

[a] The sample maximum is the highest allowable concentration for any sample as measured in the groundwater at the top of the uppermost aquifer beneath or down gradient of the infiltration site.

In the event of an exceedance of a groundwater enforcement limit, the Permittee shall:

1. Provide immediate verbal notification to Ecology's Southwest Regional Office, Water Quality Program.
2. Resample the well within 48 hours of receiving the laboratory report;
3. Provide written notification with the next monitoring report; and
4. Prepare a report documenting conditions and describing action taken and planned to reduce the level to below the enforcement limit as measured at the point of compliance.

B. Mixing Zone Authorization

1. Mixing Zone for Outfall No. 001

The following paragraphs define the maximum boundaries of the mixing zones:

Chronic Mixing Zone

The mixing zone is a cylinder with horizontal distance the radius of 250 feet measured from the center of each discharge port and the height from the seabed to the water surface. The concentration of pollutants at the boundary of the chronic zone must meet chronic aquatic life criteria and human health criteria.

Acute Mixing Zone

The acute mixing zone is a cylinder with horizontal distance the radius of 25 feet measured from the center of each discharge port and the height from the seabed to the water surface. The concentration of pollutants at the boundary of the acute zone must meet acute aquatic life criteria.

Dilution Factors for Outfall No. 001	
Acute Aquatic Life Criteria	109
Chronic Aquatic Life Criteria	786
Human Health Criteria - Carcinogen	594
Human Health Criteria - Non-carcinogen	788

2. Mixing Zone for Outfall No. 002

A mixing zone for Outfall 002 is authorized per Washington Administrative Code (WAC) 173-201A-400.

S2. MONITORING REQUIREMENTS

A. Monitoring Schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

(1) Wastewater Influent			
Wastewater influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.			
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
BOD_5	mg/L	2/week [a]	24-Hour Composite [b]
BOD_5	lbs/day	2/week [a]	Calculation [c]
TSS	mg/L	2/week [a]	24-Hour Composite
TSS	lbs/day	2/week [a]	Calculation
Flow	MGD	Daily	Continuous Recording [d]
(2) Final Reclaimed Water			
Final reclaimed water means wastewater exiting the last treatment process or operation.			
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Total Reclaimed Water Flow	MGD	Daily	Continuous Recording
Flow – Outfall 001	MGD	Daily	Continuous Recording
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Flow – Recharge Basins	MGD	Daily	Continuous Recording
BOD_5	mg/L	2/week [a]	24-Hour Composite
BOD_5	lbs/day	2/week [a]	Calculation
BOD_5	Percent Removal	2/week [a]	Calculation [e]
TSS	mg/L	2/week [a]	24-Hour Composite
TSS	lbs/day	2/week [a]	Calculation
TSS	Percent Removal	2/week [a]	Calculation [e]

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Total Coliform Bacteria	CFU/100 mL	1/day	Grab
Turbidity	NTU	Daily	Continuous Recording
pH [f]	Standard Units	Daily	Grab
Total Nitrogen	mg/L as N	1/month	Calculated
Total Ammonia	mg/L as N	1/month	24-Hour Composite
Nitrate + Nitrite	mg/L as N	1/month	24-Hour Composite
Total Kjeldahl Nitrogen (TKN)	mg/L as N	1/month	24-Hour Composite
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Dissolved Oxygen	mg/L	Daily	Grab
Temperature [g]	Degrees Celsius (°C)	Daily and 7-DADMax [h]	Grab
(3) Effluent Characterization – Final Reclaimed Water			
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Total Phosphorus	mg/L as P	Quarterly [i]	Grab
Ortho-phosphate	mg/L as P	Quarterly [i]	Grab
(4) Permit Renewal Application Requirements – Final Reclaimed Water			
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Oil and Grease	mg/L	Yearly [k]	Grab
Total Dissolved Solids	mg/L	Yearly [k]	24-Hour Composite
Total Hardness	mg/L	Yearly [k]	24-Hour Composite
Cyanide	micrograms/liter (µg/L)	Yearly [k]	Grab
Total Phenolic Compounds	µg/L	Yearly [k]	Grab

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Priority Pollutants (PP) – Total Metals [j]	µg/L; nanograms (ng/L) for mercury	Yearly [k]	24-Hour Composite; Grab for Mercury
PP – Volatile Organic Compounds [j]	µg/L	Yearly [k]	Grab
PP – Acid-extractable Compounds [j]	µg/L	Yearly [k]	24-Hour Composite
PP – Base-neutral Compounds [j]	µg/L	Yearly [k]	24-Hour Composite
Acute Toxicity Testing		2/per Year in Final Year	24-Hour Composite

(5) Recharge Basin Groundwater Elevation Monitoring Requirements

The static water elevation in each recharge basin piezometer will be measured and recorded once per week, any week that reclaimed water is discharged to the basin system. The static water elevation in each piezometer will be measured and recorded in feet below ground surface (water depth). Report the average values to Ecology.

(6) Groundwater Monitoring Requirements

The sampling points for groundwater will be Monitoring Wells 5, 6, and 9.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Depth to Groundwater	Feet (nearest 0.01 ft)	Quarterly [i]	Measurement
Temperature	^{o}C	Quarterly [i]	Measurement
Dissolved Oxygen	mg/L	Quarterly [i]	Grab
pH	SU	Quarterly [i]	Measurement
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Conductivity	µmhos/cm	Quarterly [i]	Grab
Nitrate NO_3 (as N)	mg/L	Quarterly [i]	Grab
Nitrite NO_2 (as N)	mg/L	Quarterly [i]	Grab
Total Dissolved Solids	mg/L	Quarterly [i]	Grab
Total Coliform Bacteria	cfu/100 mL	Quarterly [i]	Grab

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Chloride [l]	mg/L	Quarterly [i]	Grab
Cations/Anions: Calcium, Magnesium, Potassium, Sodium, Bicarbonate, Carbonate, Fluoride, Sulfate	mg/L	Yearly [k]	Grab
Total Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Manganese, Nickel, Silver, Zinc [j]	µg/L	Yearly [k]	Grab
Total Trihalomethanes (TTHM) [l]	µg/L	Quarterly [i]	Grab
(7) Bell Creek Temperature Study			
As specified in Permit Condition S9.			
(8) Bell Creek Receiving Water Study			
As specified in Permit Condition S10.			

a	2/week means two times during each calendar week.
b	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
c	Calculation means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day
d	Continuous means uninterrupted except for brief lengths of time for calibration, for power failure, or for unanticipated equipment repair or maintenance. The Permittee must sample hourly when continuous monitoring is not possible.
e	Percent removal = $\frac{\text{(Influent concentration (mg/L) – Effluent concentration (mg/L)}}{\text{Influent BOD}_5\text{ (mg/L)}} \times 100$ Calculate the percent removal of BOD_5 and TSS using the above equation.
f	The Permittee must report the instantaneous maximum and minimum pH daily. Do not average pH values.
g	Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which usually occurs in the late afternoon. If measuring temperature continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.

h	Calculate a 7-DAD Max for each day by arithmetically averaging the maximum temperature value of the values from the three preceding days, that day, and the values from the three following days.
i	Quarterly is defined as one sample between January and March, one sample between April and June, one sample between July and September, and one sample between October and December. Samples should generally be collected at the same time on a year to year basis. Results must be reported in accordance with the quarterly DMR scheduled contained in Condition S3.A.8.
j	See Appendix A for the required detection (DL) or quantitation (QL) levels. Report single analytical values below detection as "less than (detection level)" where (detection level) is the numeric value specified in attachment A. Report single analytical values between the agency-required detection and quantitation levels with qualifier code of j following the value. To calculate the average value (monthly average): • Use the reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value. • For values reported below detection, use one-half the detection value if the lab detected the parameter in another sample for the reporting period. • For values reported below detection, use zero if the lab did not detect the parameter in another sample for the reporting period. If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.
k	Yearly is defined as once between January and December of each year. The yearly sample should generally be collected at the same time on a year to year basis. Results must be reported in accordance with the annual DMR schedule contained in Condition S3.A.8. **Starting January 1, 2015.**
l	Chloride and TTHM monitoring is waived as long as the reclaimed water supply contains no chlorine residual. In the event that chlorination is used for the reclaimed water supply, these parameters shall be monitored as stipulated in the table.

B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 Code of Federal Regulations (CFR) Part 136 [or as applicable in 40 CFR subchapters N (Parts 400–471) or O (Parts 501-503)] unless otherwise specified in this permit. Ecology may only specify alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

C. Flow Measurement, Field Measurement, and Continuous Monitoring Devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement, continuous monitoring devices, and methods consistent with accepted scientific practices.

2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.

3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:

   a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.

   b. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.

   c. Must calibrate continuous chlorine measurement instruments using a grab sample analyzed in the laboratory within 15 minutes of sampling.

4. Calibrate micro-recording temperature devices, known as thermistors, using protocols from the Department of Ecology's (Ecology) Quality Assurance Project Plan Development Tool (Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends). This document is available online at: http://www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod6%20Ecology%20SOPs/Protocols/ContinuousTemperatureSampling.pdf. Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer.

5. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.

6. Calibrate these devices at the frequency recommended by the manufacturer.

7. Calibrate flow monitoring devices at a minimum frequency of at least one calibration per year.

8. Maintain calibration records for at least three years.

D. Laboratory Accreditation

The Permittee must ensure that all monitoring data required by Ecology is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this

requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

E. Request for Reduction in Monitoring

The Permittee may request a reduction of the sampling frequency after 12 months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.

2. Clearly state the parameters for which it is requesting reduced monitoring.

3. Clearly state the justification for the reduction.

S3. REPORTING AND RECORDING REQUIREMENTS

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

A. Reporting

The first monitoring period begins on the effective date of the permit. The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic Discharge Monitoring Report (DMR) form provided by Ecology within WAWebDMR. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for WAWebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html.

   If unable to submit electronically (for example, if you do not have an internet connection), the Permittee must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR.

2. Enter the "No Discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.

3. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.

4. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A or Condition S2.

5. Calculate average values (unless otherwise specified in the permit) using:

   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.

   b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample for the reporting period.

   c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.

6. Report single-sample grouped parameters (for example priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WAWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary). The Permittee must also submit an electronic PDF copy of the laboratory report using WAWebDMR.

   If the Permittee has obtained a waiver from electronic reporting or if submitting prior to the compliance date, the Permittee must submit a paper copy of the laboratory report providing the following information: date sampled, sample location, date of analysis, parameter name, CAS number, analytical method/number, detection limit (DL), laboratory quantitation level (QL), reporting units, and concentration detected.

   The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.

7. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

   If the Permittee has obtained a waiver from electronic reporting, it must ensure that paper forms are postmarked or received by Ecology no later than the dates specified below, unless otherwise specified in this permit.

8. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:

   a. Submit monthly DMRs by the 15th day of the following month.

   b. Submit quarterly DMRs, unless otherwise specified in the permit, by the 15th day of the month following the monitoring period. Quarterly sampling periods are January through March, April through June, July through September, and October through December.

c. Submit annual DMRs, unless otherwise specified in the permit, by January 15 for the previous calendar year. The annual sampling period is the calendar year. **Starting January 1, 2015.**

9. Submit reports to Ecology online using Ecology's electronic WAWebDMR submittal forms (electronic DMRs) as required above. If the Permittee has obtained a waiver from electronic reporting, send paper reports to Ecology at:

Water Quality Permit Coordinator
Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

10. The Permittee must also submit a duplicate DMR report to the Department of Health at:

Water Reclamation & Reuse Program Lead
Wastewater Management Section
Washington State Department of Health
16201 East Indiana Avenue, Suite 1500
Spokane Valley, WA 99216

B. Records Retention

The Permittee must retain records of all monitoring information for a minimum of three years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

C. Recording of Results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement

2. The individual who performed the sampling or measurement

3. The dates the analyses were performed

4. The individual who performed the analyses

5. The analytical techniques or methods used

6. The results of all analyses

D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR.

E. Reporting Permit Violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.

2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within 30 days of sampling.

a. Immediate Reporting

The Permittee must immediately report to Ecology, the Department of Health-Shellfish Program, and Clallam County Environmental Health Division at the numbers listed below, all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses discharging to marine surface waters.
- Any other failures of the sewage system (pipe breaks, etc.)

Department of Ecology, Southwest Regional Office	360-407-6300
Department of Health, Shellfish Program	360-236-3330 (business hours) 360-789-8962 (after business hours)
Clallam County Environmental Health Division	360-417-2258

b. Twenty-Four (24) Hour Reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1) Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.

2) Any unanticipated bypass that causes an exceedence of an effluent limit in the permit (See Condition S5.F, “Bypass Procedures”).

3) Any upset that causes an exceedence of an effluent limit in the permit (See Condition G.15, “Upset”).

4) Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.

5) Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within Five Days

The Permittee must also provide a written submission within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The written submission must contain:

1) A description of the noncompliance and its cause.

2) The period of noncompliance, including exact dates and times.

3) The estimated time the Permittee expects the noncompliance to continue if not yet corrected.

4) Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

5) If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of Written Reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All Other Permit Violation Reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not

relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

f. Report Submittal

The Permittee must submit reports to the address listed in S3.A.

F. Other Reporting

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of Revised Code of Washington (RCW) 90.56.280 and chapter 173-303-145. The Permittee can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm.

If the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

G. Maintaining a Copy of this Permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. FACILITY LOADING

A. Design Criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Maximum Month Design Flow (MMDF)	1.67 MGD
BOD_5 Influent Loading for Maximum Month	4036 lbs/day
TSS Influent Loading for Maximum Month	3855 lbs/day

B. Plans for Maintaining Adequate Capacity

1. Conditions Triggering Plan Submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

a. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.

b. The projected plant flow or loading would reach design capacity within five years.

2. Plan and Schedule Content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

a. Analysis of the present design and proposed process modifications

b. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system

c. Limits on future sewer extensions or connections or additional waste loads

d. Modification or expansion of facilities

e. Reduction of industrial or commercial flows or waste loads

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

If the Permittee intends to apply for state or federal funding for the design or construction of a facility project, the plan may also need to meet the environmental review requirements as described in 40 CFR 35.3040 and 40 CFR 35.3045, and it may also need to demonstrate cost effectiveness as required by WAC 173-95-730. The plan must specify any contracts, ordinances, methods for financing, or other arrangements necessary to achieve this objective.

C. Duty to Mitigate

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

D. Notification of New or Altered Sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:

a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.

b. Is not part of an approved general sewer plan or approved plans and specifications.

c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.

2. This notice must include an evaluation of the wastewater treatment plant's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

E. Infiltration and Inflow Evaluation

1. The Permittee must conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, *I/I Analysis and Project Certification*, available as Publication No. 97-03 at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html

2. The Permittee may use monitoring records to assess measurable infiltration and inflow.

3. The Permittee must prepare a report summarizing any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the previous report based on equivalent rainfall, the report must contain a plan and a schedule to locate the sources of infiltration and inflow and to correct the problem.

4. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by June 30th of each year after permit issuance. First report due **June 30, 2014.**

F. Wasteload Assessment

The Permittee must conduct an annual assessment of its influent flow and wasteload and submit a report to Ecology by June 30th of each year after permit issuance. First report due **June 30, 2014.**

The report must contain:

1. A description of compliance or noncompliance with the permit effluent limits.

2. A comparison between the existing and design:

   a. Monthly average dry weather and wet weather flows.

   b. Peak flows.

   c. BOD_5 loading.

   d. Total suspended solids loadings.

3. The percent change in the above parameters since the previous report (except for the first report).

4. The present and design population or population equivalent.

5. The projected population growth rate.

6. The estimated date upon which the Permittee expects the wastewater treatment plant to reach design capacity, according to the most restrictive of the parameters above.

Ecology may modify the interval for review and reporting if it determines that a different frequency is sufficient.

S5. OPERATION AND MAINTENANCE

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

A. Certified Operator

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class III plant. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts.

B. Operation and Maintenance (O&M) Program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.

2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.

3. Make maintenance records available for inspection at all times.

C. Short-Term Reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out in a manner approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, 30 days prior to such activities.

2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

D. Electrical Power Failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to, alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee must maintain Reliability Class I (EPA 430/9-74-001) at the wastewater treatment plant. Reliability Class I requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions.

E. Prevent Connection of Inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

F. Bypass Procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten days before the date of the bypass.

2. Bypass which is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:

- The use of auxiliary treatment facilities.
- Retention of untreated wastes.
- Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
- Transport of untreated wastes to another treatment.

c. Ecology is properly notified of the bypass as required in Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

a. The Permittee must notify Ecology at least 30 days before the planned date of bypass. The notice must contain:

- A description of the bypass and its cause.
- An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
- A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
- The minimum and maximum duration of bypass under each alternative.
- A recommendation as to the preferred alternative for conducting the bypass.
- The projected date of bypass initiation.
- A statement of compliance with State Environmental Policy Act (SEPA).
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedence of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation

of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

G. Operations and Maintenance (O&M) Manual

1. O&M Manual Submittal and Requirements

The Permittee must:

a. Review the O&M Manual at least annually and confirm this review by letter to Ecology by **May 1, 2014**, for the calendar year 2013 and by February 1st of the following calendar years thereafter.

b. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.

c. Keep the approved O&M Manual at the permitted facility.

d. Follow the instructions and procedures of this manual.

2. O&M Manual Components

In addition to the requirements of WAC 173-240-080 (1) through (5), the O&M Manual must include:

a. Emergency procedures for cleanup in the event of wastewater system upset or failure.

b. Wastewater system maintenance procedures that contribute to the generation of process wastewater.

c. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in the discharge permit.

d. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).

e. The treatment plant process control monitoring schedule.

f. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

g. Specify other items on case-by-case basis such as O&M for collection systems pump stations, lagoon liners, etc.

S6. PRETREATMENT

A. General Requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the Publicly Owned Treatment Works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

B. Duty to Enforce Discharge Prohibitions

1. Under federal regulations [40 CFR 403.5(a) and (b)], the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC-173-216-060.

2. The Permittee must not authorize or knowingly allow the introduction of any of the following into their treatment works:

   a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).

   b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0

standard units, unless the works are specifically designed to accommodate such discharges.

c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.

d. Any pollutant, including oxygen-demanding pollutants, (BOD_5, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.

e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.

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

g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, upon request of the Permittee, approves, in writing, alternate temperature limits.

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

i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).

3. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:

a. Noncontact cooling water in significant volumes.

b. Stormwater and other direct inflow sources.

c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.

4. The Permittee must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

C. <u>Wastewater Discharge Permit Required</u>

The Permittee must

1. Establish a process for authorizing non-domestic wastewater discharges that ensures all SIUs in all tributary areas meet the applicable state waste discharge

permit (SWDP) requirements in accordance with chapter 90.48 RCW and chapter 173-216 WAC.

2. Immediately notify Ecology of any proposed discharge of wastewater from a source, which may be a significant industrial user (SIU) [see fact sheet definitions or refer to 40 CFR 403.3(t)(i)(ii)].

3. Require all SIUs to obtain a SWDP from Ecology prior to accepting their non-domestic wastewater, or require proof that Ecology has determined they do not require a permit.

4. Require the documentation as described in S6.C.3 at the earliest practicable date as a condition of continuing to accept non-domestic wastewater discharges from a previously undiscovered, currently discharging and unpermitted SIU.

5. Require sources of non-domestic wastewater, which do not qualify as SIUs but merit a degree of oversight, to apply for a SWDP and provide it a copy of the application and any Ecology responses.

6. Keep all records documenting that its users have met the requirements of S6.C.

D. Identification and Reporting of Existing, New, and Proposed Industrial Users

1. The Permittee must take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewer system (see Appendix B of the fact sheet for definitions).

2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be a significant industrial user (SIU), the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.

3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

E. Industrial User Survey

The Permittee must complete an industrial user survey listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the survey to Ecology by **October 1, 2014**, for the calendar year 2013 and by **June 30th** of the following calendar years thereafter. At a minimum, the Permittee must develop the list of SIUs and PSIUs by means of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs must include, at a minimum, the business name, telephone number, address, description of the industrial process(s), and the known wastewater volumes and characteristics.

S7. SOLID WASTES

A. Solid Waste Handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC.

S8. APPLICATION FOR PERMIT RENEWAL OR MODIFICATION FOR FACILITY CHANGES

The Permittee must submit an application for renewal of this permit by **October 1, 2018.**

The Permittee must also submit a new application or supplement at least 180 days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S9. BELL CREEK TEMPERATURE STUDY

A. In the event that the surface water discharge at Outfall 002 will be retained in operation beyond the expiration date of this permit, the Permittee must collect information on the reclaimed water discharge and the receiving water (Bell Creek) to determine if there is a reasonable potential to cause a violation of the water quality standards. If reasonable potential exists, Ecology will use this information to calculate additional reclaimed water limits.

The Permittee must:

1. Submit a sampling and quality assurance project plan for Ecology review and approval by **November 1, 2016**. The Plan must clearly discuss how periods of "no flow" in the creek channel will be identified and monitored during the study period.

2. Conduct all sampling and analysis in accordance with the guidelines given in *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Ecology Publication 04-03-030 (http://www.ecy.wa.gov/pubs/0403030.pdf). A model Quality Assurance Plan specific for temperature is available at http://www.ecy.wa.gov/programs/wq/permits/guidance.html. The plan must include a description of the method the Permittee will use to collect daily flow data from Outfall 002 and in Bell Creek upstream and downstream of the discharge.

3. Measure temperature and flow in the reclaimed water discharge (after final aeration) and the ambient water upstream and downstream of Outfall 002

between **January 1, 2017**, and **December 31, 2017**, measure the temperature and flow of a) the reclaimed water discharge (after final aeration), and b) the ambient water upstream and downstream of Outfall 002 when Bell Creek is flowing.

4. Use micro-recording temperature devices known as thermistors to measure temperature. Ecology's Quality Assurance Project Plan Development Tool *(Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends Section)* contains protocols for continuous temperature sampling. This document is available online at https://fortress.wa.gov/ecy/publications/summarypages/0303052.html.

5. Calibrate the devices as specified in this document unless using recording devices certified by the manufacturer. Ecology does not require manufacture-specific equipment as given in this document; however, if the Permittee wishes to use measuring devices from another company, it must demonstrate the accuracy is equivalent.

6. Set the recording devices to record at one-half-hour intervals.

7. Report temperature monitoring data as: daily maximum and as the 7-day running average of the daily maximums. The model Quality Assurance Plan shows an example of these calculations.

8. Use the temperature device manufacturer's software to generate (export) an Excel text file of the cumulative temperature data each month. Send this file and placement logs to Ecology by the **15th of each month** for the prior month's data. The placement logs should include the following information for both thermistor deployment and retrieval: date, time, temperature device manufacturer ID, location, depth, whether it measured air or water temperature, and any other details that may explain data anomalies. An example of a placement log is shown in Appendix F of the document referenced in Item 4 above. Submittals must include daily flow data.

B. In the event that the discharge from Outfall 002 will be managed as a seasonal beneficial use (i.e., riparian augmentation and groundwater recharge), the Permittee must develop an update to its Water Reuse Plan (refer to Permit Condition R1.B) outlining the method that will be used to restrict the discharge to periods of "no flow" in the Bell Creek channel. This plan will identify criteria and procedures to be used to assess and demonstrate that there is no flow in the channel, as well as mechanisms that will be used to ensure that no reclaimed water leaves the Water Reuse Demonstration Site and/or adjoining City-owned land. The plan must also 1) identify reclaimed water standards that would be applicable for this proposal (e.g., groundwater quality monitoring, signs and posting, etc.), 2) present the specific mechanisms that will be used to satisfy these standards, and 3) propose an implementation schedule for the project. This plan must be submitted to Ecology for review and approval prior to **November 1, 2015**.

The temperature study in Condition S9.A will not be required if the Permittee obtains Ecology approval of the plan for managing Outfall 002 as a seasonal beneficial use

S10. BELL CREEK RECEIVING WATER STUDY

A. In the event that the surface water discharge at Outfall 002 will be retained in operation beyond the expiration date of this permit, the Permittee must collect Bell Creek receiving water information, including flow, necessary to determine if the effluent has a reasonable potential to cause a violation of the water quality standards. If reasonable potential exists, Ecology will use the study information to calculate effluent limits.

The Permittee must:

1. Submit a Sampling and Quality Assurance Plan for Ecology review and approval by **November 1, 2016**. The plan must: a) address all sampling requirements listed this permit condition; and b) include a description of the method the Permittee will use to collect daily flow data from Outfall 002 and in Bell Creek between **January 1, 2017, and December 31, 2017**, and c) clearly discuss how periods of "no flow" in the creek channel will be identified and monitored during the study period.

2. Conduct all sampling and analysis in accordance with the guidelines given in *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Ecology Publication 04-03-030. This document is available at: http://www.ecy.wa.gov/pubs/0403030.pdf.

3. Locate the receiving water sampling locations outside the zone of influence of the reclaimed water, no less than one upstream of the discharge sampling location and one downstream of the discharge sampling location.

4. Use sampling station accuracy requirements of ± 20 meters.

5. Follow the clean sampling techniques in Method 1669: *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*, EPA Publication No. 821-R-95-034, April 1995, or similar precautions adapted from Method 1669 to meet the objectives of the sampling effort.

6. At a minimum, collect monthly samples during each month that Bell Creek is flowing, at each location upstream and downstream of Outfall 002 and analyze the samples for fecal coliform bacteria, BOD_5, dissolved oxygen, ammonia, hardness, and pH.

7. In addition, analyze the samples for both the total and dissolved fractions for the following metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc.

8. Conduct all chemical analysis using the methods and the detection levels identified in Appendix A.

9. Submit the results of the study to Ecology by **April 1, 2018**.

10. The Receiving Water Data Report must also include electronic copies of the data formatted according to Ecology's Environmental Information (EIM) System templates available at the link below. http://www.ecy.wa.gov/eim/MyEIM.htm

Any subsequent sampling and analysis must also meet these requirements. The Permittee may conduct a cooperative receiving water study with other NPDES Permittees discharging in the same vicinity.

B. If the Permittee obtains Ecology approval of the plan to manage Outfall 002 as a seasonal beneficial use (refer to Permit Condition S9.B), the Permittee is not required to complete the receiving water study under Permit Condition S10.A.

S11. OUTFALL EVALUATION

The Permittee must inspect, once per permit period, the submerged portion of the outfall line and diffuser (Outfall 001) to document its integrity and continued function. If conditions allow for a photographic verification, the Permittee must include such verification in the report. The Permittee shall inspect the outfall and diffuser in the last year of the permit and submit the inspection report to Ecology by **October 1, 2018**.

S12. ACUTE TOXICITY

A. Testing when there is No Permit Limit for Acute Toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent during August 2017 and December 2017 (once in the last summer and once in the last winter prior to submission of the application for permit renewal).

2. Submit the results to Ecology with the permit renewal application.

3. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100 percent effluent and a control.

4. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia*, *Daphnia pulex*, or *Daphnia magna*	EPA-821-R-02-012

B. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.

2. The Permittee must collect 24-hour composite effluent samples or grab samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.

3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.

4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.

5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water of sufficient quality for good control performance.

6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.

RECLAIMED WATER CONDITIONS

R1. RECLAIMED WATER DISTRIBUTION AND USE

Beginning on the effective date of this permit and lasting through its expiration date, all reclaimed water produced by the Permittee under this permit shall comply with the Special Conditions and General Conditions, as well as the Reclaimed Water Conditions of this permit.

A. Authorized Uses and Locations

Beginning on the effective date and lasting through the expiration date of this permit, the Permittee is authorized to distribute water reclaimed in accordance with the terms and conditions of this permit for authorized uses.

The distribution by the Permittee of reclaimed water that does not meet the treatment, water quality and monitoring requirements established in this permit or the use of reclaimed water other than for authorized uses listed in a Departments of Health and Ecology approved reclaimed water engineering report shall constitute a violation of the terms and conditions of this permit.

B. Water Reuse Plan

The Permittee shall prepare a water reuse plan, which contains a summary description of the proposed water reuse system from the approved Engineering Report. The plan shall be submitted to the Departments of Health and Ecology by **March 31, 2015**. The Permittee shall review the plan at least annually and plan shall be updated whenever new uses or users are added to the distribution system. A copy of the revised plan shall be submitted to Ecology and Health. The plan shall contain, but not be limited to, the following:

1. Description of the reuse distribution system;

2. Identification of uses, users, location of reuse sites.

3. Evaluation of reuse sites, estimated volume of reclaimed water use, means of application, and for irrigation or surface percolation uses, the application rates, water balance, expected agronomic uptake, potential to impact ground water or surface water at the site, background water quality and hydrogeological information necessary to evaluate potential water quality impacts.

C. Reclaimed Water Operational Records

The Permittee shall maintain records and report to the Departments of Ecology and Health in accordance with Special Condition S3, and the following conditions. All records shall be retained for a minimum of three years. The falsification of information submitted to the Departments shall constitute a violation of the terms of this permit.

1. Operating records shall be maintained at the reclamation treatment plant or within a central depository within the Permittee's operating agency. These records shall include: records of all analyses performed, records of operational

problems, unit process and equipment breakdowns, and diversions to emergency storage or disposal; and all corrective or preventative action taken

2. Process or equipment failures triggering an alarm that is key to maintaining reliability of reclaimed water quality shall be recorded and maintained as a separate record file. The recorded information shall include the time and cause of failure and corrective action taken.

3. A monthly summary of operating records as specified above shall be submitted with the Discharge Monitoring Report form to the Departments of Health and Ecology at that addresses listed in Special Condition S3.A.

4. If the reclamation facility was not operating during a given monitoring period, submit the required reports with the words "No Discharge" entered in place of the monitoring results.

5. Cross Connection Control Report. An annual cross-connection control report for the preceding calendar year shall be submitted to the Departments of Health and Ecology by **January 15th of each year**. The report shall be prepared by a certified Cross-Control Specialist identifying all devices tested and any cross-connection incidents which occurred in the reuse system.

D. Bypass Prohibited

There shall be no bypassing of untreated or partially treated wastewater from the reclamation plant or any intermediate unit processes to the distribution system or point of use at any time. All reclaimed water being distributed for beneficial use must meet Class A requirements at all times. Water not meeting Class A must be retained for additional treatment by diversion to a bypass lagoon, unless discharged from Outfall 001 in accordance with the upset conditions allowed under Section S1.A.

The Departments of Health and Ecology shall be notified by telephone within 24 hours of any diversion to a bypass lagoon. Substandard wastewater shall not be discharged to the reclaimed water distribution system or use areas without specific approval from the Departments of Health and Ecology

E. Reliability

The Permittee shall maintain the highest reliability class as described in the *Water Reclamation and Reuse Standards* which require one of the following features for each of the critical reclamation treatment unit processes of oxidation, coagulation, filtration and disinfection:

1. Alarms and standby power source

2. Alarms and automatically actuated short-term (24-hour) storage or disposal provisions.

3. Automatically actuated long-term storage or disposal provisions for treated wastewater.

F. Use Area Responsibilities

1. A standard notification sign shall be developed by the Permittee using colors and verbiage approved by the state Department of Health. The signs shall be used in all reclaimed water use areas, consistent with the *Water Reclamation and Reuse Standards*.

2. Reclaimed water use, including runoff and spray shall be confined to the designated and approved use area.

3. The Permittee shall control industrial and toxic discharges to the sanitary sewer that may affect reclaimed water quality through either a delegated pretreatment program with Ecology or assuring all applicable discharges have permits issued under the Water Pollution Control Act, Chapter 90.48 RCW, and the State Waste Discharge Permit Regulation, Chapter 173-216 WAC.

4. Where the reclaimed water production, distribution and use areas are under direct control of the Permittee, the Permittee shall maintain control and be responsible for all facilities and activities inherent to the production, distribution and use of the reclaimed water. The Permittee shall ensure that the reuse system operates as approved by the Departments of Health and Ecology.

G. Service and Use Area Agreement

Where the reclaimed water additional treatment, distribution system or use area is not under direct control of the Permittee:

1. The person(s) who provides additional treatment, distributes, owns, or otherwise maintains control over the reclaimed water use area is responsible for reuse facilities and activities inherent to the production, distribution and use of the reclaimed water to ensure that the system operates as approved by the Departments of Health and Ecology in accordance with this Permit.

2. Reclaimed water use, including runoff and spray, shall be confined to the designated and approved use areas.

3. A binding Service and Use Area Agreement among the parties involved is required to ensure that construction, operation, maintenance, and monitoring meet all requirements of the Departments of Health and Ecology. This Service and Use Area Agreement must be consistent with the requirements of the *Water Reclamation and Reuse Standards*. A copy of each Service and Use Area Agreement must be submitted to and approved by the Departments of Health and Ecology prior to implementation.

4. The Service and Use Area Agreement shall provide the Permittee with authority to terminate service of reclaimed water to a customer violating the *Water Reclamation and Reuse Standards* and restrictions outlined in the reclaimed water use agreement. The Service and Use Area Agreements shall be approved by the Departments of Health and Ecology prior to the distribution of any reclaimed water.

5. No reclaimed water shall be distributed by the Permittee without a Service and Use Area Agreement approved by the Departments of Health and Ecology.

H. Reclaimed Water Ordinance

The Permittee shall complete a local ordinance to include policies and procedures for the distribution and delivery of reclaimed water. The ordinance shall provide the Permittee with the authority to terminate service of reclaimed water from any customer violating the state *Water Reclamation and Reuse Standards* and restrictions outlined in the service and use agreement.

I. Irrigation Use

1. For any irrigation use of reclaimed water, the hydraulic loading rate of reclaimed water shall be determined based on a detailed water balance analysis. The calculated loading rate(s) and the parameters and methods used to determine the loading rate(s) shall be submitted to Ecology for approval.

2. Irrigation of areas subject to public access shall occur during periods of non-use by the public. There shall be no runoff of reclaimed water applied to land by spray irrigation to any surface waters of the state or to any land not authorized by approved Service and Use Area Agreement.

3. There shall be no application of reclaimed water for irrigation purposes when the ground is saturated or frozen.

4. The reclaimed water shall not be applied to the irrigation lands in quantities that:

   a. Significantly reduce or destroy the long-term infiltration rate of the soil.

   b. Cause long-term anaerobic conditions in the soil.

   c. Cause ponding of reclaimed water and produce objectionable odors or support insects or vectors.

   d. Cause leaching losses of constituents of concern beyond the treatment zone or in excess of the approved design. Constituents of concern are constituents in the reclaimed water, partial decomposition products, or soil constituents that would alter ground water quality in amounts that would affect current and future beneficial uses.

The Permittee shall maintain all irrigation agreements for lands not owned for the duration of the permit. The Permittee shall inform the Departments of Health and Ecology in writing of any proposed changes to existing agreements.

J. Surface Percolation Use

1. For any surface percolation of reclaimed water in groundwater recharge or infiltration systems, the hydraulic loading rate shall be determined based on a detailed water balance. The calculated loading rate(s) and the parameters and

methods used to determine the loading rates shall be submitted to Ecology for approval prior to any reclaimed water discharge to the system.

2. Background/natural groundwater quality must be documented and sampling locations identified and approved by Ecology prior to any reclaimed water discharge to the system.

3. Surface waters shall not be impaired due to the infiltration of reclaimed water.

R2. OPERATION AND MAINTENANCE

The Permittee shall operate and maintain the facility loading in accordance with Special Condition S5 and the following conditions.

A. Reclaimed Water System Maintenance

The Permittee shall institute an adequate O&M program for the entire reclamation system. Maintenance records shall be maintained on all major electrical and mechanical components of the treatment plant, collection, distribution and use areas. Such records shall clearly specify the frequency and type of maintenance recommended by the manufacturer and shall show the frequency and type of maintenance performed. These maintenance records shall be available for inspection at all times.

1. At all times, the reclamation facility, distribution and use areas shall be maintained to ensure that all equipment is kept in a reliable operating condition.

2. A chlorine residual of at least 0.5 mg/L shall be maintained in the reclaimed water during conveyance from the reclamation plant to the use area unless waived by the Departments of Health and Ecology.

3. Maintenance of a chlorine residual is not required in reclaimed water impoundments and storage ponds. At the discretion of the Departments of Health and Ecology, chlorine residual may not be required in reclaimed water distributed from storage ponds.

B. Operation and Maintenance (O&M) Manual

In addition to the requirements of Special Condition S5.G, the O&M Manual for the facility shall include the following reclaimed water information:

1. An alarm condition response plan to ensure that no untreated or inadequately treated wastewater will be delivered to the use areas.

2. A discussion of the cross-connection control and inspection program, including who will be responsible for compliance and testing of cross connection control devices.

3. Operational strategies for the reclaimed water use areas.

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

A. All applications, reports, or information submitted to Ecology must be signed and certified.

1. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation; or

- The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

- In the case of a partnership, by a general partner.

- In the case of sole proprietorship, by the proprietor.

- In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

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

1. The authorization is made in writing by a person described above and submitted to Ecology.

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

C. Changes to authorization. If an authorization under paragraph B.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph B.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section must make the following certification:

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

G2. RIGHT OF INSPECTION AND ENTRY

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.

B. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.

C. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

D. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

A. The following are causes for terminating this permit during its term, or for denying a permit renewal application:

1. Violation of any permit term or condition.

2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.

3. A material change in quantity or type of waste disposal.

4. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.

5. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.

6. Nonpayment of fees assessed pursuant to RCW 90.48.465.

7. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

B. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

1. A material change in the condition of the waters of the state.

2. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

3. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

4. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

5. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

6. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

7. Incorporation of an approved local pretreatment program into a municipality's permit.

C. The following are causes for modification or alternatively revocation and reissuance:

1. When cause exists for termination for reasons listed in A1 through A7 of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

2. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. REPORTING PLANNED CHANGES

The Permittee must, as soon as possible, but no later than 60 days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

A. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b)

B. A significant change in the nature or an increase in quantity of pollutants discharged.

C. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least 180 days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

A. Transfers by Modification

Except as provided in paragraph (B) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

B. Automatic Transfers

This permit may be automatically transferred to a new Permittee if:

1. The Permittee notifies Ecology at least 30 days in advance of the proposed transfer date.

2. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

3. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. PAYMENT OF FEES

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must be punished by a fine of up to $10,000 and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to $10,000 for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

A. An upset occurred and that the Permittee can identify the cause(s) of the upset.

B. The permitted facility was being properly operated at the time of the upset.

C. The Permittee submitted notice of the upset as required in Condition S3.E.

D. The Permittee complied with any remedial measures required under S4.C of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

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

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit must, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment must be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or by both.

G20. COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date.

G21. CONTRACT REVIEW

The Permittee must submit to Ecology any proposed contract for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW. In the event that Ecology does not comment within a 30-day period, the Permittee may assume consistency and proceed with the contract.

APPENDIX A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Biochemical Oxygen Demand	SM5210-B		2 mg/L
Chemical Oxygen Demand	SM5220-D		10 mg/L
Total Organic Carbon	SM5310-B/C/D		1 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3-B and		20

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
	C/D/E/G/H		
Flow	Calibrated device		
Dissolved oxygen	SM4500-OC/OG		0.2 mg/L
Temperature (max. 7-day avg.)	Analog recorder or Use micro-recording devices known as thermistors		0.2º C
pH	SM4500-H^+ B	N/A	N/A

NONCONVENTIONAL PARAMETERS

Pollutant & CAS No. (if available)	**Recommended Analytical Protocol**	**Detection (DL)[1] µg/L unless specified**	**Quantitation Level (QL)[2] µg/L unless specified**
Total Alkalinity	SM2320-B		5 mg/L as CaCO3
Chlorine, Total Residual	SM4500 Cl G		50.0
Color	SM2120 B/C/E		10 color units
Fecal Coliform	SM 9221E,9222	N/A	Specified in method - sample aliquot dependent
Fluoride (16984-48-8)	SM4500-F E	25	100
Nitrate + Nitrite Nitrogen (as N)	SM4500-NO3- E/F/H		100
Nitrogen, Total Kjeldahl (as N)	SM4500-N_{org}B/C and SM4500NH_3-B/C/D/EF/G/H		300
Soluble Reactive Phosphorus (as P)	SM4500- PE/PF	3	10
Phosphorus, Total (as P)	SM 4500 PB followed by SM4500-PE/PF	3	10

Pollutant & CAS No. (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
Oil and Grease (HEM)	1664 A or B	1,400	5,000
Salinity	SM2520-B		3 practical salinity units or scale (PSU or PSS)
Settleable Solids	SM2540 -F		100
Sulfate (as mg/L SO_4)	SM4110-B		200
Sulfide (as mg/L S)	SM4500-S^2F/D/E/G		200
Sulfite (as mg/L SO_3)	SM4500-SO3B		2000
Total Coliform	SM 9221B, 9222B, 9223B	N/A	Specified in method - sample aliquot dependent
Total dissolved solids	SM2540 C		20 mg/L
Total Hardness	SM2340B		200 as CaCO3
Aluminum, Total (7429-90-5)	200.8	2.0	10
Barium Total (7440-39-3)	200.8	0.5	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)	EPA SW 846 8021/8260	1	2
Boron Total (7440-42-8)	200.8	2.0	10.0
Cobalt, Total (7440-48-4)	200.8	0.05	0.25
Iron, Total (7439-89-6)	200.7	12.5	50
Magnesium, Total (7439-95-4)	200.7	10	50
Molybdenum, Total (7439-98-7)	200.8	0.1	0.5
Manganese, Total (7439-96-5)	200.8	0.1	0.5
NWTPH Dx	Ecology NWTPH Dx	250	250

Pollutant & CAS No. (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
NWTPH Gx	Ecology NWTPH Gx	250	250
Tin, Total (7440-31-5)	200.8	0.3	1.5
Titanium, Total (7440-32-6)	200.8	0.5	2.5

PRIORITY POLLUTANTS

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
METALS, CYANIDE & TOTAL PHENOLS			
Antimony, Total (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Cyanide, Total (57-12-5)	335.4	5	10
Cyanide, Weak Acid Dissociable	SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	SM4500-CN G	5	10
Phenols, Total	EPA 420.1		50
ACID COMPOUNDS			
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	625/1625B	1.0	2.0
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	625	1.0	2.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dibromochloromethane (124-48-1)	624	1.0	2.0
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624	1.0	2.0
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6)[3]	624	1.0	2.0

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toluene (108-88-3)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Acenaphthene (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzyl butyl phthalate (85-68-7)	625	0.3	0.6
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Benzo(b)fluoranthene (3,4-benzofluoranthene) (205-99-2) [4]	610/625	0.8	1.6
Benzo(j)fluoranthene (205-82-3) [4]	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9) [4]	610/625	0.8	1.6
Benzo(r,s,t)pentaphene (189-55-9)	625	0.5	1.0
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane (111-91-1)	625	5.3	21.2
Bis(*2-chloroethyl*)ether (111-44-4)	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether (39638-32-9)	625	0.3	0.6
Bis(*2-ethylhexyl*)phthalate (117-81-7)	625	0.1	0.5
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (218-01-9)	610/625	0.3	0.6
Dibenzo (a,h)acridine (226-36-8)	610M/625M	2.5	10.0

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Dibenzo (a,j)acridine (224-42-0)	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (53-70-3)(1,2,5,6-dibenzanthracene)	625	0.8	1.6
Dibenzo(a,e)pyrene (192-65-4)	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene (189-64-0)	625M	2.5	10.0
3,3-Dichlorobenzidine (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6
Dimethyl phthalate (131-11-3)	625	1.6	6.4
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Di-n-octyl phthalate (117-84-0)	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*) (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0
Isophorone (78-59-1)	625	0.5	1.0
3-Methyl cholanthrene (56-49-5)	625	2.0	8.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Perylene (198-55-0)	625	1.9	7.6
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6
DIOXIN			
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (176-40-16) (2,3,7,8 TCDD)	1613B	1.3 pg/L	5 pg/L
PESTICIDES/PCBs			
Aldrin (309-00-2)	608	0.025	0.05
alpha-BHC (319-84-6)	608	0.025	0.05
beta-BHC (319-85-7)	608	0.025	0.05

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
gamma-BHC (58-89-9)	608	0.025	0.05
delta-BHC (319-86-8)	608	0.025	0.05
Chlordane (57-74-9) [5]	608	0.025	0.05
4,4'-DDT (50-29-3)	608	0.025	0.05
4,4'-DDE (72-55-9)	608	0.025	0.05[10]
4,4' DDD (72-54-8)	608	0.025	0.05
Dieldrin (60-57-1)	608	0.025	0.05
alpha-Endosulfan (959-98-8)	608	0.025	0.05
beta-Endosulfan (33213-65-9)	608	0.025	0.05
Endosulfan Sulfate (1031-07-8)	608	0.025	0.05
Endrin (72-20-8)	608	0.025	0.05
Endrin Aldehyde (7421-93-4)	608	0.025	0.05
Heptachlor (76-44-8)	608	0.025	0.05
Heptachlor Epoxide (1024-57-3)	608	0.025	0.05
PCB-1242 (53469-21-9) [6]	608	0.25	0.5
PCB-1254 (11097-69-1)	608	0.25	0.5
PCB-1221 (11104-28-2)	608	0.25	0.5
PCB-1232 (11141-16-5)	608	0.25	0.5
PCB-1248 (12672-29-6)	608	0.25	0.5
PCB-1260 (11096-82-5)	608	0.13	0.5
PCB-1016 (12674-11-2) [6]	608	0.13	0.5

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
Toxaphene (8001-35-2)	608	0.24	0.5

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417). ALSO GIVEN AS:

   The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

3. NWTPH Dx - Northwest Total Petroleum Hydrocarbons Diesel Extended Range – see http://www.ecy.wa.gov/biblio/97602.html

4. NWTPH Gx - Northwest Total Petroleum Hydrocarbons Gasoline Extended Range – see http://www.ecy.wa.gov/biblio/97602.html

5. 1, 3-dichloroproylene (mixed isomers) You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

6. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

7. Chlordane – You may report alpha-chlordane (5103-71-9) and gamma-chlordane (5103-74-2) in place of chlordane (57-74-9). If you report alpha and gamma-chlordane, the DL/PQLs that apply are 0.025/0.050.

8. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

APPENDIX C

CARLSBORG SEWER TECHNICAL MEMORANDUM NO. 1 – CARLSBORG GROWTH AREA WATER AND WASTEWATER FLOW PROJECTIONS

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TO:	Bob Martin, P.E., Clallam County Tom Martin, P.E, Clallam County PUD Mike Kitz, P.E., Clallam County PUD Paul Haines, P.E., City of Sequim
cc:	Peter Schwartzman, L.H.G., PGG Jill van Hulle, L.H.G., PGG
FROM:	Jay Swift, P.E. (G&O) Nancy Lockett, P.E. (G&O)
DATE:	February 18, 2014
SUBJECT:	Carlsborg Sewer Technical Memo No. 1 – Carlsborg Urban Growth Area Water and Wastewater Flow Projections

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This technical memorandum summarizes existing and future populations, water and sewer customers, water consumption, and wastewater flows and loadings for the Carlsborg UGA (CUGA). These projections will be used in the design of wastewater collection and conveyance facilities for the Carlsborg and in the evaluation of treatment alternatives and water reuse / mitigation alternatives involved with the construction and operation of a wastewater collection system in the CUGA.

This memorandum builds on the evaluations presented in the Public Utility District No. 1 of Clallam County (District) *Water System Plan* (2010, CH2M Hill) and the *Sewer Facilities Plan for Carlsborg UGA* (2012, BHC Consultants). Per the request of the PUD, estimated future water demand was extracted from the District's 2010 *Water System Plan.*

BACKGROUND

Clallam County wishes to construct a wastewater collection system for the CUGA by 2015. Design of the collection system is currently underway. In addition, a Wastewater Facilities Plan Amendment will be prepared for the County evaluating the "Sequim Alternative" which includes treatment of Carlsborg wastewater at the existing City of Sequim Water Reclamation Facility (WRF). Routes for conveying Carlsborg flows to Sequim will be evaluated and the impact of Carlsborg flows and loadings on the Sequim WRF will be examined. The findings of archaeological, geotechnical, environmental and wetlands consultants will be incorporated, and SERP and SEPA documentation will be updated consistent with this alternative. In addition to assessing conveyance and treatment impacts, the Sequim Alternative will be evaluated against other options available to the County, including construction of a new WWTP in the Carlsborg

area, as previously identified in the *2012 Sewer Facilities Plan*. Capital, O&M, and life cycle costs and non-monetary considerations for conveyance and treatment as well as differences in reclaimed water reuse potential and mitigation requirements will be evaluated in this comparison in the Facility Plan Addendum.

Evaluation of management options for the wastewater generated in Carlsborg will also include evaluation of the role reclaimed water could play in the future water needs for the CUGA. Completion of this task will ensure a thorough evaluation of all costs for providing wastewater treatment for the CUGA.

The District, the water purveyor for the CUGA, has determined that additional water rights will be needed to provide service to the buildout populations for the entire CUGA. The District's original plan for providing sewer service to the CUGA included reuse of the reclaimed water generated at a WRF within the CUGA for irrigation and outdoor water use along Carlsborg Road, fire training and infiltration in percolation ponds to help mitigate for hydrologic impacts associated with the new water right. Treatment and reuse of the CUGA wastewater at the Sequim WRF, the Sequim Alternative, will have an impact on the potential for reuse of the reclaimed water in the CUGA. Per the March 2013 Interlocal Agreement between the District and Clallam County, the County must evaluate the cost impact to the CUGA of reuse of the reclaimed water outside of the CUGA, and determine if future CUGA water customers would be adversely affected. If Carlsborg residents will be adversely affected, the County is obligated to acquire additional existing water rights or secondary mitigation options to offset any adverse affects associated with the Sequim Alternative for the area outside the District's current local utility district area but inside the UGA.

The District provides water service to approximately half of the Carlsborg UGA and some properties outside of the UGA. The remainder of the UGA is served by private wells and several smaller private purveyors. About 111 individual lots within the Carlsborg UGA are served by private wells. Some of these parcels are residential, and others are commercial properties. A map showing the District's Carlsborg water service area is included as Figure 1.

Clallam County would like the District to expand its water service area to include the entire UGA, and the District is interested in doing so provided that expanding service does not have an adverse impact on their existing water rights or ability to secure additional water rights.

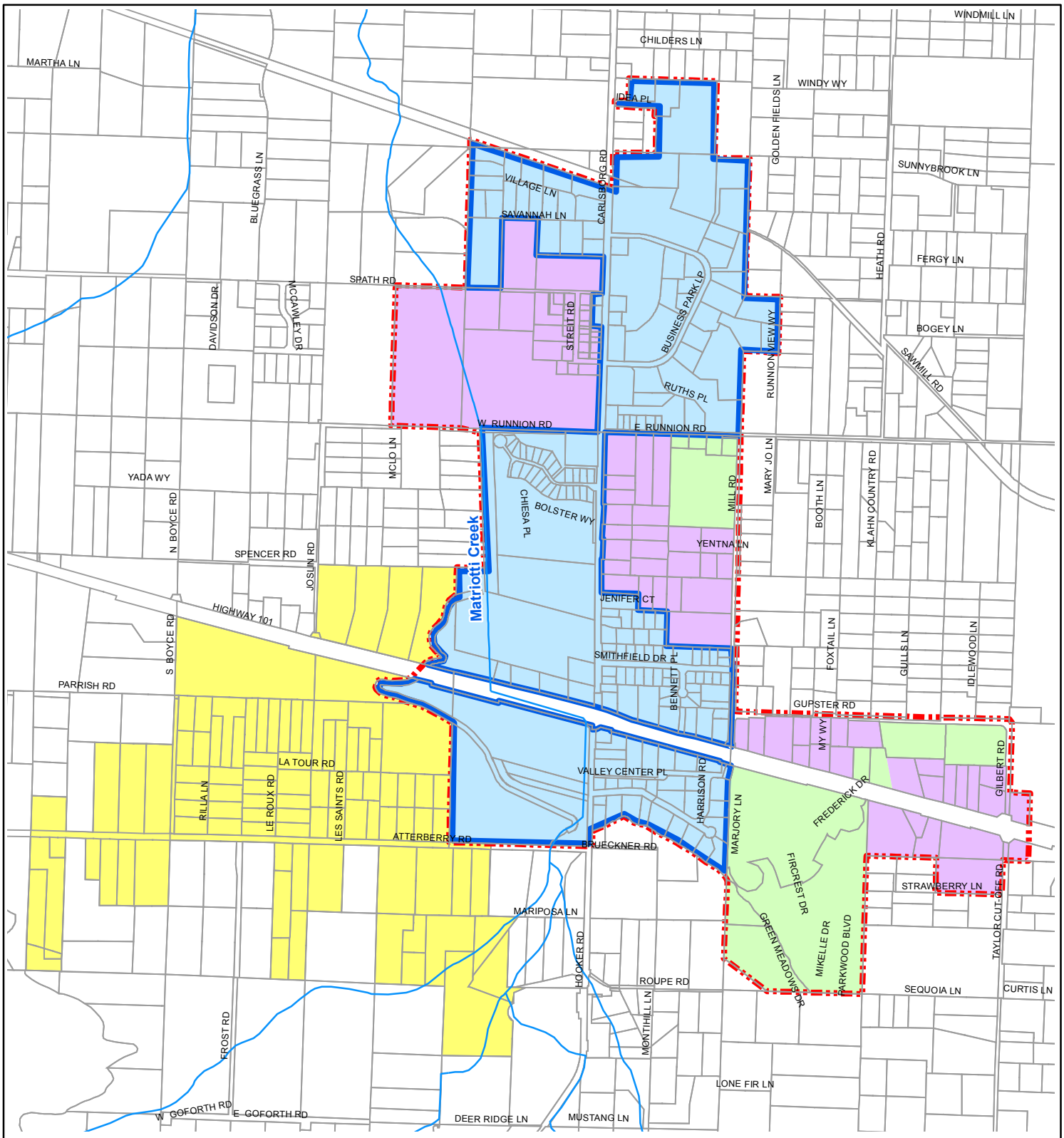
DEFINITION OF TERMS

Proper design of wastewater treatment and conveyance facilities requires an analysis of the quantity and quality of wastewater generated from each of the contributing sources. Several terms and abbreviations used in the analysis are described below.

