

# **CITY OF SNOQUALMIE**

**KING COUNTY**

**WASHINGTON**



## **WATER RECLAMATION FACILITY STAFFING STUDY**

**G&O #09505  
DECEMBER 2009**



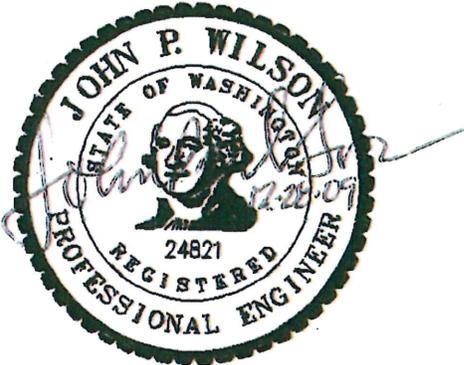
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**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

## TABLE OF CONTENTS

INTRODUCTION .....	1
EXISTING WRF AND STAFFING LEVELS .....	1
FULL-TIME EMPLOYEES.....	2
BENCHMARKING .....	2
AWWA 2007 BENCHMARKING REPORT.....	4
NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION REPORT.....	13
COLLECTION SYSTEM .....	19
CONCLUSION.....	20

## LIST OF TABLES

<u>No.</u>	<u>Table</u>	<u>Page</u>
1	Snoqualmie WRF Data for AWWA Performance Indicators <sup>(1)</sup> .....	5
2	2007 AWWA Benchmarking Data for All Survey Participants .....	5
3	2007 AWWA Benchmarking Data for West Region.....	6
4	2007 AWWA Benchmarking Data for Population Less Than 10,000.....	6
5	2007 AWWA Benchmarking Data for Population 10,000 to 50,000 .....	6
6	Performance Indicator Values for Similar Washington Reuse Facilities .....	12
7	Snoqualmie WRF Employees Required to Match AWWA Benchmarking Median Levels.....	12
8	Annual Hours Required for Operation of Processes at Snoqualmie WRF <sup>(1)</sup> (0.5 to 1.0 mgd Plant) (One-Plus Shift) .....	14
9	Annual Hours Required for Operation of Processes at Snoqualmie WRF <sup>(1)</sup> (1.0 to 5.0 mgd Plant) (One-Plus Shift) .....	14
10	Annual Hours Required for Maintenance of Processes at Snoqualmie WRF <sup>(1)</sup> (0.5 to 1.0 mgd Plant) (One-Plus Shift) .....	15
11	Annual Hours Required for Maintenance of Processes at Snoqualmie WRF <sup>(1)</sup> (1.0 to 5.0 mgd Plant) (One-Plus Shift) .....	16
12	Annual Hours Required for Laboratory Operations for Testing at Snoqualmie WRF (One-Plus Shift) .....	17
13	Estimated Annual Labor Hours Required for Biosolids/Sludge Handling at Snoqualmie WRF (0.5 to 1.0 mgd Plant) (One-Plus Shift) .....	17
14	Estimated Annual Labor Hours Required for Biosolids/Sludge Handling of Snoqualmie WRF (1.0 to 5.0 mgd Plant) (One-Plus Shift) .....	18
15	Annual Hours Required for Yard Work at Snoqualmie WRF <sup>(1)</sup> (One-Plus Shift) .....	18
16	Considerations for Additional Plant Staffing <sup>(1)</sup> .....	19
17	Estimated Total Annual Hours Required for Operation and Maintenance at Snoqualmie WRF (One-Plus Shift) .....	20

## LIST OF FIGURES

<u>No.</u>	<u>Figure</u>	<u>Page</u>
1	Existing Public Works Department Organization Chart.....	3
2	Customer Accounts per Employee in AWWA Survey.....	7
3	Wastewater Treated (mgd) per Employee in AWWA Survey.....	8
4	O&M Cost per Account in AWWA Survey .....	9
5	O&M Cost per Million Gallons Processed in AWWA Survey .....	10
6	Proposed New Public Works Department Organization Chart.....	22

## INTRODUCTION

The purpose of this study is to evaluate the City of Snoqualmie's current and future staffing needs for the Water Reclamation Facility (WRF). This evaluation uses published reports, information from the City, and data from other Washington State water reclamation facilities to estimate and recommend staffing requirements by comparing the City's staffing level to comparable water reclamation facilities and their current level of staffing.

The study compares the City's existing staffing levels to the staffing levels of other similar wastewater utilities, including 120 wastewater utilities included in the 2007 American Water Works Association (AWWA) report titled *Benchmarking Performance Indicators for Water and Wastewater Utilities: 2007 Annual Survey Data and Analysis Report*. The study uses specific performance indicators in the AWWA report to compare the City to other utilities.

The study also estimates the staffing level needed according to the size and type of specific processes found at wastewater treatment plants. This approach uses staff hour charts in the 2008 New England Interstate Water Pollution Control Commission's (NEIWPCC) report titled *The Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants* to estimate the hours necessary to perform maintenance and operational tasks associated with the specific processes at the City's WRF.

Snoqualmie collection system operation and maintenance (O&M) needs are estimated using information from the City on current staffing levels and contract services as well as from a U.S. Environmental Protection Agency (EPA) report on sewer system staffing requirements.

## EXISTING WRF AND STAFFING LEVELS

The City of Snoqualmie operates a WRF that serves the City of Snoqualmie, the Snoqualmie Casino, and Echo Glenn DSHS Youth Detention Center. Raw domestic wastewater is conveyed to the facility's headworks by means of gravity sewers and pump station force mains. A mechanical bar screen at the headworks removes rags, plastics, and large debris from the influent wastewater upstream of a vortex grit chamber, which separates and removes sand, gravel, and other heavy inert material from the flow. From the grit chamber, the wastewater flows to one of two oxidation ditches designed for BOD<sub>5</sub>, nitrogen, and phosphorus removal. Mixed liquor from the oxidation ditch is distributed to two secondary clarifiers for mixed liquor solids settling. Settled solids are returned to the oxidation ditches or wasted to an aerated sludge holding tank for further treatment by sludge dewatering and drying. Clarifier effluent flows through sand filters prior to ultraviolet disinfection. The facility discharges secondary effluent to the Snoqualmie River upstream of Snoqualmie Falls 9 months out of the year. Class A reclaimed water is produced during the summer months (July to September) and is

conveyed to Eagle Lake for irrigation use. Reclaimed water is provided with additional disinfection treatment by chlorine injection into the product water pipeline to Eagle Lake.

The City has four water and wastewater system O&M staff including the Water and Wastewater Treatment Supervisor. The staffing and organization for the City's WRF is shown on Figure 1. One of these staff is the Senior Water Operator, who is primarily responsible for the operations and maintenance of the City's water treatment facilities. The other O&M staff primarily work on wastewater treatment facility operations. Currently, operation and maintenance of the City's collection system is handled by the Wastewater Collection and Water Distribution department, but in 2010 this department will be reorganized and the collection system O&M employees placed in the new Wastewater Reclamation/Sanitary Sewer System department. At that time, operation and maintenance of the collection system will be provided by WRF staff.