WATER-RELATED DEFINITIONS

AVERAGE DAILY DEMAND

Average Daily Demand (ADD) is the total volume of water delivered to the system over a year divided by 365 days. The average use in a single day expressed in gallons per day.



LEGEND:

- PARCELS
- CURRENT LUD WATER SERVICE AREA INSIDE CUGA
- CARLSBORG UGA BOUNDARY
- CURRENT LUD WATER SERVICE AREA OUTSIDE CUGA
- AREA OUTSIDE WATER SERVICE AREA AND INSIDE CARLSBORG UGA
- PRIVATE WATER SYSTEM

N

0 650 1,300 Feet

CLALLAM COUNTY

CARLSBORG SEWER TECHNICAL MEMO NO. 1
FIGURE 1
CARLSBORG UGA LUD WATER SERVICE AREA BOUNDARY

Gray & Osborne, Inc.

L:\ClallamCo\13534.00 - Carlsborg Collection System Design & Water Rights Analysis\13534.01 - Carlsborg Facility Plan Amendment\GIS\FIGURE1.mxd

MAXIMUM DAILY DEMAND (MDD)

Maximum Daily Demand is the largest volume of water delivered to the system in a single day expressed in gallons per day. The water supply sources, treatment plant and transmission lines should be designed to handle the maximum day demand.

EQUIVALENT RESIDENTIAL UNIT (ERU, WATER)

An equivalent residential unit (ERU) is a baseline water consumer that represents the average single-family residential household. Average annual water consumed by a single-family household, or ERU, is usually expressed in units of gallons per day (gpd).

WASTEWATER-RELATED DEFINITIONS

WASTEWATER

Wastewater is water-carried waste from residential, commercial and public use facilities, together with quantities of groundwater and surface water which enter the sewer system through defective piping and direct surface water inlets. The total wastewater flow is typically expressed in gallons per day (gpd), or millions of gallons per day (mgd). Typically, wastewater is predominantly domestic in origin with lesser amounts contributed by commercial and industrial businesses and by public use facilities such as schools, parks, hospitals, and municipal functions. Infiltration and inflow entering the sewer system during periods of high groundwater levels is another contributor to wastewater.

BASEFLOW WASTEWATER

Baseflow wastewater is wastewater as generated from residential, commercial and industrial sources. Baseflow wastewater (also known as sanitary flow) does not include infiltration and inflow.

DOMESTIC WASTEWATER

Domestic Wastewater is wastewater generated from single and multifamily residences, permanent mobile home courts, and group housing facilities such as nursing homes. Domestic wastewater flow is often expressed as a unit flow based on the average contribution from each person per day. The unit quantity is typically expressed in terms of gallons per capita per day (gpcd) or gallons per ERU per day.

EQUIVALENT RESIDENTIAL UNIT (ERU, WASTEWATER)

An equivalent residential unit (ERU) is a baseline wastewater generator that represents the average single-family residential household. Average annual flow contributed by a single-family household, or ERU, is usually expressed in units of gallons per day (gpd).

The flow associated with each wastewater ERU is typically considerably less than the flow associated with each water ERU, due to the amount of water that is not returned to the sewer because of loss, evaporation, commercial consumptive use, or irrigation.

NON-RESIDENTIAL WASTEWATER

Non-residential wastewater is wastewater generated from business activities, such as restaurants, hotels and motels, stores, service stations, schools, public facilities, and office buildings. Non-residential wastewater quantities are expressed in this memo in terms of ERUs, by dividing the total flow per category by the average flow per ERU. In this memo, non-residential wastewater is identified as commercial wastewater.

INFILTRATION (IN WASTEWATER)

Infiltration (in wastewater) is groundwater entering a sewer system. Storm events or irrigation can trigger a rise in the groundwater levels and increase infiltration. The greatest infiltration is observed following significant storm events during prolonged periods of precipitation.

INFLOW (IN WASTEWATER)

Inflow (in wastewater) is surface water entering the sewer system from yard, roof and footing drains, from cross connections with storm drains and through holes in manhole covers. Peak inflow occurs during heavy storm events when storm sewer systems are taxed beyond their capacity, resulting in hydraulic backups and local ponding and discharge into the sanitary sewer. Inflow, like infiltration, can be expressed in terms of gallons per capita per day or gallons per acre per day. Typically, inflow and infiltration (I/I) are combined and used as a guide to making recommendations on improving collection system performance, efficiency and capacity.

Since infiltration and inflow (I/I) is related to the total amount of piping and appurtenances in the ground and not to any specific source of wastewater, it is generally expressed in terms of the population or total land area being served. The unit quantity generally used is gallons per capita per day (gpcd), or gallons per acre per day (gpad). As Sequim is a neighboring area with similar weather patterns and soils, Sequim WRF flow records are utilized to predict infiltration in the Carlsborg system on the basis of gallons per acre per day during dry and wet weather periods. In eastern Washington, many WWTPs experience peak flows during irrigation season (typically summer), With relatively dry climates and irrigation in the area, it might be expected that Sequim, like eastern Washington, would similarly experience peak flows in the irrigation season. However, based on an analysis of Sequim WRF flow records, irrigation did not appear to be a major source of infiltration, and it will be assumed that flows from the Carlsborg UGA will peak in or near the winter wet season.

AVERAGE DRY WEATHER FLOW (DWF)

Average dry weather flow is wastewater flow during periods when the groundwater table is low and precipitation is at its lowest of the year. For the Carlsborg / Sequim area, the dry weather

flow period is defined as July, August, and September. During these months, the wastewater strength is highest due to the lack of dilution with the ground and surface water components of I/I. Higher strength wastewater coupled with higher temperatures and longer detention times in the sewer system create the greatest potential for system odors during this time. The average dry weather flow is the average daily flow during July, August, and September.

AVERAGE ANNUAL FLOW (AAF)

Average annual flow is the average daily flow over a calendar year. This flow parameter is used to estimate annual operation and maintenance costs for treatment and pump station facilities.

MAXIMUM MONTH FLOW (MMF)

Maximum month flow is the highest average daily flow for any given month during a calendar year. In western Washington, the maximum month flow typically occurs during winter months. This wintertime flow is composed of the normal domestic, commercial and public use flows with significant contributions from I/I. The predicted maximum month flow at the end of the design period is used as the design flow for sizing treatment processes and selecting treatment equipment.

PEAK HOUR FLOW (PHF)

Peak hour flow is the highest hourly flow during a calendar year. The peak hour flow occurs in response to a significant storm event preceded by prolonged periods of rainfall, which have previously developed a high groundwater table in the service area. Peak hour flows are used in sizing the hydraulic capacity of wastewater collection, treatment and pumping components. Peak hour flow is typically determined from treatment plant flow records. In its *Criteria for Sewage Works Design* (Orange Book), Ecology also recommends a formula to calculate a "peaking factor" that may be applied to the average design flows in order to estimate peak hour flows. This formula is based on the population as well as the average annual flows (AAF).

BIOCHEMICAL OXYGEN DEMAND (BOD)

Biochemical oxygen demand (BOD) is a measure of the oxygen required by microorganisms in the biochemical oxidation (digestion) of organic matter. BOD is an indicator of the organic strength of the wastewater and is measured in either milligrams per liter (mg/L) or pounds per day (lb/day). If BOD is discharged untreated to the environment, biodegradable organics will deplete natural oxygen resources and result in the development of septic (anaerobic) conditions. BOD data together with other parameters are used in the sizing of the treatment facilities and provide a measurement for determining the effectiveness of the treatment process. The term BOD typically refers to a 5-day BOD, often written BOD_5 , since the BOD test is typically run for 5 days. The total BOD of a wastewater is primarily composed of two components – a carbonaceous oxygen demand (CBOD) and a nitrogenous oxygen demand (NBOD).

TOTAL SUSPENDED SOLIDS (TSS)

Total Suspended Solids represents the filterable solid matter carried in the waste stream. The Total Suspended Solids (TSS) concentration in a wastewater sample is determined by filtering a known volume of the sample, drying the filter paper and measuring the increase in weight of the filter paper. TSS is expressed using the same terms as BOD; milligrams per liter for concentration and pounds per day for mass load. The amount of TSS in the wastewater is used in the sizing of treatment facilities and provides another measure of the treatment effectiveness. The concentration of TSS in wastewater affects the treatment facility biosolids production rate, storage requirements, and ultimate disposal requirements.

EXISTING AND PROJECTED FUTURE CUGA WATER CONSUMPTION

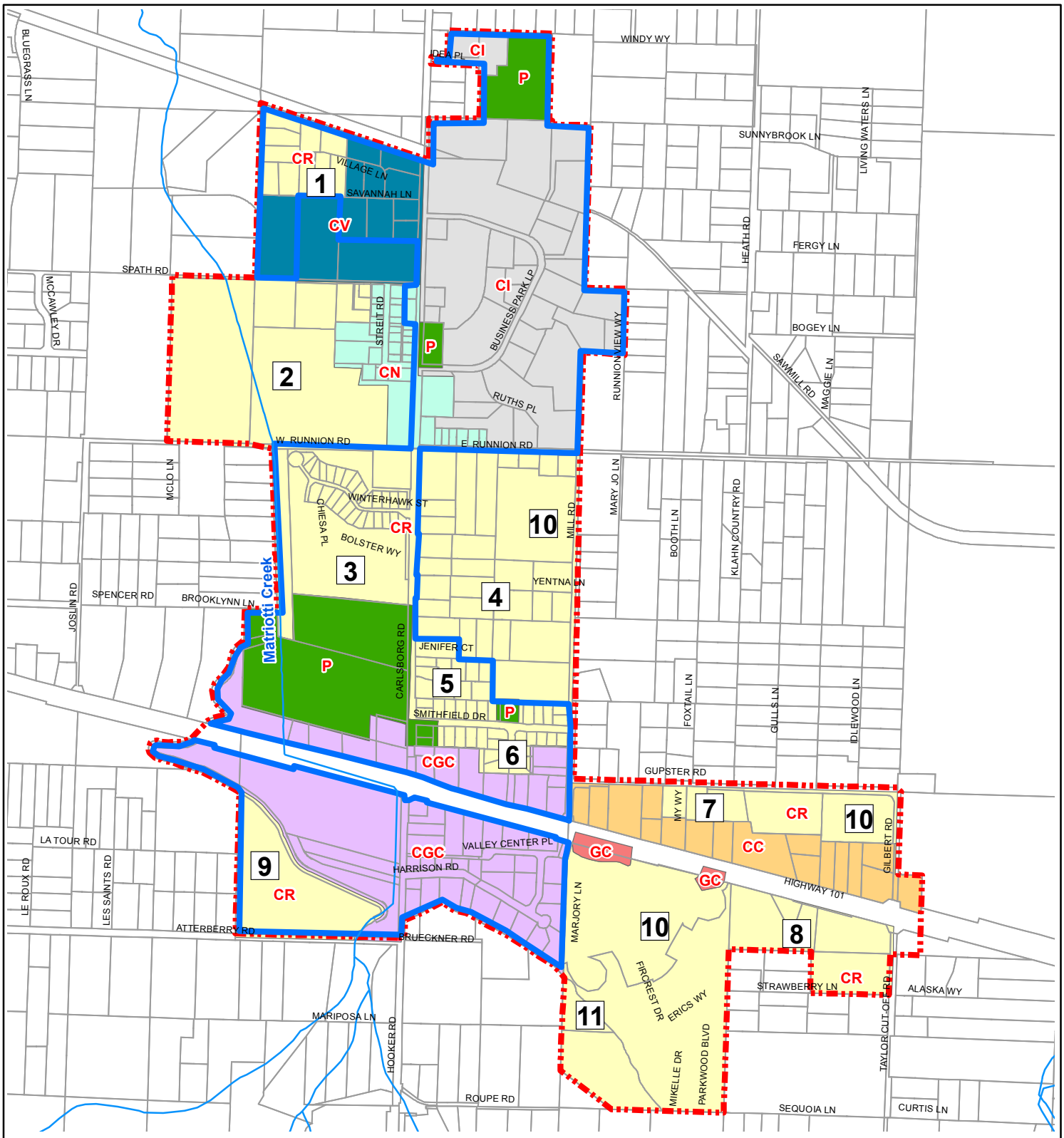
Per the request of the District, the water demand and water service area projections developed in the District's 2010 *Water System Plan* were used in this memo. Currently, commercial ERUs make up 56.46% of the total water demand in the Carlsborg system, so ERUs for the full UGA were projected using the same proportions (56.46% commercial of the total in the UGA) of water demand determined in the 2010 *Water System Plan.*

In 2010, the Carlsborg Community Advisory Council (CCAC) made residential zoning recommendations (shown in Figure 2). These zoning recommendations have not been adopted by the County to date but are utilized as a basis for water demand projections in this memorandum. (Note: Future wetland delineation, wildlife conservation, and airport influence restrictions may reduce zoning densities and overall ERUs; however, these factors are considered minor and have not been reflected in projections.

Table 1 summarizes commercial areas and ERUs within the CUGA. Section 4.5 of the Interlocal Agreement between the County and District states:

"In the event that the County proceeds with the Sequim Alternative and water-use mitigation costs to future water customers in the UGA are adversely affected by treatment and infiltration of water in Sequim vs. Carlsborg, the County will purchase or otherwise procure for the PUD additional existing water rights to <u>supply water for full buildout of the area outside the PUD's current local utility district (LUD) water service area but within the UGA</u>, in a quantity sufficient to offset any adverse effects." Accordingly, the ERUs are broken down in Table 1 into the areas within and outside the LUD water service area. Figures 1 and 2 shows these areas.

For projecting ERUs and flows at buildout, the percentage of commercial ERUs (and demand) was kept constant at 56.46% of the total in the UGA. This yields 2,137 residential ERUs and 2,771 commercial ERUs at buildout in the CUGA and an additional 205 within the existing service area outside the CUGA (grand total of 5,113 ERUs). To apportion commercial ERUs, the areas for each of the commercial zones based on CCAC recommendations and noted in Table 3-2 of the *2012 Sewer Facilities Plan* were used (modified as necessary based on the Water Service Area boundaries); the number of commercial ERUs was assumed to be simply



LEGEND:

- CURRENT LUD WATER SERVICE AREA
- CARLSBORG UGA BOUNDARY

ZONING:

- CR - CARLSBORG RESIDENTIAL
- CC - CARLSBORG COMMERCIAL
- CGC - CARLSBORG GENERAL COMMERCIAL
- CI - CARLSBORG INDUSTRIAL
- CN - CARLSBORG VILLAGE CENTER
- CV - CARLSBORG VILLAGE COMMERCIAL
- GC - GENERAL COMMERCIAL
- P - PUBLIC LAND
- PARCELS

N

0 550 1,100 Feet

CLALLAM COUNTY

CARLSBORG SEWER TECHNICAL MEMO NO. 1
FIGURE 2
CARLSBORG UGA RECOMMENDED ZONING

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proportional to the area. With 2,771 total commercial ERUs, and 248 commercial acres, this works out to 11.17 ERUs per Commercial Acre and 1,989 gpd ADD per Commercial Acre.

TABLE 1

Commercial Areas and ERUs within the CUGA

				Area Within CUGA, Outside PUD Service Area (ac.)			**Area Within CUGA, Inside PUD Service Area (ac.)**			**Area Within CUGA, Served by Private Water Systems (ac.)**	
Zoning		**Area (ac.)**		**Area (ac.)**	**ERUs**		**Area (ac.)**	**ERUs**		**Area (ac.)**	**ERUs**
CI	Industrial	77					77	860.4			-
CC	Commercial	23		20	223.5					3	34.9
CGC	General Commercial	66			-		66	737.5			-
CN	Village Center	12		9.8	109.5		2.2	24.6			-
CV	Village Commercial	26		8.3	92.7		17.7	197.8			-
GC	General Commercial	3		3	33.5						-
P	Public	41			-		41	458.1			-
					-						-
TOTAL		**248**		**41.1**	459.2		**203.9**	2,278.4		**3**	**34.9**
				16.57%			**82.22%**			**1.21%**	
TOTAL COMMERCIAL ERUS		**2,771**		**459**			**2,278**			**34**	

(1) Source of Areas: 2012 Sewer Facilities Plan (Table 3-2)
(2) ERUs per Commercial Acre 11.17
(3) ADD per Commercial Acre (gpd) 1,989

Table 2 summarizes the build-out water demand for CUGA not currently in the District Water Service Area. The "Existing District Customers" and "Total Additional Connections (Maximum)" columns in Table 2 of Appendix E of the 2010 *Water System Plan* were used to apportion residential ERUs to the various areas both within and outside the current District service area within the CUGA. 178 gpd /ERU for ADD projections (162 gpd plus 10% lost or unaccounted for water, as confirmed by the District) was used, instead of the 186 gpd/ERU (mistakenly noted as 168 gpd/ERU) used in Chapter 8 of the 2010 *Water System Plan*.

TABLE 2

Build-Out Water Demand for CUGA not Currently in the District Water Service Area (not including areas with existing water rights - mobile home parks)

Zoning Area (1)	Total Area (ac.)		Residential ERU (2)	Commercial ERU (3)	ADD (Gallons) (4)	Notes
2	47.7	Residential (12-14 DU/ac)	664		118,192	West of Carlsborg Road, south of Spath Rd, north of Runnion Rd
4	43.1	Residential (6-10 DU/ac)	418		74,404	East of Carlsborg Road, west of Mill Rd, south of Runnion Rd
7	4	Residential (8-10 DU/ac)	39		6,942	East of Mill Rd, south of Gupster Rd
8	15.9	Residential (4-6 DU/ac)	94		16,732	South of Hwy 101, east of Parkwood
11	2.1	Residential (6-8 DU/ac)	16		2,848	Southwest of Parkwood
Total Residential	**112.8**		**1,231**		**219,118**	
CN	9.8	Village Center		110	19,492	CN Zone minus areas on east side of Carlsborg Road (3.9 ac)
CV	8.3	Village Commercial		93	16,508	8.3 Acres north of Spath Road, west of Carlsborg Road
CC	20.0	Commercial		223	39,779	East of Mill Rd, north of Hwy 101
GC	3.0	General Commercial		34	5,967	East of Mill Rd, south of Hwy 101, possibly served by Parkwood
Total Commercial	**41.1**			459	81,746	
Grand Total	**153.9**		**1,690**		**300,864**	**337 acre-feet/year**

(1) Figure 3-1, Zoning Recommendations (2012 *Sewer Facilities Plan*)
(2) Based on Table 2, Clallam Public Utility District *Water System Plan* - Appendix E: Carlsborg Build out for Full CUGA and District Service Area
(3) Assumes ERUs in UGA (Water Use) 43.54% residential, 56.46% commercial, per Appendix E of the Clallam Public Utility District Water System Plan. Commerical ERUs apportioned proportional to commercial area.
(4) ADD: 178 gpd/ERU (Clallam Public Utility District Water System Plan) or 162 gpd +10% non-revenue
(5) The term "commercial" includes water used by commercial and industrial employees, industrial processes, and water used by public facilities including schools.

Table 3 summarizes the build-out water demand for mobile home parks within the CUGA with existing water rights, based on a similar analysis that was used to derive Table 2.

TABLE 3

Buildout Water Demand for Mobile Home Parks within the CUGA with Existing Water Rights

Zoning Area (1)	Total Area (ac.)	Residential ERU (2)	Commercial ERU (3)	ADD (Gallons) (4)	Notes:
10	79.5	461	34	88,025	Parkwood, Carlsborg Mobile Home Community, Green Acres Mobile Home Community (Total = 99 acre-feet / year)

(1) Figure 3-1, Zoning Recommendations (2012 *Sewer Facilities Plan*),
(2) Table 2, Clallam Public Utility District *Water System Plan* - Appendix E: Carlsborg Build out for Full CUGA and District Service Area
(3) Assume ERUs in UGA (Water Use) 43.54% residential, 56.46% commercial, per Appendix E of the Clallam Public Utility District Water System Plan
Commerical ERUs apportioned proportional to commercial area.
(4) ADD: 178 gpd/ERU (Clallam Public Utility District Water System Plan) 162 gpd +10% non-revenue
(5) The term "commercial" includes water used by commercial and industrial employees, industrial processes, and water used by public facilities including schools.

Table 4 summarizes the build-out water demand in the CUGA within the existing LUD water service area, based on a similar analysis that was used to derive Tables 2 and 3.

TABLE 4

Buildout Water Demand in CUGA Within Existing LUD Water Service Area

Zoning Area (1)	Total Area (ac.)		Residential ERUs (2)	Commercial ERUs (3)	Average Daily Demand (ADD) (Gallons) (4)
1	10.1	Residential (4-6 DU/ac)	48		8,544
3	25.1	Residential (4-6 DU/ac)	114		20,292
5	5.0	Residential (4-6 DU/ac)	24		4,272
6	9.6	Residential (4-6 DU/ac)	43		7,654
9	15.5	Residential (12-14 DU/ac)	216		38,448
Total Residential	**65.3**		**445**		**79,210**
CI	77.0	Industrial		860	153,150
CV	17.7	Village Commercial		198	35,205
P	41.0	Public		458	81,547
CN	2.2	Village Center		25	4,376
CGC	66.0	General Commercial		737	131,271
Total Commercial	**203.8**			**2,278**	**405,548**
Grand Total	**269.1**		**2,723**		**484,758**

(1) Figure 3-1, Zoning Recommendations (2012 *Sewer Facilities Plan*)
(2) Table 2, Clallam Public Utility District *Water System Plan* - Appendix E: Carlsborg Build out for Full CUGA and District Service Area
(3) Assume ERUs in UGA (Water Use) 43.54% residential, 56.46% commercial, per Appendix E of the Clallam Public Utility District Water System Plan. Commerical ERUs apportioned proportional to commercial area.
(4) ADD: 178 gpd/ERU (Clallam Public Utility District Water System Plan) 162 gpd +10% non-revenue
(5) The term "commercial" includes water used by commercial and industrial employees, industrial processes, and water used by public facilities including schools.
(6) Total ADD in CUGA Within Existing LUD Water Service Area = 543 acre-feet/year. There is an additional 20 acre-feet/year ADD in the area outside the CUGA.

Table 5 provides a Summary of ERUs and average daily demand for the Carlsborg Water System at buildout, based on the information in Tables 2, 3 and 4.

TABLE 5

Summary of ERUs and Average Daily Demand for Carlsborg Water System at Buildout

Total Buildout	**ERUs** [1]	**Average Daily Demand (ADD)** [1] **(gpd)**
RESIDENTIAL		
Residential (within CUGA, not in mobile home parks)	1,676	298,328
Mobile Home Residential	461	82,058
Outside CUGA Residential [1]	205	36,490
TOTAL RESIDENTIAL	2,342	416,876
COMMERCIAL		
TOTAL COMMERCIAL [4]	2,771	493,261
TOTAL		
GRAND TOTAL IN CUGA AND CURRENT WATER SERVICE AREA	5,113	910,137

(1) Based on the apportionment in Tables 1, 2, 3 and 4.
(2) ADD: 178 gpd/ERU (Clallam Public Utility District *Water System Plan*) = 162 gpd +10% non-revenue
(3) The term "commercial" includes water used by commercial and industrial employees, industrial processes, and water used by public facilities including schools.
(4) Assumes, for calculation purposes, that the number of commercial ERUs is 56.46% of the total within the UGA. The Water Plan had effectively used this 56.46% value for areas both inside and outside the UGA, which resulted in a slightly different split of TOTAL ERUs (2,226 residential ERUs and 2,887 commercial ERUs)
(5) Total Average Daily Demand = 1019 acre-feet/year

PROJECTED FUTURE CUGA SEWERED POPULATION AND WASTEWATER FLOWS

Table 6 summarizes projected populations for the Carlsborg sewer system, based on information in the 2010 *Water System Plan* and *2012 Sewer Facilities Plan.*

The projected *wastewater* base flow per ERU (125 gallons per ERU per day, or gpd/ERU) developed in the 2012 *Sewer Facilities Plan* was based on an evaluation of winter water use within the CUGA. The development of this 125 gpd value is consistent with accepted industry practices and is accepted for this memorandum without modification. This 125 gpd/ERU value is 70.2% of the *water* ERU value of 178 gpd/ERU. By way of comparison, in the City of Sequim, the average wastewater ERU value (110 gpd/ERU) is 67.5% of the average water ERU value (163 gpd/ERU), as noted in Sequim's 2012 *General Sewer Plan* and 2012 *Water System Plan.*

TABLE 6

Summary of Total and Sewer Service Populations for the Carlsborg Sewer System

POPULATION	2010	2013	2030	2050	Buildout
CUGA Population	842	856	1,288	1,971	3,899
New population since 2013	0	0	432	1,115	3,043
Sewer Service Area Population	0	0	900	1,971	3,899
Served by Sewers	0	0	481	1,971	3,899

(1) Based on data in Tables 3-3, 3-4, 3-12 and 3-13 in the *2012 Sewer Facilities Plan*

Tables 7 through 9 summarize wastewater flows for the Carlsborg sewer system projected for years 2030, 2050 and at Buildout. In projecting future ERUs and populations for the CUGA, the assumptions used in the 2012 *Sewer Facilities Plan* were used, with some exceptions, as described below.

1. As noted in Appendix E of the 2010 *Water System Plan*, commercial *water* ERUs are 56.46% of the total current number of ERUs (214 out of 379); however, 59 ERUs of these 214 water ERUs are for supply to a bottled water company. The majority of this water will not be returned to the sewer. However, for projecting future flows at buildout, it is assumed that commercial sewer ERUs are 56.46% of total sewer ERUs. (Note: as used in this memo, the term "commercial" includes sewage from commercial and industrial employees, industrial wastewater, and flows from public facilities including schools.)

2. The numbers of commercial and residential ERUs utilized for the 2030 projections in the *2012 Sewer Facilities Plan* have been retained in this memo. The same ratio (310 to 260 or 1.192) of commercial to residential ERUs for 2030 was used for the new 2050 projections. Because of this, the projected commercial ERUs for year 2050 have been increased from the 300 estimated in the *2012 Sewer Facilities Plan* to 1,264.

3. Based on the assumption that 56.46% of the sewer ERUs in the UGA are commercial, the total number of sewer ERUs at buildout in the CUGA is 4,908 (the 5,113 identified in the District's sewer service area minus the 205 that are within the sewer service area but outside the CUGA).

4. The areal I/I rates (gallons per acre per day, or gpad) utilized for annual average, maximum month, peak day and peak hour flow projections were based on an analysis of flows in the Sequim system, with a 25% safety factor added. These I/I rates were higher than the areal I/I rates for annual average, maximum month, peak day and peak hour flows cited for Carlsborg projections in the 2012 *Sewer Facilities Plan*. However, instead of assuming the areal rates were cumulative, the I/I rates were added to baseflow to generate the annual average, maximum month, peak day and peak hour flows (consistent with typical industry practice, and how they were derived through an analysis

of flows in the Sequim system).

5. A diurnal peaking factor (ratio of peak hour to average flow) provided in the State *Criteria for Sewage Works Design* (Orange Book) was utilized in projection of peak hour flows. This had the effect of increasing peak hour flow projections relative to those in the 2012 *Sewer Facilities Plan*. (The 2012 *Sewer Facilities Plan* had not used a diurnal peaking factor, instead adding peak hour projected infiltration and inflow to peak day flow to calculate projected peak hour flow.)

Table 7 summarizes the projected ERUs and flows projected for 2030. The ERU projections are identical to those in the 2012 *Sewer Facilities Plan.* However, the flows are somewhat higher due to higher I/I rates and the inclusion of a diurnal peaking factor.

TABLE 7

Projected ERUs and Flows for the Carlsborg Sewer System - 2030

		Value	Units	Unit Flow (gpd)	Total Flow (gpd)
Baseflow	Total Residential	260	ERU	125	32,500
			ERU	125	-
	Total Commercial	310	ERU	125	38,750
	Total Baseflow	570	ERU		71,300
	Ave Day I/I	240	acres	45	10,800
Ave Day Flow					82,100
	Max Mo I/I	240	acres	110	26,400
Max Mo Flow					97,700
	Peak Day I/I	240	acres	450	108,000
Peak Day Flow					179,300
	Peak Hour I/I	240	acres	650	156,000
Peak Hour Flow (2)					326,800

(1) Based on 20 years of growth from 2010, to be consistent with the 2012 *Sewer Facilities Plan.*
(2) Conservative estimate used for sizing Carlsborg interceptor, based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor. If peaking factor is as high as conservative Orange Book projection, flow will be equalized and attenuated prior to treatment or conveyance to Sequim.

Table 8 summarizes the projected ERUs and flows projected for 2050. The residential ERU projections are identical to those in the 2012 *Sewer Facilities Plan.* However, the commercial ERUs are substantially higher, as the same ratio of commercial to residential ERUs as used for the 2030 projections has been kept. Overall, this results in substantially higher ERUs and flows for 2050 relative to the projections in the 2012 *Sewer Facilities Plan.*

TABLE 8

Projected ERUs and Flows for the Carlsborg Sewer System - 2050

		Value	Units	Unit Flow (gpd)	Total Flow (gpd)
Baseflow	Total Residential	1,060	ERU	125	132,500
					-
	Total Commercial (3)	1,264	ERU	125	157,981
	Total Baseflow	2,324			290,481
	Ave Day I/I	430	acres	45	19,350
Ave Day Flow					309,800
	Max Mo I/I	430	acres	110	47,300
Max Mo Flow					337,800
	Peak Day I/I	430	acres	450	193,500
Peak Day Flow					484,000
	Peak Hour I/I	430	acres	650	279,500
Peak Hour Flow (2)					1,113,000

(1) Based on 40 years of growth from 2010, to be consistent with the 2012 *Sewer Facilities Plan.*
(2) Conservative estimate used for sizing Carlsborg interceptor, based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor. If peaking factor is as high as conservative Orange Book projection, flow will be equalized and attenuated prior to treatment or conveyance to Sequim.
(3) For estimating commercial ERUs, the ratio of commercial to residential from 2030 was used.

Table 9 summarizes the projected ERUs and flows projected for Buildout. The ERU projections are identical to those in the District's 2010 *Water System Plan* (after subtraction of the 205 ERUs outside of UGA); the total sewer ERUs (4,908) are considerably less than the 5,500 projected in the 2012 *Sewer Facilities Plan*. Accordingly, the majority of the flows and loading projections are less than those in the 2012 *Sewer Facilities Plan.* However, the projected peak hour flow is substantially higher, due to the inclusion of a diurnal peaking factor that was not included in the 2012 *Sewer Facilities Plan.* (Note: If the Sequim Alternative is implemented, peak hour flows to Sequim will be substantially lower than projected here, due to attenuation and equalization.)

TABLE 9

Projected ERUs and Flows for the Carlsborg Sewer System - Buildout

		Value	Units	Unit Flow (gpd)	Total Flow (gpd)
Baseflow	Total Residential	2,137	ERU	125	267,100
					-
	Total Commercial	2,771	ERU	125	346,400
	Total Baseflow	4,908			613,500
	Ave Day I/I	560	acres	45	25,200
Ave Day Flow					638,700
	Max Mo I/I	560	acres	110	61,600
Max Mo Flow					675,100
	Peak Day I/I	560	acres	450	252,000
Peak Day Flow					865,500
	Peak Hour I/I	560	acres	650	364,000
Peak Hour Flow (1)					2,133,600

(1) Conservative estimate used for sizing Carlsborg interceptor, based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor. If peaking factor is as high as conservative Orange Book projection, flow will be equalized and attenuated prior to treatment or conveyance to Sequim.

Table 10 summarizes the ERUs, flows and loadings projected in this memorandum compared to the projections in the *2012 Sewer Facilities Plan.* The new projections for ERUs and flows in Table 10 are based on the analyses summarized in Tables 7, 8 and 9. The new projections for annual average wastewater loadings of 5-Day Biochemical Oxygen Demand (BOD_5) are based on a standard loading value of 0.4 pounds per ERU, while the Total Suspended Solids (TSS) loadings are based on a a standard loading value of 0.45 pounds per ERU. Total Nitrogen loadings were calculated based on standard ratio of influent Total Nitrogen to BOD_5 of 40 mg/L to 220 mg/L. The table also compares the peak hour to average annual peaking factor calculated from Ecology's *Criteria for Sewage Works Design* (which takes into account both diurnal and I/I factors) with the peaking factor calculated from the projections.

TABLE 10

Comparison of New Projections and 2012 *Sewer Facilities Plan* Projections for ERUs, Flows and Loadings for the Carlsborg Sewer System

		2030		2050		Buildout	
		New Projection	2012 Sewer Facilities Plan Projection	New Projection	2012 Sewer Facilities Plan Projection	New Projection	2012 Sewer Facilities Plan Projection
Residential ERUs		260	260	1,060	1,060	2,137	2,122
Commercial ERUs		310	310	1,264	300	2,771	3,400
Total ERUs		570	570	2,324	1,360	4,908	5,522
Residential Baseflow	gpd	32,500		132,500		267,100	
Commercial Baseflow	gpd	38,750		158,000		346,400	
Total Baseflow	gpd	71,300	71,000	290,500	171,000	613,500	690,000
Ave Day Flow	gpd	82,100	76,000	309,800	184,000	638,700	712,000
Max Mo Flow	gpd	97,700	90,000	337,800	210,000	675,100	757,000
Peak Day Flow	gpd	179,300	150,000	484,000	318,000	865,500	897,000
Peak Hour Flow (1)	gpd	326,800	270,000	1,113,000	533,000	2,133,600	1,205,000
Peaking Factor (Peak Hour to Average Annual)							
Per Orange Book		3.98	3.98	3.59	3.59	3.34	3.34
In Projections		3.98	3.55	3.59	2.90	3.34	1.69
Wastewater Loadings							
BOD_5, ann. ave.	lb/d	228	228	930	544	1,963	2,200
BOD_5, max. mo.	lb/d	296	300	1,208	700	2,552	3,000
TSS, ann. ave.	lb/d	257	285	1,046	680	2,209	2,750
TSS, max. mo.	lb/d	333	400	1,360	800	2,871	3,500
Tot. Nitrogen, ann. ave.	lb/d	41	45	169	98	357	320

(1) Conservative estimate used for sizing Carlsborg interceptor, based on Ecology's *Criteria for Sewage Works Design* (Orange Book) population-based peaking factor. If peaking factor is as high as conservative Orange Book projection, flow may be equalized and attenuated prior to treatment or conveyance to Sequim.

APPENDIX D

INTERLOCAL AGREEMENT BETWEEN CLALLAM COUNTY AND PUD

2e
3/19/13

INTERLOCAL AGREEMENT FOR THE CARLSBORG WASTEWATER SYSTEM

This Interlocal Agreement (the "Agreement") is made and entered into pursuant to Chapter 39.34 of the Revised Code of Washington (the "RCW") by and between CLALLAM COUNTY, WASHINGTON, a subdivision of the State of Washington (hereafter the "County"), and PUBLIC UTILITY DISTRICT NO. 1 OF CLALLAM COUNTY, a Washington municipal corporation (hereafter the "District") (the County and the District are hereafter sometimes referred to individually as "Party" and collectively as the "Parties").

WHEREAS,

The Washington legislature has appropriated $10,000,000 for a loan (the "Loan") to the District through the Public Works Trust Fund (the "PWTF"), to fund the design and construction (the "Project") of a new wastewater collection, treatment and reclaimed water reuse system (the "System") for the Carlsborg Urban Growth Area in Clallam County. Repayment of the Loan was initially proposed through a local improvement district that was subsequently determined to be infeasible to set up.

The County has obligations under Washington's Growth Management Act to plan for development in unincorporated areas of the County. To that end in 2008 the Western Washington Growth Management Hearings Board ruled that the County was required to provide wastewater service to maintain Carlsborg's designation as a UGA's. And so therefore the County is willing to repay the PWTF Loan from Opportunity Fund revenues.

The County has so far spent approximately $638,000 for project planning and associated studies.

Since 2006, the County and the District have worked in coordination with one another to investigate the feasibility of building and funding a wastewater treatment and water reuse system for the Carlsborg Urban Growth Area. The County desires to design, construct, own, operate, maintain and repair the System.

The District is the eligible recipient of the Loan monies that have been allocated by the Washington Legislature.

At the time of the execution of this Agreement, the District contemplates entering into a PWTF Construction Loan Contract (the "Contract") with the Washington State Public Works Board (the "PWB") and intends, with the approval of the PWB, to assign the Contract to the County. Upon assignment of the Contract to the County, the debt will become a general obligation of the County.

The County has already established the Carlsborg Sewer Fund, the balance for which is currently approximately $4,300,000, to otherwise assist in financing the Project.

The County will commit any other and additional funds that may be required in order to fully reimburse the PWTF for funds received under the Contract.

In entering into this Agreement, it is the intent of the Parties to confirm that the County will be solely responsible for all Project and System planning, design, permitting, construction, ownership, operation, maintenance and repair, and all costs associated therewith, and that the sole function of the District hereunder will be to make the Loan funds available for the Project by executing the Contract and thereafter participating as required in facilitating Loan reimbursements to the County and Loan repayment installments by the County.

THEREFORE, in consideration of the mutual covenants and agreements set forth herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties covenant and agree as follows:

I. EXECUTION AND ASSIGNMENT OF PWTF CONTRACT

1.1 Upon execution of this Agreement, the District will execute the PWTF Construction Loan Contract. Thereafter, upon the District's receipt of written authorization by the PWB to assign the Contract to the County, the District will forthwith surrender and assign to the County, and the County will accept the surrender and assignment from the District of, all of the District's right, title and interest in, to and under the Contract. The County will thereupon assume and agree to be bound by and perform all of the obligations, terms, covenants and conditions of the Contract.

1.2 Upon receipt of confirmation that the PWB will consent to the assignment of the Contract to the County, the District's assignment and the County's assumption of the Contract will be memorialized in a manner and form acceptable to the PWB and each of the Parties. The assignment and assumption agreement shall be executed before any Project cost is charged against the Loan.

1.3 This Agreement shall be of no force and effect without the PWB's written consent to the District's assignment and the County's assumption of the Contract.

II. ADMINISTRATION OF LOAN

2.1 The PWTF Loan funds shall not be obligated, expended, or otherwise disbursed by either party until or unless the Contract has been assigned to the County. Thereafter, all use and administration of the Loan will be the responsibility of the County, subject to the terms and conditions of the Loan Contract.

2.2 The County shall be solely responsible for all Loan repayment installments due under the Contract, and for all administrative requirements of the Loan except as may otherwise be required by the Washington State Department of Commerce ("Commerce").

2.3 In the event Commerce requires the District to participate in the administration of the Loan, the District may charge the County an administrative fee, at a rate and in a manner to be negotiated by the Parties.

III. ROLE OF PARTIES

3.1 The County shall be solely responsible for all Project planning, design, permitting, and construction, and, upon completion of the Project, shall own, operate, maintain and repair the System, and shall be solely responsible for all matters related to the cost of service. The County shall be solely responsible for all costs associated with the Project and the System.

3.2 The District shall participate in the administration of the Loan as required by Commerce. The District shall not be deemed to be a party, express or implied, to any contract for consultation or design services for, or construction of, any phase of the Project, and shall not be liable for any costs associated with the Project or the System. The District shall provide information on future water supply needs for the Carlsborg UGA, to be used by the County to evaluate water-use mitigation costs to future water customers in the UGA, to full build-out of the UGA.

IV. SCOPE OF WORK REVISION

4.1 At the time of the execution of this Agreement, the scope of work for the Project is the construction of a sanitary sewer collection system and a sanitary sewer treatment and water reclamation system within the Carlsborg Urban Growth Area (the "UGA"). It is within the contemplation of the Parties at the time of the execution of this Agreement, however, that the County intends to revise the Project scope of work to the extent that sewage treatment and water reclamation and reuse will occur at the Sequim Water Reclamation Facility (the "SWRF") rather than in the UGA. (The treatment of sewage and the reclamation and reuse of water at the SWRF will hereafter be referred to as the

"Sequim Alternative.") As used throughout this Agreement, the term "Project" shall also include any consultation, design, permitting and construction work associated with the Sequim Alternative, regardless of whether the Sequim Alternative is chosen.

4.2 As set forth in the County's Carlsborg Sewer System Work Plan, revised February 19, 2013, the County will engage a consultant, at County expense, to evaluate the feasibility and cost-effectiveness of the Sequim Alternative. The consultant's study and report shall include an evaluation of the effect reclamation and reuse outside the UGA would have on water-use mitigation costs to future water customers in the UGA, to full buildout of the UGA.

4.3 With respect to the Sequim Alternative, and for the sole purpose of keeping the District informed, the County shall (1) include the District in all County correspondence to the consultant, (2) provide the District timely notice of and the opportunity to participate in meetings with the consultant, and (3) provide the District with copies of all correspondence and reports from the consultant relating to the effect reclamation and reuse outside the UGA would have on water-use mitigation costs to future water customers in the UGA, to full buildout of the UGA.

4.4 The County shall exercise due diligence in evaluating the feasibility and cost-effectiveness of the Sequim Alternative in relation to the preferred alternative of the June, 2012, Facilities Plan to build a new wastewater collection, treatment and reclaimed water reuse system in the UGA, with particular consideration given to the effect the Sequim Alternative would have on water-use mitigation costs for future development in the UGA. The County's due diligence requirement shall include providing a copy of the consultant's report to the Washington State Department of Ecology water resource division for its review and comment as to the effect the Sequim Alternative would have on water-use mitigation costs to future water customers in the UGA, at full buildout of the UGA.

4.5 In the event the County proceeds with the Sequim Alternative and water-use mitigation costs to future water customers in the UGA are thereby adversely affected, the County will purchase or otherwise procure for the District additional existing water rights to supply water for full buildout of the area outside the District's current local utility district water service areas within the UGA, in a quantity sufficient to offset any adverse effects.

4.6 The District's participation in the evaluation of the Sequim Alternative, including any communication the District may have with the consultant hired by the County, shall not be deemed to render the District a party, express or implied, to any contract for consultation or design services for, or for construction of, any phase of the Project.

4.7 The roles of the Parties as set forth herein are based upon the Parties' shared expectation that the Project's scope of work may be revised to reflect sewage treatment at the SWRF. In the event, for any reason, the scope of work is not so revised, and sewage treatment is to occur within the UGA, this Agreement may be modified in whole or in part by agreement of the Parties.

V. INDEMNIFICATION

5.1 The County shall at all times indemnify and save the District harmless from and against all liability, loss, damages, costs, and expenses, including counsel fees, which the District may for any cause at any time sustain or incur by reason of having entered into the Contract and by reason of having assigned the Contract to the County. The County shall cause payment to be made to the District on account of any such liability, loss, damages, costs, or expenses before the District is compelled to make any payment on account thereof.

5.2 If any legal action is taken against the District under the Contract, either jointly with the County or alone, the County shall defend such action at its own expense, and the District shall cooperate with the County in the defense thereof.

5.3 Each Party agrees to indemnify, defend, and hold harmless the other Party from and against third-party claims for damages for personal injury or loss, including death, and property damage connected with the Project or the System and arising out of the negligence of the indemnitor's employees, officers, and agents. This duty to indemnify, defend, and hold harmless shall not apply to liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of the indemnitee or its agents or employees. Each Party's duty to indemnify, defend, and hold harmless the other for liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the concurrent negligence of both parties or their agents or employees shall apply only to the extent of negligence of the indemnitor or its agents or employees. Each party specifically and expressly waives any immunity that may be granted it under the Washington State Industrial Insurance Act, Title 51 RCW. Further, the indemnification obligation under this Agreement shall not be limited in any way by any limitation on benefits payable to or for any third party under the workers' compensation acts.

5.4 Each Party's duty to defend, indemnify and hold harmless shall include direct costs, reasonable attorney fees, court costs and all other claim-related expenses. Each party shall be responsible for their own personnel-related costs.

5.5 The District and the County hereby certify that the terms and conditions of the indemnity provisions in this Section V are the subject of mutual negotiation by the Parties and are specifically and expressly agreed to in consideration of the mutual benefits derived under the terms of this Agreement.

5.6 The indemnification provisions, 5.1 through 5.5 above, shall survive the termination of this Agreement.

VI. GENERAL PROVISIONS

6.1 Effective Date of Agreement: This Agreement shall be effective as of the date last written below.

6.2 Entire Agreement/Amendment: This Agreement is the entire agreement between the Parties and shall not be modified or amended in any manner except by an instrument in writing executed by the Parties. No prior agreement, correspondence, or portions thereof shall be used to interpret, modify, or explain the terms of the Agreement in the event that a dispute arises with respect to the Agreement.

6.3 Supplemental Agreements: The Parties agree to complete and execute all supplemental documents necessary or appropriate to fully implement the terms of this Agreement.

6.4 Waiver: No waiver of any breach of any covenant or agreement contained herein shall operate as a waiver of any subsequent breach of the same covenant or agreement or as a waiver of any breach of any other covenant or agreement, and in case of a breach by either Party of any covenant, agreement or undertaking, the non-defaulting Party may nevertheless accept from the other any performance hereunder without in any way waiving its right to exercise any of its rights and remedies provided for herein or otherwise with respect to any such default or defaults that were in existence at the time such performance was accepted by it. The exercise of any remedy provided by law or the provisions of this Agreement shall not exclude other consistent remedies.

6.5 Dispute Resolution: Any dispute that arises out of the interpretation, performance, enforcement, or any other aspect of this Agreement shall be resolved by submitting the same to binding arbitration, which shall proceed according to the Washington arbitration act, Chapter 7.04A RCW, and shall be conducted within Clallam County, Washington; PROVIDED, however, that each Party shall select a nominating person within ten (10) days of notice of the dispute from one Party to the other. The District shall elect one nominating person, and the County shall elect one nominating person. The two nominating persons shall then meet and promptly select the arbitrator. If, within thirty (30) days of the notice of the dispute, the nominating persons do not select a person who agrees to serve as arbitrator, the arbitrator shall be selected by a Superior Court Judge of Clallam County. The Parties shall require a written decision by the

arbitrator as a condition of the selection of the arbitrator. The prevailing Party as determined by the arbitrator shall be entitled to its reasonable attorney fees and costs associated with the arbitration. The Parties shall share equally the cost of the arbitration proceeding. Venue for any action brought on the arbitration award, including enforcement of such award, shall be in the Superior Court of Clallam County, and such action shall be governed by application of the laws of the state of Washington. The prevailing Party in any such action on the arbitration award shall be entitled to its reasonable attorney fees and costs associated with such action.

6.6 Severability: If any provision of this Agreement is deemed by law to be void, invalid or inoperative for any reason, or any phrase or clause within such provision is deemed by law to be void, invalid or inoperative, that phrase, clause or provision shall be deemed modified to the extent necessary to make it valid and operative, or, if it cannot be so modified, then such phrase, clause or provision shall be deemed severed from this Agreement with the remaining phrases, clauses and provisions continuing in full force and effect as if the Agreement had been signed with the void, invalid or inoperative portions so modified or eliminated. In addition, a phrase, clause or provision shall be substituted which is consistent with the intent of this Agreement and the severed phrase, clause or provision.

6.7 No Third Party Beneficiaries: This Agreement is made and entered into for the sole protection and benefit of the Parties and their successors and permitted assigns. No other person or entity shall have any right of action or interest in this Agreement based upon any provision of the Agreement.

6.8 Notices: All communications, notices and demands of any kind which either Party requires or desires to give to the other Party shall be in writing and either served on the following individuals or deposited in the U.S. Mail, certified mail, postage prepaid, return receipt requested, and addressed as follows:

Clallam County Administrator
223 East 4th St., Suite 4
Port Angeles, WA 98362

General Manager
PUD No. 1 of Clallam County
PO Box 1090
Port Angeles, WA 98362

6.9 Compliance with Laws: All Parties shall comply with all applicable federal, state and local laws, regulations and rules in performing this Agreement.

6.10 Interlocal Cooperation Act: The performance of the obligations of this Agreement shall be in compliance with the provisions of Chapter 39.34 RCW, the Interlocal Cooperation Act. The Parties agree that no separate legal administrative entity is necessary in order to carry out this Agreement. There shall be no "joint board" as that term is used in RCW 39.34.030(4)(a).

6.11 Administration and Management: For purposes of RCW 39.34.030(4)(a), the County Administrator and the District General Manager, or their successors, shall serve as the co-Administrators responsible for administering the joint and cooperative undertaking set forth herein.

6.12 Counterparts: This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

6.13 Recording: This Agreement will be filed with the County Auditor pursuant to RCW 39.34.040 within five (5) days of the date of execution of this Agreement. All fees related to such recording shall be paid by the County. The District agrees to execute a release or other appropriate instruments as shall be necessary to certify compliance with the terms of this Agreement upon full and complete satisfaction of the terms of this Agreement.

6.14 Duration/Term: This Agreement shall terminate upon the earlier of (1) written agreement of the Parties or (2) complete repayment of the PWTF Loan.

6.15 Modification: This Agreement may be modified upon the agreement of the Parties.

6.16 Headings: The headings used in this Agreement are for general reference only and are not part of the Agreement.

CLALLAM COUNTY, WASHINGTON

APPROVED this 19th day of March, 2013.

BOARD OF CLALLAM COUNTY COMMISSIONERS:

Michael C. Chapman, Chair

Jim McEntire

Howard V. Doherty, Jr.

ATTEST:

Trish Holden, CMC
Clerk of the Board

PUD NO. 1 OF CLALLAM COUNTY

DATED this 18th day of March, 2013.

By: _____
Doug Nass, General Manager
P.O. Box 1090
Port Angeles, WA 98362-1090

Approved as to form only by:

Mark Nichols
Chief Deputy Prosecuting Attorney
Clallam County

APPENDIX E

SEPA CHECKLIST

SEPA ENVIRONMENTAL CHECKLIST
UPDATED 2014

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

***Instructions for applicants*:** [help]

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:
Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals: [help]

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. background [help]

1. Name of proposed project, if applicable: [help]

Carlsborg Wastewater Facilities Plan, Wastewater Collection System, Olympic Lift Station and Conveyance of Carlsborg Wastewater to the Sequim WRF

2. Name of applicant: [help]

Clallam County Public Works Department

3. Address and phone number of applicant and contact person: [help]

Bob Martin, P.E.
Clallam County Public Works
223 East 4th Street, Suite 6
Port Angeles, WA 98362

4. Date checklist prepared: [help]

June 2, 2014, updated July 9, 2014

5. Agency requesting checklist: [help]

Clallam County/City of Sequim/Department of Ecology

6. Proposed timing or schedule (including phasing, if applicable): [help]

Construction of the first phase of the collection system, Olympic Lift Station and conveyance to Sequim will occur in 2015-2016, once funding and permits are completed. Subsequent extensions of the collection system may occur over the next 20 years and beyond.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. [help]

Yes. The Carlsborg and Sequim wastewater collection systems will need to be updated to accommodate increasing flows from growth within the City and Carlsborg.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. [help]

BHC Consultants, LLC prepared a SEPA Checklist for a proposed project that included the Carlsborg wastewater collection system and a new Water Reclamation Facility (WRF) to serve the Carlsborg Urban Growth Area (UGA) in 2012, as discussed in the *2012 Sewer Facilities Plan* for the Carlsborg WRF. The collection system identified in the *2012 Sewer Facilities Plan* is essentially the same as the one under consideration in this SEPA Checklist.

As this project is funded by a Public Works Trust Fund Loan, a cultural resources assessment of the proposed Olympic Lift Station Site and the proposed route of the sewer mains to Sequim is currently being completed.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. [help]

The County's engineering consultant is currently working with the Washington State Department of Transportation on a Right-of-Way Use Franchise and other permitting required to install the proposed wastewater conveyance lines within WSDOT ROW and on the US Highway 101 Bridge over the Dungeness River.

10. List any government approvals or permits that will be needed for your proposal, if known. [help]

- **Conditional Use Permit (Lift station)**
- **Right-of-way Use Franchise (WSDOT), ROW Permit from the City of Sequim**
- **NHPA Section 106 consultation & approval from DAHP & Tribes**
- **Clallam County Critical Areas Review for work in the Dungeness River floodplain**
- **Ecology approval of Facility Plan, Ecology approval of design plans and specifications**

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.) [help]

For this project, a new collection system will be constructed for the Carlsborg Urban Growth Area (CUGA) and conveyance line to Sequim. The CUGA encompasses approximately 557 acres including public rights-of-way. The initial system to serve Carlsborg would serve about 80 to 200 parcels with a capacity for about 570 equivalent residential units (ERUs) over the next 20 years. Gravity sewers would be installed on Hooker Road and Carlsborg Road from Harrison Road on the south to the Olympic Lift Station that will pump wastewater to the City of Sequim WRF.

The initial sewer collection system would consist of approximately 17,500 feet of pipes ranging from 8-inch to 12-inch diameter. The trunk line to be built in Carlsborg Road would have sufficient hydraulic capacity for the projected build-out peak hour flow. The collection system to serve all parcels in the UGA at build-out will consist of at least 30,000 feet of pipe. The build-out system would include an additional lift station at Gupster Road. Wastewater from a collection area bounded by Mill Road on the west, Gupster Road on the north, Gilbert Road on the east and Highway 101 on the south will discharge by gravity to the Gupster Lift Station. It is anticipated that the CUGA south of Highway 101 and east of the Parkwood Mobile Home Park will discharge by gravity via a boring under Highway 101 to the Gupster Lift Station. Wastewater collected in the Gupster Lift Station will discharge to the trunk line in Carlsborg Road.

The proposed location for the Olympic Lift Station is within the Olympic Discovery Trail right-of-way in the vicinity of Carlsborg Road. This lift station will pump sewage from the Carlsborg UGA to Sequim via a dual force main system consisting of an 8-inch diameter force main and a 10-inch diameter force main. The 8-inch force main will be used initially. When flows exceed approximately 450 gpm the discharge from the Olympic Lift Station will be directed to the 10-inch diameter force main. When flows exceed approximately 725 gpm both the 8-inch and 10-inch force mains will be utilized. The force mains will be installed in Carlsborg Road to Smithfield Road and then east on Smithfield Road and Gupster Road and south on Gilbert Road to the Highway 101 right-of-way. These force mains will continue east within the Highway 101 right-of-way and cross the bridge over the Dungeness River in existing utility corridors in the bridge deck. Once on the east side of the bridge, the force mains will run along Hwy.101 to Washington Street. They will then follow W. Washington Street to a point of connection with the Sequim collection system at Grant Road.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. [help]

The project is planned to eventually serve the entire Carlsborg UGA in the Dungeness Valley of Clallam County at 45°5'North, 123°10'West. See the project description in No. 11 above for a detailed description of the locations of project facilities, which will extend east along Highway 101 to connect to the Sequim wastewater conveyance system to the WRF.

The Carlsborg UGA occupies portions of Sections 14, 15, 22 and 23 of Township 30 North, Range 4 West. Additionally, the force mains to Sequim will be located in Sections 24. Force mains will connect to the existing Sequim wastewater conveyance system in Section 19 of Township 30 North, Range 3 West.

B. ENVIRONMENTAL ELEMENTS [help]

1. Earth

a. General description of the site [help]
(circle one): Flat***, rolling***, hilly, steep slopes, mountainous,
other _____

b. What is the steepest slope on the site (approximate percent slope)? [help]
Approximately 5-10% near the Dungeness River banks.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. [help]

The USDA Soil Conservation Service*, Soil Survey of Clallam County Area, Washington (1987*) indicated that soils in the Carlsborg area are Carlsborg-Puget-Dungeness soils, including areas of soils that are very deep, poorly drained, well drained, and somewhat excessively well drained, nearly level and gently sloping soils; on terraces, flood plains and alluvial fans. Soils to the east in Sequim are Hoypus-Sequim-Agnew, including areas of soils that are very deep, somewhat poorly drained and somewhat excessively drained, nearly level to very steep soils; on terraces, terrace escarpment, and alluvial fans.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. [help]

No

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. [help]

Project construction involves installing sewer mains and a new lift station within public rights-of-way. Most backfill will be native material excavated from the trenches, with some gravel and other construction materials also used. Total excavation is estimated to be 59,000 cubic yards for the initial system and 92,000 cubic yards (cumulative total) for the build out system. Some pipe bedding material could be imported from local sources.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. [help]

Some erosion could occur during construction in the event of heavy rains. The Dungeness Valley has low annual precipitation. Soils are primarily sandy gravel that drains rapidly. Almost all construction will occur in existing paved rights-of-way. Pipes will be laid sequentially in trenches, which will be covered with temporary asphalt, once the pipes are in place. The temporary asphalt will be removed and disturbed surfaces will be repaved toward the end of the project.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? [help]

Portions of the Olympic Lift Station Site may not currently be paved, but will be paved once the lift station is installed. The proposed sewer lines will be installed almost entirely within existing paved WSDOT, Clallam County and City of Sequim road rights-of-way. While very little new impervious surface will be created, almost the entire project area will be impervious pavement upon project completion.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: [help]

Trenching for pipeline installation will be limited to the length of pipe that can be installed and recovered over the course of a work day. Construction BMPs for the control of sedimentation and erosion will be implemented to minimize erosion potential.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. [help]

Construction activities will generate exhaust emissions from diesel and gas engines in construction vehicles and equipment. Excavation could generate dust in particularly dry areas.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. [help]

None known

c. Proposed measures to reduce or control emissions or other impacts to air, if any: [help]

Construction vehicles and equipment will be properly operated and maintained to minimize emissions. Dusty construction areas will be watered to minimize fugitive dust.

3. **Water**

a. Surface Water: [help]

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. [help]

Matriotti Creek forms part of the western UGA boundary and flows north into the Dungeness River outside of the project area. The proposed force mains to be installed east to Sequim will cross the Dungeness River on the WSDOT Bridge within existing utility corridors under the bridge deck.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. [help]

Portions of the collection system in Carlsborg may be installed within 200 feet of Matriotti Creek. The force mains along US Highway 101 will be installed within existing utility corridors in the deck of the Dungeness River Bridge.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. [help]

As almost all excavation for this project will occur within existing public road and trail rights-of-way that are paved, no fill or dredge material will be placed in or removed from surface water or wetlands.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. [help]

Due to the low precipitation in the Dungeness Valley, surface water withdrawals and diversions during construction are not anticipated.

Future impacts to the area's streams caused by the increased development that is anticipated from the Carlsborg designation as a UGA will be mitigated in accordance with the Dungeness Water Rule, as discussed in the Facilities Plan Amendment.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. [help]

The proposed force mains will cross the 100-year floodplain of the Dungeness River east of Carlsborg en route to the connection point to the Sequim wastewater collection system. The force mains will be buried in the Highway road fill and will not affect the 100-year flood elevation.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. [help]

The proposed project will construct and operate wastewater collection and conveyance facilities designed to convey wastewater from the Carlsborg UGA to the Sequim WRF where it will be treated to Class A Reuse Water standards, which is used for a number of purposes in Sequim including groundwater re-charge. Excess Class A water and WRF effluent is routed to a marine outfall to the Strait of Juan de Fuca.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. [help]

The proposed project will construct and operate wastewater collection and conveyance facilities designed to convey wastewater from the Carlsborg UGA to the Sequim WRF where it will be treated to Class A Reuse Water, which is used for a number of purposes in Sequim including groundwater recharge.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. [help]

No waste material will be discharged to the ground from septic tanks or other sources associated with this project. The project will eventually eliminate use of on-site septic systems in the Carlsborg UGA by collecting and conveying wastewater from this area to the City of Sequim wastewater conveyance system, which directs flows to the Sequim WRF where wastewater is treated to Class A Re-use Standards. A portion of this treated Class A Reclaimed Water is used for groundwater recharge.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. [help]

Water runoff from construction sites and from the finished lift stations and roadway surfaces will flow onto the sandy/gravelly soils in the project area and drain to groundwater.

2) Could waste materials enter ground or surface waters? If so, generally describe. [help]

The project will eventually eliminate use of on-site septic systems in the Carlsborg UGA by collecting and conveying wastewater from this area to the City of Sequim wastewater conveyance system, which directs flows to the Sequim WRF where wastewater is treated to Class A Re-use Standards. A portion of this treated Class A Reclaimed Water is used for groundwater recharge.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Other than minor modifications to drainage patterns associated with installation of the proposed lift stations (for which drainage reports will be prepared per Clallam County requirements), the project will not affect drainage patterns in the project vicinity as all new sewer mains will be installed underground within existing road rights-of-way.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Construction BMPs for the control of sedimentation and erosion will be used during project implementation. Future impacts to the area's streams caused by the increased development that is anticipated from the Carlsborg designation as a UGA will be mitigated in accordance with the Dungeness Water Rule, as discussed in the Facilities Plan Amendment.

4. **Plants** [help]

a. Check the types of vegetation found on the site: [help]

_x___deciduous tree: alder, maple, aspen, other
_x___evergreen tree: **fir, cedar**, pine, other
_x___shrubs
_x___grass
_x___pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.
_x___ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

b. What kind and amount of vegetation will be removed or altered? [help]

Small areas of grass, forbs and a few trees and bushes may be removed for construction of the proposed lift stations. It is anticipated that very little vegetation will be removed for installation of the sewer mains from Carlsborg east into Sequim, as they will be installed in existing paved rights-of-way.

c. List threatened and endangered species known to be on or near the site. [help]

None known. The Washington DNR Natural Heritage Database List of Sections with Rare Plants did not include T 30 North, Range 4 West, Sections 14, 15, 22, 23 and 24 so the presence of threatened or endangered plant species is unlikely.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: [help]

Portions of lift station sites not paved will be replanted with native plant materials to the extent practicable.

e. List all noxious weeds and invasive species known to be on or near the site.

Cathy Lucero, Clallam County Noxious Weed Coordinator, was consulted regarding noxious and invasive weed species potentially present in the project area. She provided the lists below:

Required control:	**Poison Hemlock (*Conium maculatum*)** **Spotted Knapweed (*Centaurea stoebe*)** **Hoary Alyssum (*Berteroa incana)***
Control desirable:	**Canada Thistle (*Cirseum arvense)*** **Absinth Wormwood (*Artemisia absinthium*)** **Scotch Broom (*Cytisus scoparius*)**

5. **Animals**

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. Examples include: [help]

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

b. List any threatened and endangered species known to be on or near the site. [help]
Puget Sound chinook salmon, Puget Sound steelhead and Hood Canal summer chum ESUs are all identified in the Dungeness River by the Washington Department of Fish & Wildlife SalmonScape Database.

c. Is the site part of a migration route? If so, explain. [help]
Western Washington is part of the Pacific Flyway for water fowl. Anadromous salmon migrate up and down the Dungeness River.

d. Proposed measures to preserve or enhance wildlife, if any: [help]
Construction BMPs for the control of sedimentation and erosion will be implemented during construction to preserve water quality. The new sewer lines to Sequim will be installed within existing paved road rights-of-way and they will be placed in existing utility corridors under the Dungeness River Bridge deck, so that no excavation or filling will be required in the Dungeness River and adjacent wetland areas.

e. List any invasive animal species known to be on or near the site.
None known

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. [help]
Construction vehicles will use gas and diesel-powered engines. Operation of the proposed pump stations will utilize electrical energy supplied by Clallam County PUD.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. [help]
No

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: [help]
The Carlsborg collection system will be designed to operate by gravity as much as possible. New sewer lift stations will be constructed with energy-efficient pumps and motors to minimize energy use. The Sequim WRF was designed with energy efficiency as a primary objective.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe. [help]

The proposed project will collect and treat wastewater, which contains pollutants deleterious to environmental health if not properly handled, treated and disposed of. The collection system will consist of enclosed sewer pipes accessed by manholes that are generally not accessible by the public. Collection and treatment of wastewater may involve generation of hydrogen sulfide and other gases. Monitoring at lift stations will test for such concentrations and operators will take remedial action as necessary.

1) Describe any known or possible contamination at the site from present or past uses.

Handling of wastewater and conveyance equipment involves some risk of injury or infection

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Monitoring will periodically be conducted to test the liquid stream and/or gas stream at lift stations and appropriate actions taken.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Fuels, lubricants and coolants used in construction equipment will be the only hazardous materials used associated with project construction. Collection and treatment of wastewater may involve generation of hydrogen sulfide and other gases. Monitoring at lift stations will test for such concentrations and operators will take remedial action as necessary.

4) Describe special emergency services that might be required.

Handling of wastewater and conveyance equipment involves some risk of injury or infection. The headquarters and main operations center for the Clallam County Fire District No. 3 are located within the Carlsborg UGA. Response actions will be coordinated as part of the Operations and Maintenance Manual preparation for the conveyance system.

5) Proposed measures to reduce or control environmental health hazards, if any:

- **Collection and treatment of wastewater may involve generation of hydrogen sulfide and other gases. Monitoring at lift stations will test for such concentrations and operators will take remedial action as necessary.**
- **Construction vehicles and equipment will be equipped with toxic materials spill containment kits and operators will be trained in their use.**

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? [help]

US Highway 101 is the most significant noise generator within the Carlsborg UGA and the project area. Traffic noise will have no effect on the proposed wastewater collection and conveyance project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. [help]

During construction, equipment will generate noise in the immediate construction area of the Carlsborg UGA and along US 101 for a period of approximately one year. Operation of underground sewer lift stations will generate some noise, but it will be muffled by soil covering the site and will generally not be audible to surrounding residences and businesses.

3) Proposed measures to reduce or control noise impacts, if any: [help]

Noise attenuation equipment on construction equipment will be properly operated and maintained. Construction work hours will be limited to the period between 7:00 am and 6:00 pm (or in accordance with Clallam County Code) to minimize noise disturbance on adjacent properties. Generators at pump stations will be installed within sound attenuating enclosures or in buildings.

Pumps at lift stations will be underground or in noise-attenuating structures to minimize operational noise impacts to adjacent properties. Emergency generators at the new lift stations will be exercised monthly by a time clock programmed for daylight hours.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. [help]

The Carlsborg UGA includes areas zoned for public facilities, industrial and residential.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to non-farm or non-forest use? [help]

Portions of the Carlsborg UGA were originally utilized for agriculture, but these activities were reduced to a minimum level many years ago. There is some agricultural activity to the north and south of US 101 to the east, closer to Sequim, which will not be impacted by the installation of the proposed sewer mains in the US 101 right-of-way.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

During construction of pipelines within existing road rights-of-way could temporarily interfere with movement of over-sized construction vehicles and equipment through the project area. Construction activities will be properly flagged and detoured as required to minimize disruption of farming activities. Otherwise, the construction and operation of the proposed wastewater conveyance infrastructure will have no effect on surrounding working farms or forest land normal business operations (application of pesticides, tilling & harvesting), as all new pipelines

will be installed below grade and disturbed roadways and shoulders will be reconstructed in kind once construction is complete.

c. Describe any structures on the site. [help]

No structures are located on the sites where the proposed lift stations and sewer mains will be constructed. Clallam County Public Works has an operations, storage, meeting, training and maintenance building on the discharge location Operations Center property that will not be directly affected by the project.

d. Will any structures be demolished? If so, what? [help]

No structures will be demolished to construct the proposed sewer collection and conveyance facilities between Carlsborg and Sequim. However, pavement along road rights-of-way where the new sewer mains will be installed may be broken and removed to allow installation. Areas disturbed during construction will be repaved or re-planted in-kind.

e. What is the current zoning classification of the site? [help]

Olympic Lift Station: Public

f. What is the current comprehensive plan designation of the site? [help]

Olympic Lift Station: Public

g. If applicable, what is the current shoreline master program designation of the site? [help]

The Shoreline Designation for the Dungeness River east of Carlsborg is Residential Conservancy.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify. [help]

Riparian areas along the Dungeness River are environmentally sensitive floodplain areas.

i. Approximately how many people would reside or work in the completed project? [help]

The Carlsborg UGA population was estimated at 856 in 2013 with projected populations of 1,288 in 2030, 1,071 in 2050 and 3,800 at build out. Clallam County maintenance personnel would operate and manage the proposed sewer conveyance system in cooperation with the City of Sequim.

j. Approximately how many people would the completed project displace? [help]

None

k. Proposed measures to avoid or reduce displacement impacts, if any: [help]

None

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: [help]

The proposed project will provide sanitary sewer conveyance for the Carlsborg UGA to support existing and planned future development.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:

Installation of new sewer mains along state and county road rights-of-way will be properly flagged and detoured, as necessary, to facilitate the movement of over-sized farm and forestry equipment through the project area. Diversion of wastewater from the Carlsborg area to the Sequim WRF and infiltration of reclaimed water as discussed in the Plan will reduce adverse impacts to groundwater in the Carlsborg UGA and the surrounding Dungeness Valley, which will improve the quality of groundwater used for irrigation of farm and forest lands.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. [help]

None

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. [help]

None

c. Proposed measures to reduce or control housing impacts, if any: [help]

None required

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? [help]

The proposed collection system and sewer mains will be located underground. Areas disturbed during construction will be repaved or revegetated in-kind to the extent practicable. The proposed lift stations will be partially underground and partially above ground. The design of the above-ground facilities will be appropriate for structures sited in a mixed residential/commercial/industrial area.

b. What views in the immediate vicinity would be altered or obstructed? [help]

Views of sites proposed for the lift stations and sewer mains will be temporarily obstructed by construction equipment. Above-ground portions of the lift stations will be designed appropriately for a mixed residential/commercial/industrial area. Once these facilities are installed, the surrounding ground surfaces will be re-planted or re-paved in-kind and views should be similar to pre-construction conditions.

c. Proposed measures to reduce or control aesthetic impacts, if any: [help]

Once the proposed lift stations are installed, disturbed ground surfaces will be re-planted in accordance with Clallam County requirements, or re-paved in-kind.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? [help]

Proposed lift station sites will have subdued security lighting with shielding to minimize routine glare. More powerful lighting will be provided for night-time operations, as required by unusual conditions.

b. Could light or glare from the finished project be a safety hazard or interfere with views? [help]

No

c. What existing off-site sources of light or glare may affect your proposal? [help]

None

d. Proposed measures to reduce or control light and glare impacts, if any: [help]

Security lighting at lift stations will be shielded to the extent practicable.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity? [help]

The Olympic Discovery Trail passes through Carlsborg; it is used for walking and cycling. Golf, fishing, and wildlife viewing occur within a mile or two of Carlsborg. The Dungeness Wildlife Refuge and Olympic National Park are nearby.

Greywolf Elementary School in Carlsborg has a playfield for students.

b. Would the proposed project displace any existing recreational uses? If so, describe. [help]

Construction of the force main between Carlsborg and Sequim could cause short-term construction-related traffic delays.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: [help]

Construction activities along US 101 and Clallam County and City of Sequim roads and streets will be flagged and detoured to facilitate traffic flow. Once construction is complete, no traffic impediments are anticipated.

13. Historic and cultural preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe. [help]

Carlsborg core areas have structures and links to the early settlement of the Dungeness Valley. Preservation of these areas is encouraged by Clallam County land use policies.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. [help]

The cultural resources survey for the Carlsborg WRF Alternative found indications of a Native American Camp along Matriotti Creek. The proposed lift station sites and the route of the proposed sewer mains into Sequim are being surveyed by professional archaeologists at this time. Results of their report will be included in future planning documents.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc. [help]

The proposed lift station sites and the route of the proposed sewer mains into Sequim are being surveyed by professional archaeologists at this time. Results of their report will be included in future planning documents.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

As most, if not all, of the proposed wastewater conveyance infrastructure will be installed within areas that have been previously disturbed, the potential for adverse impacts to cultural, historic or archaeological resources in the project area is low. Findings and recommendations of the on-going cultural resources assessment being prepared for this project will be implemented during construction.

In the event that materials of cultural, historic or archaeological significance are encountered during construction, all work in the affected area will stop and the Clallam County Public Works Department Project Manager, Project Engineer, the Department of Archaeology and Historic Preservation and the Lower Elwha and Jamestown S'Klallam Tribal Cultural Resources Departments will be consulted regarding curation and final storage of any culturally significant materials.

14. Transportation

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any. [help]

US Highway 101 passes through the Carlsborg UGA and the Olympic Discovery Trail extends from Port Angeles to beyond Sequim, passing through Carlsborg.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop? [help]

Clallam County Transit serves Carlsborg, Sequim and other Clallam County communities, with a bus stop approximately one mile from the central portion of the UGA. Private transportation services to SeaTac Airport and similar locations are also available.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? [help]

Proposed lift station sites will likely have one or two parking spaces for maintenance personnel and service vehicles.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). [help]

The proposed sewer conveyance system will not require construction of new roads. Installation of the proposed sewer mains in existing paved US Highway, Clallam County and City of Sequim roadways will

require demolition of existing pavement. Disturbed areas will be reconstructed and repaved once the new sewer mains are installed.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. [help]

No

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? [help]

Initially, the proposed project will generate 3 to 6 maintenance vehicle trips per week for maintenance. This number of trips is likely to increase as the population of the Carlsborg UGA expands and additional areas are served by the proposed wastewater conveyance system.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

Installation of new sewer mains along state and county road rights-of-way will be properly flagged and detoured, as necessary, to facilitate the movement of over-sized farm and forestry equipment through the project area. Special coordination regarding movements of over-sized equipment during construction among the foresters and farmers in the area with the Clallam County Public Utilities and WSDOT may also be necessary during construction.

h. Proposed measures to reduce or control transportation impacts, if any: [help]

Construction activities along US 101 and Clallam County and City of Sequim roads and streets will be flagged and detoured to facilitate traffic flow. Once construction is complete, no traffic impediments are anticipated.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. [help]

No

b. Proposed measures to reduce or control direct impacts on public services, if any. [help]

None required

16. Utilities

a. Circle utilities currently available at the site: [help]
electricity, natural gas, ***water, refuse service***, ***telephone***, sanitary sewer, ***septic system***, other _____

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. [help]

The proposed project will construct sanitary sewer collection and conveyance infrastructure to collect wastewater from the Carlsborg UGA and transport it to the City of Sequim wastewater conveyance infrastructure that will route it to the Sequim WRF where it will be treated to Class A Water Re-use Standards.

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Name of signee _____

Position and Agency/Organization _____

Date Submitted: _____

D. supplemental sheet for nonproject actions [help]

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general
terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

The Carlsborg Wastewater Facilities Plan reviews proposed wastewater conveyance projects that would divert wastewater flows from septic systems in the Carlsborg UGA, which are currently compromising groundwater quality in the Dungeness Valley, to the Sequim Water Reclamation Facility. Wastewater from the Carlsborg UGA would be treated to Class A Re-use Water Standards and the product water will be used for irrigation, wash-down water at City of Sequim facilities and for infiltration and groundwater recharge. During periods when effluent from the WRF do not meet Class A Re-use Water Standards, effluent will be discharged to Sequim Bay via the existing marine outfall. Construction of the proposed wastewater conveyance facilities will have minimal potential for adverse impacts to air quality in the project area as measures will be implemented to minimize the formation and/or release of hydrogen sulfide in the sewer system. During construction, hazardous materials will largely be confined to fuels, lubricants and coolants in construction vehicles and equipment. Growth of the population and commercial development over the next 20 years will likely result in an increase in the number and types of hazardous materials used and stored in the Carlsborg UGA. Conveyance of wastewater from the project area to the

Sequim WRF will reduce the concentrations of endocrine disruptors and other by-products of population growth discharged to groundwater in the project area.

Proposed measures to avoid or reduce such increases are:
Expansion of the Sequim WRF will be accelerated to accommodate additional wastewater flows from Carlsborg as the population in the UGA expands over the next 20 years.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?
The Wastewater Facilities Plan reviews project alternatives to collect, convey, treat and dispose of wastewater from the Carlsborg UGA as the population grows over the next 20 years. Conveyance of wastewater flows to the Sequim WRF would improve groundwater quality in the Dungeness Valley and enhance water quality and aquatic habitat in the Dungeness River and its tributaries in and near the project area, which would benefit upland animals, fish and marine life in the Dungeness River and downstream in the Strait of Juan de Fuca.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:
Construction of the proposed wastewater conveyance infrastructure improvements will have limited potential for impacts to plants and wildlife, as most new pipelines and the proposed lift stations will be installed in areas that have been previously disturbed. Stream crossings and other work in sensitive areas will be timed to occur during the dry season and to avoid migration and nesting seasons to the extent practicable to minimize potential impacts to sensitive fish & wildlife. Areas disturbed during installation of proposed infrastructure improvements will be repaved or replanted with native vegetation in-kind in accordance with Clallam County and or City of Sequim landscaping requirements.

3. How would the proposal be likely to deplete energy or natural resources?
Construction of the wastewater collection and conveyance system improvements reviewed in the Wastewater Facilities Plan will require expenditure of modest amounts of mechanical energy generated by gas and diesel-powered construction equipment. Collection and conveyance of wastewater from the Carlsborg UGA will require electrical energy to pump flows to the Sequim wastewater collection system and on to the Sequim WRF. However, the systems will be designed with energy minimization as a primary objective. Small areas along existing road rights-of-way will be disturbed for pipeline and lift station installation and small areas of vegetation will likely be paved once the new infrastructure is installed.

Proposed measures to protect or conserve energy and natural resources are:
The wastewater collection and conveyance system for the Carlsborg UGA will be designed to flow by gravity as much as possible. Use of the existing Sequim WRF eliminates the need to construct a new, separate wastewater treatment facility to serve the Carlsborg UGA. High efficiency pumps and motors will be used to convey wastewater flows from the Carlsborg UGA to the Sequim WRF for treatment. New lift stations and wastewater conveyance pipelines will be installed within existing road rights-of-way to limit disturbance to previously impacted areas. Disturbed areas will be replanted with native plants to minimize adverse impacts to vegetation.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Installation and operation of wastewater conveyance infrastructure to serve the Carlsborg UGA will eliminate septic tank discharges of minimally-treated wastewater to groundwater in the Dungeness Valley and should help to preserve groundwater quality as the population of the UGA grows. Improvements to groundwater quality will improve water quality in the Dungeness River and its tributaries downstream of the project area. Improved/protected water quality will enhance critical habitat for ESA-listed threatened species of salmonids in the Dungeness River and its tributaries. Water quality off-shore of the mouth of the Dungeness River may also be improved, which should enhance foraging habitat for marbled murrelets, which are also listed as threatened under the ESA.

Construction of the proposed wastewater conveyance pipelines and lift stations will require short-term disruption of traffic along US 101 and affected Clallam County roadways, which could interfere with transport of over-sized farm and logging equipment. Prime farm and forest lands are unlikely to be directly impacted, as construction will be limited to existing road rights-of-way.

Proposed measures to protect such resources or to avoid or reduce impacts are:

New wastewater conveyance infrastructure (lift stations & pipelines) will be installed within existing State of Washington and Clallam County road rights-of-way to the extent practicable to minimize potential impacts to parks, historic or cultural sites, wilderness, wetlands, floodplains, threatened or endangered species habitat and prime farmlands. There are no parks or federally-designated Wild & Scenic Rivers in the immediate project area. A professional cultural resources survey of the proposed project areas is currently being completed. Findings and recommendations of this study will be implemented during construction to minimize the potential for adverse impacts to sites and materials of cultural, historic or archaeological significance. In the event that materials of cultural, historic or archaeological significance are encountered during construction, work at the discovery site will stop and the Department of Archaeology & Historic Preservation and the Cultural Resources Departments of the Lower Elwha and Jamestown S'Klallam Tribes will be consulted regarding curation and final storage of these materials.

The Washington Department of Fish and Wildlife will be consulted to develop construction timing and mitigation measures to minimize potential impacts to ESA-listed species and other sensitive fish, wildlife and plants. Construction activities along roadways will be properly flagged and detoured to minimize traffic impacts.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The Carlsborg Wastewater Facilities Plan will review alternatives for wastewater collection, conveyance and treatment to support existing and forecast residential and commercial growth in the Carlsborg UGA over the next 20 years. Construction and operation of the proposed wastewater conveyance infrastructure will support residential and commercial in-fill within the UGA, which may reduce development in shoreline areas and adverse impacts to shoreline resources associated with anticipated growth.

Proposed measures to avoid or reduce shoreline and land use impacts are:

The wastewater collection, conveyance and treatment alternatives reviewed in the Carlsborg Wastewater Facilities Plan will facilitate diversion of wastewater currently collected and treated by marginally-effective on-site septic systems to advanced wastewater treatment facilities currently serving the City of Sequim. Eliminating septic system discharges to groundwater in the Dungeness Valley will improve groundwater quality and water quality and aquatic habitat in the Dungeness River and its tributaries downstream of the Carlsborg UGA. Sewering the community will allow denser development and reduce development pressure on shoreline and other sensitive areas within the UGA as the population grows.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Construction of the proposed wastewater collection and conveyance infrastructure reviewed in the Carlsborg Wastewater Facilities Plan within existing road rights-of-way will require temporary, short-term impacts to traffic flow, especially transport of over-sized vehicles and equipment. Implementation of the proposed wastewater conveyance infrastructure would provide wastewater service to the Carlsborg UGA over the course of the next 20 years and beyond. Operation of these wastewater collection and conveyance facilities would require a minimal increase in electrical usage in the project area.

Proposed measures to reduce or respond to such demand(s) are:

Construction activities proposed for WSDOT and Clallam County road rights-of-way will be properly flagged and detoured to minimize disturbances to traffic flow. Work in these road rights-of-way will be concentrated during low-flow traffic periods to the extent possible to minimize traffic disruptions. The Clallam County Public Works Department will coordinate with utilities providing electricity to the Carlsborg UGA to ensure that adequate power will be available to convey flows to the Sequim WRF for treatment and disposal.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

The purpose of the projects proposed and reviewed in the Carlsborg Wastewater Facilities Plan is to eliminate septic system discharges from the UGA that are contributing to rising nitrate concentrations in groundwater in the Dungeness Valley, which present a significant threat to public health as the population grows. Wastewater collection, conveyance and treatment alternatives

under review in the Facilities Plan will be designed to comply with local, state and federal laws and requirements for the protection of the environment.

APPENDIX F

COST ESTIMATES

CLALLAM COUNTY
CARLSBORG SEWER COLLECTION SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
April 7, 2014

SEQUIM ALTERNATIVE: GRAVITY COLLECTION SYSTEM (INITIAL)

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P. 1)	1	LS	$ 170,000.00	$ 170,000.00
2	Portable Changeable Message Sign (S.P. 1)	1,200	HR	$ 15.00	$ 18,000.00
3	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 400,000.00	$ 400,000.00
4	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 7,000.00	$ 7,000.00
5	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 35,000.00	$ 35,000.00
6	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 240,000.00	$ 240,000.00
7	Control Density Fill (S.P. 2-09.5)	30	CY	$ 175.00	$ 5,250.00
8	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 23,000.00	$ 23,000.00
9	Crushed Surfacing Top Course (S.P. 4-04.5)	6,800	TN	$ 25.00	$ 170,000.00
10	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	2,400	TN	$ 125.00	$ 300,000.00
11	Temporary HMA (S.P. 5-04.5)	1,600	TN	$ 125.00	$ 200,000.00
12	Manhole 48 In. Diam. (S.P. 7-05.5)	75	EA	$ 3,500.00	$ 262,500.00
13	Manhole, Extra Depth, 48 In. Diam. (S.P. 7-05.5)	160	VF	$ 260.00	$ 41,600.00
14	Adjust Catch Basin (S.P. 7-05.5)	7	EA	$ 400.00	$ 2,800.00
15	Removal of Unsuitable Material (Trench) (S.P. 7-08.5)	260	CY	$ 50.00	$ 13,000.00
16	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 155,000.00	$ 155,000.00
17	Bank Run Gravel for Trench Backfill (S.P. 7-08.5)	12,000	TN	$ 20.00	$ 240,000.00
18	Dewatering (S.P.7-08.5)	1	LS	$ 35,000.00	$ 35,000.00
19	Adjust Valve Box (S.P. 7-012.5)	10	EA	$ 400.00	$ 4,000.00
20	Ductile Iron Sewer Pipe, 8 In. Diam. Cl. 52, RJ (S.P. 7-17.5)	250	LF	$ 110.00	$ 27,500.00
21	PVC SDR 35 Sanitary Sewer Pipe 8 In. Diam. (S.P. 7-17.5)	14,085	LF	$ 40.00	$ 563,400.00
22	PVC SDR 35 Sanitary Sewer Pipe 12 In. Diam. (S.P. 7-17.5)	3,225	LF	$ 55.00	$ 177,375.00
23	Side Sewers, Incl. Cleanout (S.P. 7-18.5)	3,800	LF	$ 40.00	$ 152,000.00
24	28 In. Diam. Jack and Bored Steel Casing Pipe, Incl. Dewatering, Carlsborg Road Crossing (S.P. 7-20.5)	250	LF	$ 400.00	$ 100,000.00
25	Retrieval Pit - Entrance, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 75,000.00	$ 75,000.00
26	Retrieval Pit - Exit, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 10,000.00	$ 10,000.00
27	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 30,000.00	$ 30,000.00
28	Adjust Monument Case and Cover (S.P. 8-13.5)	6	EA	$ 300.00	$ 1,800.00
29	Cast-in-Place Monument (S.P. 8-13.5)	3	EA	$ 400.00	$ 1,200.00
30	Permanent Signing (S.P. 8-21.5)	1	LS	$ 5,000.00	$ 5,000.00
31	Paint Line (S.P. 8-22.5)	35,000	LF	$ 2.00	$ 70,000.00
32	Plastic Traffic Arrow (8-22.5)	20	EA	$ 100.00	$ 2,000.00
33	Painted Traffic Letter (8-22.5)	60	EA	$ 35.00	$ 2,100.00
34	Plastic Stop Line (8-22.5)	120	LF	$ 20.00	$ 2,400.00
35	Plastic Crosswalk Line (8-22.5)	180	LF	$ 10.00	$ 1,800.00
36	Project Sign	1	LS	$ 1,000.00	$ 1,000.00
37	General Restoration	1	LS	$ 65,000.00	$ 65,000.00

Subtotal: ……	$ 3,609,725.00
Contingency (15%): ……	$ 541,458.75
Subtotal: ……	$ 4,151,183.75
Washington State Sales Tax (8.4%): ……	$ 348,699.44
Total Construction Cost: ……	$ 4,499,883.19
Engineer's Preliminary Construction Cost Estimate: ……	**$ 4,500,000.00**
Construction Management (12%):……	$ 540,000.00
Preliminary Project Cost Estimate:……	**$ 5,040,000.00**

CLALLAM COUNTY
CARLSBORG SEWER COLLECTION SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
January 31, 2014

SEQUIM ALTERNATIVE : GRAVITY COLLECTION SYSTEM (BUILDOUT)

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P. 1)	1	LS	$ 200,000.00	$ 200,000.00
2	Portable Changeable Message Sign (S.P. 1)	1,600	HR	$ 15.00	$ 24,000.00
3	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 600,000.00	$ 600,000.00
4	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 12,000.00	$ 12,000.00
5	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 60,000.00	$ 60,000.00
6	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 270,000.00	$ 270,000.00
7	Control Density Fill (S.P. 2-09.5)	40	CY	$ 175.00	$ 7,000.00
8	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 30,000.00	$ 30,000.00
9	Crushed Surfacing Top Course (S.P. 4-04.5)	11,800	TN	$ 25.00	$ 295,000.00
10	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	3,700	TN	$ 125.00	$ 462,500.00
11	Temporary HMA (S.P. 5-04.5)	2,600	TN	$ 125.00	$ 325,000.00
12	Manhole 48 In. Diam. (S.P. 7-05.5)	129	EA	$ 3,500.00	$ 451,500.00
13	Manhole, Extra Depth, 48 In. Diam. (S.P. 7-05.5)	220	VF	$ 260.00	$ 57,200.00
14	Adjust Catch Basin (S.P. 7-05.5)	10	EA	$ 400.00	$ 4,000.00
15	Removal of Unsuitable Material (Trench) (S.P. 7-08.5)	460	CY	$ 50.00	$ 23,000.00
16	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 250,000.00	$ 250,000.00
17	Bank Run Gravel for Trench Backfill (S.P. 7-08.5)	15,000	TN	$ 20.00	$ 300,000.00
18	Dewatering (S.P.7-08.5)	1	LS	$ 50,000.00	$ 50,000.00
19	Adjust Valve Box (S.P. 7-012.5)	15	EA	$ 400.00	$ 6,000.00
20	Ductile Iron Sewer Pipe, 8 In. Diam. Cl. 52, RJ (S.P. 7-17.5)	250	LF	$ 110.00	$ 27,500.00
21	PVC SDR 35 Sanitary Sewer Pipe 8 In. Diam. (S.P. 7-17.5)	32,050	LF	$ 40.00	$ 1,282,000.00
22	PVC SDR 35 Sanitary Sewer Pipe 12 In. Diam. (S.P. 7-17.5)	3,225	LF	$ 55.00	$ 177,375.00
23	Side Sewers, Incl. Cleanout (S.P. 7-18.5)	6,000	LF	$ 40.00	$ 240,000.00
24	28 In. Diam. Jack and Bored Steel Casing Pipe, Incl. Dewatering, Carlsborg Road Crossing (S.P. 7-20.5)	250	LF	$ 400.00	$ 100,000.00
25	28 In. Diam. Jack and Bored Steel Casing Pipe, Incl. Dewatering, West Crossing (S.P. 7-20.5)	250	LF	$ 400.00	$ 100,000.00
26	Retrieval Pit - Entrance, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 75,000.00	$ 75,000.00
27	Retrieval Pit - Entrance, West Crossing (S.P. 7-20.5)	1	LS	$ 75,000.00	$ 75,000.00
28	Retrieval Pit - Exit, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 10,000.00	$ 10,000.00
29	Retrieval Pit - Exit, West Crossing (S.P. 7-20.5)	1	LS	$ 10,000.00	$ 10,000.00
30	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 30,000.00	$ 30,000.00
31	Adjust Monument Case and Cover (S.P. 8-13.5)	10	EA	$ 300.00	$ 3,000.00
32	Cast-in-Place Monument (S.P. 8-13.5)	5	EA	$ 400.00	$ 2,000.00
33	Permanent Signing (S.P. 8-21.5)	1	LS	$ 5,000.00	$ 5,000.00
34	Paint Line (S.P. 8-22.5)	35,000	LF	$ 2.00	$ 70,000.00
35	Plastic Traffic Arrow (8-22.5)	24	EA	$ 100.00	$ 2,400.00
36	Painted Traffic Letter (8-22.5)	80	EA	$ 35.00	$ 2,800.00
37	Plastic Stop Line (8-22.5)	160	LF	$ 20.00	$ 3,200.00
38	Plastic Crosswalk Line (8-22.5)	180	LF	$ 10.00	$ 1,800.00
39	Project Sign	1	LS	$ 1,000.00	$ 1,000.00
40	General Restoration	1	LS	$ 100,000.00	$ 100,000.00

Subtotal: ……	$ 5,745,275.00
Contingency (15%): ……	$ 861,791.25
Subtotal: ……	$ 6,607,066.25
Washington State Sales Tax (8.4%): ……	$ 554,993.57
Total Construction Cost: ……	$ 7,162,059.82
Engineer's Preliminary Construction Cost Estimate: ……	**$ 7,163,000.00**
Construction Management- Initial System (12%):……	$ 540,000.00
Design, Permitting & Construction Management - additional system to meet buildout (25%):……	$ 665,800.00
Preliminary Project Cost Estimate:……	**$ 8,368,800.00**

CLALLAM COUNTY
CARLSBORG SEWER COLLECTION SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
April 7, 2014

CARLSBORG ALTERNATIVE: GRAVITY COLLECTION SYSTEM (INITIAL)

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P. 1)	1	LS	$ 170,000.00	$ 170,000.00
2	Portable Changeable Message Sign (S.P. 1)	1,200	HR	$ 15.00	$ 18,000.00
3	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 400,000.00	$ 400,000.00
4	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 7,000.00	$ 7,000.00
5	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 35,000.00	$ 35,000.00
6	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 240,000.00	$ 240,000.00
7	Control Density Fill (S.P. 2-09.5)	30	CY	$ 175.00	$ 5,250.00
8	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 23,000.00	$ 23,000.00
9	Crushed Surfacing Top Course (S.P. 4-04.5)	6,800	TN	$ 25.00	$ 170,000.00
10	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	2,400	TN	$ 125.00	$ 300,000.00
11	Temporary HMA (S.P. 5-04.5)	1,600	TN	$ 125.00	$ 200,000.00
12	Manhole 48 In. Diam. (S.P. 7-05.5)	75	EA	$ 3,500.00	$ 262,500.00
13	Manhole, Extra Depth, 48 In. Diam. (S.P. 7-05.5)	160	VF	$ 260.00	$ 41,600.00
14	Adjust Catch Basin (S.P. 7-05.5)	7	EA	$ 400.00	$ 2,800.00
15	Removal of Unsuitable Material (Trench) (S.P. 7-08.5)	260	CY	$ 50.00	$ 13,000.00
16	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 155,000.00	$ 155,000.00
17	Bank Run Gravel for Trench Backfill (S.P. 7-08.5)	12,000	TN	$ 20.00	$ 240,000.00
18	Dewatering (S.P.7-08.5)	1	LS	$ 35,000.00	$ 35,000.00
19	Adjust Valve Box (S.P. 7-012.5)	10	EA	$ 400.00	$ 4,000.00
20	Ductile Iron Sewer Pipe, 8 In. Diam. Cl. 52, RJ (S.P. 7-17.5)	250	LF	$ 110.00	$ 27,500.00
21	PVC SDR 35 Sanitary Sewer Pipe 8 In. Diam. (S.P. 7-17.5)	13,285	LF	$ 40.00	$ 531,400.00
22	PVC SDR 35 Sanitary Sewer Pipe 12 In. Diam. (S.P. 7-17.5)	4,725	LF	$ 55.00	$ 259,875.00
23	Side Sewers, Incl. Cleanout (S.P. 7-18.5)	3,800	LF	$ 40.00	$ 152,000.00
24	28 In. Diam. Jack and Bored Steel Casing Pipe, Incl. Dewatering, Carlsborg Road Crossing (S.P. 7-20.5)	250	LF	$ 400.00	$ 100,000.00
25	Retrieval Pit - Entrance, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 75,000.00	$ 75,000.00
26	Retrieval Pit - Exit, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 10,000.00	$ 10,000.00
27	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 30,000.00	$ 30,000.00
28	Adjust Monument Case and Cover (S.P. 8-13.5)	6	EA	$ 300.00	$ 1,800.00
29	Cast-in-Place Monument (S.P. 8-13.5)	3	EA	$ 400.00	$ 1,200.00
30	Permanent Signing (S.P. 8-21.5)	1	LS	$ 5,000.00	$ 5,000.00
31	Paint Line (S.P. 8-22.5)	35,000	LF	$ 2.00	$ 70,000.00
32	Plastic Traffic Arrow (8-22.5)	20	EA	$ 100.00	$ 2,000.00
33	Painted Traffic Letter (8-22.5)	60	EA	$ 35.00	$ 2,100.00
34	Plastic Stop Line (8-22.5)	120	LF	$ 20.00	$ 2,400.00
35	Plastic Crosswalk Line (8-22.5)	180	LF	$ 10.00	$ 1,800.00
36	Project Sign	1	LS	$ 1,000.00	$ 1,000.00
37	General Restoration	1	LS	$ 65,000.00	$ 65,000.00

Subtotal: ……	$ 3,660,225.00
Contingency (15%): ……	$ 549,033.75
Subtotal: ……	$ 4,209,258.75
Washington State Sales Tax (8.4%): ……	$ 353,577.74
Total Construction Cost: ……	$ 4,562,836.49
Engineer's Preliminary Construction Cost Estimate: ……	**$ 4,563,000.00**
Construction Management (12%):……	$ 547,600.00
Preliminary Project Cost Estimate:……	**$ 5,110,600.00**

CLALLAM COUNTY
CARLSBORG SEWER COLLECTION SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
April 4, 2014

CARLSBORG ALTERNATIVE: GRAVITY COLLECTION SYSTEM (BUILDOUT)

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P. 1)	1	LS	$ 200,000.00	$ 200,000.00
2	Portable Changeable Message Sign (S.P. 1)	1,600	HR	$ 15.00	$ 24,000.00
3	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 600,000.00	$ 600,000.00
4	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 12,000.00	$ 12,000.00
5	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 60,000.00	$ 60,000.00
6	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 270,000.00	$ 270,000.00
7	Control Density Fill (S.P. 2-09.5)	40	CY	$ 175.00	$ 7,000.00
8	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 30,000.00	$ 30,000.00
9	Crushed Surfacing Top Course (S.P. 4-04.5)	11,800	TN	$ 25.00	$ 295,000.00
10	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	3,700	TN	$ 125.00	$ 462,500.00
11	Temporary HMA (S.P. 5-04.5)	2,600	TN	$ 125.00	$ 325,000.00
12	Manhole 48 In. Diam. (S.P. 7-05.5)	129	EA	$ 3,500.00	$ 451,500.00
13	Manhole, Extra Depth, 48 In. Diam. (S.P. 7-05.5)	220	VF	$ 260.00	$ 57,200.00
14	Adjust Catch Basin (S.P. 7-05.5)	10	EA	$ 400.00	$ 4,000.00
15	Removal of Unsuitable Material (Trench) (S.P. 7-08.5)	460	CY	$ 50.00	$ 23,000.00
16	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 250,000.00	$ 250,000.00
17	Bank Run Gravel for Trench Backfill (S.P. 7-08.5)	15,000	TN	$ 20.00	$ 300,000.00
18	Dewatering (S.P.7-08.5)	1	LS	$ 50,000.00	$ 50,000.00
19	Adjust Valve Box (S.P. 7-012.5)	15	EA	$ 400.00	$ 6,000.00
20	Ductile Iron Sewer Pipe, 8 In. Diam. Cl. 52, RJ (S.P. 7-17.5)	250	LF	$ 110.00	$ 27,500.00
21	PVC SDR 35 Sanitary Sewer Pipe 8 In. Diam. (S.P. 7-17.5)	31,250	LF	$ 40.00	$ 1,250,000.00
22	PVC SDR 35 Sanitary Sewer Pipe 12 In. Diam. (S.P. 7-17.5)	4,725	LF	$ 55.00	$ 259,875.00
23	Side Sewers, Incl. Cleanout (S.P. 7-18.5)	6,000	LF	$ 40.00	$ 240,000.00
24	28 In. Diam. Jack and Bored Steel Casing Pipe, Incl. Dewatering, Carlsborg Road Crossing (S.P. 7-20.5)	250	LF	$ 400.00	$ 100,000.00
25	28 In. Diam. Jack and Bored Steel Casing Pipe, Incl. Dewatering, West Crossing (S.P. 7-20.5)	250	LF	$ 400.00	$ 100,000.00
26	Retrieval Pit - Entrance, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 75,000.00	$ 75,000.00
27	Retrieval Pit - Entrance, West Crossing (S.P. 7-20.5)	1	LS	$ 75,000.00	$ 75,000.00
28	Retrieval Pit - Exit, Carlsborg Road Crossing (S.P. 7-20.5)	1	LS	$ 10,000.00	$ 10,000.00
29	Retrieval Pit - Exit, West Crossing (S.P. 7-20.5)	1	LS	$ 10,000.00	$ 10,000.00
30	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 30,000.00	$ 30,000.00
31	Adjust Monument Case and Cover (S.P. 8-13.5)	10	EA	$ 300.00	$ 3,000.00
32	Cast-in-Place Monument (S.P. 8-13.5)	5	EA	$ 400.00	$ 2,000.00
33	Permanent Signing (S.P. 8-21.5)	1	LS	$ 5,000.00	$ 5,000.00
34	Paint Line (S.P. 8-22.5)	35,000	LF	$ 2.00	$ 70,000.00
35	Plastic Traffic Arrow (8-22.5)	24	EA	$ 100.00	$ 2,400.00
36	Painted Traffic Letter (8-22.5)	80	EA	$ 35.00	$ 2,800.00
37	Plastic Stop Line (8-22.5)	160	LF	$ 20.00	$ 3,200.00
38	Plastic Crosswalk Line (8-22.5)	180	LF	$ 10.00	$ 1,800.00
39	Project Sign	1	LS	$ 1,000.00	$ 1,000.00
40	General Restoration	1	LS	$ 100,000.00	$ 100,000.00

Subtotal: ……	$ 5,795,775.00
Contingency (15%): ……	$ 869,366.25
Subtotal: ……	$ 6,665,141.25
Washington State Sales Tax (8.4%): ……	$ 559,871.87
Total Construction Cost: ……	$ 7,225,013.12
Engineer's Preliminary Construction Cost Estimate: ……	**$ 7,226,000.00**
Construction Management- Initial System (12%):……	$ 547,600.00
Design, Permitting & Construction Management (25%):……	$ 665,800.00
Preliminary Project Cost Estimate:……	**$ 8,439,400.00**

CLALLAM COUNTY
CARLSBORG SEWER CONVEYANCE SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
January 31, 2014

WINTERHAWK PUMP STATION AND FORCE MAIN

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P.1)	1	LS	$ 4,000.00	$ 4,000.00
2	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 17,000.00	$ 17,000.00
2	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 300.00	$ 300.00
3	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 1,000.00	$ 1,000.00
4	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 2,500.00	$ 2,500.00
5	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 1,500.00	$ 1,500.00
6	Sawcut	1,900	LF	$ 2.00	$ 3,800.00
7	Crushed Surfacing Top Course (S.P. 4-04.5)	75	TN	$ 25.00	$ 1,875.00
8	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	120	TN	$ 125.00	$ 15,000.00
9	2x 2-In. Diam. HDPE Force Main	950	LF	$ 25.00	$ 23,750.00
10	72" I/S Dia x 15ft deep Precast Concrete Wet Well	1	LS	$ 10,000.00	$ 10,000.00
11	Excavate and Install Buried Structures, incl Wastehaul of Unsuitable Native	1	LS	$ 8,000.00	$ 8,000.00
12	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 6,000.00	$ 6,000.00
13	Dewatering	1	LS	$ 1,000.00	$ 1,000.00
14	Bank Run Gravel Backfill	150	TN	$ 20.00	$ 3,000.00
15	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 2,000.00	$ 2,000.00
16	Duplex 3 hp Submersible Grinder Station w/ Controls & Valve Vault	1	LS	$ 55,000.00	$ 55,000.00
17	Pump Station Install incl Electrical Rack	1	LS	$ 15,000.00	$ 15,000.00
18	Non-potable Water Service	1	LS	$ 5,000.00	$ 5,000.00
19	Electrical, incl Portable Generator Connxn	1	LS	$ 20,000.00	$ 20,000.00
20	PUD Service Connection	1	LS	$ 5,000.00	$ 5,000.00
21	General Restoration	1	LS	$ 2,500.00	$ 2,500.00

Subtotal: ……	$	203,225.00
Contingency (15%): ……	$	30,483.75
Subtotal: ……	$	233,708.75
Washington State Sales Tax (8.4%): ……	$	19,631.54
Total Construction Cost: ……	$	253,340.29
Engineer's Preliminary Construction Cost Estimate: ……	**$**	**254,000.00**
Construction Management (12%):…….	$	30,500.00
Preliminary Project Cost Estimate:……..……..……	**$**	**284,500.00**

CLALLAM COUNTY
CARLSBORG SEWER CONVEYANCE SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
January 31, 2014