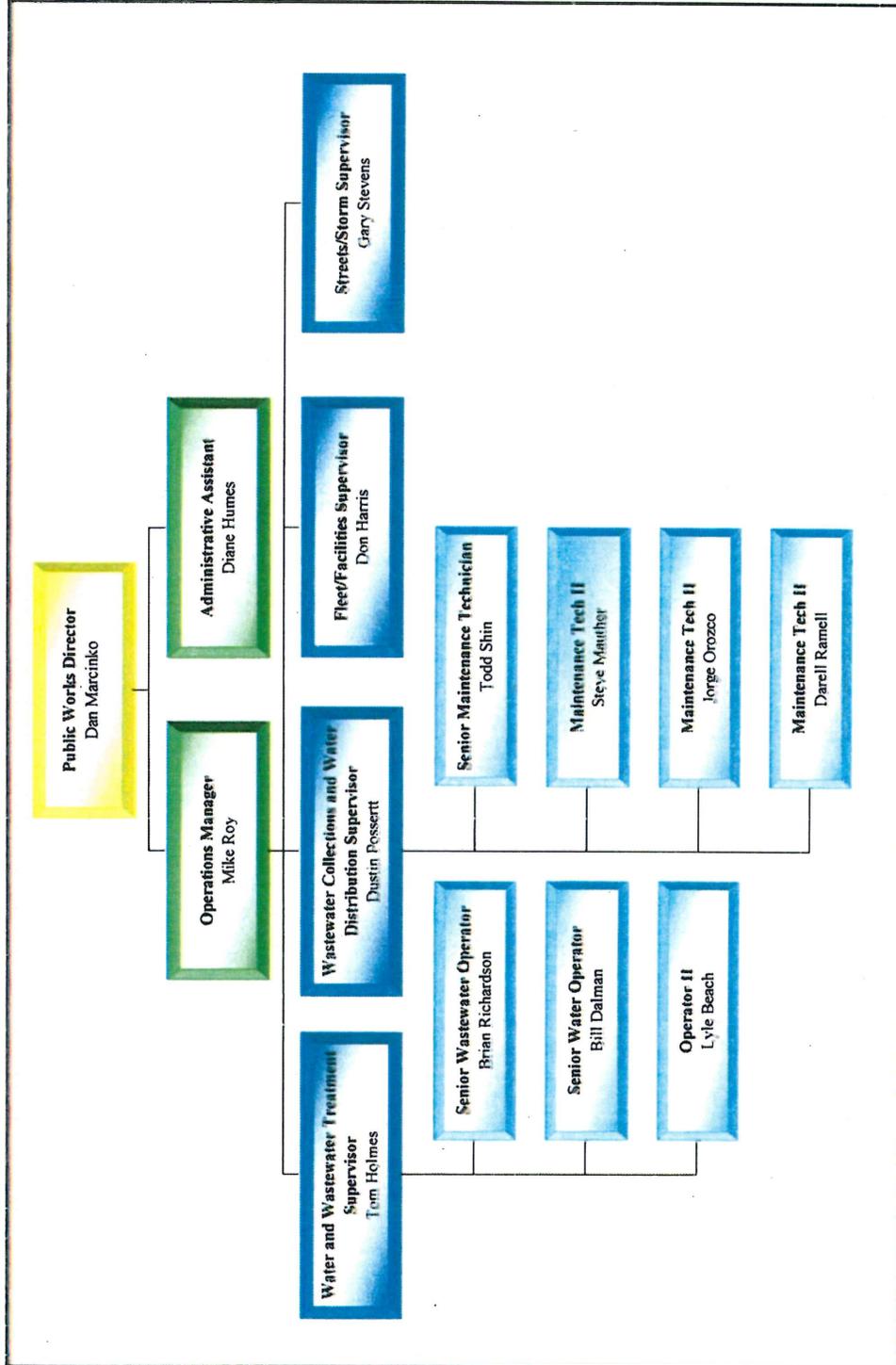
## **FULL-TIME EMPLOYEES**

This study estimates staffing requirements for the WRF in terms of full-time employees (FTEs). An FTE is defined as the equivalent labor of one employee working full time on the water reclamation facility operation and maintenance for 1 year, exclusive of established nonworking days for sick leave, vacation, and training. For the purposes of this analysis, the only FTEs considered as WRF employees are the employees who work at the water reclamation facility and who supervise the O&M staff. City engineers, billing staff, custodial personnel, and water treatment personnel are not included as WRF employees. Based on the City of Snoqualmie leave policy, one FTE is equal to 1,736 labor hours in 1 year. This total is based on the policy that each employee receives 12 sick days, an average of 16 vacation days, 12 holidays, and 3 training days per year and that a full day of work is 8 hours.

## **BENCHMARKING**

Benchmarking is the process of comparing one system to another in order to assess performance. By comparing the City's water reclamation facility to other similar systems, the City can evaluate the WRF's O&M program in terms of its relative efficiency and staffing levels.

Benchmarking is typically done with performance ratios, such as "FTEs per product produced." These ratios allow a comparison of differently sized facilities. It is important to note that no two treatment facilities are the same. Factors including age of system, operation complexity of the facility, past O&M programs, and the level of treatment required will vary from system to system and make it difficult to achieve a one-to-one comparison between any two systems. For instance, the City of Snoqualmie has a water reclamation facility that only produces reclaimed water during summer months. Another system may be of similar size but produce reclaimed water continually, which might require additional staff for monitoring and testing.



**FIGURE 1**  
**Existing Public Works Department Organization Chart**

Benchmarking standards are established for the City in this study using AWWA and NEIWPC reports. It is recommended that the City use these standards as a baseline for benchmarking or performance evaluation in the future. The City should continue to monitor and update staffing levels to ensure that the established benchmarked standards are being met, or reevaluate the standards when appropriate.

## **AWWA 2007 BENCHMARKING REPORT**

In 2007, the AWWA published a report on benchmarking performance indicator data gathered from 120 wastewater utilities including the City of Bremerton, Chelan County PUD, City of Kent, Northshore Utility District, Sammamish Plateau Water & Sewer District, and Seattle Public Utilities. These indicator data were designed to be used by utility managers as a basis of comparison among peer utilities for setting effective operational goals. There were 22 benchmarking indicators used in the report. The indicators were organized into the following five major categories:

1. Organizational Development
2. Customer Relations
3. Business Operations
4. Water Operations
5. Wastewater Operations

For the purposes of this evaluation, only wastewater utility data from the AWWA report were used in the Snoqualmie Staffing Study. The specific performance indicators presented in this evaluation and their respective categories are shown below:

- **Organizational Development**
  - Customer Accounts per Employee
  - Million Gallons per Day (mgd) Wastewater Processed per Employee
- **Wastewater Operations**
  - O&M Cost per Account
  - O&M Cost per Million Gallons

These indicators relate most directly to staffing and provide the City with a gauge with which to compare current and historical staffing levels to those of peer utilities. However, it should be noted that not all of the AWWA survey participants operated wastewater treatment facilities, and therefore, comparisons to the Snoqualmie system should include additional review as provided below.