GUPSTER PUMP STATION AND FORCE MAIN

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P.1)	1	LS	$ 5,000.00	$ 5,000.00
2	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 25,000.00	$ 25,000.00
3	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 350.00	$ 350.00
4	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 1,000.00	$ 1,000.00
5	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 2,500.00	$ 2,500.00
6	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 1,500.00	$ 1,500.00
7	Sawcut	2,400	LF	$ 2.00	$ 4,800.00
8	Crushed Surfacing Top Course (S.P. 4-04.5)	90	TN	$ 25.00	$ 2,250.00
9	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	140	TN	$ 125.00	$ 17,500.00
10	3x 3-In. Diam. HDPE Force Main	1,200	LF	$ 35.00	$ 42,000.00
11	72" I/S Dia x 18 ft deep Precast Concrete Wet Well	1	LS	$ 10,000.00	$ 10,000.00
12	Excavate and Install Buried Structures, incl Wastehaul of Unsuitable Native	1	LS	$ 7,500.00	$ 7,500.00
13	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 8,000.00	$ 8,000.00
14	Dewatering	1	LS	$ 1,000.00	$ 1,000.00
15	Bank Run Gravel Backfill	200	TN	$ 20.00	$ 4,000.00
16	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 2,000.00	$ 2,000.00
17	Triplex 3hp Submersible Grinder Station w/ Controls & Valve Vault	1	LS	$ 70,000.00	$ 70,000.00
18	Pump Station Install incl Electrical Rack	1	LS	$ 15,000.00	$ 15,000.00
19	Non-potable Water Service	1	LS	$ 5,000.00	$ 5,000.00
20	25 kW Diesel Standby Generator, incl ATS and Install	1	LS	$ 50,000.00	$ 50,000.00
21	Electrical	1	LS	$ 20,000.00	$ 20,000.00
22	PUD Service Connection	1	LS	$ 5,000.00	$ 5,000.00
23	General Restoration	1	LS	$ 2,500.00	$ 2,500.00

Subtotal: ……	$ 301,900.00
Contingency (15%): ……	$ 45,285.00
Subtotal: ……	$ 347,185.00
Washington State Sales Tax (8.4%): ……	$ 29,163.54
Total Construction Cost: ……	$ 376,348.54
Engineer's Preliminary Construction Cost Estimate: ……	**$ 377,000.00**
Design, Permitting & Construction Management (25%):……	$ 94,300.00
Preliminary Project Cost Estimate:……	**$ 471,300.00**

CLALLAM COUNTY
CARLSBORG SEWER CONVEYANCE SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
April 7, 2014

SEQUIM ALTERNATIVE: OLYMPIC DUAL FORCE MAIN

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P.1)	1	LS	$ 25,000.00	$ 25,000.00
2	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 210,000.00	$ 210,000.00
3	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 3,000.00	$ 3,000.00
4	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 15,000.00	$ 15,000.00
5	Removal of Structure and Obstruction (S.P. 2-02.5)	1	LS	$ 40,000.00	$ 40,000.00
6	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 12,000.00	$ 12,000.00
7	Crushed Surfacing Top Course (S.P. 4-04.5)	5,500	TN	$ 25.00	$ 137,500.00
8	HMA Cl. 1/2" PG 64-22, Trench Repair (S.P. 5-04.5)	2,000	TN	$ 125.00	$ 250,000.00
9	8 In. Diam. And 10 In. Diam HDPE Dual Force Main	15,400	LF	$ 90.00	$ 1,386,000.00
10	Dual Air Vacuum Release Assembly	4	EA	$ 3,500.00	$ 14,000.00
11	Cleanout Assembly	6	LS	$ 1,500.00	$ 9,000.00
12	Dungeness River Bridge Crossing	1	LS	$ 150,000.00	$ 150,000.00
13	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 7,000.00	$ 7,000.00
14	Bank Run Gravel for Trench Backfill (S.P. 7-08.5)	4,000	TN	$ 20.00	$ 80,000.00
15	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 12,000.00	$ 12,000.00
16	Permanent Signing (S.P. 8-21.5)	1	LS	$ 2,000.00	$ 2,000.00
17	General Restoration	1	LS	$ 20,000.00	$ 20,000.00

Subtotal: ……	$ 2,372,500.00
Contingency (15%): ……	$ 355,875.00
Subtotal: ……	$ 2,728,375.00
Washington State Sales Tax (8.4%): ……	$ 229,183.50
Total Construction Cost: ……	$ 2,957,558.50
Engineer's Preliminary Construction Cost Estimate: ……	**$ 2,958,000.00**
Construction Management (12%):……	$ 355,000.00
Preliminary Project Cost Estimate:……	**$ 3,313,000.00**

CLALLAM COUNTY
CARLSBORG SEWER CONVEYANCE SYSTEM
ENGINEER'S PRELIMINARY CONSTRUCTION COST ESTIMATE
G&O #13534
April 7, 2014

SEQUIM ALTERNATIVE: OLYMPIC PUMP STATION

No.	Item	Quantity		Unit Price	Amount
1	Project Temporary Traffic Control (S.P.1)	1	LS	$ 2,000.00	$ 2,000.00
2	Mobilization, Cleanup, and Demobilization (S.P. 1)	1	LS	$ 175,000.00	$ 175,000.00
3	Post Construction Services and Documentation (S.P. 1)	1	LS	$ 3,000.00	$ 3,000.00
4	Clearing and Grubbing (S.P. 2-01.5)	1	LS	$ 4,000.00	$ 4,000.00
5	Relocate 300 LF Asphalt Trail	1	LS	$ 6,000.00	$ 6,000.00
5	Locate Existing Utilities (S.P. 2-09.5)	1	LS	$ 1,000.00	$ 1,000.00
6	Crushed Surfacing Top Course (S.P. 4-04.5)	200	TN	$ 25.00	$ 5,000.00
7	HMA Cl. 1/2" PG 64-22, Yard and Trail Repair (S.P. 5-04.5)	175	TN	$ 125.00	$ 21,875.00
8	72" I/S Dia x 18 ft deep Inlet Manhole	1	LS	$ 10,000.00	$ 10,000.00
9	120" I/S Dia x 25 ft deep Wet Well	1	LS	$ 55,000.00	$ 55,000.00
9	Valve Vault	1	LS	$ 10,000.00	$ 10,000.00
10	Flow Meter Vault	1	LS	$ 15,000.00	$ 15,000.00
11	Pigging/Bypass Vault	1	LS	$ 25,000.00	$ 25,000.00
12	18'x40' Electrical Control Bldg / Public Rest Room	1	LS	$ 200,000.00	$ 200,000.00
13	Misc Reinf Concrete Slabs	50	CY	$ 1,000.00	$ 50,000.00
13	CMU Screem Wall for Bioxide Facilities	300	SF	$ 20.00	$ 6,000.00
14	Excavate and Install Buried Structures, incl Wastehaul of Unsuitable Native	1	LS	$ 65,000.00	$ 65,000.00
15	Trench Excavation Safety Systems (S.P. 7-08.5)	1	LS	$ 25,000.00	$ 25,000.00
16	Dewatering	1	LS	$ 5,000.00	$ 5,000.00
17	Bank Run Gravel Backfill	500	TN	$ 20.00	$ 10,000.00
17	Erosion/Water Pollution Control (S.P. 8-01.5)	1	LS	$ 4,000.00	$ 4,000.00
18	90 hp Submersible Pump, Base Elbow, Rails & Accessories	2	EA	$ 95,000.00	$ 190,000.00
19	Misc Piping	1	LS	$ 50,000.00	$ 50,000.00
20	16" DI Sluice Gate	1	EA	$ 5,000.00	$ 5,000.00
21	Piping Installation	1	LS	$ 40,000.00	$ 40,000.00
21	4,400 gal Bioxide Tank, Controls, Initial Fill	1	LS	$ 160,000.00	$ 160,000.00
22	Bioxide Installation	1	LS	$ 10,000.00	$ 10,000.00
23	Oxygen Generation and Injection Equipment, incl Install				
24	Biofilter	1	LS	$ 20,000.00	$ 20,000.00
25	Potable Water Service	1	LS	$ 5,000.00	$ 5,000.00
25	Non-potable Water Service	1	LS	$ 5,000.00	$ 5,000.00
26	Electrical Conduit Trench	30	LF	$ 400.00	$ 12,000.00
27	Misc HVAC	1	LS	$ 40,000.00	$ 40,000.00
28	250 kW Diesel Standby Generator, incl ATS and Install	1	LS	$ 275,000.00	$ 275,000.00
29	Electrical	1	LS	$ 350,000.00	$ 350,000.00
29	PUD Transformer	1	LS	$ 50,000.00	$ 50,000.00
30	Fencing	330	LF	$ 50.00	$ 16,500.00
31	Landscaping and General Restoration	1	LS	$ 15,000.00	$ 15,000.00

Subtotal:	$ 1,941,375.00
Contingency (15%):	$ 291,206.25
Subtotal:	$ 2,232,581.25
Washington State Sales Tax (8.4%):	$ 187,536.83
Total Construction Cost:	$ 2,420,118.08
Engineer's Preliminary Construction Cost Estimate:	**$ 2,421,000.00**
Construction Management (12%)	$ 290,520.00
Total Project Cost	**$ 2,711,600.00**
Additional for Buildout	**$ 800,000.00**
Contingency (15%)	$ 120,000.00
Washington State Sales Tax (8.4%)	$ 77,280.00
Total Construction Cost	$ 997,300.00
Engineering (25%)	$ 249,400.00
Additional for Buildout Project Total	$ 1,246,700.00
Olympic Lift Station Total	**$ 3,958,300.00**

Clallam County
Estimated Pipe Replacement Cost
Connection to Sequim Collection System, Pumped Flow - 480 gpm, Required

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	1 LS	$ 17,084	$ 17,084
2	Trench Safety Systems	1 LS	$ 2,000	$ 2,000
3	Project Temporary Traffic Control	24 HR	$ 95	$ 2,280
4	Locate Existing Utilities	1 LS	$ 2,000	$ 2,000
5	Temporary Erosion & Sedimentattion Control	1 LS	$ 2,000	$ 2,000
6	Crushed Surfacing Top Course	140 TN	$ 30	$ 4,200
7	Bank Run Gravel for Trench Backfill	510 TN	$ 30	$ 15,300
8	HMA Cl. 1/2" PG 64-22, Trench Repair	60 TN	$ 125	$ 7,500
9	Manhole, 48-inch diam.	1 EA	$ 5,000	$ 5,000
10	Removal of Unsuitable Material	5 CY	$ 50	$ 250
11	Dewatering	1 LS	$ 4,000	$ 4,000
12	Connection to Existing Manhole (24-4-03)	1 EA	$ 5,000	$ 5,000
13	12-inch PVC Sewer Pipe	796 LF	$ 75	$ 59,700
14	15-inch PVC Sewer Pipe	0 LF	$ 80	$ -
15	18-inch PVC Sewer Pipe	666 LF	$ 85	$ 56,610
16	24-inch PVC Sewer Pipe	0 LF	$ 110	$ -
17	Surface Restoration	1 LS	$ 5,000	$ 5,000
	Subtotal			$ 187,924
	Washington State Sales Tax (8.7 %)			15,786
	Subtotal:			$ 203,700
	Contingency (25%)			$ 50,925
	Total Estimated Construction Cost			**$ 255,000**
	Engineering and Administrative Costs (25%):			$ 64,000
	Total Estimated Project Cost			**$ 319,000**

** Seattle ENR Values used for November, 2013 were 10,135.

Clallam County
Estimated Pipe Replacement Cost
Connection to Sequim Collection System, Buildout Peak Day Flows

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	1	LS	$ 228,116	$ 228,116
2	Trench Safety Systems	1	LS	$ 25,000	$ 25,000
3	Project Temporary Traffic Control	624	HR	$ 95	$ 59,280
4	Locate Existing Utilities	1	LS	$ 18,000	$ 18,000
5	Temporary Erosion & Sedimentattion Control	1	LS	$ 25,000	$ 25,000
6	Crushed Surfacing Top Course	4,160	TN	$ 30	$ 124,800
7	Bank Run Gravel for Trench Backfill	15,140	TN	$ 30	$ 454,200
8	HMA Cl. 1/2" PG 64-22, Trench Repair	1,770	TN	$ 125	$ 221,250
9	Manhole, 48-inch diam.	37	EA	$ 5,000	$ 185,000
10	Removal of Unsuitable Material	130	CY	$ 50	$ 6,500
11	Dewatering	1	LS	$ 25,000	$ 25,000
12	Connection to Existing Manhole (24-4-03)	2	EA	$ 5,000	$ 10,000
13	12-inch PVC Sewer Pipe	6,610	LF	$ 75	$ 495,750
14	15-inch PVC Sewer Pipe	0	LF	$ 80	$ -
15	18-inch PVC Sewer Pipe	4,974	LF	$ 85	$ 422,790
16	24-inch PVC Sewer Pipe	1,669	LF	$ 110	$ 183,590
17	Surface Restoration	1	LS	$ 25,000	$ 25,000

Subtotal.....	$ 2,509,276
Washington State Sales Tax (8.7 %).....	210,779
Subtotal:.....	$ 2,720,100
Contingency (25%).....	$ 680,025
Total Estimated Construction Cost:.....	**$ 3,400,000**
Engineering and Administrative Costs (25%):.....	$ 850,000
Total Estimated Project Cost:.....	**$ 4,250,000**

** Seattle ENR Values used for November, 2013 were 10,135.

APPENDIX G

FINAL CONVEYANCE TECHNICAL MEMORANDUM

ZENOVIC & ASSOCIATES INCORPORATED

CIVIL ENGINEERING
LAND SURVEYING

301 East 6th Street, Suite 1
Port Angeles, Washington 98362
(360) 417-0501
Fax (360) 417-0514
E-mail: zenovic@olympus.net

TECHNICAL MEMORANDUM

CARLSBORG SEWER CONVEYANCE SYSTEM FEASIBILITY REVIEW

Date: September 12, 2013

Project: Sanitary Sewer Conveyance System
Carlsborg Urban Growth Area to City of Sequim

Prepared by: Zenovic & Associates, Inc.
301 East 6th Street, Suite 1
Port Angeles, WA 98362

EXECUTIVE SUMMARY

PROJECT DESCRIPTION

The Clallam County Department of Public Works is the lead agency in the development of a sanitary sewer collection and treatment system for the Carlsborg Urban Growth area, located on the west side of the Dungeness River, immediately west of Sequim, Washington. One option that is being considered for treatment is to convey the raw sewage to the City of Sequim Wastewater Treatment Plant using a pump system that delivers the Urban Growth Area's sewage to the existing City sanitary sewer infrastructure.

A preliminary analysis of conceptual routes for the conveyance line(s) was completed by Gray & Osborne, Inc. (Technical Memorandum dated November 30, 2011; updated for reduced design flows February 10, 2012). These memoranda established anticipated flows in the conveyance system, impacts to the City of Sequim infrastructure, and developed preliminary conveyance system costs based on the conceptual alignment alternatives.

SCOPE OF THIS REPORT

The intent of this report is to review the Gray & Osborne memoranda and provide further analysis of the conveyance route options. In addition to those routes suggested in the memoranda, the County has proposed that another alternative be considered - running the conveyance line(s) north to Old Olympic Highway and then following the highway to the City.

This analysis will expand the scope of the review to determine the potential challenges associated with each alternative, generally evaluating available rights-of-way and

easements, constructability concerns, permitting requirements, and associated cost impacts. The analysis will also look at other potential alignments that may be more feasible than those previously considered.

DESCRIPTIONS OF ALTERNATIVE ALIGNMENTS

The development of the various alignments was based on two controlling criteria – the desire to minimize the amount of property acquisition that would be required for any given route and the limited opportunities to cross the Dungeness River. Three locations for crossing the river are considered in this report; the Highway 101 right-of-way and bridge, the Railroad Bridge Park trestle and bridge, and the County bridge on Old Olympic Highway (Burlingame Bridge).

All of the alternatives assume that the main lift station will be located in the vicinity of the Olympic Discovery Trail and Carlsborg Road.

Option 1 – Alternative A

This route extends southeasterly along the alignment of the Olympic Discovery Trail through the Carlsborg Industrial Park, along Sawmill Road, and then through Railroad Bridge Park to Priest Road, crossing the river at the old railroad trestle and bridge. The route then turns north to Hendrickson Road, and east along Hendrickson Road to City of Sequim manhole #19-2-71, approximately 550 feet east of Kendall Road.

Option 1 – Alternative B

This route follows the same route as Option 1, Alternative A until it reaches Priest Road. This alternative then extends south along Priest Road to City manhole #24-1-16 at Brackett Road.

Option 2 – Alternative A

This route extends south along Carlsborg Road to Highway 101 and then continues easterly along the north margin of the highway, crossing the Dungeness River, and continuing to the location where the Washington Street right-of-way intersects with the Highway right-of-way. The route then extends northeasterly along West Washington Street to the entry to the Riverbend Center and then north along the entry road to City of Sequim manhole #24-3-13.

Option 2 – Alternative B

This alternative follows the same route as Option 2, Alternative A until it crosses the Dungeness River. The route then stays within the Highway 101 right-of-way until it reaches Grant Road at the west Sequim city limits, then proceeds north and east along Grant Road to City manhole #24-3-06 on Grant Road approximately 475 feet west of River Road.

Option 2 – Alternative C

This route proceeds south along Carlsborg Road to Smithfield Road, then east along Smithfield Road to Mill Road, south on Mill Road to Highway 101, and then east along Highway 101 and West Washington Street on the same route as Option 2, Alternative A.

Option 2, Alternative D

This alternative follows the same route as Option 2, Alternative C until it crosses the Dungeness River. The route then stays within the Highway 101 right-of-way until it reaches Grant Road at the west Sequim city limits, then proceeds north and east along Grant Road to City manhole #24-3-06 on Grant Road.

Option 3

This route heads north along Carlsborg Road to Old Olympic Highway and then follows Old Olympic Highway north, east, and south to Kendall Road, crossing the river at the Burlingame Bridge. The route then goes south along Kendall Road to Hendrickson Road and east along Hendrickson Road to City of Sequim manhole #19-2-71 approximately 550 feet east of Kendall Road.

Option 4 – Alternative A

This route is a combination of basic configurations of Options 1 and 2. The alignment heads east on the Olympic Discovery Trail and Sawmill Road to the west end of Railroad Bridge Park, and then turns south along the west line of the east ½ of Section 23, T30N, R4W. The route then proceeds south along the section centerline to Gilbert Road and continues south along Gilbert Road to Highway 101. At Highway 101, the route then heads east along the alignment of Option 2, Alternative A.

Option 4 – Alternative B

This route follows Option 4, Alternative A until it crosses the Dungeness River, and then proceeding easterly within the highway right-of-way to Grant Road, then following Grant Road to the manhole noted in Option 2, Alternative B.

ANALYSIS

The analysis is intended to compare the cost and potential risk of the alternatives provided in the previous section. In addition to the capital costs of construction, other issues that will be addressed include easement acquisition, franchise requirements, project permitting, and property issues.

The primary challenge for conveying the sewage generated in the Carlsborg service area to the City of Sequim sanitary sewer system is crossing the Dungeness River with the conveyance pipe(s). Limited options are available. Three crossing locations are considered in this analysis; the Highway 101 bridge/right-of-way, the Railroad Bridge Park bridge and trestle, and the Burlingame Bridge on Old Olympic Highway. The Dungeness River in the project area is quite wide and shallow; the river bed soils are composed of sand, gravel, cobbles, and boulders. The river banks are of similar

materials. The river is very dynamic and meanders within the channel. A review of the river reaches between the bridges did not identify any locations where crossing the river with either a pipe bridge or directional drilling would be significantly different than the three locations noted. As such, other potential routes were not reviewed as the costs for constructing such routes will be on the same order of magnitude as the proposed alternatives being reviewed and any alternate route not considered herein will most likely require obtaining easements across multiple private properties, typically a difficult and costly effort.

Cost Analysis

A preliminary cost analysis was provided in the Gray & Osborne report for the alternatives provided therein. In order to maintain consistency with previously compiled capital cost values, the unit costs for each item as provided in the Gray & Osborne report will be used in this report as well. Additional cost items beyond those in the Gray & Osborne report, based on the more thorough review of the alignments described above, have been incorporated into this analysis. These include the cost to cross the Dungeness River, premium costs for work in heavily developed areas, and restoration costs for those areas where the finished surface will not be paved.

Dungeness River Crossing

Three alternatives were considered for crossing the Dungeness River; hanging the conveyance pipes from the bridge, installing a pipe bridge, and directional boring beneath the river. In all cases, it was assumed that the length of the crossing extended from top of bank to top of bank.

The Highway 101bridge and the Burlingame Bridge are similar in design, having concrete girders and deck. The abutment and interior support wall diaphragms of both bridges have penetrations for utility infrastructure. There are communication and/or power infrastructure conduits hanging beneath each bridge. The bridge structures were assumed to be adequate to support the minimal weight of the pipe, fluid, and support structure.

The Railroad Bridge Park trestle may not be adequate to support the pipe, fluid, and support structure. However, no analysis of this bridge was completed due to other high risk factors which made the alignments which crossed the river at this location a highly unlikely choice.

The pipe bridge concept was not pursued due to the high cost and permitting challenges as compared to the directional boring option. For purposes of the analysis, the base cost values provided assume that using the existing bridge will be permitted. An allowance for the directional boring has also been provided for each option where that approach may be required.

Premium Costs for Work in Heavily Developed Areas

For the most part, the proposed alignments are located within existing roadways or trails. However, two of the alignments include construction along the north side of Highway 101 between Carlsborg Road and Mill Road. This area is developed as commercial

property with a significant number of access drives to the highway and an additional right turn lane that reduces the available work zone. A cost has been provided for the impacts to construction efficiencies in this area.

Restoration Costs

While costs were previously provided for repaving those areas where the work is expected to be within an existing roadway, significant portions of the work may be along roadway shoulders or across open fields. In order to provide a consistent comparison, a cost for restoration to the existing condition has been provided.

Risk Analysis

In addition to the cost analysis, a more subjective analysis of the potential risks for each alignment was undertaken. In general, the least risk options are those where the County or the City of Sequim has control over the construction zone (existing rights-of-way). Options that require securing franchises/permissions from other agencies (WSDOT, Jamestown S'Klallam tribe) or private landowners are considered to be a higher risk.

For this analysis, three risk levels were established. The highest risk was determined to be the need to obtain permissions to extend the conveyance route along the Olympic Discovery Trail through the Railroad Bridge Park. The anticipated construction zone would be located on land that is held in trust by the federal government for the tribe. Securing permission to use this route would require significant effort to receive tribal and federal support. In addition, most of the route through the park is within environmentally sensitive areas that are prone to flooding. Mitigation of construction and operation impacts would be significant.

Crossing private lands was considered to be the next highest risk. For the most part, the proposed alignments avoid this issue. However, the two alternatives in Option D anticipate securing permission to cross one and possibly two private owners. This risk was considered acceptable due to the significant potential cost savings for these options.

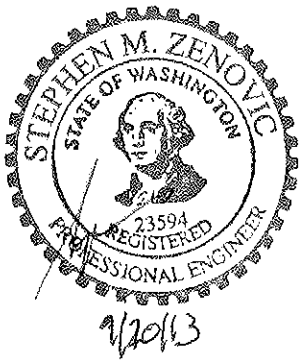
Finally, the least amount of risk was assessed to alignments that require only approval from the Washington State Department of Transportation. Two levels of risk were considered for alignments within the Highway 101 right-of-way. The higher risk is for that area where the highway has controlled access (east of the Dungeness River). Construction in this area will require approval from WSDOT headquarters. West of the river, the risk is reduced as general access is permitted and approvals are typically handled at the regional level.

SUMMARY

Based on the cost and risk analysis, two option (three alternative alignments) were deemed to have significant cost or risk impacts and are not worthy of further consideration at this time. These include the alignments through Railroad Bridge Park (Options 1-A and 1-B) and the alignment along Old Olympic Highway (Option 3). The remaining alternatives are very similar in the relative cost and risk and should be considered as potential options.

The following Comparison Summary Spreadsheet provides rankings for cost and risk. Any of the remaining options are deemed to be viable for the conveyance system at this time. We recommend the four alternatives in Option 2 be reviewed by the County for their preferred route; it is our recommendation that Alternative C of Option 2 be the route selected due to the low risk factor and relatively minimal cost increase over the other alternatives.

Option 4, while being the least cost, does require securing an agreement with at least one landowner and the alternatives in that option will could have a significant impact on the development potential for the property.



CAMPARISON SUMMARY - CARLSBORG SEWER CONVEYANCE ROUTE OPTIONS													
ROUTE	CONSTRUCTION COSTS		CONSTRUCTION CONTINGENCIES			CONSTRUCTION COSTS WITH CONTINGENCIES		SOFT COSTS (35%)		TOTAL COST		RANKING	
	BASE COST	DIRECTIONAL BORING COSTS	PERCENT	VALUE - BASE	VALUE - W/BORING	BASE	W/BORING	BASE	W/BORING	BASE	W/BORING	LEAST COST	LEAST RISK
OPTION 1, ALT. A	$2,092,325	$350,000	35%	$732,314	$732,698	$2,824,639	$3,175,023	$988,624	$1,111,258	$3,813,262	$4,286,280	8	9
OPTION 1, ALT. B	$1,976,590	$350,000	35%	$691,807	$697,977	$2,668,397	$3,024,567	$933,939	$1,058,598	$3,602,335	$4,083,165	7	8
OPTION 2, ALT. A	$1,836,410	$350,000	26%	$477,467	$568,467	$2,313,877	$2,754,877	$809,857	$964,207	$3,123,733	$3,719,083	5	4
OPTION 2, ALT. B	$1,794,005	$350,000	25%	$448,501	$536,001	$2,242,506	$2,680,006	$784,877	$938,002	$3,027,383	$3,618,008	2	5
OPTION 2, ALT. C	$1,899,610	$350,000	26%	$493,899	$584,899	$2,393,509	$2,834,509	$837,728	$992,078	$3,231,237	$3,826,587	6	2
OPTION 2, ALT. D	$1,811,640	$350,000	25%	$452,910	$540,410	$2,264,550	$2,702,050	$792,593	$945,718	$3,057,143	$3,647,768	3	3
OPTION 3	$3,126,210	$0	25%	$781,553	N/A	$3,907,763	N/A	$1,367,717	N/A	$5,275,479	N/A	9	1
OPTION 4, ALT. A	$1,776,860	$350,000	30%	$533,058	$638,058	$2,309,918	$2,764,918	$808,471	$967,721	$3,118,389	$3,732,639	4	6
OPTION 4, ALT. B	$1,621,026	$350,000	30%	$486,308	$591,308	$2,107,334	$2,562,334	$737,567	$896,817	$2,844,901	$3,459,151	1	7

COMMENTS:

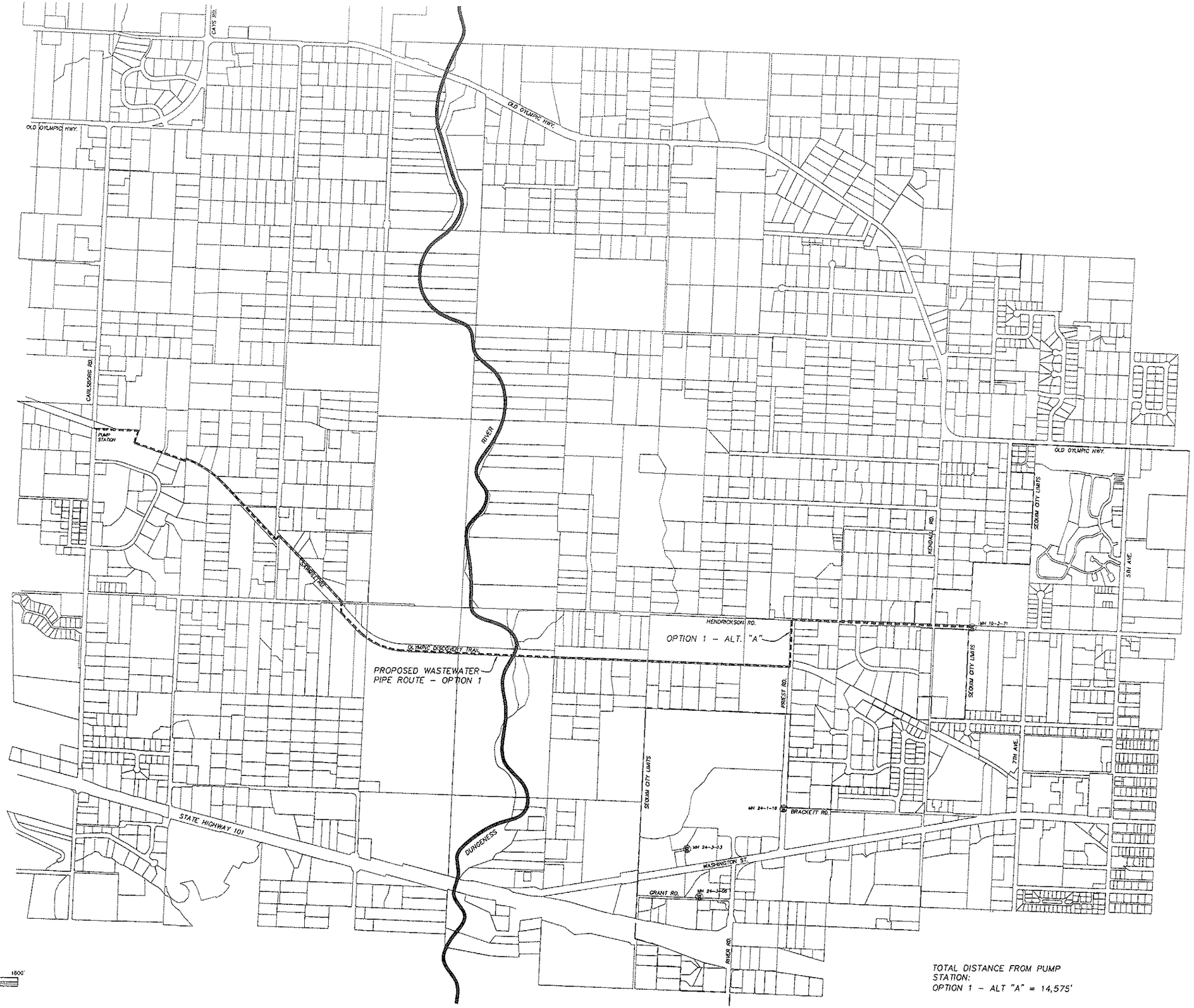
OPTION 1, ALT. A	Requires obtaining permission from Jamestown S'Klallam Tribe; Railroad Bridge may not suppoprt pipe; narrow working zones
OPTION 1, ALT. B	Requires obtaining permission from Jamestown S'Klallam Tribe; Railroad Bridge may not suppoprt pipe; narrow working zones
OPTION 2, ALT. A	Requires franchise along Highway 101 from Mill Street to Carlsborg Road
OPTION 2, ALT. B	Requires franchise along Highway 101 from Mill Street to Carlsborg Road; significant work in Controlled Acces zone
OPTION 2, ALT. D	Significant work in Controlled Access zone
OPTION 4, ALT. A	Requires obtaining easement from private landowner (1)
OPTION 4, ALT. B	Requires obtaining easement from private landowner (1); significant work in Controlled Access zone

NOTES:

1. SOFT COSTS INCLUDES ENGINEERING AND ADMINISTRATIVE FEES, WASHINGTON STATE SALES TAX, PERMITTING COSTS
2. HIGHWAY 101 IS A CONTROLLED ACCESS ZONE EAST OF THE DUNGENESS RIVER BRIDGE; WORK IN THAT AREA REQUIRES WSDOT HEADQUARTERS APPROVAL
3. THE OLYMPIC DISCOVERY TRAIL ROUTE THROUGH RAILROAD BRIDGE PARK IS TRUST LAND UNDER THE CONTROL OF THE JAMESTOWN S'KLALLAM TRIBE
4. DIRECTIONAL BORING COSTS ARE ADDITIONAL COSTS ABOVE BRIDGE MOUNTED INSTALLATION AND EXTEND FROM ABUTMENT TO ABUTMENT

APPENDIX A

MAPS OF ALTERNATIVE ALIGNMENTS



REVISIONS:

DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 1 - ALT 'A'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ZENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST. SUITE J
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
EMAIL: ZENOVICZSHOWLINE1

SCALE: 1" = 600'

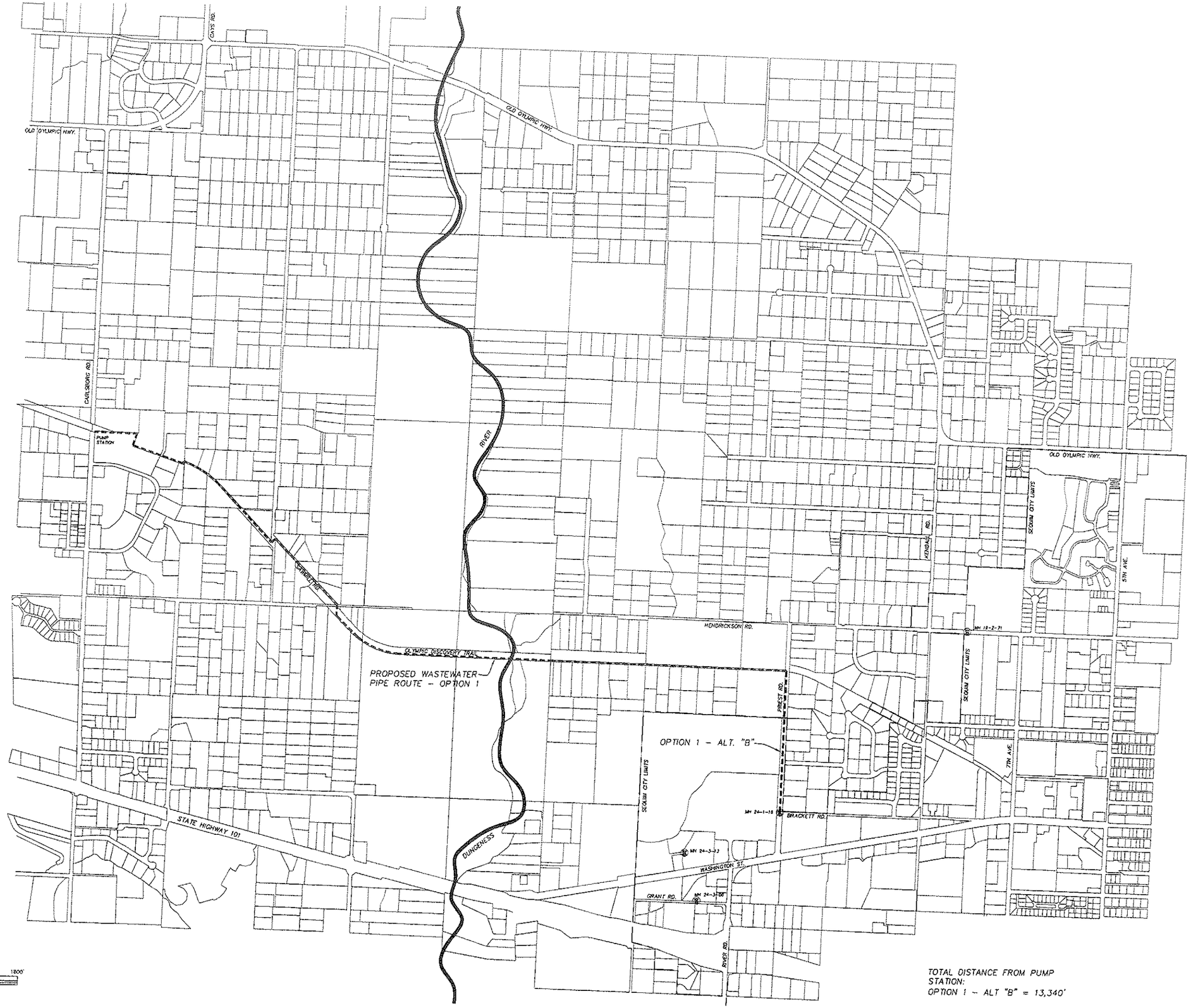
DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN W. ZENOVIC
STATE OF WASHINGTON
23594
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



Scale: 1" = 600'

0 600' 1200' 1800'

TOTAL DISTANCE FROM PUMP STATION:
OPTION 1 - ALT "B" = 13,340'

REVISIONS:		
DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 1 - ALT 'B'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST. SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
E-MAIL: ZENOVIC@ZENOVIC.NET

SCALE: 1" = 600'

DATE: September 12, 2013

FILE: 13045BAS

JOB NO. 13045X

STEPHEN M. ZENOVIC
STATE OF WASHINGTON
23324
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1

Scale: 1" = 600'

0 600' 1200' 1800'

TOTAL DISTANCE FROM PUMP STATION:
OPTION 2 - ALT "A" = 14,010'

REVISIONS:

DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 2 - ALT 'A'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ZENOVICH & ASSOCIATES INCORPORATED
301 EAST 6TH ST. SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
EMAIL: ZENOVICH@NWINC.NET

SCALE: 1" = 600'

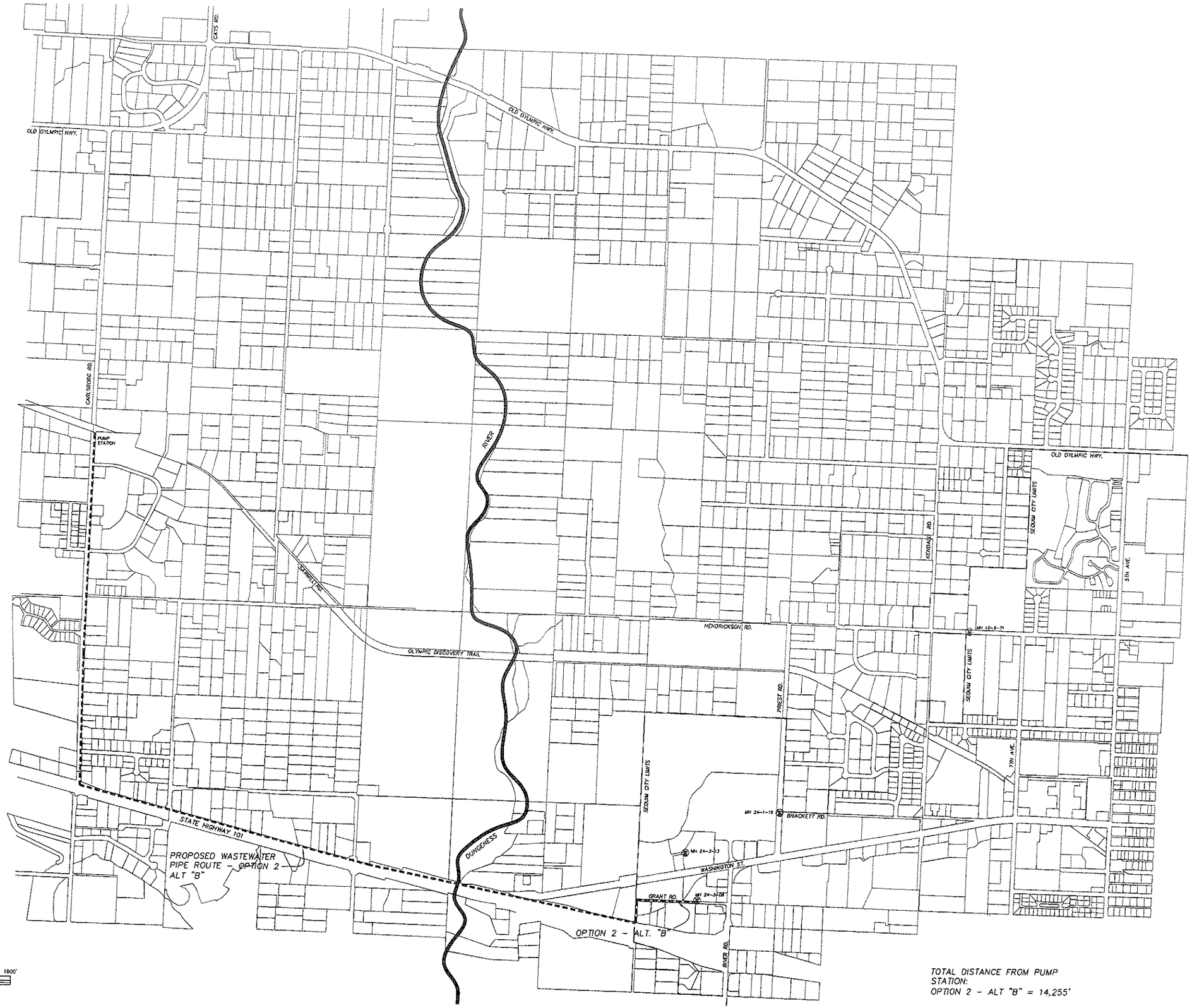
DATE: September 12, 2013

FILE: 13045BAS

JOB NO.: 13045X

STEPHEN M. ZENOVICH
STATE OF WASHINGTON
23594
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



TOTAL DISTANCE FROM PUMP STATION:
OPTION 2 - ALT "B" = 14,255'

REVISIONS:

DATE	MARK	NOTE

FILE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 2 - ALT 'B'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ZENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST. SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0504
EMAIL: ZENOVIC@ZENOVIC.NET

SCALE: 1" = 600'

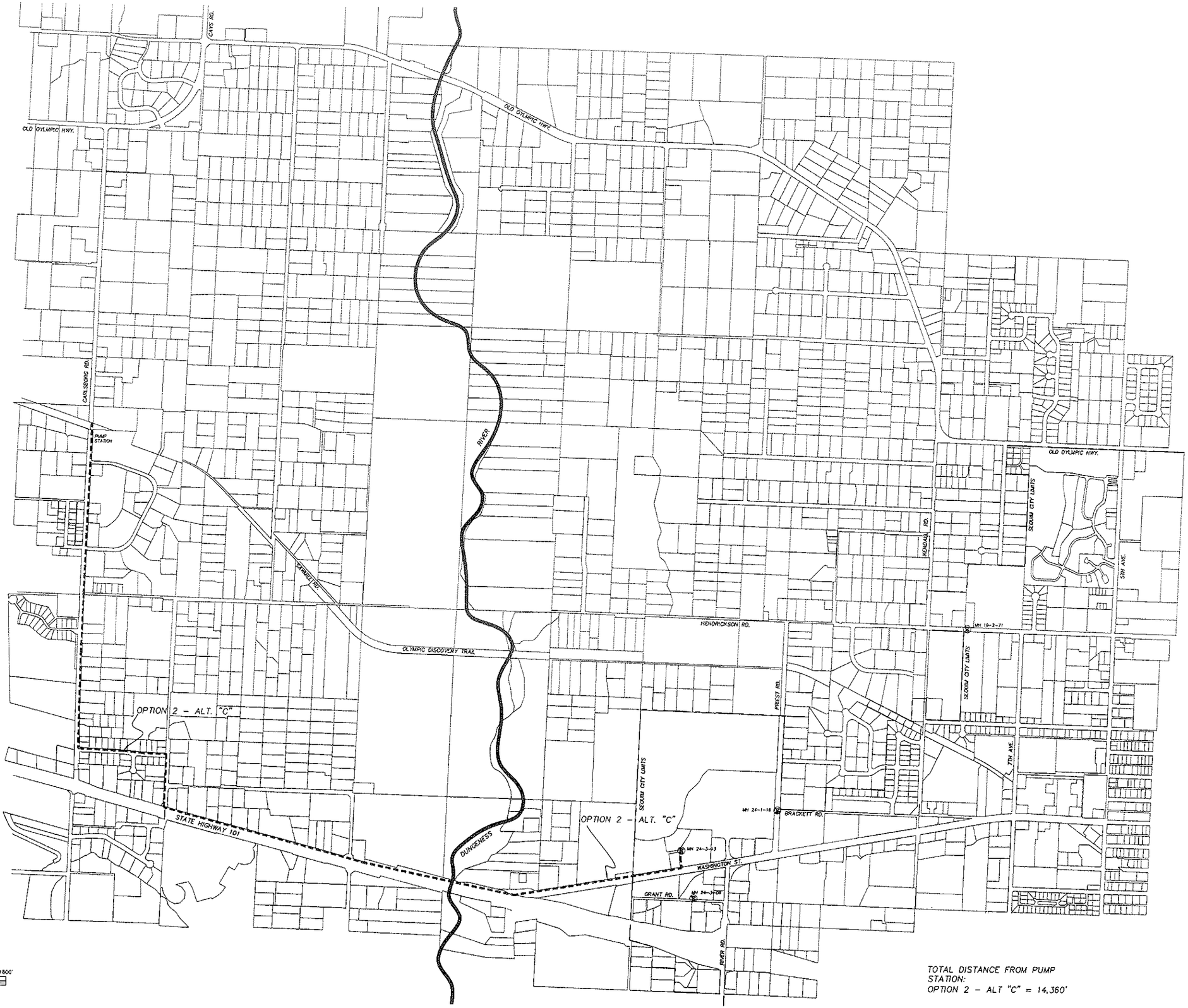
DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN G. ZENOVIC STATE OF WASHINGTON 23594 REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



Scale: 1" = 600'

0 600' 1200' 1800'

TOTAL DISTANCE FROM PUMP STATION:
OPTION 2 - ALT "C" = 14,360'

REVISIONS:

DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 2 - ALT 'C'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST, SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
EMAIL: ZENOVIC@ZENOVIC.NET

SCALE: 1" = 600'

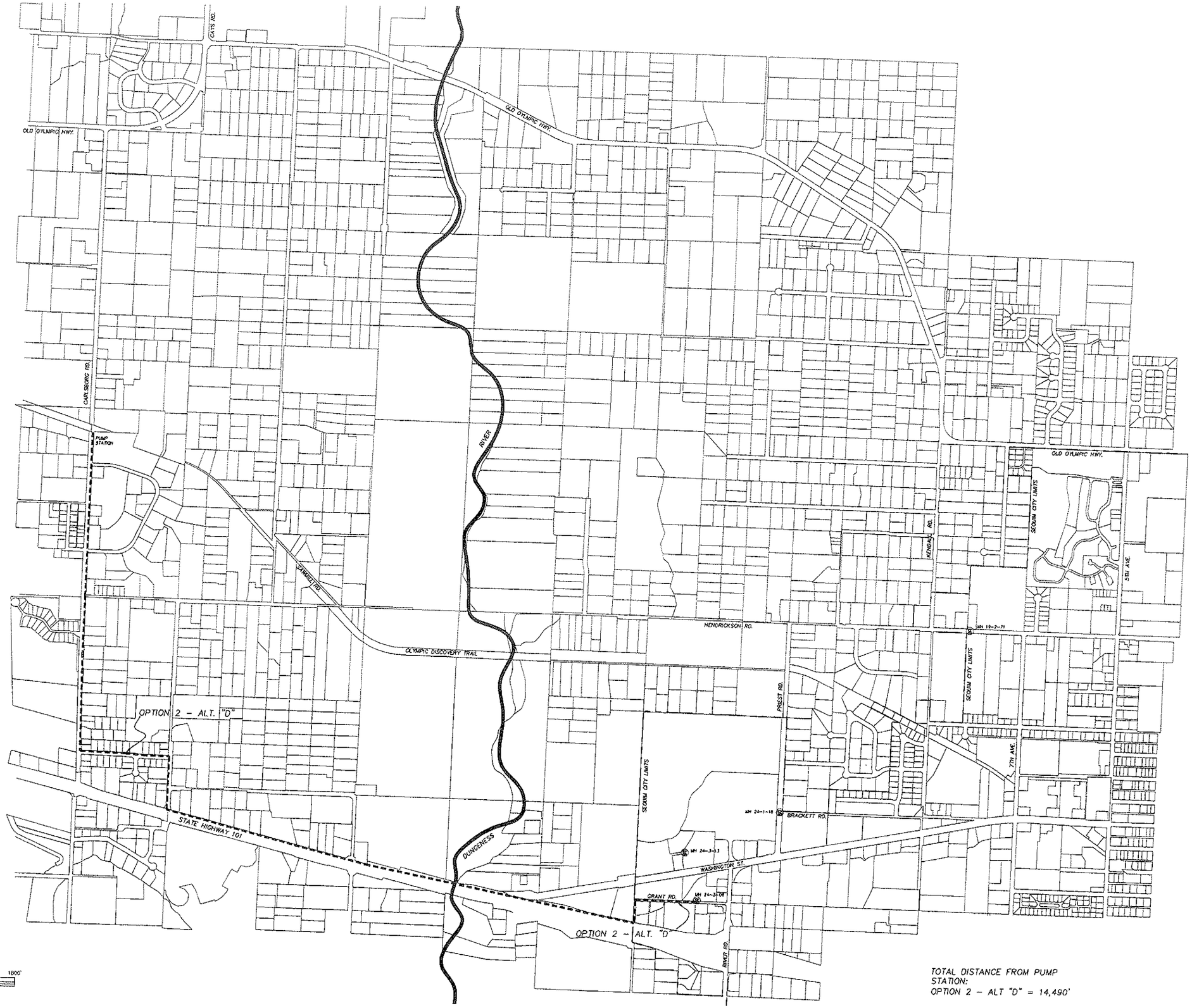
DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN M. ZENOVIC
STATE OF WASHINGTON
18359
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



Scale: 1" = 600'

0 600' 1200' 1800'

TOTAL DISTANCE FROM PUMP STATION:
OPTION 2 - ALT "D" = 14,490'

REVISIONS:

DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 2 - ALT 'D'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ZENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST. SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0504
E-MAIL: ZENOVIC@TENOVIC.NET

SCALE: 1" = 600'

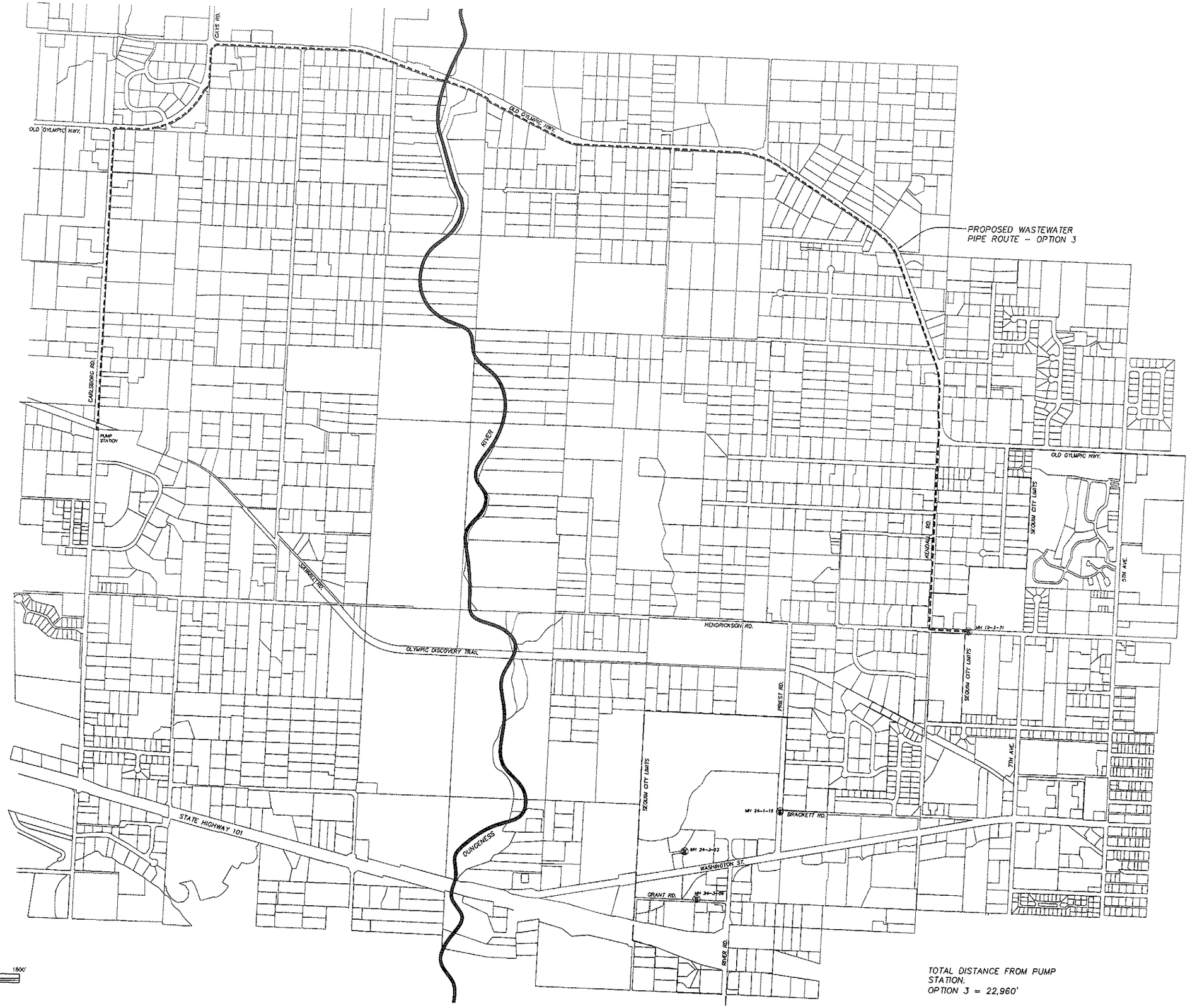
DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN M. ZENOVIC
STATE OF WASHINGTON
23594
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