In order to compare the City with other utilities on the selected performance indicators in the AWWA analysis, it is first necessary to compute the value of each of the indicators for the City's water reclamation facility. Table 1 gives the pertinent information for the City's water reclamation facility and the value of the indicators used in this study.

Tables 2 through Table 5 present benchmarking data for all the AWWA survey participants as well as various subsets of the survey participants that have similarities with the City. As presented in the tables, the indicator values vary between each subset, but many similarities and trends are apparent. The median number of customer accounts per employee range from 396 to 646. The O&M and production costs per gallon are significantly higher for systems with less than 10,000 people, as may be expected to result from the economies of the scale.

**TABLE 1**

**Snoqualmie WRF Data for AWWA Performance Indicators<sup>(1)</sup>**

<b>Indicator</b>	<b>City of Snoqualmie Value (2008)</b>
O&M Employees	3
Customer Accounts	3,417
Average Wastewater Treated (mgd)	0.808
O&M Cost	\$1,468,000
Customer Accounts/Employee	1,139
Wastewater Treated/Employee (mgd)	0.27
O&M Cost/Account	\$429
O&M Cost/Million Gallons	\$4,977
Planned Maintenance Ratio	0%

(1) Data from the City.

**TABLE 2**

**2007 AWWA Benchmarking Data for All Survey Participants**

<b>Performance Indicator</b>	<b>25<sup>th</sup> Percentile</b>	<b>Median</b>	<b>75<sup>th</sup> Percentile</b>
Customer Accounts/Employee	378	555	809
Wastewater Treated/Employee (mgd)	0.20	0.27	0.36
O&M Cost/Account	\$222	\$302	\$418
O&M Cost/Million Gallons	\$1,067	\$1,960	\$2,615
Planned Maintenance Ratio (cost)	31%	50%	69%
Planned Maintenance Ratio (hours)	40%	67%	77%

**TABLE 3**

**2007 AWWA Benchmarking Data for West Region**

<b>Performance Indicator</b>	<b>25<sup>th</sup> Percentile</b>	<b>Median</b>	<b>75<sup>th</sup> Percentile</b>
Customer Accounts/Employee	426	646	901
Wastewater Treated/Employee (mgd)	0.17	0.22	0.33
O&M Cost/Account	\$133	\$213	\$343
O&M Cost/Million Gallons	\$1,523	\$2,293	\$3,398
Planned Maintenance Ratio (cost)	48%	66%	82%
Planned Maintenance Ratio (hours)	63%	74%	83%

**TABLE 4**

**2007 AWWA Benchmarking Data for Population Less Than 10,000**

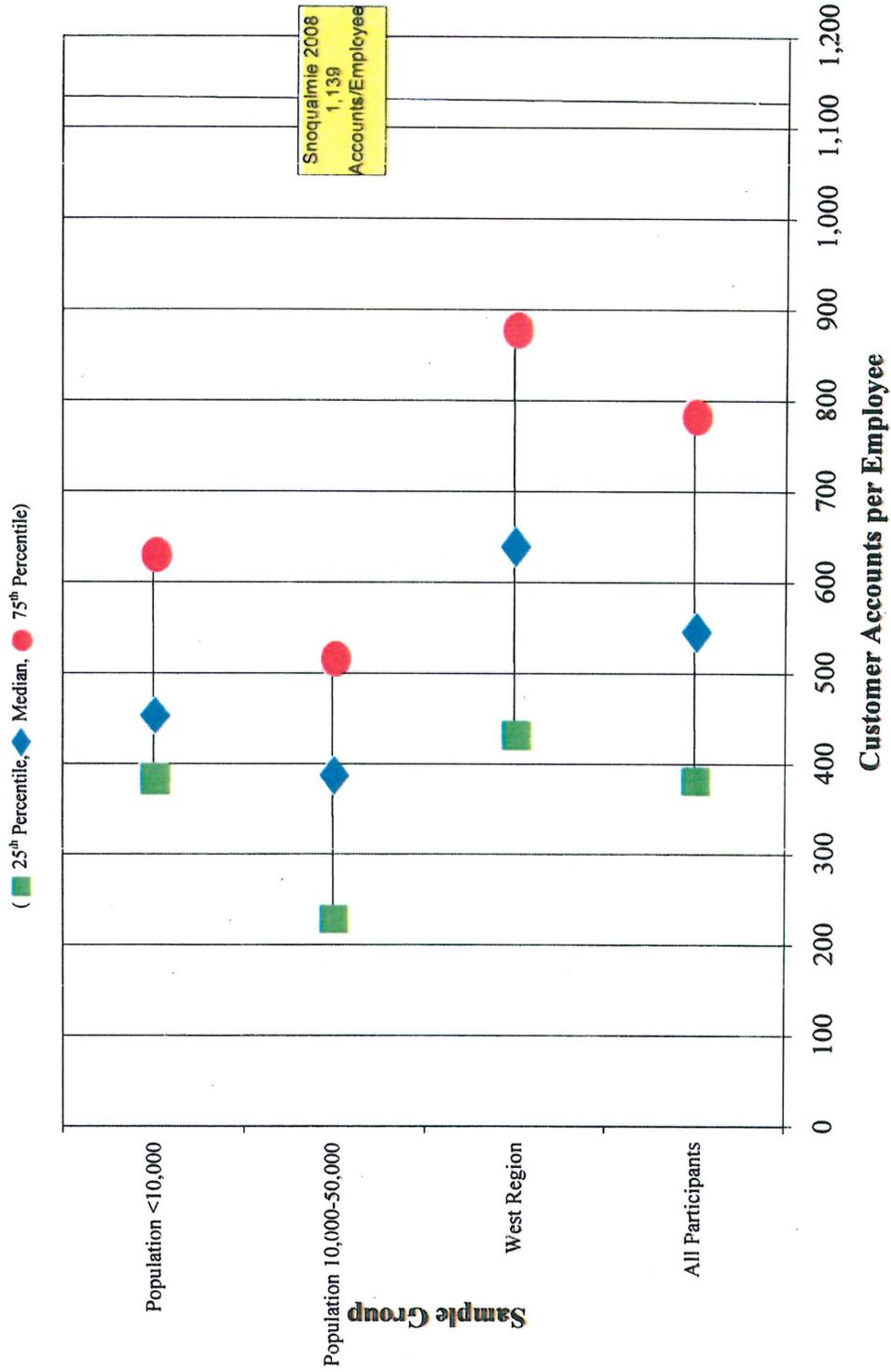
<b>Performance Indicator</b>	<b>25<sup>th</sup> Percentile</b>	<b>Median</b>	<b>75<sup>th</sup> Percentile</b>
Customer Accounts/Employee	378	463	658
Wastewater Treated/Employee (mgd)	0.13	0.16	0.24
O&M Cost/Account	\$147	\$199	\$237
O&M Cost/Million Gallons	\$2,083	\$3,321	\$5,373
Planned Maintenance Ratio (cost)	21%	50%	85%
Planned Maintenance Ratio (hours)	23%	63%	84%