REVISIONS:

DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 3

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ZENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST, SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0314
EMAIL: ZENOVIC@ZENOVIC.NET

SCALE: 1" = 600'

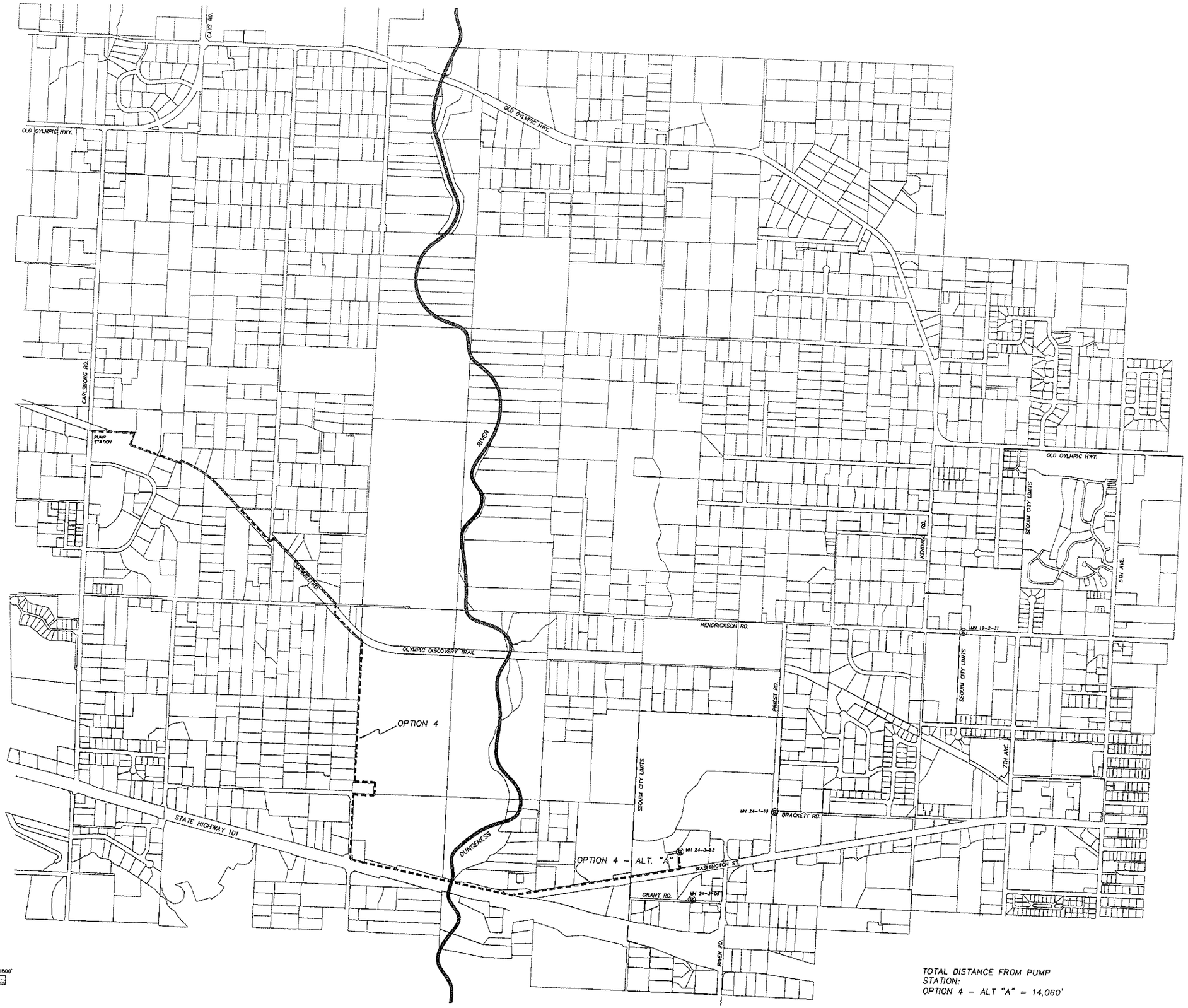
DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN H. ZENOVIC
STATE OF WASHINGTON
23594
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



Scale: 1" = 600'

0 600' 1200' 1800'

TOTAL DISTANCE FROM PUMP STATION:
OPTION 4 - ALT "A" = 14,060'

REVISIONS:		
DATE	MARK	NOTE

CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

TITLE: CONVEYANCE ROUTE STUDY MAP - OPTION 4 - ALT 'A'

ZENOVIC & ASSOCIATES INCORPORATED
301 EAST 6TH ST. SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
EMAIL: ZENOVIC@NOWCNET

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

SCALE: 1" = 600'

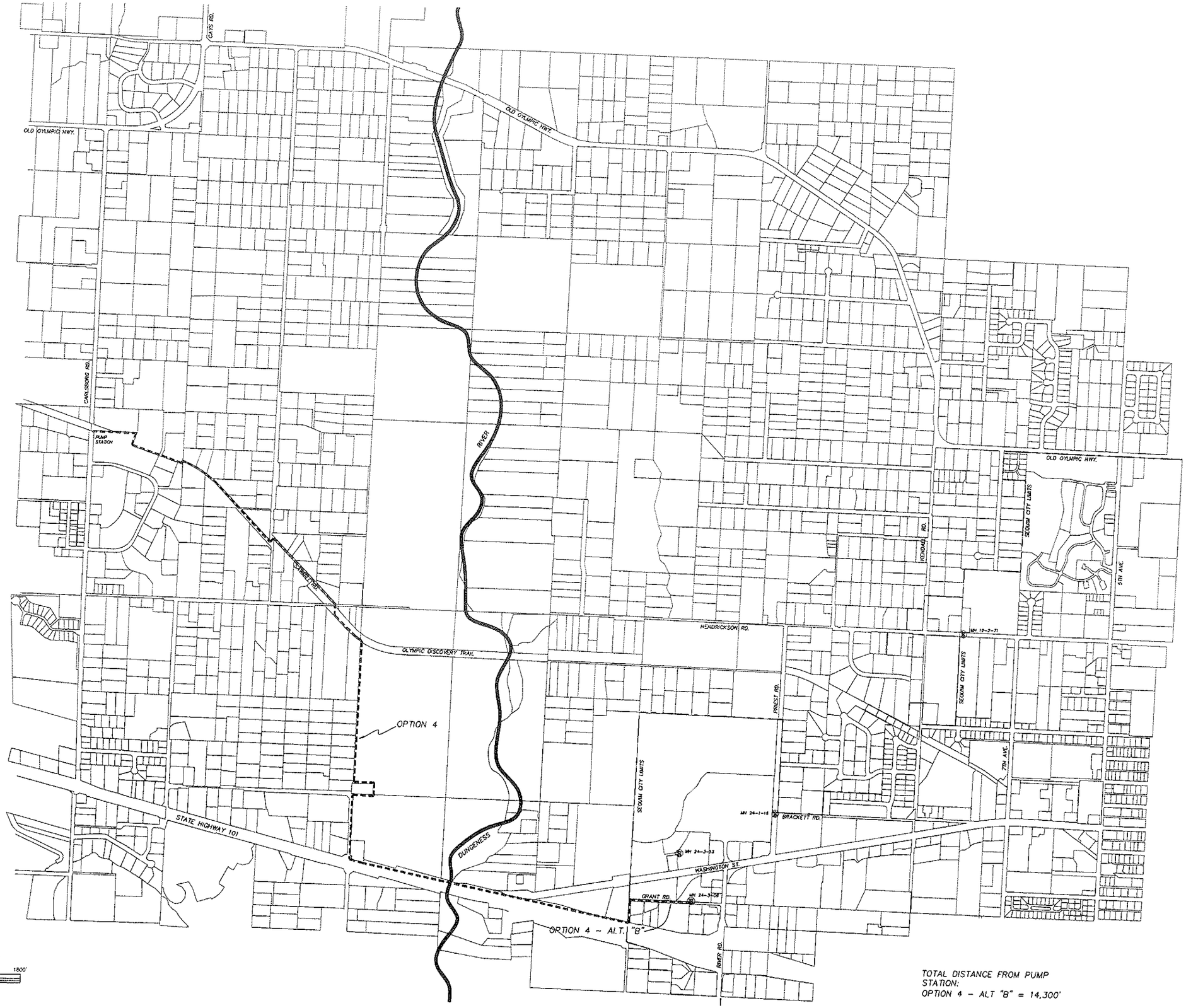
DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN M. ZENOVIC
STATE OF WASHINGTON
23594
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1



TOTAL DISTANCE FROM PUMP STATION:
OPTION 4 - ALT "B" = 14,300'

REVISIONS:

DATE	MARK	NOTE

TITLE: CARLSBORG WASTEWATER SYSTEM - CONVEYANCE ROUTE FEASIBILITY REPORT

CONVEYANCE ROUTE STUDY MAP - OPTION 4 - ALT 'B'

CLIENT: CLALLAM COUNTY ROAD DEPARTMENT
223 EAST 4TH STREET
PORT ANGELES, WA 98362

ZENOVIC & ASSOCIATES, INCORPORATED
301 EAST 6TH ST. SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
EMAIL: ZENOVIC@ZENOVIC.NET

SCALE: 1" = 600'

DATE: September 12, 2013

FILE: 13045BAS

JOB NO: 13045X

STEPHEN H. ZENOVIC
STATE OF WASHINGTON
23574
REGISTERED PROFESSIONAL ENGINEER

SHEET 1 OF 1

APPENDIX B

ESTIMATED PROJECT COSTS OF ALTERNATIVE ALIGNMENTS

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 1, ALTERNATE A - OLYMPIC DISCOVERY TRAIL TO MH 19-2-71 (HENDRICKSON ROAD)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$190,000	$190,000
2	Trench Safety Systems	1	LS	$33,000	$33,000
3	Permits and Environmental	1	LS	$100,000	$100,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	750	LF	$200	$150,000
6	2 ea 4" Dia. Force Main	14575	LF	$51	$743,325
7	Hot Mix Asphalt	3820	TN	$150	$573,000
8	Connection at MH 19-2-71	1	LS	$3,000	$3,000
			SUBTOTAL		$2,092,325
			Sales Tax (8.4%)		$175,755
			SUBTOTAL		$2,268,080
			Contingency @ 25%		$567,020
			SUBTOTAL		$2,835,100
			Engineering and Administrative Services @ 25%		$708,775
			TOTAL PROJECT COST		$3,543,875

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 1, ALTERNATE B - OLYMPIC DISCOVERY TRAIL TO MH 24-1-16 (BRACKETT AT PRIEST)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$180,000	$180,000
2	Trench Safety Systems	1	LS	$33,000	$33,000
3	Permits and Environmental	1	LS	$100,000	$100,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	750	LF	$200	$150,000
6	2 ea 4" Dia. Force Main	13340	LF	$51	$680,340
7	Hot Mix Asphalt	3535	TN	$150	$530,250
8	Connection at MH 24-1-16	1	LS	$3,000	$3,000
			SUBTOTAL		$1,976,590
			Sales Tax (8.4%)		$166,034
			SUBTOTAL		$2,142,624
			Contingency @ 25%		$535,656
			SUBTOTAL		$2,678,279
			Engineering and Administrative Services @ 25%		$669,570
			TOTAL PROJECT COST		$3,347,849

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 2, ALTERNATE A - CARLSBORG ROAD/HIGHWAY 101 TO MH 24-3-13(RIVERBEND PLAZA)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$167,000	$167,000
2	Trench Safety Systems	1	LS	$33,000	$33,000
3	Permits and Environmental	1	LS	$50,000	$50,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	14010	LF	$51	$714,510
7	Hot Mix Asphalt	2560	TN	$150	$384,000
8	Restoration	6240	LF	$10	$62,400
9	Trench Premium in Commercial Area	1300	LF	$25	$32,500
10	Connection at MH 24-3-13	1	LS	$3,000	$3,000
			SUBTOTAL		$1,836,410
			Sales Tax (8.4%)		$154,258
			SUBTOTAL		$1,990,668
			Contingency @ 25%		$497,667
			SUBTOTAL		$2,488,336
			Engineering and Administrative Services @ 25%		$622,084
			TOTAL PROJECT COST		$3,110,419

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 2, ALTERNATE B - CARLSBORG ROAD/HIGHWAY 101 TO MH 24-3-06 (GRANT ROAD)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$163,000	$163,000
2	Trench Safety Systems	1	LS	$32,400	$32,400
3	Permits and Environmental	1	LS	$50,000	$50,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	14255	LF	$51	$727,005
7	Hot Mix Asphalt	2125	TN	$150	$318,750
8	Restoration	7735	LF	$10	$77,350
9	Trench Premiun in Commercial Area	1300	LF	$25	$32,500
10	Connection at MH 24-3-06	1	LS	$3,000	$3,000
			SUBTOTAL		$1,794,005
			Sales Tax (8.4%)		$150,696
			SUBTOTAL		$1,944,701
			Contingency @ 25%		$486,175
			SUBTOTAL		$2,430,877
			Engineering and Administrative Services @ 25%		$607,719
			TOTAL PROJECT COST		$3,038,596

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 2, ALTERNATE C - CARLSBORG ROAD/SMITHFIELD ROAD/HIGHWAY 101 TO MH 24-3-13(RIVERBEND PLAZA)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$172,750	$172,750
2	Trench Safety Systems	1	LS	$32,400	$32,400
3	Permits and Environmental	1	LS	$50,000	$50,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	14360	LF	$51	$732,360
7	Hot Mix Asphalt	3130	TN	$150	$469,500
8	Restoration	4960	LF	$10	$49,600
9	Connection at MH 24-3-13	1	LS	$3,000	$3,000
			SUBTOTAL		$1,899,610
			Sales Tax (8.4%)		$159,567
			SUBTOTAL		$2,059,177
			Contingency @ 25%		$514,794
			SUBTOTAL		$2,573,972
			Engineering and Administrative Services @ 25%		$643,493
			TOTAL PROJECT COST		$3,217,464

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 2, ALTERNATE D - CARLSBORG ROAD/SMITHFIELD ROAD/HIGHWAY 101 TO MH 24-3-06 (GRANT ROAD)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$164,750	$164,750
2	Trench Safety Systems	1	LS	$32,900	$32,900
3	Permits and Environmental	1	LS	$50,000	$50,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	14490	LF	$51	$738,990
7	Hot Mix Asphalt	2700	TN	$150	$405,000
8	Restoration	2700	LF	$10	$27,000
9	Connection at MH 24-3-06	1	LS	$3,000	$3,000
			SUBTOTAL		$1,811,640
			Sales Tax (8.4%)		$152,178
			SUBTOTAL		$1,963,818
			Contingency @ 25%		$490,954
			SUBTOTAL		$2,454,772
			Engineering and Administrative Services @ 25%		$613,693
			TOTAL PROJECT COST		$3,068,465

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 3 - CARLSBORG ROAD/OLD OLYMPIC HIGHWAY TO MH 19-2-71 (HENDRICKSON ROAD)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$284,250	$284,250
2	Trench Safety Systems	1	LS	$47,000	$47,000
3	Permits and Environmental	1	LS	$25,000	$25,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	22960	LF	$51	$1,170,960
7	Hot Mix Asphalt	8040	TN	$150	$1,206,000
8	Connection at MH 19-2-71	1	LS	$3,000	$3,000
			SUBTOTAL		$3,126,210
			Sales Tax (8.4%)		$262,602
			SUBTOTAL		$3,388,812
			Contingency @ 25%		$847,203
			SUBTOTAL		$4,236,015
			Engineering and Administrative Services @ 25%		$1,059,004
			TOTAL PROJECT COST		$5,295,018

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 4, ALTERNATE A - OLYMPIC DISCOVERY TRAIL/SELINCO/HIGHWAY 101 TO MH 24-3-13 (RIVERBEND PLAZA)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$161,500	$161,500
2	Trench Safety Systems	1	LS	$32,400	$32,400
3	Permits and Environmental	1	LS	$50,000	$50,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	14060	LF	$51	$717,060
7	Hot Mix Asphalt	2490	TN	$150	$373,500
8	Restoration	4940	LF	$10	$49,400
9	Connection at MH 24-3-13	1	LS	$3,000	$3,000
			SUBTOTAL		$1,776,860
			Sales Tax (8.4%)		$149,256
			SUBTOTAL		$1,926,116
			Contingency @ 25%		$481,529
			SUBTOTAL		$2,407,645
			Engineering and Administrative Services @ 25%		$601,911
			TOTAL PROJECT COST		$3,009,557

CARLSBORG SEWER CONVEYANCE LINE COST ESTIMATE

OPTION 4, ALTERNATE B - OLYMPIC DISCOVERY TRAIL/SELINCO/HIGHWAY 101 TO MH 24-3-06 (GRANT ROAD)

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT
1	Mobilization and Demobilization	1	LS	$146,000	$146,000
2	Trench Safety Systems	1	LS	$32,500	$32,500
3	Permits and Environmental	1	LS	$50,000	$50,000
4	Carlsborg Pump Station	1	LS	$300,000	$300,000
5	River Crossing	450	LF	$200	$90,000
6	2 ea 4" Dia. Force Main	14300	LF	$51	$729,300
7	Hot Mix Asphalt	1270	TN	$150	$190,500
8	Restoration	6430	LF	$10	$64,300
8	Connection at MH 24-3-06	1	LS	$3,000	$3,000
9					
			SUBTOTAL		$1,605,600
			Sales Tax (8.4%)		$134,870
			SUBTOTAL		$1,740,470
			Contingency @ 25%		$435,118
			SUBTOTAL		$2,175,588
			Engineering and Administrative Services @ 25%		$543,897
			TOTAL PROJECT COST		$2,719,485

APPENDIX H

CARLSBORG SEWER FINANCIAL PLAN

FCS GROUP
Solutions-Oriented Consulting

CARLSBORG SEWER DRAFT FINANCIAL PLAN

A. INTRODUCTION

The purpose of the Carlsborg Sewer Financial Plan is to see what financial outcomes would result from a set of reasonable assumptions about the yet-to-be-created Carlsborg sewer system. How much would the system need to generate in revenues in order to support a prudent level of expenditures and reserves? How much would customers have to pay in monthly rates? In order to achieve this level of monthly rates, how much will Clallam County need to subsidize the Carlsborg sewer system from other funding sources, and for how long? What decisions can the County make that would maximize the Carlsborg sewer system's ability to develop into a sustainable self-supporting utility over the long run? How much should new customers have to pay in connection charges, and what connection requirements should property owners face once sewer service is available? If the County were to offer loan financing to property owners, how much would that cost the County, and how much would repayment cost property owners?

With any financial plan, understanding the assumptions is critical to understanding the results. This is especially the case with a new utility that is planned but not yet built, where there are no actual customers yet. The following sections will describe the key policy and economic assumptions in the financial plan. After discussing the assumptions, we will explain the resulting financial requirements and rate forecast.

In terms of its impact on the financial health of the Carlsborg sewer utility, one of the most important assumptions has to do with the number of properties with existing septic systems that are connected to the new sewer line within the first two years of sewer availability. For that reason, our analysis describes the sensitivity of the monthly rate to the pace of initial connections—what happens to monthly rates if there are fewer connections than are assumed in the base case scenario? What if connections occur faster than projected?

After we present the assumptions, rate forecast, and alternate growth scenarios, a separate section describes a recommended connection policy that is intended to maximize the odds that the Carlsborg system will achieve the number of new connections that are assumed in the base case scenario.

This financial plan was prepared by FCS GROUP, with support and cooperation from Gray & Osborne, Clallam County staff, and City of Sequim staff.

B. BASIC ASSUMPTIONS

Following are some basic assumptions that are relevant to the Carlsborg Sewer Financial Plan.

New Utility, Eventually Self-Supporting – We are assuming that the Carlsborg sewer system will be a new utility, independent of the City of Sequim sewer system. We assume that the system would be owned and operated by Clallam County as an enterprise fund. Our understanding is that the County is committed to seeing the Carlsborg sewer utility successfully launched, but that the County's intent is that the Carlsborg utility eventually be financially independent, so County subsidies must be explicit and limited-term. In keeping with this assumption, the Carlsborg utility must plan ahead for operating reserves and future capital costs, in addition to meeting current-year operating and maintenance (O&M) costs.

Sequim Alternative – This forecast applies only to the "Sequim Alternative," not the alternative of building a new treatment plant in Carlsborg. Modeling the financial impact of the Sequim Alternative required that we engage in preliminary discussions at the staff level about the financial provisions of an interlocal agreement between the City and County for wastewater conveyance and disposal. The financial provisions discussed in this chapter have not yet been considered or approved by the Sequim City Council or the Clallam County Board of Commissioners. However, they do represent our recommended approach, and we believe these provisions are reasonable, practical, and fair to both parties.

Connection Policy – The recommended connection policy will be discussed in detail later in this chapter, but our underlying assumption is that the County wants to offer property owners some degree of choice about whether to connect after sewer is available, but that the connection policy must be consistent with the financial health of the new utility and fairness toward those property owners who do connect as soon as sewer lines are available. Due to Carlsborg's status as an Urban Growth Area (UGA), we assume that all properties will eventually be required to connect to the system—that a developed property within the UGA within range of a sewer line will not be allowed to stay on septic indefinitely.

Timing of Initial Construction – The financial plan assumes that the construction of the initial system would take place during 2015. The initial system would consist of the collection system, two pump stations, and a force main to the City of Sequim sewer system. We assumed that the County would designate an Initial Connection Period of two years after sewer service is available to any given property, during which connection incentives would apply. For the sake of simplicity in modeling, we assume that all properties in the Initial Connection Area would be within range of a sewer line by the end of 2015, properties would begin connecting at the beginning of 2016, and the Initial Connection Period would conclude at the end of 2017.

Initial Connection Area – We assumed that after construction of the initial system, the requirements and incentives contained in the connection policy will apply to properties with existing septic systems for which any part of the property is within 200 feet of the initial collection system, with the exception of the Parkwood Mobile Estates. (Under State statute, mobile home parks cannot be required to connect unless their existing septic systems are out of compliance with current health codes. The initial collection system is designed to bring the sewer line to the boundary of the Parkwood Mobile Estates, but sewering inside that area is not included in the construction cost estimate, and its 209 ERUs are not included in the number of ERUs assumed for the Initial Connection Area.) The properties within 200 feet of the initial sewer lines and subject to the connection policy will be referred to in the financial plan as the Initial Connection Area.

C. ASSUMPTIONS – COSTS PAID TO CITY

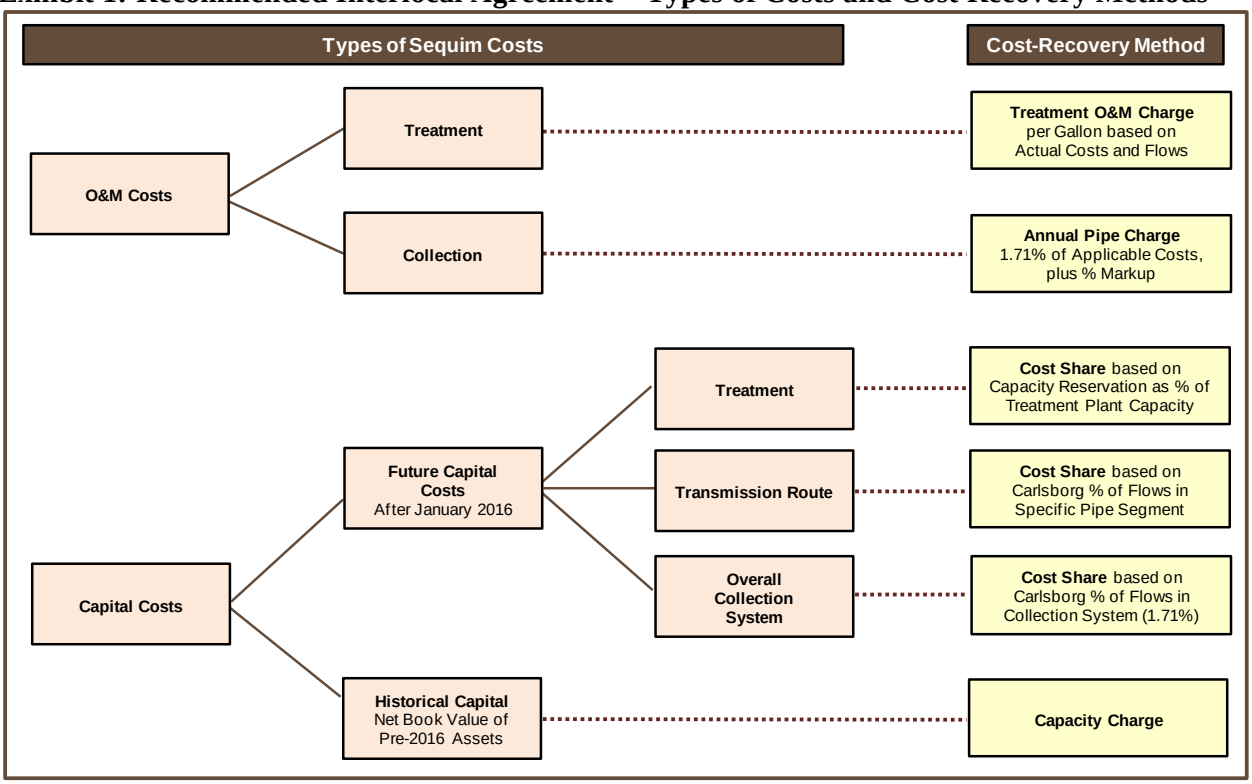
Under the Sequim Alternative, the Carlsborg system would be receiving two types of services from the City of Sequim, wastewater disposal and wastewater transmission. Wastewater disposal includes everything done to the wastewater that is downstream of the headworks to the Sequim Wastewater Reclamation Facility (WRF), including reclaimed water activities. Upstream of the headworks, the Carlsborg flows would be benefitting from the City's pipes along a designated transmission route. The point of delivery—where the Carlsborg flows would enter City pipes—and the transmission route would be defined in the interlocal agreement.

The City's sewer budget is divided into two main categories, Treatment and Collection, which correspond nicely to the two types of services to be received by Carlsborg. There are certain services that the Sequim wastewater utility provides to City residents that would not be applicable to Carlsborg, such as customer service (meter reading and billing), stormwater service, and the pumping

of wastewater. For these functions, the applicable operating and/or capital costs should be subtracted before assigning Carlsborg a share of the remaining collection system costs.

Exhibit 1 illustrates graphically the different types of City costs and how they would be recovered in our recommended approach to the interlocal agreement. In addition to dealing with Treatment and Collection costs separately, our recommended provisions would deal with capital costs separately from operating costs, and for capital costs, it would distinguish between the City's capital costs incurred before January 2016 and those incurred after January 2016.

Exhibit 1: Recommended Interlocal Agreement – Types of Costs and Cost Recovery Methods



C1. OPERATING COSTS

a) Treatment Operating Costs

For treatment operating costs, the approach favored by both City and County staff is a simple per-gallon rate based on flows and costs for each year. For a given year, such a charge can be estimated in advance, subject to a "true-up" adjustment after the close of the year in order to reflect actual costs and relative flows from each party. The rate would consist of the City's total treatment O&M costs, minus State tax, plus a 1.15 out-of-City multiplier, divided by the total gallons of flow for the year. (The multiplier is explained below, along with the City utility tax.)

State tax is subtracted from the City's costs because under current state law, the City would not have to pay State tax on its revenue from Carlsborg, so there is no need to recover that cost as part of its charge to Carlsborg. If the law is ever changed so that intergovernmental revenue is taxable, then that cost should be added to the calculation of the treatment O&M charge.

Note that capital reserves, capital transfers, and debt service are all subtracted from the calculation of the treatment O&M charge, because capital costs are recovered through a separate method.

Based on actual data from the most recent year, our projection for 2016 (the first year of operation for the Carlsborg system) is that the treatment O&M charge would be $.0098 per gallon, just under a penny per gallon, including the out-of-City multiplier. This is shown in Exhibit 2.

Exhibit 2: Projected Treatment O&M Charge in 2016

Operating Charges Paid to City of Sequim		2013 City	Exclude	Applicable 2013	2016
Assumed general inflation - CPI				2.50%	2.50%
Flow Projections are from Draft General Sewer Plan (GSP), Table 2-9					
Sequim Treatment O&M					
Direct:					
City B&O Tax (to be added back below)		184,665	(184,665)	-	-
Salaries		224,345		224,345	241,595
OT		13,417		13,417	14,449
Call Wages		14,252		14,252	15,348
L&I Ins		8,498		8,498	9,151
FICA/Medicare		19,621		19,621	21,130
PERS		20,535		20,535	22,114
Health Ins		55,037		55,037	59,269
Other Benefits		8,747		8,747	9,419
Supplies/Chemicals		116,328		116,328	125,273
Fuel		45,027		45,027	48,489
Small Tools/Minor Equip		5,772		5,772	6,216
Prof Svcs		49,564		49,564	53,375
Travel & Meals		23		23	25
Utilities		71,664		71,664	77,175
Repair & Maint		47,095		47,095	50,716
Misc Svcs & Fees		9,937		9,937	10,701
Xfer Intergov & Excise		47,210	(47,210)	-	-
Reuse Prof Svcs		155,832		155,832	167,814
Subtotal		1,097,570	(231,874)	865,696	932,260
Share of Util Mgr Salary		26,786		26,786	28,846
Additional Staffing for Carlsborg (1 FTE, per Draft GSP 6-21)		-	-	-	100,000
Total Treatment O&M Direct		1,124,357	(231,874)	892,482	1,061,106
Indirect:					
Transfer - Allocated Central Services		691,964		691,964	745,170
Capital Replacement Reserve		100,657	(100,657)	-	-
Debt Svc		629,895	(629,895)	-	-
Total Indirect		1,422,516	(730,552)	691,964	745,170
Total Treatment Costs		2,546,873	(962,426)	1,584,447	1,806,276
Projected flow to Water Reclamation Facility (WRF)		Avg Growth			
Sequim Flow Projections (mgd) - from Draft GSP, Table 2-9		2.78%		0.705	0.766
Sequim (kgal/year) (2013 estimated actual value)				204,000	221,520
Carlsborg (kgal/year) - from "Assumptions" tab in this model				-	8,968
Combined flow to WRF				204,000	230,488
Cost per gallon before City O&M markup				$ 0.0078	$ 0.0078
Assumed multiplier	1.15				
City B&O tax rate (gross receipts rate)	8.00%				
City B&O tax rate (equivalent markup %)	8.70%				
Total O&M Markup Percentage	25.00%				
Treatment Charge per gallon after City O&M markup				$ 0.0097	$ 0.0098

Note about Out-of-City Multiplier and City Utility Tax – Exhibit 2 also shows the impact of the out-of-City multiplier and the City utility tax. Out-of-City multipliers are a common practice with city-owned utilities. They consist of a multiple that is applied to in-City rates to create out-of-City rates. They can be applied to both retail and wholesale customers, though wholesale customers are more likely to have a reduced out-of-City multiplier or none at all. The multiplier recognizes the risk borne by in-City ratepayers in creating and managing the system, including creating excess capacity that might or might not be used for a long time. By City policy, Sequim's out-of-City multiplier is 2.0 except where set at a different level by contract. Bell Hill currently pays an out-of-City multiplier of 1.5, and all other out-of-City retail customers of Sequim pay 2.0 times the in-City rates.

This financial plan assumes that the City would support a reduced multiplier for Carlsborg of 1.15, subject to City Council approval. A lower multiplier for Carlsborg reflects the fact that the City's risks are much lower for a wholesale customer that builds and maintains its own collection system than they are for retail customers. The forecast assumes that the out-of-City multiplier applies to O&M charges but not to the capital cost share or the initial capacity charge. Because the purpose of the multiplier is to give City ratepayers a return on their investment, it logically applies to an ongoing charge for service. However, the capital cost share is not a charge for service; it is "contributed capital" or a co-investment that directly reduces the amount that the City needs to invest in a given asset. It does not make sense to earn a return on an investment that has not been made.

Exhibit 2 also shows the effect of the City utility tax, another common feature with city-owned utilities in Washington. It is paid by in-City as well as out-of-City customers, and it generates revenue for the City General Fund. Consistent with the City's current treatment of connection charge revenue, we assume that the City utility tax would not apply to the capital cost share or the capacity charge. The tax is calculated as 8% of gross receipts, which is equivalent to a markup of about 8.7% on the sewer bill before the tax. When combined with the out-of-City multiplier, the total City markup on Carlsborg O&M costs would be 25%. In other words, if a bill before the markup were $100, then the out-of-City multiplier would make it $115. Then, the City utility tax means that the City sewer system would need to collect $125 in order to net $115 after the tax, since 8% of $125 equals $10. Out of a total markup of 25% to be paid by Carlsborg customers to Sequim, 10% would go to the City General Fund and 15% would benefit inside-City sewer customers.

b) Collection System Operating Costs

The Carlsborg system's share of flows in the shared pipes varies depending on where along the transmission route a given pipe is located. Close to the point of delivery, the percentage would be close to 100%, but as the flows progress eastward toward the treatment plant, Sequim's own flows would gradually constitute an increasing share of the total, until just before the headworks, where the Carlsborg share would be approximately the same as its share of treatment plant flows. Gray & Osborne has estimated the "Carlsborg percentage" of each segment of the transmission route, based on forecasted Carlsborg flows as a percentage of forecasted total City + Carlsborg flows. According to Gray & Osborne, the average "Carlsborg percentage" along the entire transmission route is 44.1%, and since the shared pipes represent 3.9% of the total lineal feet in the Sequim collection system, on average Carlsborg is projected to use 3.9% x 44.1% = 1.71% of the City's overall collection system.

Note that the collection system includes laterals in the public right of way, manholes, cleanouts, and other assets as well as pipes. This methodology assumes that those types of assets are used in proportion to the lineal feet of pipe. Lift stations are part of the collection system but are not relevant to Carlsborg, since no City lift stations are on the transmission route. Carlsborg will be doing its own pumping at the Olympic Pump Station, which will raise the flows to an elevation sufficient to take them to the treatment plant using City gravity lines only. By the same token, Carlsborg will be providing its own customer service, possibly through a contract with the PUD.

For operating costs, it is not practical to try to separate maintenance activities by particular segments of pipe, so for O&M costs, we recommend using the 1.71% factor as a way to assign the Carlsborg cost responsibility. The Sequim collection system costs would be calculated (once again, with a before-the-fact estimate followed by an after-the-fact true-up). The calculation would subtract costs not incurred (State tax on Carlsborg revenues) and services not relevant to Carlsborg (customer service, pumping, and stormwater service). The calculation would include citywide and department overhead and the City utility tax, but it would exclude debt service and anything else capital-related. A 1.15 out-of-city multiplier would be applied to the net cost of the collection system, and the result would then be multiplied by 1.71% to generate a fixed annual "pipe charge" to the Carlsborg system, representing Carlsborg's share of the cost of maintaining the transmission route each year.

Our projections are that the pipe charge would be about $16,000 per year by 2016, the first year of operation for the Carlsborg system. This is shown in Exhibit 3.

Exhibit 3: Collection System Operating Costs for City of Sequim

Operating Charges Paid to City of Sequim		2013 City	Exclude	Applicable 2013	2016
Sequim Collection/Transmission O&M					
Direct:					
Billing Supplies		1,530		1,530	1,648
Admin Prof Svcs		-		-	-
Admin Communications		8,695		8,695	9,364
Admin Repair & Maint		3,611		3,611	3,889
Admin Intergov Prof Svcs		15,131		15,131	16,294
Admin City B&O tax (to be added back below)		89,156	(89,156)	-	-
Trans Salaries		150,127		150,127	161,670
Trans OT		9,407		9,407	10,131
Trans Call Wages		7,300		7,300	7,861
Trans L&I Ins		4,657		4,657	5,015
Trans FIC/Medicare		13,381		13,381	14,410
Trans PERS		13,708		13,708	14,762
Trans Health Ins		36,582		36,582	39,395
Trans Supplies		24,298		24,298	26,166
Trans Inv for Sale (BFP)		1,902		1,902	2,048
Trans Tools & Minor Equip		28,161		28,161	30,327
Trans Prof Svcs		20,766		20,766	22,362
Trans Travel & Meals		1,508		1,508	1,624
Pump Station Utilities		17,131	(17,131)	-	-
Trans Repair & Maint		36,283		36,283	39,073
Trans Misc Svcs & Fees		13,535		13,535	14,576
Trans Intergov & Excise		19,252	(19,252)	-	-
Subtotal		516,122	(125,540)	390,582	420,614
Share of Util Manager Salary		26,786		26,786	28,846
Total Sewer O&M Direct		542,908	(125,540)	417,369	449,460
Indirect:					
Transfer - Allocated Central Services		334,123		334,123	359,814
Capital Transfer to Streets - Sequim Ave Util Repair		319,163	(319,163)	-	-
Capital Transfer to Stormwater - Master Plan		24,000	(24,000)	-	-
Operating Transfer to Stormwater		55,000	(55,000)	-	-
Capital Replacement Reserve		48,603	(48,603)	-	-
Total Indirect		780,889	(446,766)	334,123	359,814
Total Collection/Transmission Costs		1,323,797	(572,306)	751,491	809,274
Exclude Pump Station Labor (Assume .25 FTE @ $80K/FTE incl benefits)		(20,000)		(20,000)	(21,538)
Exclude Sewer Customer Service O&M		(39,000)		(39,000)	(41,999)
Net Collection/Transmission Costs		1,264,797	(572,306)	692,491	745,737
Total Sequim Collection/Transmission System (lf)	385,440				
Shared pipes with Carlsborg (lf)	14,985				
Shared pipes as % of total collection/transmission system	3.9%				
Assumed Carlsborg avg % of flow in shared pipes	44.10%				
Carlsborg pipe charge per lineal foot of shared pipe				0.79	0.85
Carlsborg share as % of total collection system	**1.71%**				
Annual pipe charge before City O&M markup				11,873	12,786
City O&M markup percentage	25.00%				
Annual pipe charge after City O&M markup				14,841	15,982
Carlsborg as % of total collection system, after markup	2.14%				
Assumptions for Customer Service Costs:					
Assumed direct cost/account/year	$ 30				
Number of Sequim accounts (per City web site)	2,600				
Estimated cost of Sequim Customer Service function	$ 78,000				
Assumed % Sewer	50%				
Assumed sewer share (56%) Customer Svc O&M	$ 39,000				

In estimating the pipe charge, we did not have specific data for customer service costs for the City of Sequim, so we relied on an earlier study for another client, in which we found that customer service costs were about $30 per account per year. We used that assumption to estimate about $39,000 of customer service costs for the City of Sequim, which was deducted from the total applicable collection system costs. In the future, if the City generates its own estimate of the cost of the customer service function, that estimate should be substituted for the one shown on Exhibit 3.

We also did not have specific data for the labor cost of maintaining the City's three lift stations. (The cost of electricity for pumping is broken out in the line item detail, but not the labor). For pumping labor, we assumed .25 FTE with an average cost per FTE (including benefits) of $80,000, resulting in an estimate of $20,000 per year. Again, if the City generates its own estimate of the pumping cost, that should take the place of the one used here.

C2. FUTURE CAPITAL COSTS

For future capital costs, we recommend – with concurrence from both City and County staff – that Carlsborg share the cost of treatment capital projects on a pay-as-you-go basis, directly as they are incurred. In order to meet its funding obligations, the Carlsborg system would need to plan in advance, based on the City's schedule of planned capital improvements and the expected Carlsborg cost share. Carlsborg system management will need to decide whether to rely on capital reserves, connection charge income, current rate revenue, or borrowing. As the capital costs are actually incurred, the City would send the Carlsborg utility an invoice at some regular interval for its cost share, and the Carlsborg utility would pay the bill. The simplest interval for City staff would be to invoice Carlsborg annually, after the year-end closing of the books, but the billing could also be done quarterly. The City should have the option of including accrued interest in the invoice.

The Carlsborg percentage of project costs would depend on whether the project is for the treatment plant or the collection system, and if the latter, which part of the collection system. The following paragraphs discuss each of those possibilities.

a) Treatment Capital Cost Share

The Carlsborg share of treatment capital should be based on its capacity reservation (expressed in gallons per day, maximum monthly) as a percentage of the total rated plant capacity of the City's treatment plant, which is currently 1,670,000 gpd (or 1.67 mgd). The capacity reservation would be the amount of wastewater the County has a right to discharge, to be specified in the interlocal agreement. The choice about how much capacity to request is at the option of the County, and the choice about whether to grant the requested level of treatment capacity is at the option of the City. The intent of both City and County staff is that the capacity reservation should represent long-term projected demand for Carlsborg. In the financial plan, the assumed capacity reservation is based on our projections for 20-year forecasted demand for Carlsborg. We further assumed that the capacity reservation figure would be updated every 10 years, so Carlsborg always has enough treatment capacity to accommodate between 10 and 20 years of growth.

Based on our 20-year growth projections, the financial plan assumes an initial capacity reservation of 105,000 gallons per day (maximum monthly), or 6.3% of current plant capacity. So for the ten years after 2015, Carlsborg would pay for 6.3% of the cost of treatment capital projects. This percentage would change every ten years. In 2025, we assumed a capacity reservation of 130,000 gpd, so the Carlsborg share of treatment capital project costs would rise to 7.8%.

What happens when the treatment plant needs to be expanded? We modeled that scenario, assuming a plant expansion to 2,240,000 gpd in 2033. This would be an expensive project. We assumed that it would cost $10 million in constant 2013 dollars (approximately what the last major plant expansion cost the City), or $19.9 million in 2033 inflated dollars. The Carlsborg cost share of an expansion

project should be based on the post-expansion percentage of capacity—that is, the Carlsborg capacity reservation after expansion divided by plant capacity after expansion. Based on our growth projections, we assume that Carlsborg would request and be granted an additional 30,000 gpd, to a new total capacity reservation of 160,000 gpd. That represents 7.1% of the post-expansion plant capacity of 2,240,000 gpd, so Carlsborg would be responsible for 7.1% of the expansion cost, over $1.4 million. A funding commitment like that would clearly require advance planning.

Note about Independent Growth Assumptions – The long-term growth and demand projections used in the financial plan are independent of the long-term growth assumptions contained in other sections of this Facilities Plan. There are two reasons for that. One reason is that the meaning of "conservative" for the purpose of facilities planning is the opposite of "conservative" for the purpose of financial forecasting. In planning facilities, a conservative ERU and flow forecast will tend to fall on the high side of the reasonable range, because underestimating demand could lead to a capacity shortfall, a more serious problem than would result from overestimating demand. For financial planning, the opposite is true: a conservative growth forecast will tend to fall on the low side of the reasonable range, because assuming too many customers could lead to a revenue shortfall and rate spike, a more serious problem than would result from assuming too few customers.

The other reason for an independent set of growth projections is that the long-term growth forecast in other sections of this Facilities Plan must take into account "build out" capacity, which is tied to potential density under the UGA zoning. In the case of Carlsborg, the UGA zoning designations would allow a total number of ERUs in Carlsborg that is equivalent to today's total ERUs in the City of Sequim. That seems to be a very high forecast. The projections in earlier chapters of the Facilities Plan imply an average growth in maximum monthly flows of 6.4% per year between the years 2030 and 2050, from 97,700 gpd to 337,800 gpd over 20 years. Again, that seems too high an annual growth rate for a prudent financial forecast. Under current zoning, the land might have a very high development potential, but that does not mean there is an actual market demand for that much new development over the next few decades.

The use of an independent set of projections is not a criticism of other forecasts. It merely follows from the fact that the purpose of a facilities planning forecast is different from the purpose of a financial forecast. For each forecast to be conservative, a financial forecast will nearly always assume slower long-term growth.

There is one exception to this conservatism in the financial plan. The calculation of the connection charge is based on the facilities planning growth forecast, which assumes 2,324 ERUs by the year 2050. That might be a high estimate, but it is consistent with the long-term cost estimates, which are also based on the more aggressive demand projections presented in other sections of this Facilities Plan. So once again, the best set of assumptions depends on the purpose of the forecast. In the case of a connection charge, what matters most is an apples-to-apples relationship between costs and units of demand. If we were to assume moderate growth in demand but aggressive growth in costs, it would result in an overstated connection charge.

b) Collection System Capital Cost Share

There are a few capital projects that are relevant to the entire collection system but not any particular segment—such as the replacement of a Vactor truck, or the preparation of GIS mapping for the collection system. For these types of systemwide capital projects, the 1.71% cost share is the logical way to assign costs to Carlsborg. This is the same percentage that applies to collection system operating costs, except that the markup factor for the out-of-City multiplier and City utility tax would not apply to the capital cost share.

However, most capital projects for a collection system are specific to a particular segment of pipe or pump station. For collection system projects with a specific location that are not on the transmission

route, there would be no Carlsborg cost share; we expect that to be the case with most collection system projects.

For projects along the transmission route, we can use Gray & Osborne's estimates of the Carlsborg percentage share of the flow for each segment along the route. There are two collection system projects in the current capital plan that affect the transmission route. The Sunnyside Avenue pipe upsizing project, which is scheduled for 2015, occurs at a part of the transmission route where Gray & Osborne estimates Carlsborg to represent 20.9% of projected flows, so that percentage can be used as the Carlsborg cost share for that project. Farther downstream along the transmission route, the North Blake Avenue sewer line replacement project occurs at a place where Carlsborg is only 8.5% of projected flows, so Carlsborg should pay 8.5% of that cost. (We noted earlier that the average Carlsborg percentage for the entire length of the transmission route is 44.1%. It is not surprising that the two capital projects currently planned along the transmission route are both at locations where the Carlsborg percentage is less than 44.1%, because it is where Carlsborg flows are combined with a significant amount of flows from Sequim that pipe capacity is most likely to be constrained, thus requiring an upgrade project.)

C3. CAPACITY CHARGE

In order for Carlsborg to pay an appropriate share of Sequim capital costs, the methodology must account for not only future capital costs but also past capital investment. This subsection discusses past capital investment and our recommendations about how it should be recovered.

City and County staff have agreed that there should be an up-front capacity charge that recognizes the net book value of the City's past investment in its treatment assets. Exhibit 4 on the following page shows data from the City on its treatment plant assets, along with their original cost, the year they were placed in service, their design life, depreciation as a percentage of original cost, and their "net book value" (that is, their original cost minus accumulated depreciation) at five-year intervals beginning in 2015. This represents the depreciated value of the assets that Carlsborg would be buying into in 2015. At the bottom of the table, the net book value is expressed as a unit cost, per unit of plant capacity (in gallons per day).

Exhibit 4 contains actual expenditures through 2013, but for 2014 and 2015, the costs are estimates based on the CIP. We are assuming that the capacity charge would be payable at the end of 2015, based on actual expenditures. We do not have cost figures for the transmission route, so this estimate only includes the net book value of treatment assets. Sometime before the end of 2015, if the City can determine the original cost, age, and accumulated depreciation for the pipes in the transmission route, the net book value of those assets can be added to the basis of the capacity charge. The Carlsborg share would be its percentage of projected flows in each segment of pipe.

The capacity charge only applies to pre-2016 assets, because for City capital costs after January 2016, Carlsborg will be paying a cost share on a pay-as-you-go basis. The capacity charge would be imposed in the future if the Carlsborg capacity reservation increases. However, the unit rate will continue to decline over time, as the pre-2016 assets get older and depreciation accumulates.

Exhibit 4 shows that the 2015 capacity charge would be $8.56 per gpd, or $898,800 for a capacity reservation of 105,000 gpd. Exhibit 5 shows projections of future capacity charges as well as capital cost shares. The capacity charges and capital cost shares projected through 2035 total $3.56 million.

Since the Sunnyside Avenue pipe upsizing would be occurring at the same time as the construction of the Carlsborg system—and since its timing is driven by the addition of Carlsborg flows—we have treated that project as a post-January 2016 cost share rather than including it in the pre-2016 capacity charge calculation. Carlsborg's share of that project would be about $150,000, so the total capacity charge and cost share payable to Sequim at the beginning of 2016 would be about $1.05 million.