**TABLE 5**

**2007 AWWA Benchmarking Data for Population 10,000 to 50,000**

<b>Performance Indicator</b>	<b>25<sup>th</sup> Percentile</b>	<b>Median</b>	<b>75<sup>th</sup> Percentile</b>
Customer Accounts/Employee	226	396	545
Wastewater Treated/Employee (mgd)	0.10	0.15	0.19
O&M Cost/Account	\$66	\$164	\$371
O&M Cost/Million Gallons	\$1,757	\$3,193	\$4,968
Planned Maintenance Ratio (cost)	69%	80%	86%
Planned Maintenance Ratio (hours)	50%	83%	88%

Figures 2 through 5 depict the AWWA benchmarking data in graphical form, with Snoqualmie data superimposed for comparison. As depicted on the figures, Snoqualmie has more customer accounts per employee, yet the City has a higher O&M cost per account than all participants in the AWWA survey. However, in terms of wastewater treated per employee, the City of Snoqualmie was within the median range of all participants, and in terms of O&M cost per million gallons processed the City was near the 75<sup>th</sup> percentile for population 10,000 and under.



**FIGURE 2**  
**Customer Accounts per Employee in AWWA Survey**

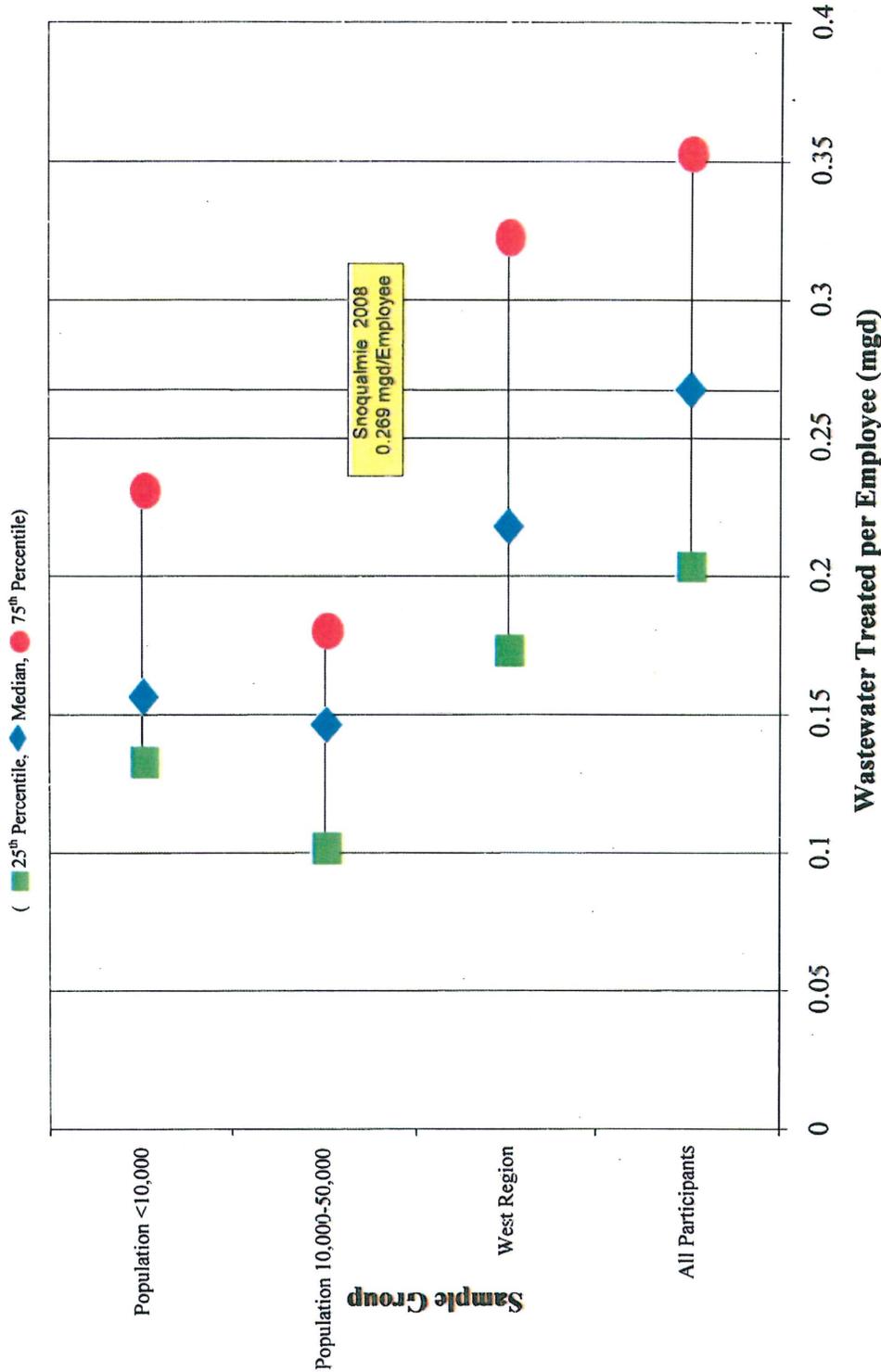