Exhibit 4: Basis of Capacity Charge

Costs and Depreciation for Pre-2016 Sequim Wastewater Treatment Assets

Sources: Nov 2011 G&O Tech Memo, Appendix B, plus future CIP projects from Draft General Sewer Plan Table 8-1 and Peninsula Financial Consulting Feb 2013 Draft GFC Study

					Net Book Value of Pre-2016 Assets (Original Cost Net of Depreciation)								
Asset	Year Installed	Design Life	Annual Deprec %	Original Cost	2015	2020	2025	2030	2035	2040	2045	2050	2055
New Headworks	1984	50	2.0%	1,224,364	465,258	342,822	220,386	97,949	-	-	-	-	-
Secondary Splitter Box													
New Lab Building 2													
New Oxidation Ditch													
New Clarifier 1													
Waste Sludge Pump Building													
Tank Conversions													
Chlorine Tank													
Aerobic Digesters	1993	40	2.5%	600,000	270,000	195,000	120,000	45,000	-	-	-	-	-
Building Conversion	1993	50	2.0%	150,000	84,000	69,000	54,000	39,000	24,000	9,000	-	-	-
Clarifier #2	1993	50	2.0%	620,000	347,200	285,200	223,200	161,200	99,200	37,200	-	-	-
RAS Pumping Station	1993	40	2.5%	60,000	27,000	19,500	12,000	4,500	-	-	-	-	-
Other 1993 Projects	1993	40	2.5%	897,000	403,650	291,525	179,400	67,275	-	-	-	-	-
Flow Eq Basin	1997	50	2.0%	442,000	282,880	238,680	194,480	150,280	106,080	61,880	17,680	-	-
Flow Diversion	1997	40	2.5%	70,000	38,500	29,750	21,000	12,250	3,500	-	-	-	-
Coagulation Facility	1997	40	2.5%	676,000	371,800	287,300	202,800	118,300	33,800	-	-	-	-
Holding Pond	1997	40	2.5%	321,000	176,550	136,425	96,300	56,175	16,050	-	-	-	-
Control Building	1997	50	2.0%	233,000	149,120	125,820	102,520	79,220	55,920	32,620	9,320	-	-
Backwash Basin	1997	50	2.0%	42,000	26,880	22,680	18,480	14,280	10,080	5,880	1,680	-	-
UV Basin	1997	40	2.5%	207,000	113,850	87,975	62,100	36,225	10,350	-	-	-	-
Other 1997 Projects	1997	40	2.5%	319,000	175,450	135,575	95,700	55,825	15,950	-	-	-	-
Biosolids Improvements	2003	30	3.3%	1,107,165	664,299	479,772	295,244	110,717	-	-	-	-	-
Phase 1A & 1B WWTF Improvements	2010	30	3.3%	9,755,000	8,129,167	6,503,333	4,877,500	3,251,667	1,625,833	-	-	-	-
General Sewer Plan	2012	6	16.7%	93,500	46,750	-	-	-	-	-	-	-	-
WRF Screwpress Building	2013	40	2.5%	28,000	26,600	23,100	19,600	16,100	12,600	9,100	5,600	2,100	-
Digester Upgrade (Work in Progress)	2013	40	2.5%	70,000	66,500	57,750	49,000	40,250	31,500	22,750	14,000	5,250	-
Reclaimed Water Project	2013	40	2.5%	831,096	789,541	685,654	581,767	477,880	373,993	270,106	166,219	62,332	-
Aux Generator Loadbanks	2014	40	2.5%	31,050	30,274	26,393	22,511	18,630	14,749	10,868	6,986	3,105	-
WRF Headworks Modifications #1	2014	40	2.5%	279,450	272,464	237,533	202,601	167,670	132,739	97,808	62,876	27,945	-
Equalization Basin Aeration System	2014	40	2.5%	55,890	54,493	47,507	40,520	33,534	26,548	19,562	12,575	5,589	-
Grit Removal System Replacement	2014	40	2.5%	289,800	282,555	246,330	210,105	173,880	137,655	101,430	65,205	28,980	-
Lime Sludge Mixing Improvements	2014	40	2.5%	114,885	112,013	97,652	83,292	68,931	54,570	40,210	25,849	11,489	-
Replace WRF Recirculation Pump	2014	40	2.5%	25,875	25,228	21,994	18,759	15,525	12,291	9,056	5,822	2,588	-
Digester Aeration System Improvemts	2014	40	2.5%	672,750	655,931	571,838	487,744	403,650	319,556	235,463	151,369	67,275	-
Purchase New Land near WRF	2015	40	2.5%	208,889	208,889	182,778	156,667	130,556	104,444	78,333	52,222	26,111	-
Total Pre-2016 Treatment Assets				19,424,714	14,296,842	11,448,884	8,647,676	5,846,468	3,221,408	1,041,265	597,404	242,763	-
Total Projected Treatment Capacity (gpd)					1,670,000	1,670,000	1,670,000	1,670,000	2,240,000	2,240,000	2,240,000	2,240,000	2,240,000
(Feb 2012 G&O Tech Memo, Figure 2, assuming expansion in 2033)													
Net Book Value of Pre-2016 Assets per gpd Capacity (max monthly)					**$ 8.56**	**$ 6.86**	**$ 5.18**	**$ 3.50**	**$ 1.44**	**$ 0.46**	**$ 0.27**	**$ 0.11**	**$ -**

Exhibit 5: Capacity Charge and Carlsborg Cost Share Projections

Carlsborg Capacity Charge									
Allocate to Total WRF Capacity (based on max monthly flows):	2015	2020	2025	2030	2035	2040	2045	2050	2055
Total Projected Flows (gpd, max month)									
Sequim (Draft General Sewer Plan, Table 2-9)	945,000	1,061,000	1,219,000	1,382,000	1,548,500	1,715,000	1,860,000	2,005,000	2,161,304
Carlsborg (Assumptions tab for 2015-35, extrapolation thereafter at 2.15%/year)	29,238	62,494	74,207	87,860	103,303	114,896	127,790	142,130	158,081
Total Sequim and Carlsborg	974,238	1,123,494	1,293,207	1,469,860	1,651,803	1,829,896	1,987,790	2,147,130	2,319,385
Carlsborg as % of Total Sequim and Carlsborg	3.0%	5.6%	5.7%	6.0%	6.3%	6.3%	6.4%	6.6%	6.8%
Carlsborg Current-Year Demand as % of WRF Capacity	1.8%	3.7%	4.4%	5.3%	4.6%	5.1%	5.7%	6.3%	7.1%
Total Projected Treatment Capacity (gpd)	1,670,000	1,670,000	1,670,000	1,670,000	2,240,000	2,240,000	2,240,000	2,240,000	2,240,000
Net Book Value of Pre-2016 Assets per gpd Capacity (max monthly)	**$ 8.56**	**$ 6.86**	**$ 5.18**	**$ 3.50**	**$ 1.44**	**$ 0.46**	**$ 0.27**	**$ 0.11**	**$ -**
Assume Capacity Reservation Based on 20-year Demand Forecast, updated every ten years:									
Assumed Carlsborg Capacity Reservation (gpd, max month)	105,000	105,000	130,000	130,000	160,000				
Carlsborg Capital Share (Capacity Reservation as % of Total Plant Capacity)	**6.3%**	**6.3%**	**7.8%**	**7.8%**	**7.1%**				
Carlsborg 2015 Capacity Charge with 20 years' growth	$ 898,903								
Plus: Carlsborg share of Transmission Route Improvements in 2015	150,675								
Total Carlsborg Up-front Capital Charge	$ 1,049,579								
Incremental Carlsborg Capacity Reservation (gpd, rolling 20 years)			25,000		30,000				
Future Capacity Charges		$ -	$ 129,456	$ -	$ 43,144				
Total Up-front Capital Charge and Future Capacity Charges	$ 1,222,179								

Carlsborg Share of Future Treatment Capital Costs	2016-2020	2021-2025	2026-2030	2031-2035
Carlsborg ERUs consistent with these flow projections	344	408	483	568
Assumed WRF Rehab Cost (2013 dollars)				$ 3,000,000
Assumed WRF Expansion Cost (2013 dollars)				7,000,000
Treatment CIP costs other than WRF Expansion/Rehab	$3,922,115	$ 7,351,468	$ 2,429,000	
Assumed WRF Rehab Cost in 2033 dollars (@3.5% annual construction inflation)				6,000,000
Assumed WRF Expansion Cost in 2033 dollars (@3.5% annual construction inflation)				13,900,000
Total Treatment Capital Costs	$3,922,115	$ 7,351,468	$ 2,429,000	$19,900,000
Assume WRF Expansion Cost Allocated Based on Post-Expansion % of Capacity	2016-2020	2021-2025	2026-2030	2031-2035
Carlsborg Capital Share (20-yr Capacity Reservation as % of Total Plant Capacity)	**6.3%**	**6.3%**	**7.8%**	**7.8%**
Carlsborg Share of Treatment Capital other than WRF Rehab/Expansion	$ 246,600	$ 462,218	$ 189,084	$ -
Carlsborg Share of Collection System Capital	-	-	-	-
Carlsborg Share of Transmission Route Capital	-	20,037	-	-
Carlsborg % of Post-Expansion Capacity				**7.1%**
Carlsborg Share of WRF Rehab/Expansion Cost				$ 1,421,429
Total Carlsborg Capital Cost Share	$ 246,600	$ 482,255	$ 189,084	$ 1,421,429
Carlsborg Capital Cost Share per ERU	$ 718	$ 1,182	$ 391	$ 2,503
Cumulative Carlsborg Capital Cost Share through 2035	$2,339,367			

Total Projected Capacity Charges and Future Capital Cost Share	2015	2016-2020	2021-2025	2026-2030	2031-2035
Capacity Charge for pre-2016 Treatment Assets	$ 1,049,579	$ -	$ 129,456	$ -	$ 43,144
Future Capital Cost Share		246,600	482,255	189,084	1,421,429
Total Carlsborg Capital-related Costs Paid to Sequim	$ 1,049,579	$ 246,600	$ 611,711	$ 189,084	$ 1,464,572
Cumulative Total through 2035	$ 3,561,546				

D. ASSUMPTIONS – OTHER CARLSBORG COSTS

D1. CARLSBORG CAPITAL COSTS

Exhibit 6 shows the projected capital costs for the initial construction and future improvements to the Carlsborg system, including the Carlsborg cost share of Sequim projects.

The initial construction of the Carlsborg system is projected to cost $13.2 million in 2015 dollars. The initial project funding—from a $10 million Public Works Trust Fund (PWTF) loan and County funds—totals $14.3 million. Estimates previously reported to the County Board were more nearly balanced, but the most recent estimate of the Sequim capacity charge is less than the previous estimate. Depending on construction inflation and the bidding climate at the time of construction, actual project costs could be higher or lower. Construction inflation tends to have bigger swings than the Consumer Price Index—when the economy is slack, construction prices go down, but when the economy heats up, construction inflation is much higher than general inflation. Actual construction bid prices depend on where this project is in the economic cycle. For that reason, it is good to have a funding cushion at this point in the process. In addition, the $14.3 million is the presumptive source of funding for beginning working capital, the capitalization of the "Get Connected" loan program (discussed later), and an operating subsidy to smooth the rates over the first four years.

Exhibit 6: Projected Capital Expenditures – Carlsborg System

Initial Capital Costs in Inflated Dollars

Description	2015
Gravity Collection System	$ 5,376,800
Winterhawk Pump Station and Force Main	299,300
Gupster Pump Station and Force Main	-
Matriotti Pump Station and Force Main	-
Olympic Pump Station	2,852,779
Dual Force Main	3,485,552
Initial Capacity Charge/Sunnyside Main Upsizing	1,124,335
Future Capacity Charges	-
Carlsborg Share of Sequim Projects	13,134
	$13,151,900

Future Capital Costs in Inflated Dollars, 2016-2025

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Gravity Collection System	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Winterhawk Pump Station and Force Main	-	-	-	-	-	-	-	-	-	-
Gupster Pump Station and Force Main	-	-	-	-	-	-	-	-	-	-
Matriotti Pump Station and Force Main	-	-	-	-	-	-	-	-	-	-
Olympic Pump Station	-	-	-	-	-	-	-	-	-	-
Dual Force Main	-	-	-	-	-	-	-	-	-	-
Initial Capacity Charge/Sunnyside Main Upsizing	-	-	-	-	-	-	-	-	-	-
Future Capacity Charges	-	-	-	-	-	-	-	-	-	195,617
Carlsborg Share of Sequim Projects	5,228	21,501	87,146	63,531	69,194	71,616	94,260	102,969	94,089	119,319
	$ 5,228	$ 21,501	$ 87,146	$ 63,531	$ 69,194	$ 71,616	$ 94,260	$ 102,969	$ 94,089	$314,937

Future Capital Costs in Inflated Dollars, 2026-2035

Description	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Gravity Collection System	$ 424,755	$439,621	$455,008	$470,933	$ 487,416	$504,475	$522,132	$ 540,407	$559,321	$578,897
Winterhawk Pump Station and Force Main	-	-	-	-	-	-	-	-	-	-
Gupster Pump Station and Force Main	-	-	-	-	744,252	-	-	-	-	-
Matriotti Pump Station and Force Main	-	-	-	-	625,803	-	-	-	-	-
Olympic Pump Station	-	-	-	-	-	-	-	-	-	-
Dual Force Main	-	-	-	-	-	-	-	-	-	-
Initial Capacity Charge/Sunnyside Main Upsizing	-	-	-	-	-	-	-	-	-	-
Future Capacity Charges	-	-	-	-	-	-	-	-	-	91,962
Carlsborg Share of Sequim Projects	60,873	63,003	65,208	-	-	-	-	1,421,429	-	-
	$ 485,627	$502,624	$520,216	$470,933	$1,857,471	$504,475	$522,132	$1,961,835	$559,321	$670,859

The Carlsborg system will also have future capital costs after its initial construction. We have already discussed the cost share and capacity charges payable to Sequim, including an assumed $1.4 million charge for a treatment plant expansion in 2033. This forecast also assumes that the remainder of the collection system begins to be built out starting in 2026, at a cost of between $420,000 and $580,000 per year. In addition, the forecast assumes that the Gupster and Matriotti pump stations and force mains are built in 2030, at a total cost of about $1.4 million.

D2. CARLSBORG OPERATING COSTS

Exhibit 7 shows projected O&M costs for the Carlsborg system for the years 2016-2018. Because the per-gallon treatment operating charge is such a large part of the total, 2018 gives the truest picture of ongoing O&M costs, since the Initial Connection Period would be ending in December 2017.

Exhibit 7: Projected Operating and Maintenance Costs

Projected O&M Costs (Inflated Dollars)				
Category	**Description**	**2016**	**2017**	**2018**
Power				
Olympic Pump Station	Basic Customer Charge - Medium General Service	$ 660	$ 676	$ 693
Olympic Pump Station	Demand Charge (Based on Max Peak Mthly Load)	3,361	3,445	3,531
Olympic Pump Station	Power Factor Charge (as % of Demand Charge)	187	191	196
Olympic Pump Station	Energy Charge, Flow Based Loads	828	926	1,036
Olympic Pump Station	Energy Charge, HVAC and Misc Loads (@ 25% of Max Demand)	5,924	6,073	6,224
Winterhawk Pump Station	Basic Customer Charge - Small General Service	637	652	669
Winterhawk Pump Station	Energy Charge	5	5	7
Gupster Pump Station	Basic Customer Charge - Small General Service	-	-	-
Gupster Pump Station	Energy Charge	-	-	-
Matriotti Pump Station	Basic Customer Charge - Small General Service	-	-	-
Matriotti Pump Station	Energy Charge	-	-	-
Water		-	-	-
Olympic Pump Station	Basic Commercial Customer Charge, Non-Potable (1" Meter)	894	916	939
Olympic Pump Station	Non-Potable Water Use Charge, avg incl irrigation	767	786	806
Olympic Pump Station	Basic Commercial Customer Charge, Potable (3/4" Meter)	357	366	375
Olympic Pump Station	Potable Water Use Charge, avg	1,534	1,572	1,612
Small Pump Stations	Basic Commercial Customer Charge, Non-Potable (3/4" Meter)	357	366	375
Small Pump Stations	Non-Potable Water Use Charge, avg	153	157	161
Communications	Telephone Service	1,891	1,938	1,987
Chemicals and Supplies		-	-	-
Chemicals and Supplies	Bioxide	20,775	21,294	21,827
Chemicals and Supplies	Biofilter Media - R&R @ 5Yr Intervals	946	969	993
Chemicals and Supplies	Olympic PS Generator Fuel - 1 hr test each week @ full load	3,387	3,472	3,559
Chemicals and Supplies	Olympic PS Generator Fuel - 200 hr run @ 25% load	4,203	4,308	4,415
Chemicals and Supplies	Gupster PS Generator Fuel - 1 hr test each week @ full load	-	-	-
Chemicals and Supplies	Gupster PS Generator Fuel - 200 hr run @ 25% load	-	-	-
Chemicals and Supplies	Misc Supplies	525	538	552
Contracted Maintenance		-	-	-
Olympic Pump Station	Pumping Equipment - Routine Annual Service	4,203	4,308	4,415
Olympic Pump Station	Generator Maintenance - Routine	2,627	2,692	2,760
Olympic Pump Station	MCC and Control Panel Maint - Routine	1,051	1,077	1,104
Olympic Pump Station	HVAC Annual Check - Routine	525	538	552
Olympic Pump Station	Misc Facility Repairs	2,101	2,154	2,208
Small Pump Stations	Pumping Equipment - Routine Annual Service	420	431	442
Small Pump Stations	Gupster PS Generator Maintenance - Routine	525	538	552
In-House Maintenance		-	-	-
In-House Maintenance	Collection System Monitoring and Maintenance - 0.25 FTE	27,316	27,999	28,699
In-House Maintenance	Service Vehicle	3,164	3,243	3,324
In-House Maintenance	Employee Training	525	538	552
Sewer Cleaning	Per JS Email: ($3 per foot every 7 years) --> annualized	8,510	8,723	8,941
Administrative & Billing	Admin / Billing (Escalated with Inflation + Customer Growth)	16,098	16,501	17,180
Subtotal Collection O&M		**114,455**	**117,394**	**120,684**
Non-Collection Related Expenditures				
State Tax on Connection Charge Revenue		-	1,365	1,358
Sequim Treatment Charge	*Calculated: Gallons/Year X Rate*	48,044	125,733	168,351
Sequim Pipe Charge	*From Analysis of Sequim Charges*	15,982	16,382	16,791
Total O&M Expenditures excluding State Tax on Rate Revenue		$ 178,481	$ 260,873	$ 307,184
State Taxes on Rate Revenue	*Calculated based on projected revenue*	$ 790	$ 3,062	$ 4,276
Total O&M Expenditures		**$ 179,271**	**$ 263,935**	**$ 311,460**
Total Treatment O&M Charge		$ 48,044	$ 125,733	$ 168,351
Total Annual Fixed O&M Costs		131,227	138,202	143,108
Total O&M Expenditures		$ 179,271	$ 263,935	$ 311,460
Treatment O&M Charge as % of Total O&M Costs		27%	48%	54%

Total O&M costs by 2018 are projected to be about $311,000 per year. About 54% of the total O&M in 2018 is a variable cost, based on how many gallons of wastewater is sent to the Sequim treatment plant. At the assumed level of flows, by 2018 the treatment operating charge paid to Sequim would be about $168,000 per year. For variable costs, the risk of slower-than-expected connections is low, because fewer connections would mean lower flows and therefore lower treatment O&M charges.

On the other hand, 46% of the total O&M cost, or about $143,000 per year in 2018, is relatively fixed, meaning that this amount has to be paid each year whether there are few or many customers. The fixed operating costs include about $103,000 per year for maintenance and operation of the pump stations and other parts of the collection system, about $17,000 per year for administration and billing, and about $6,000 per year for State taxes on both rate revenue and connection charge revenue. (Contract payments to Sequim can be deducted from the revenue on which State tax is calculated, so $6,000 per year represents a relatively low level of State taxes.) The pipe charge to Sequim would be about $17,000 per year by 2018.

E. OTHER ASSUMPTIONS

E1. COUNTY SUBSIDY

Our understanding is that while the Carlsborg system is expected to eventually be fully self-supporting, the County is committed to launching it successfully. That requires limited-term subsidies to the Carlsborg utility from other County funding sources.

Following are the types of subsidies or potential subsidies addressed in the financial plan:

Initial Construction Subsidy – The County secured a $10 million State Public Works Trust Fund loan for initial construction and is planning to pay the debt service throughout the life of the loan. In addition, the County has pledged an additional $4.3 million in County funds toward construction and other startup costs. The debt service on the PWTF loan is expected to be about $513,000 per year.

Potential Additional Project Costs – In order to get the system launched, the County must also be prepared for additional project costs if the current commitment of $14.3 million turns out to be insufficient. Currently, the financial plan does not show that an additional construction subsidy is needed, but as the project progresses, this is a possibility.

Initial Operating Subsidy – An operating subsidy will be needed during the first three years as part of a "rate-smoothing" strategy. During the Initial Connection Period, the fixed annual costs must be paid even though the number of ERUs will not yet be sufficient to avoid very high rates. Absent an operating subsidy, monthly rates in 2016 would have to be about $196, followed by $88 per month in 2017, then a third-year rate somewhere in the $70 range. The operating subsidy avoids that scenario. The financial plan shows an initial operating subsidy totaling about $203,000 over the first three years: $136,000 in 2016, $56,000 in 2017, and $11,000 in 2018.

"Get Connected" Loan Program – A fourth type of potential subsidy would be a loan program to assist existing septic owners with the cost of the private lateral and septic decommissioning. These costs are an especially significant factor for single-family residential customers, and a loan program is one way to help property owners connect who are motivated to do so. Because we have seen it done in other Washington jurisdictions, the financial plan assumes that a loan program for private sewer connection costs can meet the requirements of the State constitution and statutes, but if the County wants to pursue this concept, it should seek legal advice on that question.

The financial plan assumes a "Get Connected" loan program of $600,000 total, available during the Initial Connection Period in amounts up to $3,000 per loan, to be repaid over 10 years with 3% interest. Repayments would add $28.97 per month to a property owner's sewer bill. The financial

plan assumes that the repayments (about $70,000 per year) would go to the County without being restricted to the Carlsborg system.

E2. GROWTH AND FLOW ASSUMPTIONS

Long-term growth assumptions were discussed earlier, along with the capacity reservation. This subsection discusses our projections for short-term growth. How many ERUs and how much flow are assumed for this new system in the critical early years of its existence?

The financial plan assumes that an Equivalent Residential Unit (ERU) generates domestic flow of 125 gallons per day. This is equivalent to a winter average metered water consumption of 5.08 ccfs (hundred cubic feet) per month. We used Gray & Osborne estimates of the amount of Inflow and Infiltration (I&I), which during the first ten years is equivalent to between 3.3% and 4% of sanitary flows.

How many properties with existing septic systems are within 200 feet of the initial sewer line, and how many ERUs do those properties represent? Gray & Osborne estimates that there are 484 ERUs within the Initial Connection Area, of which 78 are residential and 406 are commercial.

How many of those potential initial ERUs might connect during the first two years (the Initial Connection Period)? Much depends on the combination of requirements and incentives contained in the connection policy, which is discussed later in this document. The base case scenario in the financial plan assumes that 75% of the potential initial ERUs will either choose to connect during the Initial Connection Period or be required to connect then based on the age or condition of their septic system. In the base case scenario, we also assume that the remainder of the existing septic properties in the Initial Connection Area will be connected over the next 18 years, so that all existing septic systems would be decommissioned by 2035. This implies a growth rate of 1.61% per year from properties with existing septic systems.

In addition to connection from properties with existing septic systems, another key variable is growth from new development once a sewer line is built, since sewer availability makes property subdivision and development more attractive. The base case scenario assumes a 2.15% annual growth rate, the same annual growth rate projected by BHC Consultants in the 2012 Carlsborg Sewer Facilities Plan.

The result of these assumptions about growth from the conversion of existing septic systems and growth from new development is that in the base case scenario, the Carlsborg system would have 677 ERUs by 2035, twenty years after the construction of the sewer system.

Because the financial outcomes are very sensitive to the growth assumptions, we also prepared three other scenarios.

- In the “Slower Growth” scenario, only 50% of the potential initial ERUs connect within the first two years, and a growth rate of 1.5% per year occurs from the properties with existing septic systems. The Slower Growth scenario also assumes 1.5% per year growth from new development.
- In the “Faster Growth” scenario, 90% of the potential initial ERUs connect during the Initial Connection Period. From the group of existing septic properties, growth occurs at a 2% per year pace, and growth from new development occurs at a 3% annual rate.
- In the “Very Slow Growth” scenario, only 35% of the potential initial ERUs connect during the first two years. Growth from the group of existing septic properties proceeds at a rate of 1.5% per year, and growth from new development is 1% per year.

E3. FINANCIAL AND ECONOMIC ASSUMPTIONS

a) Financial Policies

The following assumptions are made about financial policies in the new Carlsborg utility.

- Operating reserve: 45-60 days of operating expenses
- Capital contingency: 1% of asset value
- Rate-funded capital reinvestment gradually increases over the life of the forecast. Starting at 5% of annual depreciation, it would increase to 10% of depreciation in 2021, then to 15% in 2026, and then to 20% in 2031. By 2035, rate-funded capital would be about $74,000 per year.

b) Economic assumptions

The financial plan also contains assumptions regarding economic conditions.

- General inflation (CPI): 2.5% CPI
- Construction inflation (ENR): 3.5%
- Future debt (not needed until 2030): 20-year term, 4.75% rate
- Initial $10 million PWTF loan: Assume the County opts for a 20-year payoff schedule and qualifies for the .25% rate

F. FORECAST RESULTS

F1. PROJECTED REVENUE REQUIREMENTS

Exhibits 8, 9, and 10 summarize the capital financing strategy, the annual revenue requirement forecast, and the projected fund balances for the Carlsborg system.

Through 2025, capital requirements would be funded primarily by connection charge revenue. However, we are assuming that beginning in 2030, the Carlsborg utility would begin building the remainder of its collection system, so annual capital costs would increase to about $500,000 per year. As a result of this, the capital fund balance would begin dropping, as annual capital spending exceeds connection charge revenue. Then, beginning in 2030, the system would face two major capital cost obligations. The construction of the Gupster and Matriotti pump stations in 2030 would cost about $1.4 million, and the Sequim treatment plant expansion is assumed to cost Carlsborg another $1.4 million in 2033. As a result of these major projects and the continued expansion of the collection system, the Carlsborg utility would need to issue about $4.0 million in debt between 2030 and 3035.

The effect of this additional debt would be to add a cumulative total of $346,000 of annual debt service to the forecast by its final year, 2035. In Exhibit 9, this row is shaded in orange. The total revenue needed from ratepayers is the row highlighted in yellow, ranging from just over $317,000 in 2018 to $969,000 per year by 2035. Because of the new debt service, the final years of the forecast show the average monthly charge per ERU growing from about $70 in 2029 to $119 in 2035. However, the 2035 rate – when viewed in constant 2013 dollars – represents the equivalent of $71 per month today. Both prices and incomes tend to rise over a 20-year period. In addition, the purpose of expanding the collection system would be to allow additional connections in the final years of the forecast. Growth in ERUs tends to moderate the rates. As the time horizon approaches, if growth seems unlikely to materialize, then capital projects can be delayed commensurately. For these reasons, the long-term rate forecast is less of a concern than the rates projected in the first ten years.

Exhibit 8: Capital Funding Strategy

Capital Funding Strategy, 2016-2025	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Beginning Fund Balance	**$ 969,250**	**$1,069,800**	**$1,156,661**	**$1,209,868**	**$ 1,291,041**	**$1,370,053**	**$1,470,454**	**$ 1,552,312**	**$1,629,495**	**$1,729,288**
plus: Connection Charges	91,000	90,500	119,008	121,563	124,173	135,899	138,816	141,796	154,497	167,677
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-	-	-	-	-
plus: Rate-Funded Capital Replacement	10,901	10,907	10,934	11,043	11,123	22,418	22,597	22,833	23,090	23,326
plus: Interest Earnings	3,877	6,954	10,410	12,099	12,910	13,701	14,705	15,523	16,295	17,293
plus: Transfer of Surplus from Operating Fund	-	-	-	-	-	-	-	-	-	-
Total Capital Resources	$1,075,028	$1,178,161	$1,297,013	$1,354,573	$ 1,439,248	$1,542,071	$1,646,572	$ 1,732,465	$1,823,377	$1,937,583
less: Capital Expenditures (Escalated Dollars)	$ (5,228)	$ (21,501)	$ (87,146)	$ (63,531)	$ (69,194)	$ (71,616)	$ (94,260)	$ (102,969)	$ (94,089)	$ (314,937)
Ending Capital Fund Balance	**$1,069,800**	**$1,156,661**	**$1,209,868**	**$1,291,041**	**$ 1,370,053**	**$1,470,454**	**$1,552,312**	**$ 1,629,495**	**$1,729,288**	**$1,622,647**

Capital Funding Strategy, 2026-2035	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Beginning Fund Balance	**$1,622,647**	**$1,360,692**	**$1,094,114**	**$ 812,315**	**$ 592,880**	**$ 254,567**	**$ 277,138**	**$ 294,640**	**$ 301,034**	**$ 338,458**
plus: Connection Charges	171,277	185,245	189,222	204,022	208,402	212,877	228,891	233,805	262,707	268,347
plus: Net Debt Proceeds Available for Projects	-	-	-	-	1,264,591	249,909	244,994	1,667,195	258,287	332,401
plus: Rate-Funded Capital Replacement	36,169	37,194	38,255	39,352	40,235	61,716	62,977	64,283	72,741	74,139
plus: Interest Earnings	16,226	13,607	10,941	8,123	5,929	2,546	2,771	2,946	3,010	3,385
plus: Transfer of Surplus from Operating Fund	-	-	-	-	-	-	-	-	-	-
Total Capital Resources	$1,846,319	$1,596,738	$1,332,531	$1,063,813	$ 2,112,038	$ 781,614	$ 816,772	$ 2,262,869	$ 897,779	$1,016,730
less: Capital Expenditures (Escalated Dollars)	$ (485,627)	$ (502,624)	$ (520,216)	$ (470,933)	$ (1,857,471)	$ (504,475)	$ (522,132)	$ (1,961,835)	$ (559,321)	$ (670,859)
Ending Capital Fund Balance	**$1,360,692**	**$1,094,114**	**$ 812,315**	**$ 592,880**	**$ 254,567**	**$ 277,138**	**$ 294,640**	**$ 301,034**	**$ 338,458**	**$ 345,871**

Exhibit 9: Annual Revenue Requirement Forecast

Revenue Requirement Forecast, 2016-2025	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Expenses/Requirements										
Total O&M Expenses excl Tax on Rate Revenue	178,481	260,873	307,184	316,642	325,786	335,410	345,252	355,052	365,339	376,256
State Taxes on Rate Revenue	790	3,062	4,276	4,514	4,762	5,041	5,387	5,516	5,649	5,792
Debt Service - Initial System Loan from County	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229
New Debt Service	-	-	-	-	-	-	-	-	-	-
Rate Funded Capital Replacement	10,901	10,907	10,934	11,043	11,123	22,418	22,597	22,833	23,090	23,326
"Get Connected" Loan Program (Upfront Principal)	300,366	300,366	-	-	-	-	-	-	-	-
Additions Needed to Meet Min. Op. Fund Balance	21,944	10,218	5,710	1,166	1,018	1,296	1,213	1,208	1,145	1,469
Total Requirements	**$1,025,711**	**$1,098,655**	**$ 841,332**	**$ 846,595**	**$ 855,918**	**$ 877,395**	**$ 887,679**	**$ 897,838**	**$ 908,452**	**$ 920,071**
ERU Forecast (Cumulative)	**91**	**272**	**377**	**391**	**405**	**420**	**435**	**450**	**466**	**483**
Percentage Growth in ERUs	n/a	*198.9%*	*38.6%*	*3.7%*	*3.6%*	*3.7%*	*3.6%*	*3.4%*	*3.6%*	*3.6%*
Monthly Rate per ERU	**$ 70.00**	**$ 70.00**	**$ 70.00**	**$ 70.97**	**$ 70.43**	**$ 72.18**	**$ 71.65**	**$ 71.15**	**$ 70.60**	**$ 70.12**
Percentage Growth in Rates										
Rate in Constant 2014 dollars	*$66.63*	*$65.00*	*$63.42*	*$62.73*	*$60.73*	*$60.72*	*$58.81*	*$56.97*	*$55.15*	*$53.44*
Revenues										
Rate Revenue	$ 76,440	$ 228,480	$ 316,680	$ 332,987	$ 342,298	$ 363,766	$ 374,036	$ 384,183	$ 394,785	$ 406,394
Other Revenue Including Interest	-	143	289	379	390	401	414	426	438	449
County Subsidy - Debt Service	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229
County Subsidy - Get Connected Loan Program	300,366	300,366	-	-	-	-	-	-	-	-
County Subsidy - Operating Subsidy	135,676	56,438	11,134	-	-	-	-	-	-	-
Total Revenues	**$1,025,711**	**$1,098,655**	**$ 841,332**	**$ 846,595**	**$ 855,918**	**$ 877,395**	**$ 887,679**	**$ 897,838**	**$ 908,452**	**$ 920,071**

Revenue Requirement Forecast, 2026-2035	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Expenses/Requirements										
Total O&M Expenses excl Tax on Rate Revenue	387,284	398,661	410,306	422,307	450,603	463,185	476,287	489,699	503,847	518,511
State Taxes on Rate Revenue	6,118	6,522	6,699	6,888	8,961	12,315	13,580	17,077	19,970	21,300
Debt Service - Initial System Loan from County	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	-
New Debt Service	-	-	-	-	108,985	130,523	151,637	295,319	317,578	346,225
Rate Funded Capital Replacement	36,169	37,194	38,255	39,352	40,235	61,716	62,977	64,283	72,741	74,139
"Get Connected" Loan Program (Upfront Principal)	-	-	-	-	-	-	-	-	-	-
Additions Needed to Meet Min. Op. Fund Balance	1,360	1,403	1,297	1,618	3,489	1,551	1,455	1,814	-	-
Total Requirements	**$ 944,160**	**$ 957,009**	**$ 969,786**	**$ 983,393**	**$ 1,125,502**	**$1,182,518**	**$1,219,164**	**$ 1,381,420**	**$1,427,365**	**$ 960,175**
ERU Forecast (Cumulative)	**500**	**518**	**536**	**555**	**574**	**593**	**613**	**633**	**655**	**677**
Percentage Growth in ERUs	*3.5%*	*3.6%*	*3.5%*	*3.5%*	*3.4%*	*3.3%*	*3.4%*	*3.3%*	*3.5%*	*3.4%*
Monthly Rate per ERU	**$ 71.74**	**$ 71.32**	**$ 70.91**	**$ 70.52**	**$ 88.81**	**$ 93.98**	**$ 95.89**	**$ 114.85**	**$ 116.68**	**$ 119.22**
Percentage Growth in Rates										
Rate in Constant 2014 dollars	*$53.35*	*$51.73*	*$50.18*	*$48.69*	*$59.83*	*$61.76*	*$61.48*	*$71.84*	*$71.21*	*$70.98*
Revenues										
Rate Revenue	$ 430,468	$ 443,303	$ 456,066	$ 469,660	$ 611,753	$ 668,734	$ 705,364	$ 872,392	$ 917,128	$ 968,520
Other Revenue Including Interest	464	477	491	504	521	556	571	586	652	688
County Subsidy - Debt Service	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	513,229	-
County Subsidy - Get Connected Loan Program	-	-	-	-	-	-	-	-	-	-
County Subsidy - Operating Subsidy	-	-	-	-	-	-	-	-	-	-
Total Revenues	**$ 944,160**	**$ 957,009**	**$ 969,786**	**$ 983,393**	**$ 1,125,502**	**$1,182,518**	**$1,219,164**	**$ 1,386,207**	**$1,431,008**	**$ 969,208**

Exhibit 10: Projected Fund Balances

Fund Balance Summary, 2016-2025	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operating Fund	$ 21,944	$ 32,162	$ 37,872	$ 39,038	$ 40,056	$ 41,352	$ 42,565	$ 43,774	$ 44,919	$ 46,388
Capital Fund	$ 1,069,800	$ 1,156,661	$ 1,209,868	$ 1,291,041	$ 1,370,053	$ 1,470,454	$ 1,552,312	$ 1,629,495	$ 1,729,288	$ 1,622,647
Debt Reserve Fund	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	**$ 1,091,745**	**$ 1,188,823**	**$ 1,247,739**	**$ 1,330,080**	**$ 1,410,109**	**$ 1,511,806**	**$ 1,594,877**	**$ 1,673,269**	**$ 1,774,207**	**$ 1,669,034**
Operating Reserve (Days of O&M Expense)	*45*	*45*	*45*	*45*	*45*	*45*	*45*	*45*	*45*	*45*
Target Capital Contingency	*$ 131,571*	*$ 131,786*	*$ 132,658*	*$ 133,293*	*$ 133,985*	*$ 134,701*	*$ 135,644*	*$ 136,673*	*$ 137,614*	*$ 140,764*
Capital Contingency Deficit (if any)	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*

Fund Balance Summary, 2026-2035	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Operating Fund	$ 47,747	$ 49,150	$ 50,447	$ 52,065	$ 55,554	$ 57,105	$ 58,560	$ 65,161	$ 68,804	$ 77,837
Capital Fund	$ 1,360,692	$ 1,094,114	$ 812,315	$ 592,880	$ 254,567	$ 277,138	$ 294,640	$ 301,034	$ 338,458	$ 345,871
Debt Reserve Fund	$ -	$ -	$ -	$ -	$ 108,985	$ 130,523	$ 151,637	$ 295,319	$ 317,578	$ 346,225
Total	**$ 1,408,439**	**$ 1,143,264**	**$ 862,763**	**$ 644,945**	**$ 419,105**	**$ 464,766**	**$ 504,836**	**$ 661,513**	**$ 724,841**	**$ 769,933**
Operating Reserve (Days of O&M Expense)	*45*	*45*	*45*	*45*	*45*	*45*	*45*	*49*	*50*	*55*
Target Capital Contingency	*$ 145,620*	*$ 150,646*	*$ 155,848*	*$ 160,558*	*$ 179,132*	*$ 184,177*	*$ 189,399*	*$ 209,017*	*$ 214,610*	*$ 221,319*
Capital Contingency Deficit (if any)	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*

F2. MONTHLY RATES

Exhibit 11 summarizes the forecast results for the years 2016-2020, 2025, and 2035. It shows that with the assumptions described above, the average charge to customers over the first ten years of the forecast would be approximately $70 per month per ERU.

Exhibit 11: Summary of Forecast Results – Base Case Scenario

Basic Summary	2016	2017	2018	2019	2020	2025	2035
ERUs							
ERU Forecast (Cumulative)	91	272	377	391	405	483	677
Percentage growth in ERUs		198.9%	38.6%	3.7%	3.6%	3.6%	3.4%
2016 and 2017 ERU figures are mid-year average							
County Funds							
County Subsidy - Debt Service on PWTF Loan	513,229	513,229	513,229	513,229	513,229	513,229	-
County Subsidy - Get Connected Loan Program	300,366	300,366	-	-	-	-	-
County Subsidy - Additional Project Costs	-	-	-	-	-	-	-
County Subsidy - Operating Subsidy	135,676	56,438	11,134	-	-	-	-
Monthly Rates							
Volume Rate (per ccf winter average)	$8.66	$ 7.58	$ 7.32	$ 7.29	$ 7.26	$ 7.11	$ 6.84
Monthly Base Charge per ERU	$26.00	$ 31.48	$ 32.79	$ 33.92	$ 33.54	$ 33.98	$ 84.45
Avg Volume Charge/ERU (125 gpd winter avg)	$44.00	$ 38.52	$ 37.21	$ 37.05	$ 36.90	$ 36.14	$ 34.76
Total Monthly Charge/ERU (125 gpd winter avg)	**$70.00**	**$ 70.00**	**$ 70.00**	**$ 70.97**	**$ 70.43**	**$ 70.12**	**$ 119.22**
Increase/(decrease) in monthly rate		*0.0%*	*0.0%*	*1.4%*	*-0.8%*	*-0.7%*	*2.2%*
Total Monthly Charge/ERU (constant 2014 dollars)	*$66.63*	*$65.00*	*$63.42*	*$62.73*	*$60.73*	*$53.44*	*$70.98*
Flat Rate for Properties on Wells (@150 gpd)	$78.80	$77.70	$77.44	$78.38	$77.81	$77.34	$126.17

Note: 2015 is assumed to be the construction year

One message from this table is that without the County's sponsorship and subsidy, the Carlsborg sewer system would not be economically feasible. If the $513,000 in annual debt service on the initial PWTF loan had to be paid by system customers, then customers in 2018 would need to pay an additional $113 per month per ERU, leading to average monthly charges of $183 rather than $70 per month. Even with County support, $70 per month per ERU can be challenging, but at least it is reachable.

The actual rates would be a combination of a fixed monthly charge per ERU and a volume rate per winter average ccf. (The Carlsborg system would have to rely on meter data from the Clallam PUD, which measures water consumption per hundred cubic feet, or ccf.) In 2016, for instance, the average monthly charge of $70.00 per ERU would be comprised of a fixed charge of $26.00 plus a volume rate of $8.66 per winter-average ccf. Monthly water consumption of 125 gallons per day translates into 5.08 ccf per month, and 5.08 x $8.66 equals about $44.00 per month.

Note that the volume rate charged to customers would not be exactly the same as the volume rate charged by Sequim to the Carlsborg system. Because of inflow of surface water and infiltration of groundwater into the system (I&I), the total wastewater delivered to Sequim will exceed the sum of the winter average metered water consumption of the Carlsborg customers, so the volume rate charged to customers will have to be about 3-4% higher than the volume rate paid to Sequim.

Gray & Osborne has estimated that about 24 ERUs within range of the initial sewer line are on well water. Because a flat charge is necessary for these properties (in the absence of meter data), we recommend assuming an amount equivalent to 150 gpd of water use (which is 20% more than the 125 gpd assumed for metered customers), out of recognition that properties on unmetered water (including those on wells) generally consume more water than properties on metered water. In 2016, the flat rate for these properties would be $78.80 per ERU. If the property on well water is a commercial property, some reasonable method will need to be devised to estimate the number of ERUs. This method could be based on fixture units or on comparable business types from other jurisdictions.

F3. RATE SENSITIVITY ANALYSIS

Exhibit 12 and 13 show how the monthly rate is affected by different growth assumptions.

Exhibit 12: Impact of Alternate Growth Scenarios on Monthly Rates

Rate Sensitivity Analysis		2016	2017	2018	2019	2020	2025	2035
Detailed Scenarios								
Total Revenue from Volume Charges		$ 48,044	$ 125,733	$ 168,351	$ 173,846	$ 179,317	$ 209,467	$ 282,411
Base Case Fixed Costs		$ 28,396	$ 102,747	$ 148,329	$ 159,141	$ 162,981	$ 196,927	$ 686,109
Total Rate Revenue Requirement		$ 76,440	$ 228,480	$ 316,680	$ 332,987	$ 342,298	$ 406,394	$ 968,520
Assumed Total Existing Structures within Range of Initial Sewer Lines (ERUs)		484						
Note: 2016 and 2017 ERU projections are average ERUs throughout the year, not year-end ERUs.								
Base Case								
% Connected in first two years	75%							
Converted ERUs - annual growth	1.61%	91	272	369	375	381	412	484
New Development - annual growth	2.15%	-	-	8	16	24	71	193
Total ERUs		**91**	**272**	**377**	**391**	**405**	**483**	**677**
Connection Charge Revenue		$ 91,000	$ 90,500	$ 119,008	$ 121,563	$ 124,173	$ 167,677	$ 268,347
Monthly Base Charge per ERU		$26.00	$31.48	$32.79	$33.92	$33.54	$33.98	$84.45
Avg Volume Charge per ERU		$44.00	$38.52	$37.21	$37.05	$36.90	$36.14	$34.76
Total Monthly Sewer Charge per ERU		**$70.00**	**$70.00**	**$70.00**	**$70.97**	**$70.43**	**$70.12**	**$119.22**
Slower Growth								
% Connected in first two years	50%							
Converted ERUs - annual growth	1.50%	121	242	246	249	253	273	316
New Development - annual growth	1.50%	-	-	4	7	11	32	84
Total ERUs		**121**	**242**	**249**	**257**	**264**	**305**	**401**
Connection Charge Revenue		$ 61,000	$ 60,000	$ 63,586	$ 64,925	$ 66,294	$ 73,578	$ 124,627
Monthly Base Charge per ERU		$45.00	$50.48	$51.79	$52.43	$52.09	$54.31	$144.33
Avg Volume Charge per ERU		$44.00	$38.52	$37.21	$37.05	$36.90	$36.14	$34.76
Total Monthly Sewer Charge per ERU		**$89.00**	**$89.00**	**$89.00**	**$89.49**	**$88.98**	**$90.45**	**$179.09**
Faster Growth								
% Connected in first two years	90%							
Converted ERUs - annual growth	2.00%	218	436	444	453	462	484	484
New Development - annual growth	3.00%	-	-	13	27	41	124	333
Total ERUs		**218**	**436**	**457**	**480**	**503**	**608**	**817**
Connection Charge Revenue		$ 42,000	$ 42,700	$ 35,427	$ 39,312	$ 40,132	$ 44,500	$ 65,653
Monthly Base Charge per ERU		$19.00	$24.48	$25.79	$27.11	$26.45	$26.26	$72.76
Avg Volume Charge per ERU		$44.00	$38.52	$37.21	$37.05	$36.90	$36.14	$34.76
Total Monthly Sewer Charge per ERU		**$63.00**	**$63.00**	**$63.00**	**$64.17**	**$63.35**	**$62.40**	**$107.52**
Very Slow Growth								
% Connected in first two years	35%							
Converted ERUs - annual growth	1.50%	85	169	172	175	177	191	221
New Development - annual growth	1.00%	-	-	2	3	5	15	38
Total ERUs		**85**	**169**	**174**	**178**	**182**	**206**	**259**
Connection Charge Revenue		$ -	$ -	$ -	$ -	$ -	$ -	$ -
Monthly Base Charge per ERU		$69.00	$74.48	$75.79	$75.96	$75.69	$79.62	$221.77
Avg Volume Charge per ERU		$44.00	$38.52	$37.21	$37.05	$36.90	$36.14	$34.76
Total Monthly Sewer Charge per ERU		**$113.00**	**$113.00**	**$113.00**	**$113.01**	**$112.58**	**$115.76**	**$256.54**

Exhibit 13: Summary of Rate Sensitivity Analysis

Rate Sensitivity Analysis		2016	2017	2018	2019	2020	2025	2035
Summary - Total Monthly Charge per ERU								
Base Case		$70.00	$70.00	$70.00	$70.97	$70.43	$70.12	$119.22
% Connected in first two years	75%							
Converted ERUs - annual growth	1.61%							
New Development - annual growth	2.15%							
Slower Growth		$89.00	$89.00	$89.00	$89.49	$88.98	$90.45	$179.09
% Connected in first two years	50%							
Converted ERUs - annual growth	1.50%							
New Development - annual growth	1.50%							
Faster Growth		$63.00	$63.00	$63.00	$64.17	$63.35	$62.40	$107.52
% Connected in first two years	90%							
Converted ERUs - annual growth	2.00%							
New Development - annual growth	3.00%							
Very Slow Growth		$113.00	$113.00	$113.00	$113.01	$112.58	$115.76	$256.54
% Connected in first two years	35%							
Converted ERUs - annual growth	1.50%							
New Development - annual growth	1.00%							

In the critical early years of the Carlsborg utility's existence, the single most important variable that drives the level of rates is the number of ERUs that connect to sewer. If only 35% of the potential initial ERUs are connected, then those "early in" customers who do connect at the outset would see rates averaging $113 per month per ERU. On the other hand, if 90% of the potential initial ERUs are connected, then average rates would be $63 per month. The base case scenario, with an average monthly rate of $70, depends on the assumption that 75% of the potential initial ERUs are connected. The rate sensitivity analysis illustrates the importance of the connection policy to keeping monthly rates manageable.

To see why the rates would be so sensitive to growth, remember that the fixed O&M costs (back at Exhibit 7) are projected to be about $143,000 per year by 2018. In the Base Case Scenario, there would be 377 ERUs connected, which means an average of $32 per month per ERU [$143,000/year ÷ 377 ERUs ÷ 12 months/year] just for the fixed operating costs. If it turns out that there are only 249 ERUs by 2018 (Slower Growth Scenario), then the same $143,000 still has to be paid, but in this case there are fewer customers to pay the bill, and each ERU would have to be pay $48 per month just for fixed operating costs.

If growth turns out to be better than in the base case scenario and there are 457 ERUs by 2018, then the fixed operating costs would cost each ERU only $26 per month. However, if the pace of connections is disastrously slow and only 174 ERUs have connected by 2018 (the Very Slow Growth scenario), then that same $143,000 would cost each connected ERU an average of $68 per month, just for fixed operating costs.

Capital costs are another type of fixed charge, and the level of growth also affects how capital costs are covered. In the first ten years, the base case scenario shows that connection charge income would be sufficient to pay for capital costs, which would consist entirely of the capital cost share to Sequim. However, in this forecast, connection charge income depends primarily on assumptions about growth from new development (rather than properties with existing septic systems). If that growth rate is slower than expected and the difference is wide enough, then the capital costs would need to be funded either by current rates or by issuing debt.

Fortunately, the treatment charge would be a variable cost based on flow, so if there are fewer customers than expected, then the charge to the Carlsborg system would be commensurately less. That is a benefit to Carlsborg customers that comes specifically from the Sequim option. If Carlsborg had its own treatment plant, probably 70-90% of its O&M costs would be fixed. Looking back to Exhibit 2, note that only 17% of direct expenses at the Sequim treatment plant consist of chemicals and electricity (which are variable costs); the remaining 83% of its costs are relatively fixed.

F4. CONNECTION CHARGE

Exhibit 14 shows the calculation of the connection charge at two points in time, 2015 and 2025. The difference between them can be used to create an average percentage increase each year for the next ten years.

Exhibit 14: Connection Charge Calculation

Connection Charge 2015	Calculations	Notes
Capital Projects (2013 Dollars)	$ 17,303,317	*Total capital costs 2015-35*
Inflation to Convert to 2015	$ 1,232,429	*Adds two years of inflation to escalate to system construction year*
Capital Projects (2015 Dollars)	$ 18,535,746	
Estimated ERUs	2,324	*Projected ERUs in 2050, per G&O Nov 19, 2013 Tech Memo, Table 8*
Calculated Connection Charge 2015	$ 7,976	*Connection charge per ERU in 2015*
Assume payments to Sequim included in cost basis for connection charge?	Yes	
Projected Connection Charge 2025	**Calculations**	**Notes**
Existing Cost Basis		
Existing Assets as of 2025	$ 13,761,435	*Cost of assets to be constructed between 2015 and 2024, in nominal dollars*
Plus: Accrued Interest on Existing Assets		
Weighted Average Interest Rate	1.69%	*$10M with 0.25% , $4M with 5.30% (1/30/14 Bond Buyer Revenue Bond Index)*
Accrued Interest - Up to 10 Years	$ 2,267,489	*Interest on Existing Assets per RCW 35.92.025 (Up to 10 Years of Interest)*
Total Existing Cost Basis	$ 16,028,924	
Future Cost Basis		
Planned Capital Projects (2025 Dollars)	$ 6,893,483	*Carlsborg capital projects planned but not yet built as of 2024*
Total Cost Basis	$ 22,922,407	
Projected ERUs	2,324	*Projected ERUs in 2050, per G&O Nov 19, 2013 Tech Memo, Table 8*
Projected Connection Charge 2025	$ 9,863	*Connection charge per ERU projected for ten years after system construction*
Average Annual Increase 2015-2025	2.15%	*This factor can be used to escalate connection charge each year until 2025*

For the 2015 snapshot, the calculation is simple: future capital costs divided by future ERUs. The numerator in this calculation is the cost basis, or the total amount planned to be invested by the County in the Carlsborg system through 2035. Expressed in 2015 dollars, the estimated cost basis is about $18.5 million, using Gray & Osborne cost projections. The denominator is the number of ERUs projected in 2050, following the Gray & Osborne forecast, which is 2,324 ERUs. The cost basis divided by the total projected ERUs is $7,976 per ERU, which represents the projected unit cost of capacity in 2015 dollars. In choosing a time horizon for ERUs (2050) that is longer than the cost basis (through 2035), we are intentionally being conservative by assuming that the assets built through 2035 will provide capacity in advance of actual growth.

The approach to the 2025 projected snapshot is similar, except that by 2025, some of the costs will have been in the past and other costs will still lie in the future. Consistent with State law and typical professional practice in Washington, we assume that previously invested assets can accrue interest for up to ten years. For example, the initial system construction would be ten years old in 2025, so we have added ten years of accrued interest to its estimated 2015 cost. On the other hand, capital costs incurred in 2024 would only have one year of accrued interest. In the 2025 projected snapshot, future capital costs are expressed in 2025 constant dollars. Based on existing and future capital costs totaling $22.9 million, divided by Gray & Osborne's projection of 2,324 ERUs in 2050, the projected 2025 connection charge would be $9,863 per ERU. This represents an average annual growth of 2.15% in the connection charge.

In order to create a schedule of connection charges between 2015 and 2025, the 2.15% annual escalation factor is applied to the 2015 charge of $7,976. Although the connection charge is initially calculated based on a 2015 snapshot, the system will not actually be completed and available for connection until 2016, so the first connection charge that would apply to new development would be $8,147 per ERU in 2016. This is shown in Exhibit 15.

Exhibit 15: Schedule of Recommended Connection Charges

Recommended Connection Charge Schedule Through 2025						
10-Year Average Annual Increase				2.15%		
		2015	2016	2017	2018	2019
Connection Charge 2016-19		$ 7,976	$ 8,147	$ 8,322	$ 8,501	$ 8,683
	2020	2021	2022	2023	2024	2025
Connection Charge 2020-25	$ 8,869	$ 9,060	$ 9,254	$ 9,453	$ 9,656	$ 9,863

Should the capital cost share and capacity charges paid to Sequim be included in the cost basis for the connection charge?

We believe that the capital payments to Sequim are a defensible capital expenditure and should be included in the cost basis for the Carlsborg connection charge. Under the definitions in Governmental Accounting Standards Board (GASB) Statement 51, the contractual right to discharge wastewater can be booked as an intangible asset, recorded in the same way as water rights. The capacity charge and future capital cost share payments are required in order to secure that right, and they are based on underlying capital expenditures made by the City. For the City, payments from Carlsborg should be considered contributed capital and deducted from the cost basis of the City connection charge, so the investment would not be double-counted. For those reasons, the financial plan includes the Sequim capital payments in the capital cost basis for the connection charge.

However, the County should seek legal advice about this question. If the County were to exclude the Sequim payments from the cost basis, the 2016 connection charge would be $6,921 per ERU, a difference of $1,226 from the 2016 charge shown in the financial plan. Without the Sequim payments, the 2025 charge would be $8,408 per ERU, a difference of $1,456 from the 2025 charge with the Sequim capital payments included.

F5. COMPARISON WITH SEQUIM RETAIL RATES AND CONNECTION CHARGES

Exhibits 16 compares the projected Carlsborg connection charges with those adopted by the City of Sequim for the years 2016-2018.

Exhibit 16: Connection Charge Comparison with Sequim

Rate and Connection Charge Comparison	2016	2017	2018
Connection Charge			
Carlsborg Projected			
Existing Structures	$ 500	$ 500	$ 8,501
New Development	$ 8,147	$ 8,322	$ 8,501
Sequim			
In-City	$ 8,550	$ 8,800	$ 9,050

During this period, projected Carlsborg connection charges are about $400-$550 less per ERU than comparable Sequim connection charges.

Exhibit 17 compares the projected Carlsborg monthly rates with retail rates adopted by the City of Sequim for the years 2016-2018.