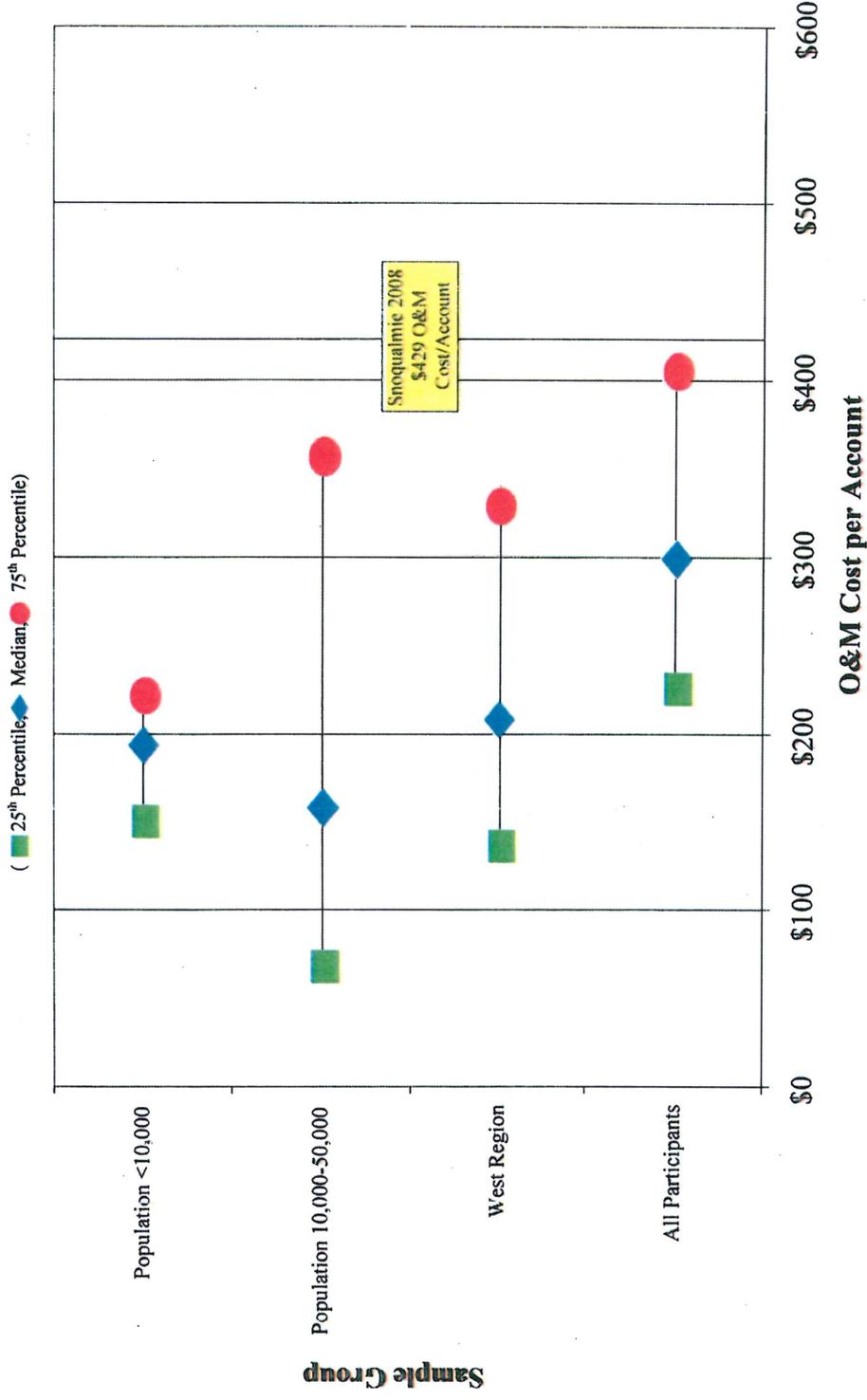
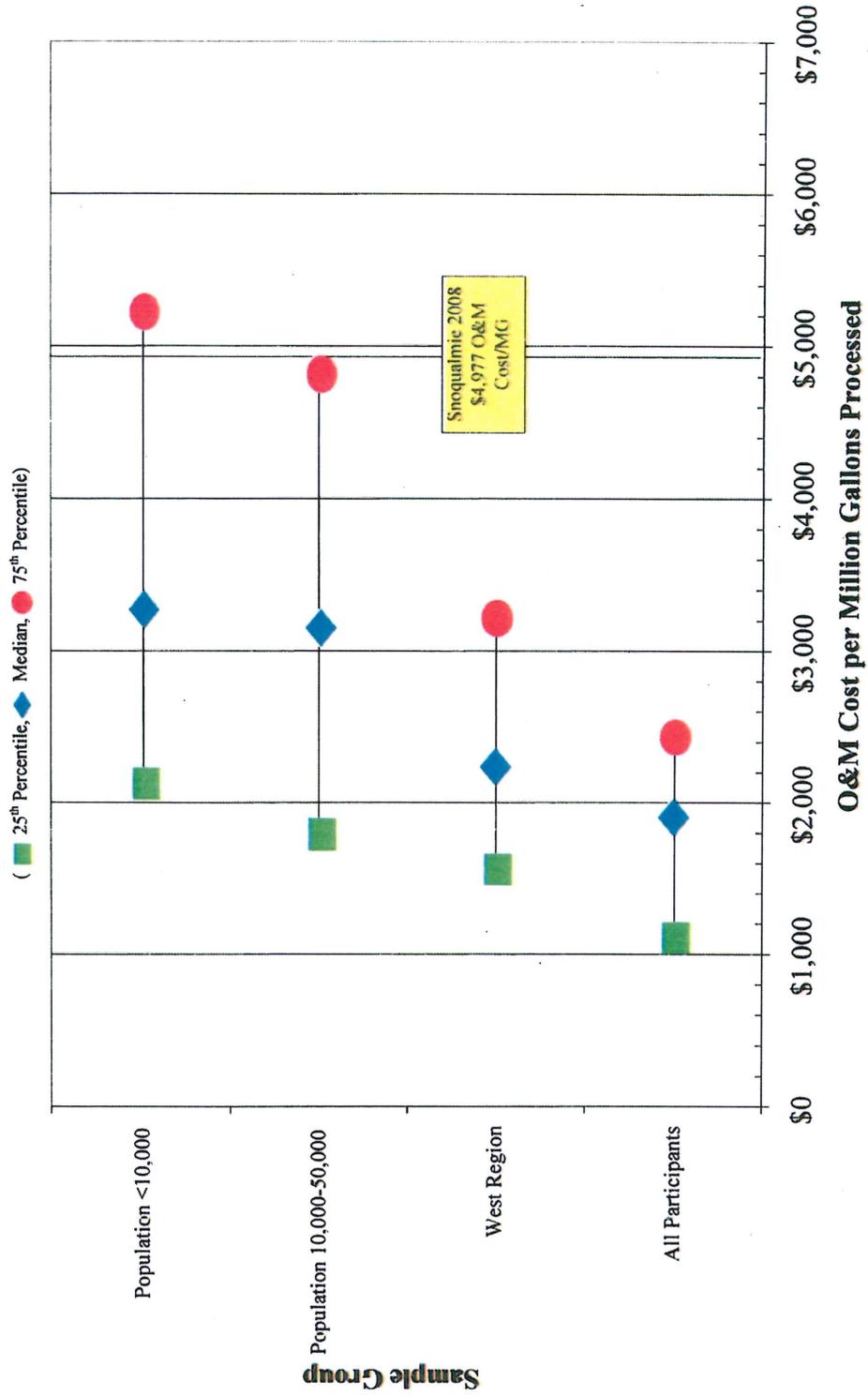


FIGURE 3

Wastewater Treated (mgd) per Employee in AWWA Survey



**FIGURE 4**  
**O&M Cost per Account in AWWA Survey**



**FIGURE 5**  
**O&M Cost per Million Gallons Processed in AWWA Survey**

Table 6 shows a comparison of AWWA performance indicator values for water reuse facilities in the State of Washington. This information was developed by direct communication with these Washington state facilities by Gray & Osborne. The plant sizes vary greatly but the ratios of mgd treated per employee for these facilities fall within the benchmarking values shown in the tables above. Customer accounts per employee for reuse plants in the State of Washington show higher than normal ratios.

The number of employees that the City of Snoqualmie WRF would need to have on staff to match median AWWA benchmarking levels of accounts and production per employee can be calculated using the medians and the City of Snoqualmie's total number of accounts and the total volume of wastewater processed. These values are given in Table 7.

TABLE 6

Performance Indicator Values for Similar Washington Reuse Facilities

Indicator	Snoqualmie		Sequim		Summer <sup>(1)</sup>		Royal City		Warden		Ephrata		Cheney	
	Oxidation Ditch		Oxidation Ditch		Conventional A/S <sup>(2)</sup>		Package A/S <sup>(2)</sup>		Oxidation Ditch		Oxidation Ditch		Oxidation Ditch	
Capacity (mgd)	2.15		1.6		4.6		0.25		0.45		1.0		1.06	
Customer Accounts	3,417		2,500		12,526		547		850		2,719		5,570	
Current Staffing	3		4.2		9		1.5		2		2		5	
Average Treated (mgd)	0.808		0.600		2.10		0.155		0.240		0.60		1.60	
Customer Accounts/Employee	1,139		595		1,392		365		425		1,360		1,114	
Wastewater Treated/Employee (mgd)	0.27		0.14		0.23		0.10		0.12		0.30		0.32	

(1) Conventional secondary wastewater treatment plant.

(2) A/S = Activated Sludge

TABLE 7

Snoqualmie WRF Employees Required to Match AWWA Benchmarking Median Levels

Indicator	All AWWA Survey Participants		Western Region		Population 10,000-50,000		Population <10,000		Washington State Reuse Facilities		Average	
	Participants		Region		10,000-50,000		<10,000		State Reuse Facilities		Average	
Customer Accounts/Employee	6.2		5.3		8.6		7.4		4.0		6.3	
Wastewater Treated/Employee (mgd)	3.0		3.7		5.4		5.1		4.0		4.2	

## NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION 2008 REPORT

The Snoqualmie Staffing Study also used benchmarking information from the 2008 NEIWPCC report titled *The Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants*. The NEIWPCC report is based on and updates information in the EPA's 1973 guide *Estimated Staffing for Municipal Wastewater Treatment Facilities*. The New England report utilized the EPA's manual as a guideline and enhanced the EPA recommendations to include new treatment technologies, laboratory practices, and treatment plant automation systems to make the information applicable to modern facilities. Unlike the AWWA study, the New England guide estimates the amount of staffing needed to operate and maintain a treatment facility based on the types of processes found at the facility and the volume of flow treated.

The NEIWPCC data is presented in charts of annual labor hours required per treatment process and volume of flow treated. In order to calculate the annual hours required for operation and maintenance of the Snoqualmie reclamation facility using the NEIWPCC charts, it is first necessary to establish the Snoqualmie processes involved, the shifts worked, and the flow range. The City of Snoqualmie maintains an 8-hour shift at the WRF, 5 days per week, with a rotating shift during the weekend. According to the NEIWPCC report, this schedule would be considered a "One-Plus Shift." For the Snoqualmie Staffing Study, report data for two flow ranges, 0.5 to 1.0 mgd and 1.0 to 5.0 mgd, were chosen for this analysis to estimate the amount of staffing needed to operate and maintain the WRF at current flows (0.808 mgd) and at future design flows (2.15 mgd).

The following tables indicate the processes relevant to the Snoqualmie reclamation facility and the estimated annual hours to perform the necessary O&M duties associated with them, according to the New England study. Tables 8 and 9 below show estimates of annual hours needed to operate the processes at the Snoqualmie facility. Tables 10 and 11 provide estimates of annual hours needed to maintain the basic and advanced operations at the facility.

**TABLE 8**

**Annual Hours Required for Operation of Processes at Snoqualmie WRF<sup>(1)</sup>  
(0.5 to 1.0 mgd Plant) (One-Plus Shift)**

<b>Process</b>	<b>Estimated Annual Hours/Process Unit (0.5–1.0 mgd)</b>	<b>Multiplier (# Units)</b>	<b>Total Annual Hours for Plant</b>
Preliminary Treatment	160	1	160
Oxidation Ditch w/BNR <sup>(2)</sup>	2,240	1.5	3,360 <sup>(3)</sup>
Granular Media Filters (Sand)	320	3	960
Plant Reuse Water	32	1	32
Chlorination	160	1	160
Ultraviolet Disinfection	160	1	160
<b>Total Annual Hours</b>			<b>4,832</b>

(1) Data from NEIWPCCC report.

(2) Hours for secondary clarification and RAS/WAS pumping are included in the estimated hours.

(3) Total annual hours estimated at 1.5 times annual hours per unit since oxidation ditches, secondary clarifiers, and RAS pumping equipment are part of combined system.

**TABLE 9**

**Annual Hours Required for Operation of Processes at Snoqualmie WRF<sup>(1)</sup>  
(1.0 to 5.0 mgd Plant) (One-Plus Shift)**

<b>Process</b>	<b>Estimated Annual Hours/Process Unit (1.0–5.0 mgd)</b>	<b>Multiplier (# Units)</b>	<b>Total Annual Hours for Plant</b>
Preliminary Treatment	320	1	320
Oxidation Ditch w/BNR <sup>(2)</sup>	3,200	1.5	4,800 <sup>(3)</sup>
Granular Media Filters (Sand)	320	3	960
Plant Reuse Water	32	1	32
Chlorination	320	1	320
Ultraviolet Disinfection	320	1	320
<b>Total Annual Hours</b>			<b>6,752</b>

(1) Data from NEIWPCCC report.

(2) Hours for secondary clarification and RAS/WAS pumping are included in the estimated hours.

(3) Total annual hours estimated at 1.5 times annual hours per unit since oxidation ditches, secondary clarifiers, and RAS pumping equipment are part of combined system.

**TABLE 10**

**Annual Hours Required for Maintenance of Processes at Snoqualmie WRF<sup>(1)</sup>  
(0.5 to 1.0 mgd Plant) (One-Plus Shift)**

<b>Activity</b>	<b>Estimated Annual Hours/Process Unit (0.5–1.0 mgd)</b>	<b>Multiplier (# Units)</b>	<b>Total Annual Hours for Plant</b>
Mechanically Cleaned Screens with Grinders/Washer/Compactor	160	1	160
Vortex Grit Removal	32	1	32
Additional Process Tanks (Sludge Holding Tank)	32	1	32
Circular Clarifiers	80	2	160
Pumps	100	7	700
Mechanical Mixers	32	6	192
Aerators	64	4	256
Sand Filters	64	3	192
Ultraviolet Disinfection (per rack)	32	6	192
Chlorination (Liquid)	64	1	64
Probes/Instrumentation/Calibration	32	3	96
<b>Total Annual Hours</b>			<b>2,076</b>

(1) Data from NEIWPC report.

**TABLE 11**

**Annual Hours Required for Maintenance of Processes at Snoqualmie WRF<sup>(1)</sup>  
(1.0 to 5.0 mgd Plant) (One-Plus Shift)**

<b>Activity</b>	<b>Estimated Annual Hours/Process Unit (1.0–5.0 mgd)</b>	<b>Multiplier (# Units)</b>	<b>Total Annual Hours for Plant</b>
Mechanically Cleaned Screens with Grinders/Washer/Compactor	320	1	320
Vortex Grit Removal	80	1	80
Additional Process Tanks (Sludge Holding Tank)	32	1	32
Circular Clarifiers	160	2	320
Pumps	250	7	1,750
Mechanical Mixers	32	6	192
Aerators	64	4	256
Sand Filters	64	3	192
Ultraviolet Disinfection (per rack)	32	6	192
Chlorination (Liquid)	64	1	64
Probes/Instrumentation/Calibration	32	3	96
<b>Total Annual Hours</b>			<b>3,494</b>

(1) Data from NEIWPC report.