Exhibit 17: Rate Comparison with Sequim

Rate and Connection Charge Comparison	2016	2017	2018
Monthly Sewer Charges per ERU			
Carlsborg (assuming 5.08 ccf/month winter avg)	$70.00	$70.00	$70.00
Carlsborg (assuming 8 ccf/month winter avg)	$95.25	$92.11	$91.36
Sequim In-City			
Low Volume SF Res (<8 ccf/mo winter avg)	$62.25	$64.74	$67.33
High Volume SF Res (>8 ccf/mo winter avg)	$72.23	$75.12	$78.12
Sequim Out-of-City (assuming 1.15 multiplier)			
Low Volume SF Res (<8 ccf/mo winter avg)	$71.58	$74.45	$77.42
High Volume SF Res (>8 ccf/mo winter avg)	$83.06	$86.39	$89.84
Carlsborg % Over Sequim In-City Rates			
Low Volume	12%	8%	4%
High Volume	32%	23%	17%
Carlsborg % Over Sequim Out-of-City			
Low Volume	-2%	-6%	-10%
High Volume	15%	7%	2%

The Carlsborg monthly rates have a significant volume-related component, so the comparison with Sequim rates depends on how much volume a given customer generates. For most customers, however, Sequim inside-City rates are less than what a Carlsborg customer would be charged.

Sequim has a two-tiered flat rate for single-family customers, based on whether the winter average volume is greater or less than 8 ccf per month. The low-volume rate for inside-City customers is $62.25 per month growing to $67.33 per month by 2018, while the Carlsborg rate (assuming the typical winter average volume of 5.08 ccf per month) is projected to be $70.00 during that time period. For Sequim customers using more than 8 ccf per month, the monthly flat charge goes up to $72.23 in 2016 (increasing further to $78.12 in 2018); however, by the time a customer's volume in Carlsborg gets to 8 ccf per month, the monthly charge would be over $90. Only at lower-than-average volumes are Carlsborg rates less than the Sequim inside-City charges. In 2016, a Carlsborg customer would have to generate less than 4.2 ccf per month in order to pay less than a Sequim inside-City customer.

Once the Sequim out-of-City multiplier is applied, however, the comparison changes. Even with the multiplier at only 1.15 (which is what we are assuming for Carlsborg customers instead of the City's standard multiplier of 2.0), a Carlsborg customer using the assumed standard amount of water would be paying less than if that same customer were to pay Sequim retail rates plus the multiplier. The Carlsborg charges are still sensitive to volume, and a high-volume customer would still pay more in the Carlsborg system, but the gap narrows considerably by 2018.

In summary, Carlsborg connection charges would be somewhat lower than Sequim, while Carlsborg monthly rates are generally higher than Sequim, but the difference is not dramatic for either type of charge. Assuming the base case scenario, projected Carlsborg rates and connection charges are in the same ballpark as the rates and charges that Sequim residents are required to pay. That is a clue that the rates projected in this financial plan are in the reasonable range for Carlsborg customers, as long as the ERU estimates hold up.

G. UNCERTAINTIES IN FORECAST

There are several uncertainties in the forecast worth noting here as a caveat.

Interlocal Agreement – The costs payable to Sequim are subject to an interlocal agreement between the Clallam County Board of Commissioners and the Sequim City Council. We believe that they are reasonable and fair, but until both parties agree to them, some of the key assumptions on which this financial plan rests will remain uncertain.

Capital and Operating Costs – As we mentioned earlier, construction project costs can vary noticeably from estimates due to fluctuations in the business cycle and bidding climate. Ongoing O&M expenses are another point of uncertainty.

Effectiveness of Connection Policy – In the next section, we will be discussing our recommended connection policy, which is designed to maximize the odds that existing septic properties within 200 feet connect to the new sewer line. However, the effectiveness of that recommended policy will not be known until it is tried. We do not know the age or condition of the existing septic systems within range of the sewer line, nor do we know how effective the recommended incentives would be at prompting connections from properties that would not be required to connect.

Growth Assumptions – Growth assumptions in general are a key uncertainty, not just growth from existing septic parcels but also from new development. Connection charge revenue is driven by the pace of new development, and the financial plan depends on connection charge revenue to pay most of the new system's capital costs for the first ten years. If growth from new development is slower than expected, those capital costs would need to be covered either from monthly rate revenue or by borrowing.

Implementation of ERUs – A high proportion of the 484 potential initial ERUs comes from commercial properties. Gary & Osborne's estimate is that there are only 78 existing single-family properties within 200 feet of the initial sewer line. The other 406 potential initial ERUs consist of commercial properties. For that reason, the relative water consumption between residential and commercial is a significant factor, particularly in the implementation of the project, where planning estimates have to give way to the actual assignment of ERUs to particular properties. The number of actual ERUs can be different from the planned ERUs, and that difference can have an impact on the actual monthly fixed rates per ERU.

In the implementation of the new sewer system, a method is needed to determine the actual number of ERUs for which a given commercial property will be charged. We suggest that during 2015, while the initial sewer line is being constructed, an updated analysis of metered water consumption be conducted for existing properties that are connected to the Clallam County PUD water system. This analysis should examine a three-year history of off-peak metered water consumption for each parcel in detail, including whether a given structure was vacant during part of that time, whether some of its water was for "consumptive use" (that is, not returned to the sewer system, as in a water bottling plant), whether there are multiple businesses or lease tenants sharing a common water meter, whether there are multiple structures on the same legal parcel, the type of business (or each business type if there are multiple tenants), the number and types of plumbing fixtures, and other details about the property that will help the County assign the appropriate number of ERUs to each metered structure and to similar structures that might not have metered water service. The analysis should also update our estimate of residential winter-average water use.

This updated analysis should be used to assign actual ERUs to individual properties, which will determine their connection charges and the fixed component of their monthly rates. In addition, it should be used to help develop guidelines for the assignment of ERUs to unmetered commercial

properties (such as those on well water) or newly developed commercial structures, for which metered water data is not available.

The assumption in this financial plan is that an ERU—the average single-family residential water consumption during off-peak months—is 125 gallons per day. However, this ERU definition is based on old water records, from 2005. The estimate of 484 potential initial ERUs is based on the same 2005 data. In most places, water consumption has been declining since 2005, so one question for this updated analysis is: how much water conservation has there been since 2005 among single family households in Carlsborg, and how does that relate to the water conservation from businesses during that same time period? One of the main purposes of an ERU is to create a *scale* for commercial water demand, so that we can spread out costs equitably between residential and commercial customers. If it turns out that commercial properties have been conserving water since 2005 more than the average residential customers, then the total number of initial potential ERUs will be lower than currently forecasted. This will raise the per-ERU rate, which has the effect of raising charges for residential and reducing overall charges to commercial. The opposite is also possible. If residential properties have been conserving water more aggressively than commercial since 2005, then there will be a higher number of initial potential ERUs, leading to a lower per-ERU rate, lower charges for residential, and higher charges for commercial. Either way, the money has to come from one or the other group of customers to cover the fixed costs of the system.

The updated analysis should also include data about the meter size of each structure connected to the PUD water system, and based on that data, the County can consider whether to define commercial ERUs based on the standard meter-capacity-equivalents published by the American Water Works Association. Basing a sewer ERU on water meter-equivalents is conceptually less satisfactory than basing it on estimated flows, because meter capacity is a direct measure of the capacity required of a water system but only indirectly related to the capacity required of a sewer system. However, meter-equivalents are easy to measure, and they do not change from one year to the next. If after an updated estimate, flow-based ERUs turn out to be not too different from what would be implied by the meter-equivalent method, then the County could consider changing the basis of its charges to meter-equivalence. Lacking meter data at this point, the financial plan assumes a sewer ERU based on 125 gpd of domestic flow.

H. CONNECTION POLICY

We have noted that for the financial viability of the new system, a crucial variable is the number of ERUs connected during the initial connection period. In seeking initial ERUs, the County faces competing goals. On the one hand, there is a natural desire to allow property owners to choose whether and when to connect, since connection represents such a high cost to them, both up-front and on an ongoing basis. On the other hand, the County must plan for a financially solvent sewer system and be fair to the "early in" property owners who connect as soon as sewer service is available. This section contains a recommended connection policy that is intended to balance those two objectives, giving property owners some amount of choice but avoiding extremely high initial rates.

H1. CONNECTION REQUIREMENT

In order for this new system to "scale up" successfully, the connection policy needs to have both "push" and "pull," both *legal requirements* and *financial incentives*.

Our recommended *legal requirement* has two parts, one for properties within the Initial Connection Area and one for properties outside of the Initial Connection Area.

1. Once sewer service is within 200 feet of any part of a given parcel, the property must connect within one year unless (a) it has been less than 20 years since the existing septic system has

been constructed or substantially renovated, and (b) the septic system meets current standards, including being designed to remove 50% of nitrates. After a septic system (including substantial renovations to it) becomes more than 20 years old or fails to meet current standards, connection is required.

2. Subject to the hardship exception described below in 2(b), if an existing septic system fails or new development is proposed for an area farther away than 200 feet from existing sewer service, then the property owner must pay to extend the sewer line, and the property must be connected, provided that:

    a. The property owner(s) who extend a line can enter into development reimbursement agreements with the County and receive latecomer fees from subsequent connections for up to fifteen years (per State statute); and

    b. As a hardship exception, the County may allow the installation of a new septic system if the cost of extending the line would be over 125% of the cost of an approved septic system, and if the property owner signs a nonprotest agreement for a future ULID to extend the sewer line. The suggested criterion for the hardship exception is the same as the criterion for the County's sewer system in the East Port Angeles UGA.

Allowing property owners within the Initial Connection Area to amortize their existing septic systems for 20 years seems fair, since septic systems are such a large capital investment for any property. At the same time, the 20-year limit is important because it conveys to property owners the crucial message that "this cannot keep going on forever—sooner or later, I will have to connect." That realization is a psychologically important step. Once the property owner acknowledges the reality that he will eventually have to connect, then the financial incentives can provide motivation to do it now rather than later.

H2. INCENTIVES

In addition to a legal requirement, the connection policy needs to contain a *financial incentive* that prompts property owners to connect now even if they could choose to wait. The County has already created a major financial subsidy, since the County has committed to paying the debt service for the construction of the initial collection system, and extension of a sewer line is normally the type of cost that is paid for by developers or property owners. However, that subsidy is available to all property owners within the Initial Connection Area, regardless of whether they connect immediately or choose to wait, and regardless of whether it is an existing septic parcel or new development.

In order to create an incentive for connection sooner rather than later, we recommend a septic disconnection credit that would be designed to effectively reduce the connection charge to $500 per ERU. This septic disconnection credit would apply only to properties with existing septic systems and only for the first two years after sewer is available, during the Initial Connection Period (assumed here to be 2016 and 2017). The impact of the septic disconnection credit is shown in Exhibit 18.

Exhibit 18: Recommended Connection Charge Schedule with Septic Disconnection Credit

Recommended Connection Charge Schedule with Septic Disconnection Credit					
10-Year Average Annual Increase			2.15%		
	2015	2016	2017	2018	2019
Connection Charge 2016-19	$ 7,976	$ 8,147	$ 8,322	$ 8,501	$ 8,683
Less: Septic Disconnection Credit		(7,647)	(7,822)	-	-
Net Charge for Existing Septic Properties		$ 500	$ 500	$ 8,501	$ 8,683
	2020	2021	2022	2023	2024	2025
Connection Charge 2020-25	$ 8,869	$ 9,060	$ 9,254	$ 9,453	$ 9,656	$ 9,863

The septic disconnection credit would apply to all existing septic properties within the Initial Connection Area that are connected within two years, including those properties that would have to be connected anyway because their septic systems are more than 20 years old. In part, the septic disconnection credit is an acknowledgement that properties with functioning septic systems that are connected to a public sewer system are having the useful life of the septic systems shortened. While the credit is not an exact, dollar-for-dollar compensation for the reduced value of a septic system (which would vary from one property to another), it does generally recognize that there is a loss of economic value, and it seems fair to acknowledge that loss in the pricing of the initial connection charge.

At the same time, the septic disconnection credit directly responds to the public purpose in the creation of the Carlsborg sewer system, which is to prevent pollution by discontinuing the use of septic systems within urban growth areas. It does not apply to new development, because a newly developed structure does not contain a septic system that needs to be disconnected.

The two-year limit on the septic disconnection credit is what makes it effective as a timing incentive. Because of the credit, property owners will be able to go through the decision-making calculation illustrated in Exhibit 19, based on a hypothetical property owner with one ERU, average water usage, and the option of waiting for ten years before connecting.

Exhibit 19: Property Owner Decision-Making Example

Property Owner Decision-Making Example		
Hypothetical Case - 1 ERU:		
Based on age of septic system, could wait until 2025.		
Cost of side sewer & septic decommissioning is $3,000.		
Connection charge up-front is $500.		
Connection charge in 2025 would be $9,863.		
Assumed average monthly sewer charge is $70/month.		
Assume inflation for private plumbing costs is 3% per year.		
Cost to Customer	Connect in 2015	Connect in 2025
Connection charge	$ 500	$ 9,863
Private plumbing costs	3,000	4,032
Monthly sewer bills for ten years	8,400	-
Total Cost to Customer	$ 11,900	$ 13,895
Savings from connecting in 2015	$ 1,995	

In this hypothetical example, the property owner can compare the cost of connecting in 2015 – along paying monthly sewer bills for the following ten years – with the cost of connecting in 2025, with no septic disconnection credit. Because the connection charge and private plumbing costs would keep increasing each year, and because connecting in 2025 would mean foregoing the deep discount on the

connection charge, this property owner would save almost $2,000 from connecting sooner rather than later.

Even if the margin of savings is narrower—for example, if the property owner expects to be able to wait for 15 years—the fact that there is always uncertainty about when a given septic system might fail adds to the property owner's incentive to take the plunge sooner rather than later. A person might think that a septic system will last for another fifteen years, but if it then failed after only five years, the property owner would need to connect right then, paying full price on the connection charge. The risk of earlier-than-expected failure is eliminated if a property owner opts to connect as soon as sewer service is available.

The septic disconnection credit is a particularly powerful incentive for commercial property owners. In a typical sewer ULID project, there are three types of costs that a property owner has to pay: the sewer extension, the connection charge, and the private plumbing costs (private lateral and septic decommissioning). In this case, the County is paying for the sewer extension (at least in the Initial Connection Area), the septic disconnection credit reduces the connection charge to a relatively small amount, and the only remaining cost is the private plumbing costs. But the private plumbing costs are approximately the same for any given size parcel, regardless of whether the occupant is a single family home or a large business. By minimizing the connection charge as an up-front cost to a business, the County would be making it relatively easy for commercial property owners to connect. That increases the likelihood that the system can reach 377 ERUs by 2018, as projected in our Base Case Scenario, which improves the odds that the initial monthly charges will average $70 per ERU per month.

While the septic disconnection credit is assumed in the financial forecast to apply only to existing septic properties in the Initial Connection Area, it logically could be applied to future connections of septic parcels that right now are beyond the range of the initial connection system. For example, the policy could be written so that all parcels with septic systems existing as of 2015 would qualify for a net connection charge (after the septic disconnection credit) of $500 if they are connected within two years after sewer service is available within 200 feet of that property. In our modeling, we have not focused on existing septic systems outside of the Initial Connection Area, so we do not have a projection of the foregone revenue from such a policy. However, we do know that this approach would be consistent with the underlying policy rationale for the septic disconnection credit, and it would put all existing septic parcels on equal footing.

I. SUMMARY OBSERVATIONS

Following are some summary observations about the Carlsborg sewer system based on the results of the Financial Plan.

- It is a new system, with high cost and uncertainties.
- Its economic feasibility depends on County sponsorship and subsidies.
- The Sequim option carries a cost: the 25% markup on operating charges. However:
    - The 25% markup is on top of costs that reflect economies of scale. There is no guarantee that a separate Carlsborg treatment plant would cost less than Sequim with a 25% markup.
    - Most significantly, the Sequim option reduces the Carlsborg growth risk by converting the treatment function from a very large fixed cost into a variable cost. This is especially valuable in the first 10-15 years, when the Carlsborg system is most vulnerable financially.

- Under the base case scenario, the average monthly charge would be about $70 per ERU through the first fourteen years of the forecast.
- However, this depends on 75% of the potential initial ERUs connecting in the first two years; the monthly rate is very sensitive to the number of ERUs.
- Therefore, the connection policy needs to have both legal requirements and financial incentives, in order to balance the goal of property owner choice against the goal of fairness to the "early in" customers.
- We recommend a connection requirement tied to the age and condition of the septic system, so that a property with a septic system meeting current standards and less than 20 years old could wait for connection until the 20-year point or septic system non-compliance, whichever comes first.
- We recommend a septic disconnection credit for existing septic properties that are connected within the first two years after sewer availability, sufficient for the net connection charge to be $500 per ERU.
- For all new development, and for septic parcels in the Initial Connection Area that are connected after the 2-year Initial Connection Period, we recommend a connection charge of $8,147 in 2016, escalating by 2.15% per year.
- We recommend that during 2015, an updated analysis of metered water consumption be undertaken within the Carlsborg UGA, with a particular focus on properties in the Initial Connection Area. The purpose of this analysis would be to (a) assign the appropriate number of ERUs to each commercial property within the Initial Connection Area, and (b) to help develop guidelines for the assignment of ERUs to properties on wells and to newly developed properties, for which metered water data is not available.

APPENDIX I

INTERLOCAL AGREEMENT BETWEEN CLALLAM COUNTY AND SEQUIM

INTERLOCAL AGREEMENT FOR CARLSBORG WASTEWATER DISPOSAL

This Agreement ("Agreement") pursuant to RCW 39.34, the Interlocal Cooperation Act, is made by and between City of Sequim, a Washington municipal corporation ("City"), and Clallam County, a political subdivision of the State of Washington ("County") (individually a "Party" and collectively the "Parties"). In consideration of the terms and conditions set forth in this Agreement, the Parties agree as follows:

Section 1. Recitals

1.1 The City owns and operates a wastewater collection and treatment system ("City System"), including a Wastewater Reclamation Facility ("WRF"), and is authorized pursuant to RCW 35.67.020(1) to provide sewer service to customers and properties located both within and outside of the city limits.

1.2 The County, under its authority granted in RCW 36.94, intends to construct, own, and manage a wastewater collection system ("Carlsborg System") located in the Carlsborg Urban Growth Area, which is located in Clallam County near the City of Sequim.

1.3 The City's WRF currently has available capacity, and the City desires to accept wastewater flows from the Carlsborg System.

1.4 The County has evaluated its options for treating and disposing of wastewater from the Carlsborg System and finds that, given the charges set forth in this Agreement, the most cost-effective method is to discharge the wastewater into the City System and have it be treated by the City's WRF.

1.5 City and County representatives have met and discussed the discharge of wastewater from the Carlsborg System into the City System, including the charges that should be paid by the County to the City for the right to discharge. Both parties are in agreement that the charges, terms and conditions set forth in this Agreement are reasonable and equitable.

1.6 It is the purpose of this Agreement to provide for long-term wastewater disposal, planning and certainty for both the City and the County.

1.7 The Parties now desire to enter into an interlocal agreement pursuant to RCW 39.34, the Interlocal Cooperation Act, for the disposal of wastewater from the Carlsborg System.

Section 2. Definitions

2.1 "Agreement" means this document.

2.2 “Average Carlsborg Transmission Percentage” means the weighted average of the Carlsborg Transmission Percentages, based on the length of each segment of pipe along the Transmission Route. The Average Carlsborg Transmission Percentage set forth in Exhibit A is assumed for the purposes of this Agreement, unless and until that percentage is updated pursuant to Section 5.1.2(c).

2.3 "Biochemical Oxygen Demand" or "BOD" means the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures during five (5) days at twenty (20) degrees Celsius, expressed as a loading in lbs/day.

2.4 “Capacity Charge” means an up-front payment by the County to the City for the right to discharge a given amount of Wastewater, or a given incremental increase in the amount of Wastewater, into the City System.

2.5 “Capacity Percentage” means the Capacity Reservation divided by the total rated flow capacity of the WRF, measured as a percentage of maximum monthly flow. When determining the Carlsborg Cost Share for capital projects that expand WRF flow capacity, Capacity Percentage means the Capacity Reservation after WRF expansion divided by the total rated flow capacity after WRF expansion.

2.6 "Capacity Reservation” means the maximum Carlsborg Flows that may be discharged to the City System in a given calendar year, as measured by Maximum Monthly Flow in gallons per day (gpd), as updated pursuant to Section 3.4.2.

2.7 “Capital Cost Share” means a required payment from the County to the City toward the cost of capital improvements to the WRF, the Transmission Route, or the City Collection System as a whole, where the capital cost is incurred after December 31, 2013.

2.8 "Carlsborg Flow" or "Carlsborg Flows" mean the actual volume of Wastewater through the Sewer Meter in a given period of time.

2.9 “Carlsborg System” means the sewerage system consisting of a sanitary sewer collection system, sewage trunk lines, sewer pumping stations, and appurtenances owned, operated, and maintained by the County in the Carlsborg Service Area, including a force main extending to the Point of Delivery.

2.10 “Carlsborg Service Area” means the Carlsborg Urban Growth Area as presently designated or as modified in the future.

2.11 “Carlsborg Transmission Percentage” means the projected Carlsborg Flow in gallons per minute gpm, peak hourly, as a percentage of projected total Wastewater flow (gpm, peak hourly) through any given segment of pipe along the Transmission Route. The Carlsborg

Transmission Percentages set forth in Exhibit A are assumed for the purposes of this Agreement, unless and until those percentages are updated pursuant to Section 5.1.2(c).

2.12 "City" means the City of Sequim, a Washington municipal corporation existing and operating pursuant to Title 35 Revised Code of Washington.

2.13 "City Collection System" means the City-owned sanitary sewer trunk lines, laterals in City right-of-way, lift stations, and force mains through which sewage flows to the WRF, including manholes and other appurtenances but not including the WRF.

2.14 "City Service Area" means the current sewer service area boundary of the City, and as such boundary may be modified and amended in the future.

2.15 "City System" means the City Collection System plus the WRF.

2.16 "City Wastewater Source Control Program" means regulations, policies and procedures adopted by the City for the pretreatment of wastewater discharged into the City System, currently set forth in Sequim Municipal Code 13.48, and as such regulations, policies and procedures may be modified, amended, repealed and superseded by the City.

2.17 "County" means Clallam County, a political subdivision of the State of Washington organized, existing and operating pursuant to Title 36 Revised Code of Washington.

2.18 "DOE" means the Washington State Department of Ecology.

2.19 "Domestic Wastewater" means water carrying human wastes, similar in character and volume to wastewater generated from single and multifamily residences and permanent mobile home courts.

2.20 "FOG" means wastewater whose components of fats, oils and grease are subject to measurement by the methods described in Standard Methods of Examination of Water and Wastewater, 20th Edition, 1998, Section 5520, or latest edition; the term "fats, oils and grease" shall include polar and non-polar fats, oils and grease.

2.21 "High Strength Waste" means any water or wastewater having a concentration of BOD, TSS, or FOG in excess of the domestic concentration thresholds set forth in the City Wastewater Source Control Program.

2.22 "Industrial Wastewater" means water or liquid-carried waste from any industry, manufacturing operation, trade, business, or commercial establishment and public use facilities which includes process wastewater, cooling water, contaminated stormwater, contaminated leachates, or other waters in some combination such that the combined effluent differs in some way from Domestic Wastewater, or is subject to regulation under (a) Federal Categorical

Pretreatment Standards ("Standards"), (b) the State Waste Discharge Permit Program ("WDP Program"), or as such Standards and WDP Program may be updated, modified or amended.

2.23 "Inflow and Infiltration" or "I&I" means water that enters the sewer system from the outside environment, not from domestic or industrial structures. "Inflow" means surface water that enters the wastewater system from yard, roof and footing drains, from cross-connections with storm drains, downspouts, and through holes in manhole covers; "infiltration" means infiltration of groundwater that is influenced by surface or sea water, that enters sewer pipes, interceptors, collectors, manholes, or side sewers through breaks, holes, joint failures, connection failures and other openings.

2.24 "Initial Capacity Charge" means the Capacity Charge to be paid when the Carlsborg System is first connected to the City System.

2.25 "Initial Capacity Reservation" means the Capacity Reservation in effect upon initial connection of the Carlsborg System to the City System and thereafter, until updated pursuant to the procedure set forth in Section 3.4.2.

2.26 "Maximum Monthly Flow" ("MMF") means the total flow of sewage in gallons divided by the total number of days in that month during which the greatest volume of flow occurs, in any given calendar year, expressed in gallons per day (gpd).

2.27 "Net Book Value" means the original cost of a capital asset, less the portion of the cost funded by contributed capital such as grants, less accumulated depreciation on the non-contributed portion.

2.28 "O&M Markup" means an amount that is added to the cost basis for the two types of O&M charges set forth in Section 5.1, to account for the City Business & Occupation Tax and an out-of-City multiplier. The O&M Markup is equal to twenty-five (25%) of the cost basis. There is no similar markup for the Capacity Charge or Capital Cost Share.

2.29 "Point of Delivery" means the boundary at which wastewater originating in the Carlsborg System is conveyed into the City System, located in proximity to 1453 West Washington Street within the City, as shown in Exhibit A. All sewer lines upstream of the Point of Delivery are the responsibility of the County.

2.30 "Sewage" or "Wastewater" means water-carried human wastes or a combination of water-carried wastes from residences, business buildings, institutions, industrial establishments and public use facilities, together with such I&I as may be present.

2.31 "Sewer" means any pipe, conduit ditch, or other device used to collect and transport sewage from the generating source to the Wastewater Reclamation Facility.

2.32 "Sewer Meter" means a sewer flow meter, including a vault, sample port, and electronic equipment to allow remote meter reading, through which Carlsborg Flows shall enter the City System.

2.33 "Total Suspended Solids" or "TSS" means the total suspended matter that floats on the surface of, or is suspended in, water, wastewater, or other liquid, and which is removable by laboratory filtering, expressed as a loading in lbs/day.

2.34 "Transmission Route" means the linear path of City Sewer pipes, including manholes and related facilities, through which Carlsborg Flows are primarily conveyed from the Point of Delivery to the City WRF, as shown in Exhibit A. The Transmission Route does not include any sewage lift stations.

2.35 "Wastewater Reclamation Facility" or "WRF" means the City's wastewater treatment and reclamation plant located at 247 Schmuck Road, Sequim, Washington, along with its appurtenant headworks, marine outfall, and water recycling facilities.

Section 3. Delivery and Acceptance of Wastewater

3.1 Wastewater Delivery. The County shall deliver to the City, not to exceed the Capacity Reservation, the Wastewater collected by the Carlsborg System, and the City shall accept and treat the Carlsborg Flows in accordance with the terms of this Agreement.

3.2 Wastewater Metering. The County shall deliver the Wastewater to the City at the Sewer Meter, which the County shall construct at the County's sole expense at the Point of Delivery. Upon completion of construction, the County shall transfer to the City ownership of the Sewer Meter, including any warranties or sureties, after which the City shall operate and maintain it at the City's sole expense.

3.3 Initial Capacity Reservation. The Initial Capacity Reservation is one hundred five thousand (105,000) gallons per day (Maximum Monthly Flow).

3.4 Future Updates to Capacity Reservation.

3.4.1 Planning Basis for Capacity Reservation. The intent of the Parties is that the Capacity Reservation be based on a long-term demand forecast for the Carlsborg System, so that the Carlsborg System has reserved capacity sufficient to accommodate between ten and twenty years of planned growth at any given time. The choice about how much treatment capacity to request is at the sole discretion of the County, and the choice about whether to grant the requested level of capacity is at the sole discretion of the City. Both parties must be reasonable in exercising their discretion.

3.4.2 Process for Updating Capacity Reservation. At five-year intervals, the County shall assess the projected level of demand from the Carlsborg System, and the City shall assess the total projected demand for the WRF. Based on the Carlsborg demand forecast, the County shall determine whether the Carlsborg System has sufficient reserved treatment capacity to accommodate its projected future growth. If the County requests a change in the Capacity Reservation and the request is granted by the City, with approval from their respective legislative bodies, the incremental change and the revised Capacity Reservation shall be documented in a joint memorandum signed by the managers responsible for the Carlsborg System and the City System, such memorandum to be appended to the Agreement. The Capacity Percentage shall thereby be updated to reflect the new percentage of WRF capacity committed to the Carlsborg System, and the County shall pay the appropriate Capacity Charge on the incremental Capacity reservation.

3.4.3 Plan for Maintaining Adequate Capacity Reservation. Even if it has been less than five years since the most recent demand forecast, if the Carlsborg Flow exceeds eighty-five percent (85%) of the Capacity Reservation, the County shall update the Carlsborg demand forecast and submit a plan to the City for continuing to maintain adequate treatment capacity, potentially including a request for additional Capacity Reservation.

3.4.4 Reductions in Capacity Reservation. If the City requests a reduction in Capacity Reservation and the County agrees, then the City shall pay the County a Capacity Refund Payment. As illustrated in Exhibit C, the Capacity Refund Payment shall be based on the then-current Net Book Value of the capital assets previously funded by Capital Cost Shares and the then-current Net Book Value of the pre-2014 assets included in previously paid Capacity Charges, the sum divided by the then-current WRF total capacity (in gpd) and then multiplied by the change in Capacity Reservation (in gpd).

3.5 High Strength Waste and Industrial Wastewater. The City agrees to accept and treat High Strength Waste and Industrial Wastewater from the Carlsborg System; however, the City shall have the right to regulate and control the conditions under which High Strength Waste and Industrial Wastewater is accepted into the City System.

3.5.1 Pretreatment Requirements for Carlsborg Customers. The County shall adopt and implement a pretreatment program for Carlsborg System customers discharging High Strength Waste or Industrial Wastewater, with requirements at least as stringent as what the City Wastewater Source Control Program requires of City System customers. The County pretreatment program may include requirements to install on-site pretreatment facilities, adopt specified wastewater management practices, monitor wastewater flows from particular customers, be subject to inspections by County or City pretreatment staff, and/or pay fees for retreatment program administration and lab testing. The County shall not accept into the Carlsborg System hauled waste discharges, including discharges from septic haulers.

3.5.2 County Responsible for Carlsborg High Strength Waste and Industrial Wastewater. The City shall be responsible for testing at its own expense the BOD, TSS, FOG, and other regulated characteristics of the Carlsborg Flows at the Point of Delivery. The County shall be responsible for any violations of the City Wastewater Source Control Program or DOE permit requirements resulting from Carlsborg Flows. A pattern or practice of violations by the County of the City Wastewater Source Control Program or DOE permit requirements for high strength waste or industrial wastewater may be considered grounds for the City to terminate the Agreement, with ten (10) years advance written notice.

3.6 County Access to Reclaimed Water from Sequim Water Reclamation Facility.

3.6.1 Statement of Intent. Both parties recognize that the County is contributing to the effluent flows at the WRF. The reclaimed water generated by the WRF offers a resource that is valuable to the region and may be of interest to the County in the future. Nothing in this Agreement requires the City of Sequim to have reclaimed water that meets the standards or volumes needed for upland or aquifer recharge. The City shall have the choice of which wastewater treatment standard to apply and may base this decision on many factors, including but not limited to State regulations, discharge permit conditions, cost to produce reclaimed water, market demand for reclaimed water, WRF operating constraints, upset plant conditions, and/or distribution system constraints.

3.6.2 County Right to Acquire Reclaimed Water. Prior to the City selling or committing reclaimed water to other customers or for mitigation projects, the County will have a right of first refusal to purchase a quantity of reclaimed water equal to the amount of Carlsborg Flows, as measured at the Sewer Meter. The County will have ninety (90) calendar days to formally commit to such a purchase after being notified in writing by the City of its availability. The price charged to the County for reclaimed water shall equal the price charged to in-City customers plus fifteen percent (15%), provided that if any part of the cost of creating reclaimed water is already included in the County's wastewater treatment bill, that amount will be deducted from the cost of the reclaimed water purchase. If County use of the reclaimed water requires special pumping or conveyance not otherwise provided to City customers, the cost shall be borne by the County. If the County uses its purchased reclaimed water for water rights mitigation or other long-term commitments, it will do so solely at its own discretion, and the City will not be responsible for any guaranteed delivery of the reclaimed water beyond what is normal policy for all customers of the City.

3.7 Pipe Capacity. The County shall design and operate the Carlsborg System so as not to cause surcharging, as defined in the DOE *Criteria for Sewage Works Design* (Orange Book), due to Carlsborg Flow exceeding its share of pipe capacity. The City shall have the right to review and comment on the design and operating procedures for Carlsborg lift stations.

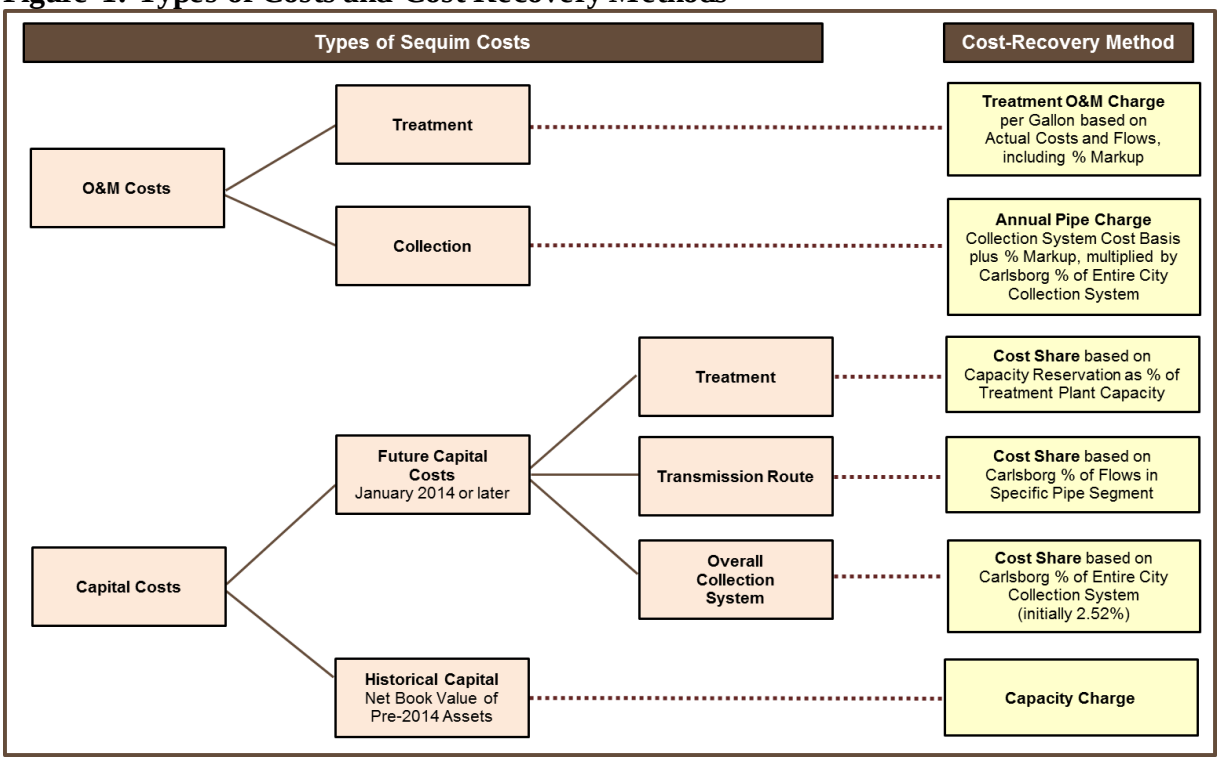
Section 4. Excess Discharge

4.1 Maximum Carlsborg Flow. The County shall not discharge more than the Capacity Reservation into the City System. The City's acceptance of any wastewater above the Capacity Reservation shall by itself create no right, title or interest in the County in any increase in the Capacity Reservation.

4.2 Remedies for Excess Discharge. If the Capacity Reservation is exceeded in any given year, the City may, at its option, (a) require the County to agree to an increased Capacity Reservation, (b) if the City determines it does not have sufficient WRF capacity to allow an increased capacity reservation, require the County to impose a moratorium on new connections within the Carlsborg UGA, and/or (c) terminate this Agreement and discontinue receiving County Wastewater after at least ten (10) years prior written notice to the County. Before imposing a remedy, the City shall consult with the County to determine which remedy the County considers to be the least burdensome and most realistic, provided, however, the City shall retain the right in its sole discretion to impose the appropriate remedy.

Introductory Note to Sections 5 and 6. Figure 1 is a graphic depiction of the methods by which capital and operating costs related to the City WRF and Transmission Route are to be recovered from the County by the City. Section 5 addresses the recovery of operating and maintenance ("O&M") costs; Section 6 addresses the recovery of capital costs.

Figure 1: Types of Costs and Cost Recovery Methods



Section 5. Operating & Maintenance Charges

5.1 Types of Operating and Maintenance Charges. The County shall pay the City monthly two types of O&M Charges for the disposal of sewage collected by the County within the Carlsborg Service Area and delivered to the City System: a Treatment O&M Charge based on a Treatment O&M Rate per gallon multiplied by the number of gallons of Carlsborg Flow in a given month, and an Annual Pipe Charge divided by twelve (12) months.

5.1.1 Calculation of Treatment O&M Rate. A Treatment O&M Rate per gallon shall be calculated each year based on the Treatment Operating Cost Basis plus the O&M Markup, the sum divided by the actual total gallons of influent to the WRF during that year. The Treatment Operating Cost Basis means the actual cost of operating and maintaining the WRF in a given year, subject to the inclusions and exclusions set forth in Section 5.2.

5.1.2 Annual Pipe Charge. The Annual Pipe Charge shall be calculated each year based on the Collection System Operating Cost Basis plus the O&M Markup, the sum multiplied by the Carlsborg Percentage of the Entire City Collection System. The Annual Pipe Charge divided by twelve (12) shall be billed each month, beginning with the date the Carlsborg System is connected to the City System, with the first month pro-rated to the number of days of service during that month.

(a) The Collection System Operating Cost Basis means the actual cost of operating and maintaining the City System minus the Treatment Operating Cost Basis, subject to the inclusions and exclusions set forth in Section 5.2.

(b) The Carlsborg Percentage of the Entire City Collection System results from the Average Carlsborg Transmission Percentage being multiplied by [the Transmission Route lineal feet as a percentage of the total lineal feet in the entire City Collection System], as shown in Exhibit A. Until updated in the future, the Carlsborg Percentage of the Entire City Collection System is two point five two percent (2.52%). Every five years, the City shall update the Carlsborg Percentage of the Entire City Collection System based on updated information about total lineal feet in the City Collection System. The updated number of total lineal feet in the City Collection System and resulting updated Carlsborg Percentage of the Entire City Collection System shall be documented in a memorandum from the manager responsible for the City System, appended to the Agreement, and used in subsequent calculations of the Annual Pipe Charge and Capital Cost Share.

(c) If both Parties agree in writing, with approval from their respective legislative bodies, to update the Carlsborg Transmission Percentages, then an engineering analysis shall be performed to forecast the peak hourly flows (in gallons per minute, or gpd) of the Carlsborg System and City System, respectively, through the shared pipes of the Transmission Route. The time frame for the engineering analysis shall be fifteen (15) years, and

the cost of the analysis shall be shared equally by both Parties. The updated Carlsborg Transmission Percentages and Carlsborg Percentage of the Entire City System resulting from the analysis shall be documented in a joint memorandum signed by the managers responsible for the Carlsborg System and the City System, to be appended to the Agreement, and shall supersede the percentages shown in Exhibit A and be used for subsequent calculations of the Annual Pipe Charge and Capital Cost Share.

5.2. Included and Excluded Costs.

5.2.1. Included Costs. The Treatment Operating Cost Basis and Collection System Operating Cost Basis shall include both direct and indirect costs of operating and maintaining the City System, subject to the exclusions set forth in Section 5.2.2. Indirect costs such as administrative, general, and insurance costs shall be allocated in proportion to the amount of direct costs.

5.2.2. Excluded Costs. The Treatment Operating Cost Basis and Collection System Operating Cost Basis shall exclude the following:

(a) Any capital-related costs, such as capital expenditures, debt service costs, or transfers for the purpose of funding capital reserves.

(b) The City Business & Occupation Tax.

(c) State public utility and B&O taxes not applicable on sales to governmental customers.

(d) The cost of services not received by the Carlsborg System, such as stormwater service, sewage pumping, retail meter reading, or retail customer billing.

Exhibit B illustrates the calculation of the Treatment O&M Charge and Annual Pipe Charge.

5.3. Estimated O&M Charges and True-up Adjustment. In advance of a given year, the City shall create an estimated Treatment O&M Rate based on estimated costs and flows, and the estimated rate shall be applied to actual Carlsborg Flows during that year. The City shall also create an estimated Annual Pipe Charge based on the estimated Collection System Operating Cost Basis. After fiscal year-end, the Treatment O&M Rate for the given year shall be re-calculated based on actual costs and flows and a corrected Treatment O&M Charge calculated. Also after fiscal year-end, a corrected Annual Pipe Charge shall be calculated based on the actual Collection System Operating Cost Basis. The difference between estimated and corrected amounts for both types of O&M charges shall be divided into twelve equal parts and added to or subtracted from the following twelve monthly bills to the County. Exhibit B provides an example of a true-up adjustment after the end of a fiscal year.

Section 6. Capacity Charge and Capital Cost Share

6.1 Introduction to Section 6. In general, under the terms of this agreement, Capacity Charges are used to recover a proportionate share of the Net Book Value of WRF and Transmission Route assets built or acquired prior to December 31, 2013, including Construction Work in Progress as of December 31, 2013. For City capital costs incurred for WRF and Transmission Route projects after December 31, 2013, a proportionate share of the City capital cost is recovered through a Capital Cost Share.

6.2 Capacity Charges.

6.2.1 Initial Capacity Charge. Within ninety (90) calendar days of the effective date of this Agreement, the County shall pay to the City an Initial Capacity Charge of $1,334,666, pursuant to calculations shown in Exhibit C. The Initial Capacity Charge is based on the Carlsborg share of the Net Book Value of pre-2014 WRF and Transmission Route assets, assuming accumulated depreciation as of December 2015, which is the projected date for the Carlsborg System to be connected to the City System.

6.2.2 Subsequent Capacity Charges. If the Capacity Reservation is increased pursuant to Section 3.4.2, a subsequent Capacity Charge shall be paid by the County to the City. Subsequent Capacity Charges shall be calculated following the method illustrated in Exhibit C, based on the Net Book Value per gpd of pre-2014 treatment assets, multiplied by the increase in Capacity Reservation. The Net Book Value for subsequent Capacity Charges shall be net of year-end accumulated depreciation for the year immediately preceding the date the charge is payable. If the increase in Capacity Reservation occurs in conjunction with a WRF expansion project, post-expansion WRF capacity shall be used in calculating the subsequent Capacity Charge. Subsequent Capacity Charges shall be payable prior to the increase in Capacity Reservation taking effect.

6.3 Capital Cost Share. For capital expenditures to the City System incurred subsequent to December 31, 2013, the County shall pay to the City a Capital Cost Share based on Eligible City Capital Costs and the applicable Capital Cost Share percentages.

6.3.1. Capital Cost Share Percentages. The Capital Cost Share shall be based on the percentages set forth below:

(a) Treatment Capital. For capital improvements to the WRF, the applicable Capital Cost Share percentage shall be the Capacity Percentage, except that if the capital improvements are triggered by the need to expand the capacity for BOD or TSS loadings, the cost of those treatment improvements shall be shared on the basis of each party's relative BOD or TSS loadings at the time the need for the expansion is triggered.

(b) Transmission Route Capital. For capital improvements to the Transmission Route, the applicable Capital Cost Share percentage shall be the Carlsborg Transmission Percentage for the applicable segment of the Transmission Route. If more than one segment is involved in a single capital improvement project, the project cost shall be allocated by segment so that the relevant Carlsborg Transmission Percentage can be applied to each improved segment. If a City Collection System project improves sewer lines both on and off the Transmission Route, the Capital Cost Share shall only apply to the portion on the Transmission Route.

(c) Collection Systemwide Capital. For capital improvements or acquisitions that benefit the City Collection System as a whole without being geographically specific, the applicable Capital Cost Share percentage shall be the Carlsborg Percentage of the Entire City Collection System, as set forth in section 5.1.2 (b). Examples of this type of project might include improved GIS mapping or the replacement of a Vactor truck.

(d) City Collection System Projects Not on the Transmission Route. For capital improvements to a geographically specific part of the City Collection System that is not on the Transmission Route, there is no Capital Cost Share.

6.3.2. Eligible City Capital Costs. The Capital Cost Share shall be based on Eligible City Capital Costs actually incurred. Eligible City Capital Costs shall include the cost of construction, engineering fees, staff time spent directly on engineering or project management, major equipment acquisition, legal fees, land acquisition costs, and other types of costs customarily paid for by the City from capital funding sources for a capital asset, provided that eligible City Capital Costs shall not include interest or other financing charges, except for accrued interest as set forth in Section 6.3.3. Eligible City Capital Costs shall be offset by grants specific to the capital project. Eligible City Capital Costs shall not be reduced by capital cost shares paid by other wholesale customers that the City may potentially have in the future, nor shall it be reduced by the City's use of its own connection charge income.

6.3.3 Annual Billing for Capital Cost Share. Beginning in 2015, the City shall bill the County prior to March 31 each year for the Carlsborg Capital Cost Share relevant to the previous year's capital expenditures, and the County shall make the required payment within 30 calendar days, subject to the dispute resolution process outlined in Section 7.5 and Section 12. The City may add three-quarters of one percent (0.75%) to the capital cost share as an approximation of accrued interest during the year in which capital expenditures are incurred. The accrued interest factor is further explained in Exhibit C.

6.3.4. No Markup or Out-of-City Multiplier. The Capital Cost Share shall not include a markup or an out-of-City multiplier.

Section 7. Billing and Payment

7.1 Billing and Payments for O&M Charges and Capital Cost Share. In consideration for the transmission, treatment and disposal of Wastewater received from the Carlsborg System, the City shall bill the O&M Charges to the County on a monthly basis for the Treatment O&M Charge and one-twelfth (1/12) of the Annual Pipe Charge. The City shall also bill the County annually as set forth in Section 6.3.3 for the Capital Cost Share. The County shall make payments to the City based on the bill. Billing and payment are further described herein.

7.2 Billings. A bill that has been properly addressed and deposited in the United States mail, either to the address shown in Section 13.1 or to another address designated by the County in writing, shall be deemed to be presented to the County for payment. If both parties agree in writing, electronic billing may be used, in which case the billing date is the date the bill is sent electronically to the e-mail address designated in writing by the County. The County's payment in full of the monthly bill shall be due and payable at the City's Business Office twenty-five (25) days after the deposit of the City bill in the United States mail or the bill is sent electronically to the County ("Due Date"). Any bill not paid by the Due Date shall be past due. The City may charge interest on any past due bill at the rate applied to other City customers, subject to RCW 35.67.210 or as such statute may be modified, amended or superseded, for every month or portion of a month that the past due amount remains unpaid.

7.3 Temporary Lapses in Sewer Meter Data. If metered sewage volume is incomplete or inaccurate for any period of time, the City may bill the County for such period based on an estimated volume using any of the following methods: historical Carlsborg Flows, historical relationship of Carlsborg Flows to related metered water use, or surrogate Carlsborg Flows agreed upon in writing by the Parties. The City shall provide the County documentation of the basis for the estimated Carlsborg Flow in any such instance.

7.4 County Customers. The County shall be solely responsible for billing and collecting for sewer service from retail customers connected to the Carlsborg System.

7.5 Disputed Bills. If the County believes that a bill from the City is in error, the County shall notify the City and provide supporting documents within the thirty (30) calendar days after the City's transmittal of the bill to the County. Notice of disputed bills shall include payment of undisputed amounts and fifty percent (50%) of disputed amounts. Within ten (10) business days thereafter the City and County shall meet to attempt to resolve the dispute. If the dispute cannot be resolved, then the Parties shall proceed with dispute resolution under Section 12.

7.6 Notice and Opportunity to Cure Default. If a past due bill remains unpaid and no notice of dispute has been timely filed under Section 7.5, the City shall give written notice and opportunity to cure to the County ("Notice to Cure").

7.7 Default on Payment Obligations. If the County does not pay the past due bill within fifteen (15) business days after the Notice to Cure is mailed by the City to the County, the City shall have the right to collect the past due amount and impose a one-time penalty of ten percent (10%) of the amount of each past due bill. If the County has provided notice to the City of a dispute concerning a bill pursuant to Section 7.5, no penalty will be added to the bill, but interest will still accrue on the unpaid due amount until the dispute has been resolved and the appropriate payment made, in which case interest shall only apply to the unpaid portion of the appropriate payment. If the dispute resolution process results in an appropriate payment that is less than what the County has already remitted, the City shall refund the difference. The City shall have the right to pursue all lawful means of pursuing debt collection from the County. Subject to the dispute resolution process set forth in Section 12, failure of the County to make payments required under this agreement shall be considered grounds for the City to terminate this Agreement, on at least ten (10) years prior written notice to the County.

Section 8. Sewage Meter/Monitoring Vault

8.1 Access and Maintenance. The City and the County shall have equal access to the Sewer Meter for the purpose of periodic reading of County flows and to perform maintenance and operation functions.

8.2 Meter Recalibration. The Sewer Meter shall be re-calibrated upon the request of either Party. The cost of this recalibration shall be the responsibility of the requesting Party, except that the cost shall be the City's responsibility if a re-calibration has not been performed within the time frame recommended by the manufacturer of the meter. Representatives of each Party shall have the right to observe the recalibration. Should a meter recalibration reflect meter variation greater than five per cent (5%) of the measured meter reading, either Party may request a billing adjustment for the six (6) months previous to the recalibration using the meter variation percentage.

Section 9. Books, Records and Communications

9.1 Books. The City shall keep full and complete books of accounts showing all costs and expenses incurred in connection with the City System, including the maintenance and operations costs, capital costs, and any other costs or offsetting revenues used in calculating amounts payable by the County under this Agreement.

9.2 Inspection. Each Party shall have the right to inspect and copy, during regular business hours, all reports and records maintained by the other Party that relate to this Agreement, including, but not limited to, maintenance and operations costs or any other matter affecting the County's rates, flow records, wastewater quality reports, pretreatment monitoring records, connection records and reports, and reports to the DOE or other regulatory authorities, excepting public records maintained by either Party that (a) are exempt from disclosure pursuant to chapter 42.56 RCW, the Public Records Act, (b) are privileged and confidential pursuant to

chapter 5.26 RCW, or (c) are otherwise not subject to public disclosure or production in civil litigation.

9.3. Policy Notifications. At least fifteen (15) business days in advance of adoption, the City and County shall provide each other with copies of any policies or ordinances related to City treatment capacity, Carlsborg or City pretreatment requirements, or Carlsborg connection requirements. Each party shall endeavor to maintain communications with the other at the management level in order to be aware of the other party's interests while the proposed policies are being developed.

9.4 Annual Report on Industrial or High Strength Customers. The County shall report to the City annually on individual customers who are permitted to discharge industrial or high strength wastewater into the Carlsborg System. This report shall identify the relevant pretreatment requirements and monitoring results for each industrial or high strength customer.

Section 10. Indemnification and Insurance

10.1 City. The City shall indemnify, defend, and hold harmless the County, its officers, agents, and employees from all suits, claims, or liabilities of any nature, including attorney fees, costs, and expenses, for or on account of injuries or damages sustained by any person or property, resulting from acts or omissions of and to the extent harm is caused by the City, its agents or employees in connection with maintenance and operation of the City System or for breach of its duties under this Agreement. If suit in respect to the above is filed, the City shall defend the suit at the City's own cost and expense, and if judgment is rendered or settlement made requiring payment by the County, its officers, agents or employees, the City shall pay the same. Should a court of competent jurisdiction determine that this indemnity agreement is subject to RCW 4.24.115, then in the event of liability for damages arising out of bodily injury to persons or damages to property caused or resulting from the concurrent negligence of the City and the County, its officials, officers, employees or agents, the City's liability hereunder shall only be to the extent of the City's negligence. It if further specifically and expressly understood that the indemnification provided herein constitutes the City's waiver of immunity under industrial insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the Parties.

10.2 County. The County shall indemnify, defend, and hold harmless the City, its officers, agents, and employees from all suits, claims, or liabilities of any nature, including attorney fees, costs, and expenses, for or on account of injuries or damages sustained by any person or property, resulting from acts or omissions of and to the extent harm is caused by the County, its agents or employees in connection with maintenance and operation of the County Sewer System or for breach of its duties under this Agreement. If suit in respect to the above is filed, the County shall defend the suit at the County's own cost and expense, and if judgment is rendered or settlement made requiring payment by the City, its officers, agents or employees, the County shall pay the same. Should a court of competent jurisdiction determine that this

indemnity agreement is subject to RCW 4.24.115, then in the event of liability for damages arising out of bodily injury to persons or damages to property caused or resulting from the concurrent negligence of the City and the County, it officials, officers, employees agents, the County's liability hereunder shall only be to the extent of the County's negligence. It if further specifically and expressly understood that the indemnification provided herein constitutes the County's waiver of immunity under industrial insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the Parties.