Table 12 below is the NEIWPC laboratory operations chart that estimates the amount of time spent on each laboratory test parameter and the frequency each test is performed based on the City of Snoqualmie Water Reclamation Facility Waste Discharge and Reclaimed Water NPDES Permit. Coliform testing is performed 5 days per week during the winter months, and 7 days per week during the summer when reclaimed water is being produced. Therefore, an average of 6 days per week is shown for coliform testing.

TABLE 12

**Annual Hours Required for Laboratory Operations for Testing at  
Snoqualmie WRF  
(One-Plus Shift)**

Test Required by WRF Permit	Testing Time (hours) <sup>(1)</sup>	Days/Week <sup>(2)</sup>	Days/Month <sup>(2)</sup>	Annual Hours
BOD	2.5		2	60
CBOD	2.5	3		390
TSS	3.0	3		468
Coliform (Total, Fecal)	1.0	6		312
Ammonia	2.0	1		104
Phosphorus	2.0	1		104
Sampling for Contract Lab Service	0.25	3		39
QA/QC	1.0	1		52
<b>Total Annual Hours</b>				<b>1,529</b>

(1) Data from NEIWPC report. Hours estimated in this chart include sampling time.

(2) Data from Snoqualmie WRF NPDES permit.

Table 13 and 14 below present estimates of the amount of annual hours spent operating the biosolids and sludge handling portion of the Snoqualmie facility. There is no sludge drying category in the *Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants*, therefore the hours estimated are based on the reports supplied by the City of Snoqualmie. According to the sludge dryer operations report form, current hours needed to operate the sludge drying facility average 2 hours 22 minutes per drying cycle per day. The dryer is operated one cycle per day, 5 days per week.

TABLE 13

**Estimated Annual Labor Hours Required for Biosolids/Sludge Handling at  
Snoqualmie WRF  
(0.5 to 1.0 mgd Plant) (One-Plus Shift)**

Process	Estimated Annual Hours (0.5–1.0 mgd)	Multiplier (# Units)	Total Annual Hours for Plant
Centrifuge <sup>(1)</sup>	365	1	365
Drying <sup>(2)</sup>	616	1	616
<b>Total Annual Hours</b>			<b>981</b>

(1) Data from NEIWPC report.

(2) Data from the City on current operation requirements.

**TABLE 14**

**Estimated Annual Labor Hours Required for Biosolids/Sludge Handling of  
Snoqualmie WRF  
(1.0 to 5.0 mgd Plant) (One-Plus Shift)**

<b>Process</b>	<b>Estimated Annual Hours (0.5–1.0 mgd)</b>	<b>Multiplier (# Units)</b>	<b>Total Annual Hours for Plant</b>
Centrifuge <sup>(1)</sup>	960	1	960
Drying <sup>(2)</sup>	616	1.5	924
<b>Total Annual Hours</b>			<b>1,884</b>

(1) Data from NEIWPC report.

(2) Data from the City on current operation requirements (extrapolated).

Table 15 presents the estimated annual labor hours for yard work based on the Snoqualmie plant layout. The hours are adjusted for seasonal and maintenance help from other departments in the City.

**TABLE 15**

**Annual Hours Required for Yard Work at Snoqualmie WRF<sup>(1)</sup>  
(One-Plus Shift)**

<b>Work Done</b>	<b>Estimated Hours</b>
Snow Removal	30
Mowing/Weed Eating	50
Facility Painting	60
Rust Removal	60
Pressure Washing	60
<b>Total Annual Hours</b>	<b>260</b>

(1) Data from the City.

Table 16 lists considerations for additional staffing at treatment plants. These considerations derive from the NEIWPC report. However, these items were not built into the NEIWPC charting of O&M hours, as these tasks are not common responsibilities for all treatment facilities. An additional O&M requirement of 0.2 FTE is estimated to perform these responsibilities at the Snoqualmie WRF.

TABLE 16

Considerations for Additional Plant Staffing<sup>(1)</sup>

Responsibilities	Applicable to WRF?
Management Responsibilities (i.e., budgets, reporting, other clerical duties)	Yes
Plant Operators Responsible for Operating Generators and Emergency Power	Yes
Plant Staff Involved in Generating Additional Energy	No
Plant Receives Extra High Septage and/or Grease Load (higher than designed organic and grease loadings) or Plant Takes in Sludge from Other Treatment Plants	No
Plant is Producing Class A Biosolids Product (these hours are included in Tables 13 and 14)	Yes
Plant Responsible for Industrial Pretreatment Program	No
Plant Staff Responsible for Plant Upgrade and Large Projects Done Both On-Site and Off-Site (i.e., collection system, manholes, etc.)	No
Plant Operators Responsible for Machining Parts On-Site	No
Age of Plant Equipment (over 15 years of age)	No
Plant Operators Responsible for Collection System O&M, Pump Station Inspections, and/or Combined Sewer Overflow (these hours are included in Table 17)	Yes (2010)

(1) From NEIWPCC report.

Based on the information in the tables above, the estimated total staffing requirement to adequately operate and maintain the City of Snoqualmie Water Reclamation Facility is shown in Table 17. The first column indicates the estimated staffing needed to operate and maintain the plant at its current average daily flow, and the second column is the amount of staff estimated to operate and maintain the plant at design flow (2.15 mgd). The estimated additional staff is based on the added responsibilities listed in Table 16.

## COLLECTION SYSTEM

To estimate the staffing needs for the Snoqualmie collection system, the 1973 EPA report titled *Manpower Requirements for Waste Water Collection Systems in Cities and Towns up to 150,000 in Population* was referenced. Based on the number of lift stations and the size of population in the City of Snoqualmie, this study recommends that approximately 1.5 FTEs are employed to maintain the City's sewer lines and 13 lift stations. Collection system management, which will increase the WRF workload, will be added to the WRF staff's responsibilities in 2010 and is added in line seven of Table 17.

TABLE 17

**Estimated Total Annual Hours Required for Operation and Maintenance at  
Snoqualmie WRF  
(One-Plus Shift)**

<b>Activity</b>	<b>Est. Annual Hours (0.5–1.0 mgd Plant)</b>	<b>Est. Annual Hours (1.0–5.0 mgd Plant)</b>
1 – Treatment Operation	4,832	6,752
2 – Maintenance	2,076	3,494
3 – Laboratory	1,529	1,529
4 – Biosolids/Sludge Handling	981	1,884
5 – Yard Work	260	260
Subtotal	9,678	13,919
	<b>Employees</b>	<b>Employees</b>
Estimated O&M Staff (subtotal/1,736 hr/employee)	5.6	8.0
6 – Estimated Additional Staff <sup>(1)</sup>	0.2	0.2
7 – Collection System <sup>(2)</sup>	1.5	2.0
<b>Estimated Total Staffing Required</b>	<b>7.3</b>	<b>10.2</b>

(1) Estimated based on O&M considerations listed in Table 16.

(2) Estimate based on EPA report on collection system O&M requirements. Collection system operation and maintenance will be added to the WRF workload in 2010.

## CONCLUSION

Based on the benchmarking analysis presented above and using published O&M data from various municipal wastewater utilities and treatment plants as well as information from other Washington State water reclamation facilities, it is estimated that the Snoqualmie WRF requires about 6 FTEs at current plant flows and 8 FTEs at future flows (>2 mgd) to adequately operate and maintain the WRF. Once the operation and maintenance of the City's collection system is added to the WRF staff's workload, the estimated staffing requirement at current plant flows is about 7 FTEs and at future flows is 10 FTEs.

An increase in WRF staff would benefit the City by providing adequate labor to fully implement a preventive maintenance program. The benefit of increased routine and preventive maintenance is a reduction in the emergency maintenance that the City currently outsources, a reduction in equipment downtime, decreased cost of equipment replacement, and a more reliable and efficient facility. Some collection system and lift station cleaning services may be contracted to private companies on an "as-needed" basis, thereby reducing the need to use City employees to perform this work.

A proposed new Organization Chart showing the recommended staffing for the Water Reclamation/Sanitary Sewer System department, at current plant flows, and once

collection system operation and maintenance is added to the department's responsibilities, is presented on Figure 6.

The City has included funds in its 2010 budget to hire three additional employees, increasing the WRF staff to seven employees.

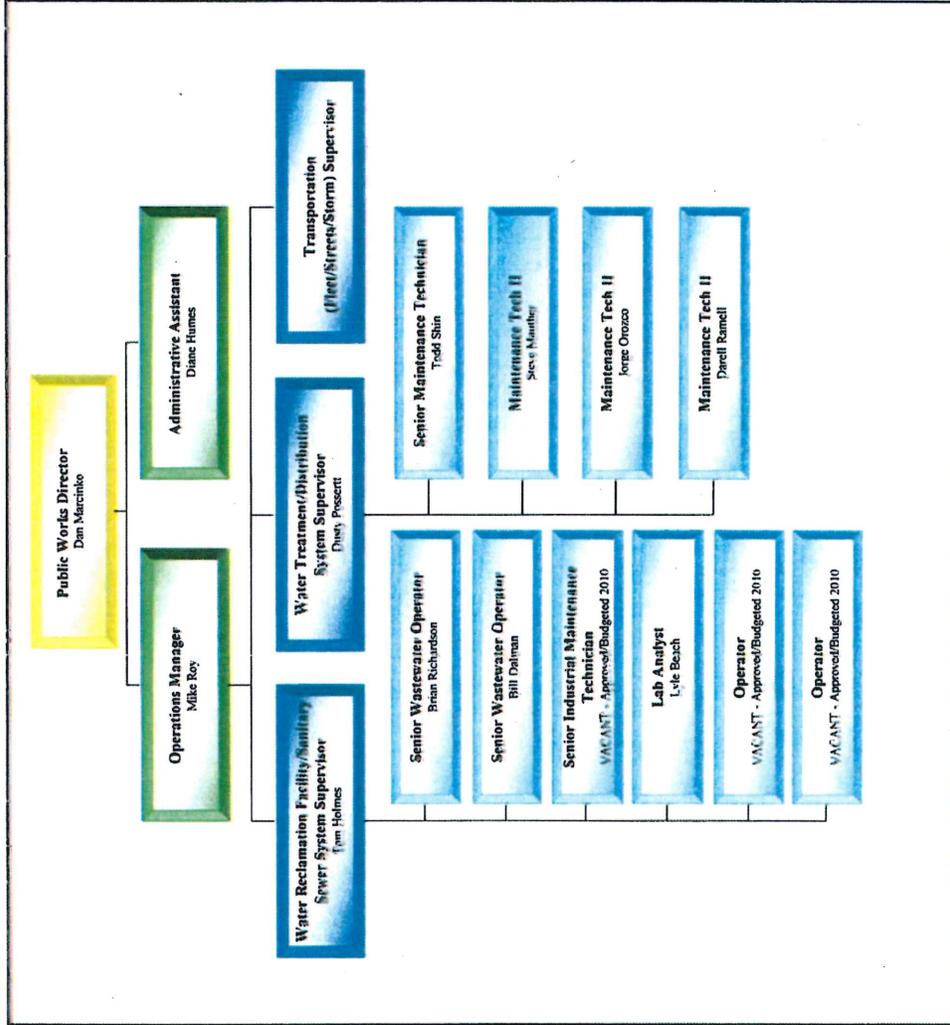


FIGURE 6

Proposed New Public Works Department Organization Chart



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

December 29, 2009

Mr. Shawn McKone, P.E.  
Water Quality Permit Manager  
Washington State Department of Ecology  
Northwest Regional Office  
3190 160<sup>th</sup> Avenue SE  
Bellevue, Washington 98008-5452

**SUBJECT: WATER RECLAMATION FACILITY STAFFING STUDY  
CITY OF SNOQUALMIE, KING COUNTY, WASHINGTON  
G&O #09505.00**

Dear Mr. McKone:

On behalf of the City of Snoqualmie, the attached two copies of the Water Reclamation Facility (WRF) Staffing Study are submitted in compliance with the requirements of Section S5.B of the City's NPDES permit. The Staffing Study evaluates and recommends staffing levels for the WRF, lift stations, collection system, and the reclaimed water production and distribution system.

As stated in the existing WRF Operation and Maintenance Manual (Tetra Tech/KCM Inc., April 2004), "approximately six full-time employees are required for the plant and pump stations, and three full-time employees are required for the sewers." This approximate staffing level would be appropriate for the facilities at wastewater flows and loads greater than current levels and closer to the design capacity of the plant (2.15 mgd). Also, some sewer and pump station cleaning services are currently contracted to private companies, a practice which decreases the need for using City employees to perform this work.

The attached Staffing Study recommends seven total WRF employees at current plant flows and ten employees at future plant flows. The City has included funds in its 2010 budget to hire three additional employees, increasing the WRF staff to seven employees. This staffing level is consistent with the recommendations in the Operation and Maintenance Manual. Since the staffing needs identified in the study do not differ from the levels specified in the approved WRF Operation and Maintenance Manual, it is the City's understanding that the Operation and Maintenance Manual does not need to be updated to reflect new staffing recommendations, per Section S5.B in the NPDES permit.



Mr. Shawn McKone, P.E.  
December 29, 2009  
Page 2

Please call me if you have any questions about this submittal.

Very truly yours,

GRAY & OSBORNE, INC.

John P. Wilson, P.E.

JPW/hhj  
Encl.

cc: Mr. Dan Marcinko, Public Works Director, City of Snoqualmie, w/encl.  
Mr. Mike Roy, Operations Manager, City of Snoqualmie, w/encl.  
~~Mr. Tom Holmes, Water Reclamation Facility Manager, City of Snoqualmie, w/encl.~~