10.3 Recovery of Cost of Regulatory Violations. If the City incurs fines, penalties, or remedial capital or cleanup costs for which the County is partially or fully responsible, the City shall have the right to charge the County for a proportionate share of any such fines, penalties and remedial capital or cleanup costs, and the County agrees to pay such charges to the City.

10.4 County Insurance Requirement. The County shall maintain insurance sufficient to pay any suits, claims, or liabilities of the City described in Section 10.2 and, in addition, the cost of remediation of environmental damage caused by any County discharge, such as the discharge into or transfer of toxic wastes from the Carlsborg System into the City System. The County, a charter county government under the Washington State Constitution, maintains an insurance program through the Washington Counties Risk pool for the protection and handling of the County's liabilities including injuries to persons and damage to property. The County's current insurance limits are $10,000,000 per occurrence. The City presumptively agrees that the County's coverage as of the date of this agreement is sufficient to cover known risks as of that date. The County agrees, at its own expense, to maintain this insurance coverage for all of its liability exposures for this Agreement. The County agrees to provide the City with at least thirty (30) days prior written notice of any material change in the County's insurance program. The City acknowledges and understands the County does not purchase Commercial General Liability ("CGL") insurance and therefore the County does not have the ability to add the City as an additional insured under such insurance. Should the County elect to cease insurance through the risk pool and purchase CGL insurance, County agrees to add the City as an additional insured on such insurance and to provide the City with an endorsement confirming the City as an additional insured on such policy or policies. The maintenance of, or lack thereof, of insurance coverage shall not limit the liability of the County to the City.

10.5 Survival. The obligations of this section shall survive the termination of this Agreement, except that insurance need not be maintained that covers events occurring after the termination of the Agreement.

Section 11. Term of Contract

11.1 Term. The Contract shall commence on the Effective Date and continue until terminated in accordance with Section 11.2.

11.2 Expiration and Termination. In the absence of agreement to the contrary, or termination as otherwise provided in this Agreement, this Agreement shall expire on December 31, 2044 ("Expiration Date"); provided, at least ten (10) years prior to the Expiration Date, either Party must notify the other Party in writing if the Party intends to (a) let the Agreement expire and terminate on the Expiration Date, or (b) negotiate changes in the terms and conditions of the Agreement and renew and extend the Agreement. If neither Party provides notice as provided in Section 11.2(a) or (b), the Agreement shall automatically be extended for an additional ten (10) year term on its existing terms and conditions commencing from the Expiration Date set forth above, subject to the ten (10) year notice provision prior to any new Expiration Date, and thereafter until the Agreement is terminated. Notwithstanding the foregoing, the County may terminate this Agreement at any time on at least ten (10) years prior written notice to the City. In addition, the City may terminate this Agreement at any time for cause, only as provided in Section 3.5.2, Section 4.2, or Section 7.7 of this Agreement, on at least ten (10) years prior written notice to the County.

Section 12. Dispute Resolution

12.1 Applicable Law. This Agreement, including all matters of interpretation, validity and performance, shall be governed and enforced in accordance with the laws of the State of Washington.

12.2 Informal Resolution of Disputes. Any dispute arising out of this Agreement, including without limitation issues relating to the validity or enforcement of the Agreement and billing disputes under Section 7.5, shall be referred to representatives of the Parties, who shall meet and make a good faith effort to resolve the dispute among themselves.

12.3 Notice of Formal Dispute. If the Parties have met to resolve the dispute informally and the dispute remains unresolved, then within thirty (30) days of the informal dispute resolution meeting, the Party raising the issue in dispute may invoke formal dispute resolution by providing the other Party with written notice of the dispute, including a brief description of the nature of the dispute and the Party's proposed resolution of the dispute. Notice given by the County of a billing dispute under Section 7.5 shall satisfy the notice requirement for billing disputes.

12.4 Alternative Dispute Resolution. Within fifteen (15) business days after notice is given the Parties shall meet to explore whether the dispute should be resolved by mediation or arbitration. By mutual agreement, the Parties may submit the dispute to non-binding mediation or to binding arbitration. If the Parties agree on arbitration, the arbitration shall be conducted in accordance with this subsection.

12.4.1 Any agreement to arbitrate shall be in writing signed by the Parties, shall conform to the requirements of this subsection, and shall specify the procedures governing the arbitration.

12.4.2 The arbitrator or arbitration panel selected shall have the power and authority to grant legal and equitable relief in accordance with Washington law and the provisions of this Agreement.

12.4.3 The decision of the arbitrator or of a majority of the arbitration panel members shall be final and binding. The costs of arbitration shall be borne equally by the Parties, unless the arbitrator or arbitration panel rules otherwise.

12.5 Litigation of Disputes. In the event that the dispute is not resolved informally or by mediation and the Parties do not agree to arbitration, either Party may commence a suit in Clallam County Superior Court on all claims related to the dispute.

12.6 Emergency Relief. Notwithstanding the other provisions of this Section 12, either Party may seek emergency or temporary equitable relief in Clallam County Superior Court concerning disputes governed by this Section 12 if imminent and irreparable harm to the Party will likely result if action is delayed until completion of the dispute resolution procedures. The Court may grant such temporary relief as may be required to preserve the status quo or otherwise prevent irreparable harm while the Parties pursue resolution of the dispute. The Court may require the Party requesting relief to give such security as the Court deems necessary for the payment of costs and damages that may be incurred by the other Party resulting from temporary relief wrongfully granted.

Section 13. General Provisions

13.1 Notice. Whenever written notice is required by this Agreement, except for notice to cure or notice to terminate, the notice may be given to the following representatives by actual delivery, by United States mail, or by electronic mail addressed to the respective Party at the following addresses or a different address hereafter designated in writing by the Party:

CITY	COUNTY
City Manager	County Administrator
152 W. Cedar Street	223 East 4th Street
Sequim, WA 98382	Port Angeles, WA 98362

The date of notice shall be deemed to be the date of actual delivery in person or by electronic mail, or the postmarked date if notice is by United States mail. Notice to Cure or notice of termination must be accomplished by actual delivery or by both first-class mail and certified mail (with return receipt requested) deposited with the United States Postal Service. In these cases the date of the notice shall be the date received.

13.2 Severability. The purpose of this Agreement is to provide for long-term wastewater disposal, planning and certainty for both Parties. It is the intent of the Parties that if

any provision of this Agreement or its application is held by a court of competent jurisdiction to be illegal, invalid or void, the validity of the remaining provisions of the Agreement or its application shall not be affected. The remaining provisions shall continue in full force and effect, and the rights and obligations of the Parties shall be construed and enforced as if the Agreement did not contain the particular invalid provision; however, if the invalid provision or its application is found by a court of competent jurisdiction to be substantive and to render the performance of the remaining provisions unworkable and non-feasible, or is found to seriously affect the consideration and is inseparably connected to the remainder of the Agreement, the entire Agreement shall be null and void.

13.2.1 Agreement Contingent on DOE Approval. This agreement is contingent on DOE approval of the Carlsborg Wastewater Facilities Plan Amendment ("Amendment") submitted in June 2014, and other agreements deemed necessary by DOE to allow delivery of Carlsborg wastewater to the City in lieu of constructing a treatment plant in Carlsborg. If the DOE response to the Amendment prevents the County from delivering wastewater to the City, or if the DOE imposes conditions that substantially change the economic viability of delivering wastewater to the City as determined by the County, then this entire Agreement shall be null and void. In that case, any payments the County has paid to the City prior to the DOE decision shall be refunded to the County within ninety (90) calendar days of DOE's decision or as agreed upon in writing by the Parties.

13.3 No Joint Venture - Individual Liability. This is not an agreement of joint venture or partnership, and no provisions of this Agreement shall be construed so as to make the City individually or collectively a partner or joint venturer with the County. Neither Party is an agent of the other. Neither the City nor the County shall be liable for the acts of the other in any representative capacity whatsoever.

13.4 Complete Agreement. This Agreement represents the entire agreement between the Parties concerning this subject matter. The Agreement may be amended as provided herein, or as otherwise agreed to by the legislative bodies of both Parties.

13.5 Venue, Jurisdiction and Specific Performance. In the event of litigation between the Parties, venue and jurisdiction shall lie with the Clallam County Superior Court of the State of Washington. The Parties shall be entitled to specific performance of the terms and conditions of this Agreement.

13.6 Default Other Than Payment Default. In the event of default other than on payment obligations addressed in Section 7, the non-defaulting Party shall issue written notice to the other Party setting forth the nature of the default. The defaulting Party shall use its best efforts to cure the default within ninety (90) calendar days. If such default cannot be reasonably cured within such ninety (90) day period, the defaulting party shall, upon written request prior to the expiration of the ninety (90) day period, be granted an additional sixty (60) calendar days to cure the default.

13.7 Force Majeure. The time periods for the Parties performance under any provisions of this Agreement shall be extended for a reasonable period of time during which the respective Party's performance is prevented, in good faith, due to fire, flood, earthquake, lockouts, strikes, embargoes, acts of God, war or civil disobedience. If this provision is invoked, the Parties agree to immediately take all reasonable steps to alleviate, cure, minimize or avoid the cause preventing such performance, at their respective sole cost and expense.

13.8 Successors and Assigns. This Agreement shall inure to the benefit of and be binding upon the Parties and their respective successors and assigns, provided the County shall not have the right to assign its rights and obligations in this Agreement without the City's prior written approval of any such proposed assignment, such approval not to be unreasonably withheld.

13.9 Recitals Incorporated by Reference. The Recitals set forth in Section 1 above are hereby incorporated in this Agreement in full by this reference.

13.10 No Third Party Beneficiaries. Except as expressly set forth in this Agreement, nothing in this Agreement is intended to confer upon any person or entity, other than the Parties hereto, any rights, benefits, privileges or obligations. No such third-party shall have any right to enforce any of the terms of this Agreement unless expressly stated otherwise.

13.11 Waiver. A waiver by either Party of any terms or conditions of this Agreement shall not be deemed or construed to be a waiver of any other term or condition, nor shall the waiver of any breach or default by either Party under the Agreement be deemed or construed to constitute a waiver of any subsequent breach or default, whether of the same or any other term or condition of this Agreement.

13.12 Exhibits. Exhibits A, B, and C are attached and incorporated into this Agreement in full by this reference.

13.13 Effective Date. This Agreement and its terms and conditions shall be effective on the date by which the Agreement is signed by both Parties ("Effective Date").

13.14 Recording. This Agreement shall be recorded with the Clallam County Auditor following its approval and execution by the Parties.

IN WITNESS WHEREOF, the Parties hereby execute this Agreement.

CITY OF SEQUIM

By: _____

Title: _____

Date: _____

APPROVED AS TO FORM:

_____
City Attorney

CLALLAM COUNTY

APPROVED this _____ day of _____ 2014

_____
County Prosecutor

BOARD OF CLALLAM COUNTY COMMISSIONERS

_____
Michael C. Chapman, Chair

_____
Jim McEntire

_____
Howard V. Doherty, Jr.

ATTEST:

_____
Trish Holden, CMC, Clerk of the Board

EXHIBIT A

Map and Table Identifying Transmission Route and Carlsborg Transmission Percentages

EXHIBIT A: Map and Table of Transmission Route

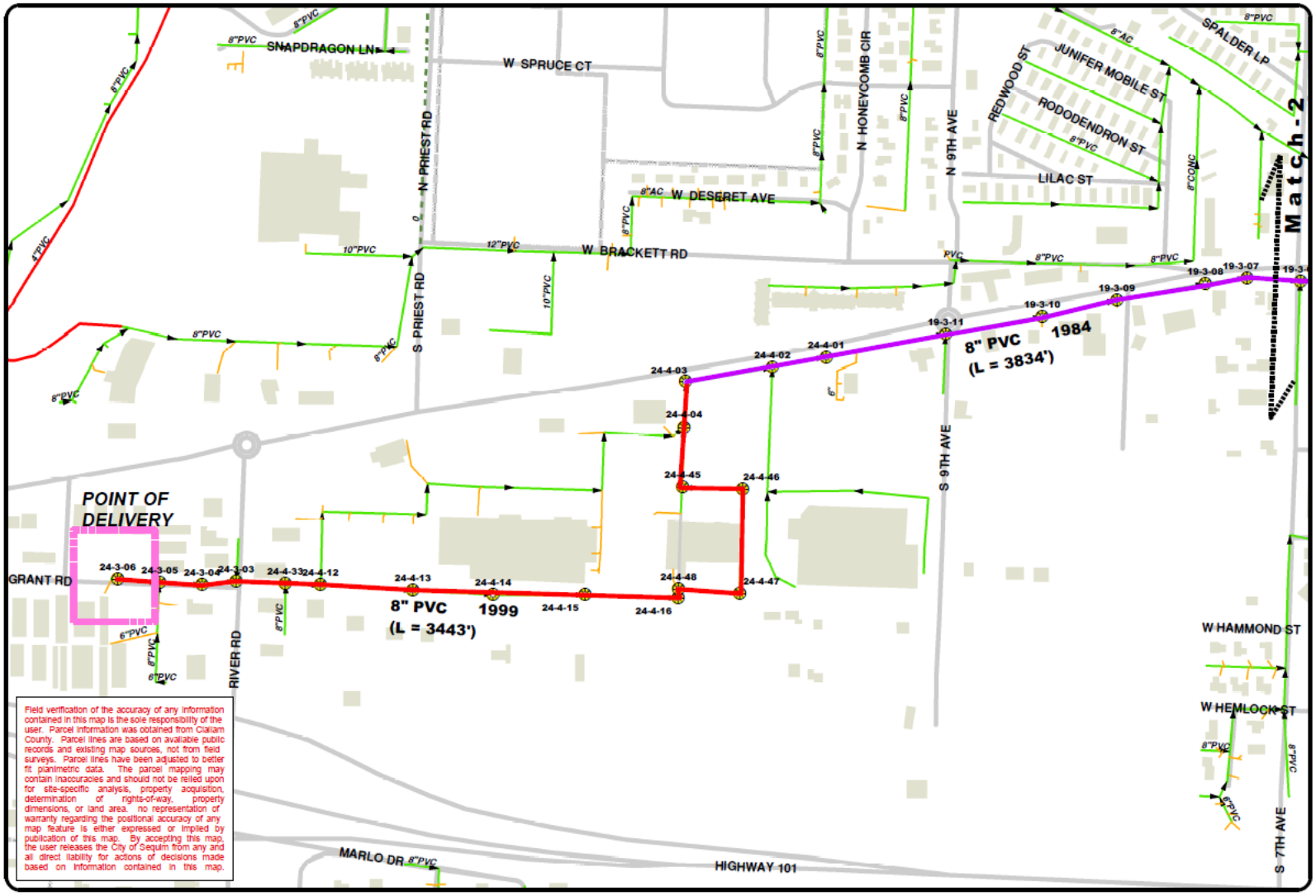


EXHIBIT A: Transmission Route Map

560 280 0 560 Feet

CITY OF SEQUIM

Page: 1 / 4

Printed Date: 11/19/2014

EXHIBIT A: Map and Table of Transmission Route

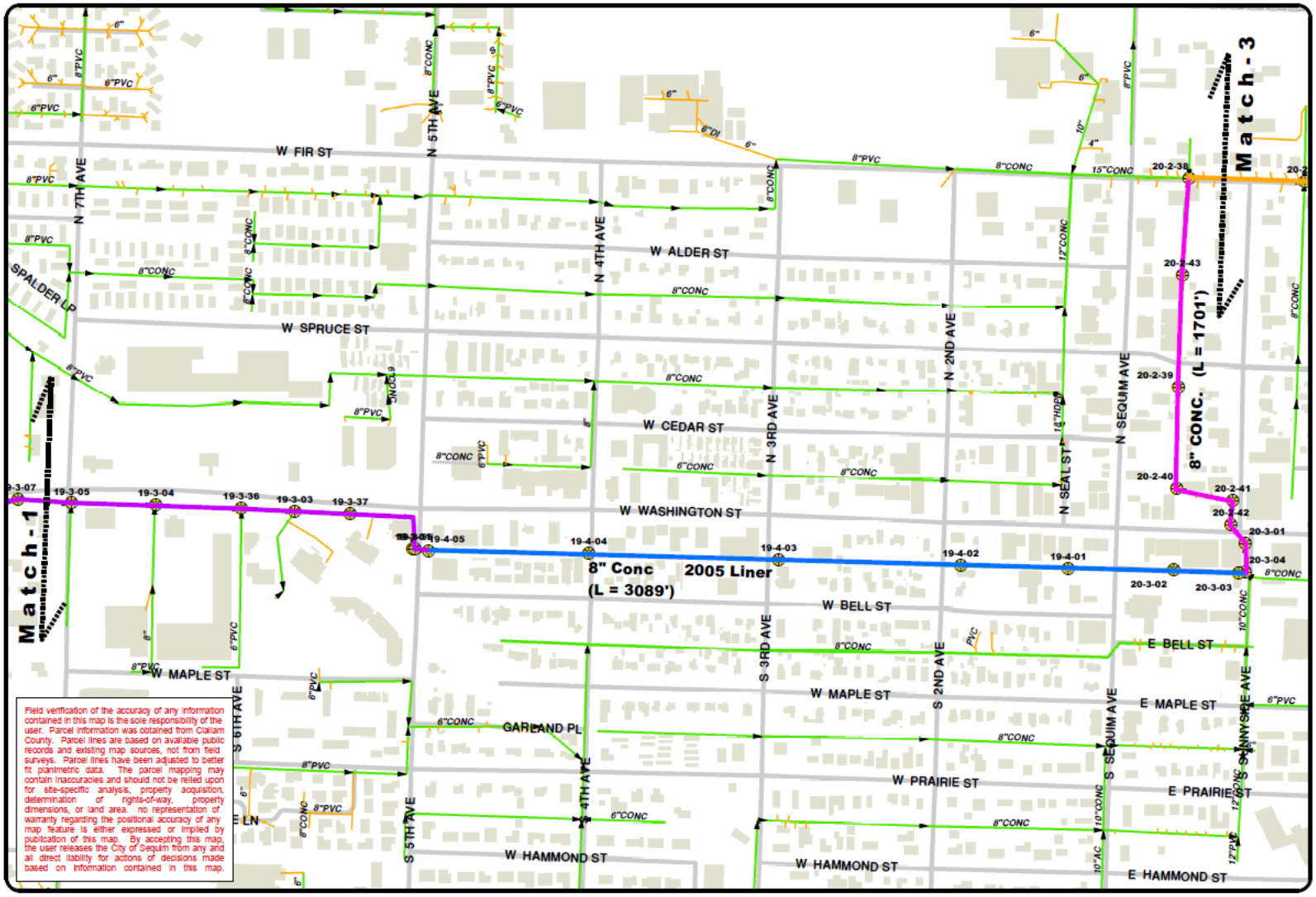


EXHIBIT A: Transmission Route Map

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CITY OF SEQUIM

Page: 2 / 4

Printed Date: 11/19/2014

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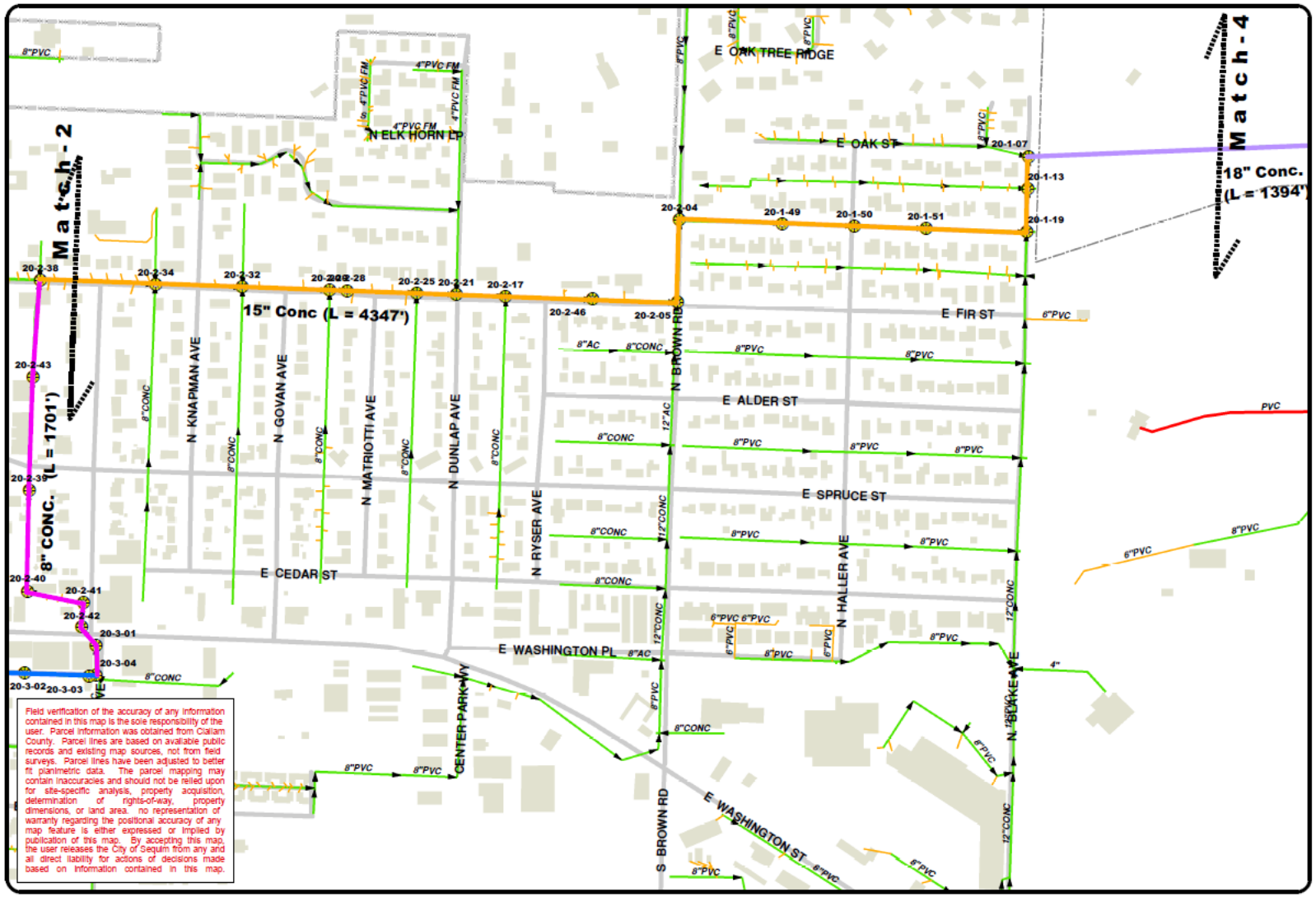

EXHIBIT A: Transmission Route Map

560 280 0 560 Feet

CITY OF SEQUIM

Page: 3 / 4

Printed Date: 11/20/2014

EXHIBIT A: Transmission Route Map

560 280 0 560 Feet

CITY OF SEQUIM

Page: 4 / 4

Printed Date: 11/19/2014

Table Identifying Transmission Route and Carlsborg Transmission Percentages

Exhibit A: Carlsborg Percentage of Transmission Route Projected Flows								
From Manhole	To Manhole	Direction of Flow	Direction & Nearest Street Alignment	Diameter (inches)	Pipe Material	Length (lineal ft.)	Total Flow (gpm)	Carlsborg Transmission Percentages
Source: Gray & Osborne, Pipe Replacement_020314.xlsx, with pipe lengths from City GIS. Assumes 227 gpm Peak Hour Flow from Carlsborg in 2030, per Table 2-3, Carlsborg Wastewater Facilities Plan Amendment.								
24-3-06	24-4-47	East	Grant Road/Priv. Prop.	8	PVC	2,404	268	84.6%
24-4-47	24-4-46	North	Private Property	8	PVC	398	268	84.6%
24-4-46	24-4-45	West	Private Property	8	PVC	240	268	84.6%
24-4-45	24-4-03	North	Private Property	8	PVC	401	268	84.6%
24-4-03	19-3-04	East	W. Washington St.	8	PVC	2,685	268	84.6%
19-3-04	19-4-05	East	W. Washington/S. 5th	8	PVC	1,149	268	74.3%
19-4-05	20-3-04	East	Alley W. Bell/Etta St.	8	Insituform	3,089	306	74.3%
20-3-04	20-3-01	North	S. Sunnyside Ave.	12	Concrete	110	1,088	74.3%
20-3-01	20-2-38	North	S. Sunnyside Ave.	12	Concrete	1,591	1,088	20.9%
20-2-38	20-2-34	East	E. Fir St.	15	Concrete	440	1,477	15.4%
20-2-34	20-2-29	East	E. Fir St.	15	Concrete	660	1,529	14.8%
20-2-29	20-2-25	East	E. Fir St.	15	Concrete	332	1,546	14.7%
20-2-25	20-2-17	East	E. Fir St.	15	Concrete	339	1,554	14.6%
20-2-17	20-2-05	East	E. Fir St.	15	Concrete	654	1,561	14.5%
20-2-05	20-2-04	North	N. Brown Rd.	15	Concrete	313	1,589	14.3%
20-2-04	20-1-19	East	Alley E. Willow St.	15	Concrete	1,321	2,256	10.1%
20-1-19	20-1-07	North	N. Blake Ave.	15	Concrete	288	2,659	8.5%
20-1-07	21-2-01	East	West of WRF	18	Concrete	1,394	2,659	8.5%
21-2-01	21-2-02	East	West of WRF	18	PVC	519	2,683	8.5%
21-2-02	21-2-22	East	West of WRF	18	DI	744	2,683	8.5%
21-2-22	21-2-23	East	West of WRF	18	PVC	1,349	2,683	8.5%
21-2-23	Headworks	East	West of WRF	18	PVC	1,024	2,683	8.5%
Total						21,444		
Weighted Average Carlsborg Percentage of Transmission Route								45.39%
Total Sequim Collection System (lineal feet)						385,440		
Transmission Route as % of Total Collection System								5.56%
Carlsborg Percentage of Entire City Collection System								**2.52%**

EXHIBIT B

Examples Showing Calculation of O&M Charges:

1. Treatment O&M Charge
2. Annual Pipe Charge
3. Estimated vs. Adjusted O&M Charges

1. Treatment O&M Charge

Calculation of Treatment O&M Charge Example	City Expenditures	Exclude	Applicable City Expenditures
Sequim Treatment O&M Cost Basis			
Direct:			
City B&O Tax - Treatment	184,665	(184,665)	-
Salaries	224,345		224,345
OT	13,417		13,417
Call Wages	14,252		14,252
L&I Ins	8,498		8,498
FICA/Medicare	19,621		19,621
PERS	20,535		20,535
Health Ins	55,037		55,037
Other Benefits	8,747		8,747
Supplies/Chemicals	116,328		116,328
Fuel	45,027		45,027
Small Tools/Minor Equip	5,772		5,772
Prof Svcs	49,564		49,564
Travel & Meals	23		23
Utilities	71,664		71,664
Repair & Maint	47,095		47,095
Misc Svcs & Fees	9,937		9,937
State Utility Taxes	47,210	(47,210)	-
Reuse Prof Svcs	155,832		155,832
Subtotal	1,097,570	(231,874)	865,696
Share of Utility Mgr Salary	26,786		26,786
Total Treatment O&M Direct	1,124,357	(231,874)	892,482
Indirect:			
Transfer - Allocated Central Services	691,964		691,964
Capital Replacement Reserve	100,657	(100,657)	-
Debt Svc	629,895	(629,895)	-
Total Indirect	1,422,516	(730,552)	691,964
Total Treatment O&M Cost Basis (annual $)	2,546,873	(962,426)	**1,584,447**
O&M Markup Percentage			25.00%
O&M Markup - Treatment			396,112
Treatment O&M Cost Basis plus O&M Markup			1,980,558
Total Flow to WRF (gallons/year)			204,112,542
Treatment O&M Rate ($/gallon, rounded off to four decimal places)			**$ 0.0097**
Carlsborg Actual Flows in example month (gal)			680,375
Treatment O&M Charge in example month			**$ 6,600**
Carlsborg Actual Flows in example year (gal)			9,185,064
Treatment O&M Charge in example year			**$ 89,095**

2. Annual Pipe Charge

Calculation of Pipe Charge Example	City Expenditures	Exclude	Applicable City Expenditures
Sequim Collection System O&M Cost Basis			
Direct:			
Billing Supplies	$ 1,530	$ (1,530)	$ -
Admin Communications	8,695		8,695
Admin Repair & Maint	3,611		3,611
Admin Intergov Prof Svcs	15,131		15,131
City B&O tax - Admin	89,156	(89,156)	-
Trans Salaries	150,127		150,127
Trans OT	9,407		9,407
Trans Call Wages	7,300		7,300
Trans L&I Ins	4,657		4,657
Trans FIC/Medicare	13,381		13,381
Trans PERS	13,708		13,708
Trans Health Ins	36,582		36,582
Trans Supplies	24,298		24,298
Trans Inv for Sale (BFP)	1,902		1,902
Trans Tools & Minor Equip	28,161		28,161
Trans Prof Svcs	20,766		20,766
Trans Travel & Meals	1,508		1,508
Pump Station Utilities	17,131	(17,131)	-
Trans Repair & Maint	36,283		36,283
Trans Misc Svcs & Fees	13,535		13,535
State Utility Taxes	19,252	(19,252)	-
Subtotal	516,122	(127,070)	389,052
Share of Util Manager Salary	26,786		26,786
Total Sewer O&M Direct	542,908	(127,070)	415,839
Indirect:			
Transfer - Allocated Central Services	334,123		334,123
Capital - Utility Repair	319,163	(319,163)	-
Capital Transfer to Stormwater	24,000	(24,000)	-
Operating Transfer to Stormwater	55,000	(55,000)	-
Capital Replacement Reserve	48,603	(48,603)	-
Total Indirect	780,889	(446,766)	334,123
Total Collection/Transmission Costs	1,323,797	(573,835)	749,961
Exclude:			
Pump Station Maintenance Labor	(24,200)		(24,200)
Sewer Share of Customer Service Labor	(30,470)		(30,470)
Total Collection System O&M Cost Basis (annual $)	$ 1,269,127	$ (573,835)	**$ 695,291**
O&M Markup Percentage			25.00%
O&M Markup - Collection System			173,823
Collection System O&M Cost Basis plus O&M Markup			$ 869,114
Carlsborg Percentage of Entire City Collection System:			
As of September 2014			
Total Sequim Collection System (lf)			385,440
Shared pipes along Carlsborg transmission route (lf)			21,444
Shared pipes as % of total City collection system (rounded off)			5.56%
Average projected Carlsborg % of flow in shared pipes (rounded off)			45.39%
Carlsborg Percentage of Entire City Collection System (rounded off)			**2.52%**
Annual Pipe Charge for Example Year			$ 21,902
Monthly Pipe Charge during Example Year			$ 1,825

3. Estimated vs. Adjusted O&M Charges

Estimated vs. Adjusted O&M Charge Example	Estimate	Actual/ Corrected	Adjustment
Treatment O&M Charge			
Treatment O&M Cost Basis	1,600,000	1,584,447	
O&M Markup %	25.00%	25.00%	
O&M Markup	400,000	396,112	
Treatment O&M Basis plus O&M Markup	2,000,000	1,980,558	
Total Flow to WRF (gallons/year)	210,000,000	204,112,542	
Treatment O&M Rate ($/gallon)	$ 0.009524	$ 0.009703	
Carlsborg Flows (gallons/year)	9,185,064	9,185,064	
Treatment O&M Charge	$ 87,477	$ 89,125	$ 1,648
Annual Pipe Charge			
Collection System O&M Cost Basis	730,000	695,291	
O&M Markup %	25.00%	25.00%	
O&M Markup	182,500	173,823	
Collection System O&M Cost Basis plus O&M Markup	912,500	869,114	
Carlsborg Pct of Entire City Collection System	2.52%	2.52%	
Annual Pipe Charge	$ 22,995	$ 21,902	$ (1,093)
Combined O&M Charges			
Total O&M Charges	$ 110,472	$ 111,027	$ 555
Monthly Adjustment for Next 12 Months			$ 46

EXHIBIT C

Calculation of Capacity Charges and Explanation of Accrued Interest Factor:

1. Calculation of Initial Capacity Charge for Transmission Route
2. Calculation of Initial Capacity Charge for Treatment Assets and Total Initial Capacity Charge
3. Hypothetical Calculation of Future Capacity Charges if Capacity Reservation is Increased
4. Hypothetical Calculation of Future Capacity Refund Payment if Capacity Reservation is Decreased
5. Explanation of Accrued Interest Factor

1. Calculation of Initial Capacity Charge for Transmission Route

Assumed Unit Replacement Costs by Pipe Size

Actual Unit Cost of Collection System Extension		
Source: City bid records		
Length of Sewer Extension		1,800 LF
Cost of Pipe:		
8" pipe		$ 144,000
Sales Tax	8.40%	12,096
Total Cost of Pipe		$ 156,096
Cost of Pipe per LF		$ 87
Cost of Installation & Project Mgt:		
Installation Costs		$ 163,700
Sales Tax	8.40%	13,751
Engineer/Project Admin	25%	83,387
Total Installation/Proj Mgt Cost		$ 260,838
Installation/Proj Mgt Cost per LF		$ 145
Total Cost of Sewer Extension		$ 416,934
Avg Replacement Cost/LF (8" pipe)		$ 232

Source of Pipe Unit Costs: Carlsborg Wastewater Facilities Plan Amendment, Appendix F (pp. 341, 349)

Pipe Diameter	Pipe Unit Costs	Cost Factor	Pipe Cost/LF	Installation Cost/LF	Est. Cost/LF Sewer Line
8"	$55	1.00	$87	$145	$232
12"	75	1.36	118	145	263
15"	80	1.45	126	145	271
18"	85	1.55	134	145	279

Estimated Original Cost by Pipe Segment

Exhibit C - Transmission Route From Manhole	To Manhole	Direction of Flow	Direction & Nearest Street Alignment	Length (lineal ft.)	Assumed Year Installed	Assumed Replacemt Cost/LF	Est 2014 Replacemt Cost ($)	ENR Inflation Factor	Estimated Original Cost ($)
Source: City of Sequim GIS data. Installation date of 1960 is assumed average for sewer lines installed 1950-1970. Actual cost of 2005 Insituform lining of W. Bell line is shown. Manhole 21-2-22 to 21-2-23 segment replaced by WSDOT in 2000 at no cost to City.									
24-3-06	24-4-47	East	Grant Road/Priv. Prop.	2,404	1999	$ 232	$ 556,838	0.613	$ 341,487
24-4-47	24-4-46	North	Private Property	398	1999	232	92,189	0.613	56,536
24-4-46	24-4-45	West	Private Property	240	1999	232	55,591	0.613	34,092
24-4-45	24-4-03	North	Private Property	401	1999	232	92,884	0.613	56,962
24-4-03	19-3-04	East	W. Washington St.	2,685	1984	232	621,926	0.420	260,961
19-3-04	19-4-05	East	W. Washington/S. 5th	1,149	1984	232	266,143	0.420	111,674
19-4-05	20-3-04	East	Alley W. Bell/Etta St.	3,089	2005				153,249
20-3-04	20-3-01	North	S. Sunnyside Ave.	110	1960	263	29,016	0.083	2,420
20-3-01	20-2-38	North	S. Sunnyside Ave.	1,591	1960	263	418,694	0.083	34,917
20-2-38	20-2-34	East	E. Fir St.	440	1960	271	119,261	0.083	9,946
20-2-34	20-2-29	East	E. Fir St.	660	1960	271	178,919	0.083	14,921
20-2-29	20-2-25	East	E. Fir St.	332	1960	271	89,988	0.083	7,504
20-2-25	20-2-17	East	E. Fir St.	339	1960	271	91,774	0.083	7,653
20-2-17	20-2-05	East	E. Fir St.	654	1960	271	177,363	0.083	14,791
20-2-05	20-2-04	North	N. Brown Rd.	313	1960	271	84,813	0.083	7,073
20-2-04	20-1-19	East	Alley E. Willow St.	1,321	1960	271	358,054	0.083	29,860
20-1-19	20-1-07	North	N. Blake Ave.	288	1960	271	78,062	0.083	6,510
20-1-07	21-2-01	East	West of WRF	1,394	1960	279	388,831	0.083	32,426
21-2-01	21-2-02	East	West of WRF	519	1960	279	144,765	0.083	12,073
21-2-02	21-2-22	East	West of WRF	744	1960	279	207,525	0.083	17,306
21-2-22	21-2-23	East	West of WRF	1,349	2000				-
21-2-23	Headworks	East	West of WRF	1,024	1960	279	285,626	0.083	23,820
Total				21,444			$4,338,262		$1,236,179

1. Calculation of Initial Capacity Charge for Transmission Route, continued
Carlsborg Share of Net Book Value by Pipe Segment

Exhibit C - Transmission Route From Manhole	To Manhole	Direction of Flow	Direction & Nearest Street Alignment	Estimated Original Cost ($)	Assumed Useful Life	Age in 2015	Net Book Value as of 2015	Carlsborg Transmission Percentages	Carlsborg Share of Net Book Value
24-3-06	24-4-47	East	Grant Road/Priv. Prop.	$ 341,487	60	16	$ 250,424	84.6%	$ 211,858
24-4-47	24-4-46	North	Private Property	56,536	60	16	41,459	84.6%	35,075
24-4-46	24-4-45	West	Private Property	34,092	60	16	25,001	84.6%	21,151
24-4-45	24-4-03	North	Private Property	56,962	60	16	41,772	84.6%	35,339
24-4-03	19-3-04	East	W. Washington St.	260,961	60	31	126,131	84.6%	106,707
19-3-04	19-4-05	East	W. Washington/S. 5th	111,674	60	31	53,976	74.3%	40,080
19-4-05	20-3-04	East	Alley W. Bell/Etta St.	153,249	60	10	127,708	74.3%	94,830
20-3-04	20-3-01	North	S. Sunnyside Ave.	2,420	60	55	202	74.3%	150
20-3-01	20-2-38	North	S. Sunnyside Ave.	34,917	60	55	2,910	20.9%	607
20-2-38	20-2-34	East	E. Fir St.	9,946	60	55	829	15.4%	127
20-2-34	20-2-29	East	E. Fir St.	14,921	60	55	1,243	14.8%	185
20-2-29	20-2-25	East	E. Fir St.	7,504	60	55	625	14.7%	92
20-2-25	20-2-17	East	E. Fir St.	7,653	60	55	638	14.6%	93
20-2-17	20-2-05	East	E. Fir St.	14,791	60	55	1,233	14.5%	179
20-2-05	20-2-04	North	N. Brown Rd.	7,073	60	55	589	14.3%	84
20-2-04	20-1-19	East	Alley E. Willow St.	29,860	60	55	2,488	10.1%	250
20-1-19	20-1-07	North	N. Blake Ave.	6,510	60	55	542	8.5%	46
20-1-07	21-2-01	East	West of WRF	32,426	60	55	2,702	8.5%	231
21-2-01	21-2-02	East	West of WRF	12,073	60	55	1,006	8.5%	85
21-2-02	21-2-22	East	West of WRF	17,306	60	55	1,442	8.5%	122
21-2-22	21-2-23	East	West of WRF	-	60	15	-	8.5%	-
21-2-23	Headworks	East	West of WRF	23,820	60	55	1,985	8.5%	168
Total				$1,236,179			$ 684,905		
Initial Capacity Charge for Transmission Route									**$ 547,460**

2. Calculation of Initial Capacity Charge for Treatment Assets and Total Initial Capacity Charge

Carlsborg Initial Capacity Charge
Pre-2014 Sequim Wastewater Treatment Assets
Estimated Original Cost less Depreciation as of December 2015

Exhibit C - Treatment Assets Pre-2014 Asset	Year Installed	Original Cost	Est. Useful Life	Annual Deprec %	Age in 2015	Net Book Value as of 2015
Sources: Gray & Osborne November 2011 Technical Memo Appendix B, subsequent City accounting records.						
Treatment Assets:						
1984 Plant Improvements:	1984	1,224,364	50	2.0%	31	465,258
New Headworks						
Secondary Splitter Box						
New Lab Building 2						
New Oxidation Ditch						
New Clarifier 1						
Waste Sludge Pump Building						
Tank Conversions						
Chlorine Tank						
Aerobic Digesters	1993	600,000	40	2.5%	22	270,000
Building Conversion	1993	150,000	50	2.0%	22	84,000
Clarifier #2	1993	620,000	50	2.0%	22	347,200
RAS Pumping Station	1993	60,000	40	2.5%	22	27,000
Other 1993 Projects	1993	897,000	40	2.5%	22	403,650
Flow Equalization Basin	1997	442,000	50	2.0%	18	282,880
Flow Diversion	1997	70,000	40	2.5%	18	38,500
Coagulation Facility	1997	676,000	40	2.5%	18	371,800
Holding Pond	1997	321,000	40	2.5%	18	176,550
Control Building	1997	233,000	50	2.0%	18	149,120
Backwash Basin	1997	42,000	50	2.0%	18	26,880
UV Basin	1997	207,000	40	2.5%	18	113,850
Other 1997 Projects	1997	319,000	40	2.5%	18	175,450
Biosolids Improvements	2003	1,107,165	30	3.3%	12	664,299
Phase 1A & 1B WRF Improvements	2010	9,755,000	30	3.3%	5	8,129,167
Filtration Basin Design 2011	2011	24,028	40	2.5%	4	21,625
Carlsborg Engineering	2011	17,985	30	3.3%	4	15,587
Miscellaneous Treatment Projects	2011	11,908	40	2.5%	4	10,717
General Sewer Plan	2012	88,150	6	16.7%	3	44,075
Filtration Basin Design 2012	2012	31,920	40	2.5%	3	29,526
Filtration Basin Construction 2012	2012	205,545	40	2.5%	3	190,129
WRF Server Room	2012	38,117	40	2.5%	3	35,258
Digester Engineering	2013	70,067	40	2.5%	2	66,564
Filtration Basin Construction 2013	2013	401,315	40	2.5%	2	381,249
Total Pre-2014 Treatment Assets		$17,612,564				$12,520,335
Total Projected Treatment Capacity (gpd)						1,670,000
Net Book Value of Pre-2014 Assets per gpd Capacity						$ 7.50
Initial Capacity Reservation (gpd)						105,000
Initial Capacity Charge for Treatment Assets						**$ 787,207**
Initial Capacity Percentage						*6.29%*
Initial Capacity Charge for Transmission Route Assets						$ 547,460
Total Initial Capacity Charge						**$ 1,334,666**

3. Hypothetical Calculation of Future Capacity Charges if Capacity Reservation is Increased *(applies to Treatment Assets only)*

Exhibit C - Treatment Assets Pre-2014 Asset	Year Installed	Original Cost	Est. Useful Life	Hypothetical Future Capacity Charges Net Book Value of Pre-2014 Assets 2020	2025	2035	2045
Treatment Assets:							
1984 Plant Improvements:	1984	1,224,364	50	342,822	220,386	-	-
New Headworks							
Secondary Splitter Box							
New Lab Building 2							
New Oxidation Ditch							
New Clarifier 1							
Waste Sludge Pump Building							
Tank Conversions							
Chlorine Tank							
Aerobic Digesters	1993	600,000	40	195,000	120,000	-	-
Building Conversion	1993	150,000	50	69,000	54,000	24,000	-
Clarifier #2	1993	620,000	50	285,200	223,200	99,200	-
RAS Pumping Station	1993	60,000	40	19,500	12,000	-	-
Other 1993 Projects	1993	897,000	40	291,525	179,400	-	-
Flow Equalization Basin	1997	442,000	50	238,680	194,480	106,080	17,680
Flow Diversion	1997	70,000	40	29,750	21,000	3,500	-
Coagulation Facility	1997	676,000	40	287,300	202,800	33,800	-
Holding Pond	1997	321,000	40	136,425	96,300	16,050	-
Control Building	1997	233,000	50	125,820	102,520	55,920	9,320
Backwash Basin	1997	42,000	50	22,680	18,480	10,080	1,680
UV Basin	1997	207,000	40	87,975	62,100	10,350	-
Other 1997 Projects	1997	319,000	40	135,575	95,700	15,950	-
Biosolids Improvements	2003	1,107,165	30	479,772	295,244	-	-
Phase 1A & 1B WRF Improvements	2010	9,755,000	30	6,503,333	4,877,500	1,625,833	-
Filtration Basin Design 2011	2011	24,028	40	18,622	15,618	9,611	3,604
Carlsborg Engineering	2011	17,985	30	12,590	9,592	3,597	-
Miscellaneous Treatment Projects	2011	11,908	40	9,229	7,740	4,763	1,786
General Sewer Plan	2012	88,150	6	-	-	-	-
Filtration Basin Design 2012	2012	31,920	40	25,536	21,546	13,566	5,586
Filtration Basin Construction 2012	2012	205,545	40	164,436	138,743	87,357	35,970
WRF Server Room	2012	38,117	40	30,494	25,729	16,200	6,670
Digester Engineering	2013	70,067	40	57,805	49,047	31,530	14,013
Filtration Basin Construction 2013	2013	401,315	40	331,085	280,921	180,592	80,263
Total Pre-2014 Treatment Assets		$17,612,564		$ 9,900,152	$ 7,324,045	$ 2,347,979	$ 176,574
Hypothetical Future Capacity Charges (applies to Treatment only):							
Assumed WRF Treatment Capacity (gpd)				1,670,000	1,670,000	2,240,000	2,240,000
Net Book Value of Pre-2016 Assets per gpd				$ 5.93	$ 4.39	$ 1.05	$ 0.08
Assumed Carlsborg Capacity Reservation (gpd)				105,000	130,000	160,000	180,000
Incremental Capacity Reservation				-	25,000	30,000	20,000
Future Capacity Charge				**$ -**	**$ 109,641**	**$ 31,446**	**$ 1,577**
Future Carlsborg Capacity Percentages				*6.3%*	*7.8%*	*7.1%*	*8.0%*

4. Hypothetical Calculation of Future Capacity Refund Payment if Capacity Reservation is Decreased *(applies to Treatment Assets only)*

Exhibit C - Capacity Refund Payment Pre-2014 Asset	Year Installed	Original Cost	Est. Useful Life	Annual Deprec %	Age in 2025	Net Book Value as of 2025
Net Book Value of Pre-2014 Treatment Assets included in Capacity Charges:						
1984 Plant Improvements	1984	1,224,364	50	2.0%	41	220,386
Aerobic Digesters	1993	600,000	40	2.5%	32	120,000
Building Conversion	1993	150,000	50	2.0%	32	54,000
Clarifier #2	1993	620,000	50	2.0%	32	223,200
RAS Pumping Station	1993	60,000	40	2.5%	32	12,000
Other 1993 Projects	1993	897,000	40	2.5%	32	179,400
Flow Equalization Basin	1997	442,000	50	2.0%	28	194,480
Flow Diversion	1997	70,000	40	2.5%	28	21,000
Coagulation Facility	1997	676,000	40	2.5%	28	202,800
Holding Pond	1997	321,000	40	2.5%	28	96,300
Control Building	1997	233,000	50	2.0%	28	102,520
Backwash Basin	1997	42,000	50	2.0%	28	18,480
UV Basin	1997	207,000	40	2.5%	28	62,100
Other 1997 Projects	1997	319,000	40	2.5%	28	95,700
Biosolids Improvements	2003	1,107,165	30	3.3%	22	295,244
Phase 1A & 1B WWTF Improvements	2010	9,755,000	30	3.3%	15	4,877,500
Filtration Basin Design 2011	2011	24,028	40	2.5%	14	15,618
Carlsborg Engineering	2011	17,985	30	3.3%	14	9,592
Miscellaneous Treatment Projects	2011	11,908	40	2.5%	14	7,740
General Sewer Plan	2012	88,150	6	16.7%	13	-
Filtration Basin Design 2012	2012	31,920	40	2.5%	13	21,546
Filtration Basin Construction 2012	2012	205,545	40	2.5%	13	138,743
WRF Server Room	2012	38,117	40	2.5%	13	25,729
Digester Engineering	2013	70,067	40	2.5%	12	49,047
Filtration Basin Construction 2013	2013	401,315	40	2.5%	12	280,921
Total Pre-2014 Treatment Assets		$17,612,564				$ 7,324,045

4. Hypothetical Calculation of Future Capacity Refund Payment if Capacity Reservation is Decreased, continued

Exhibit C - Capacity Refund Payment Pre-2014 Asset	Year Installed	Original Cost	Est. Useful Life	Annual Deprec %	Age in 2025	Net Book Value as of 2025
Net Book Value of Treatment Assets Funded by Capital Cost Shares:						
Hypothetical capital expenditures from 2014 through 2025, for which Carlsborg will have paid a 6.29% capital cost share based on a 105,000 gpd Capacity Reservation. Assume reduction of capacity reservation is effective at the end of 2025, so that Carlsborg will still be responsible for 6.29% of the 2025 capital expenditures.						
Aux Generator Loadbanks	2014	30,000	40	2.5%	11	21,750
WRF Headworks Modifications #1	2014	270,000	40	2.5%	11	195,750
Equalization Basin Aeration System	2014	54,000	40	2.5%	11	39,150
Grit Removal System Replacement	2014	280,000	40	2.5%	11	203,000
Lime Sludge Mixing Improvements	2015	111,000	40	2.5%	10	83,250
Replace WRF Recirculation Pump	2015	25,000	40	2.5%	10	18,750
Digester Aeration System Improvemts	2015	650,000	40	2.5%	10	487,500
Purchase New Land near WRF	2015	195,000	40	2.5%	10	146,250
Aerobic Digester Capacity Upgrades	2017	1,950,000	40	2.5%	8	1,560,000
Biosolids Handling & Distrib Ctr	2018	1,320,000	40	2.5%	7	1,089,000
WRF Headworks Modifications #2	2019	350,000	40	2.5%	6	297,500
WRF Pumping System Reconfiguration	2019	660,000	40	2.5%	6	561,000
Outfall Pipeline Repair/Replacement	2023	1,450,000	40	2.5%	2	1,377,500
Rapid Infiltration Basin Improvements	2023	1,700,000	40	2.5%	2	1,615,000
High Pressure Zone Expansion	2025	1,550,000	40	2.5%	0	1,550,000
Total Treatment Assets Funded by Capital Cost Shares						$ 9,245,400
Total Treatment Assets - Net Book Value 2025						16,569,445
Assumed Total Treatment Capacity (gpd)						1,670,000
Net Book Value of Treatment Assets per gpd Capacity						$ 4.39
Initial Capacity Reservation (gpd)						105,000
Assumed Revised Capacity Reservation (gpd)						95,000
Reduction in Capacity Reservation (gpd)						10,000
Capacity Refund Payment						**$ 43,857**
Revised Capacity Percentage						*5.69%*

So in this scenario, for the Capital Cost Share for the year 2025, the City would bill Carlsborg prior to March 31, 2026 as follows:

	Cost:	multiplied by:	
Capital Cost Share for 2025 capital expenditures	1,550,000	6.29%	$ 97,495
Plus accrued interest	97,495	0.75%	731
Total payment for Carlsborg share of 2025 capital			$ 98,226
Less credit for Capacity Refund Payment (reducing Capacity Reservation to 95,000 gpd)			(43,857)
Net Carlsborg capital payment to City in this scenario			$ 54,370

5. Explanation of Accrued Interest Factor

Referred to in Section 6.3.3

Calculation of Accrued Interest Factor

Assumptions:

Annual expenditure by City	$ 1,000
Annual interest rate	1.2%
Quarterly interest rate	0.30%

Quarter	Quarterly Expenditure	Quarterly Interest	Number of Periods	Accrued Interest
1Q	$ 250	$ 0.75	4	$ 3.00
2Q	$ 250	$ 0.75	3	$ 2.25
3Q	$ 250	$ 0.75	2	$ 1.50
4Q	$ 250	$ 0.75	1	$ 0.75
	$ 1,000			$ 7.50
Implied accrued interest rate				**0.75%**

In other words, if we assume a level stream of capital expenditures by the City throughout the year, and if we assume an annual interest rate of 1.2% (representing the City's foregone interest earnings), and if we assume that the City completes its year-end project accounting and bills the County by March 31 of the following year, then then a 0.75% markup on the Capital Cost Share will approximately compensate the City for accrued interest.