Friday Harbor
Water System Plan Update

Prepared for

Town of Friday Harbor, Washington

June 2013

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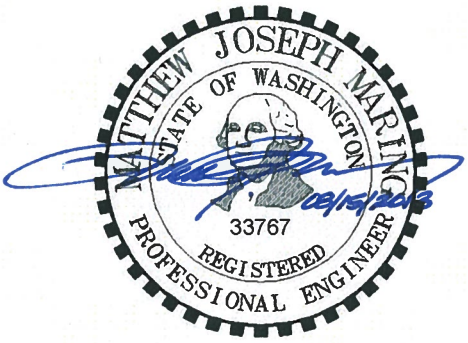

Project Number 137804

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Table of Contents

List of Figures viii
List of Tables ix
List of Abbreviations xi
Executive Summary ES-1
Plan Overview ES-1
Planning Conclusions and Summary ES-2
1. Water System Description 1-1
1.1 Ownership and Management 1-1
1.2 System Background 1-2
1.2.1 Water System Development and Growth History 1-4
1.2.2 Geography and Topography 1-5
1.2.3 Climate 1-5
1.2.4 Geology and Hydrology 1-6
1.2.5 Neighboring/Adjacent Purveyors 1-6
1.2.6 Ordinances and Bylaws 1-8
1.3 Existing Facilities Inventory 1-8
1.3.1 Sources of Supply 1-14
1.3.2 Water Treatment Facilities 1-16
1.3.3 Distribution System 1-16
1.3.4 Storage Tanks 1-17
1.3.5 Pump Stations 1-17
1.3.6 Current Number of Service Connections 1-19
1.3.7 Existing Interties 1-19
1.4 Related Plans and Documents 1-19
1.5 Existing Service Area Characteristics 1-20
1.5.1 Existing Service Area Boundaries 1-20
1.5.2 Existing Zoning and Land Use 1-21
1.6 Future Service Area 1-21
1.6.1 Future Service Area Boundaries 1-21
1.6.2 Future Zoning and Land Use 1-24
1.7 Service Area Agreements 1-24
1.8 Service Area Policies 1-24
1.9 Satellite Management 1-26
1.10 Conditions of Service 1-26
1.11 Complaints 1-27
2. Basic Planning Data and Water Demand Forecasting 2-1
2.1 Current Population, Service Connections, Water Use, and Equivalent Residential Units 2-1

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

2.1.1 Current Population 2-1
2.1.2 Total Service Connections 2-3
2.1.3 Water Use Data Collection 2-5
2.1.4 Equivalent Residential Units 2-10
2.2 Projected Land Use, Future Population, and Water Demand 2-11
2.2.1 Projected Land Use 2-11
2.2.2 Projected Population 2-11
2.2.3 Projected Nonresidential Water Demand 2-11
2.2.4 Projected Non-Revenue Water 2-12
2.2.5 Water Rates and Rate Impacts on Water Demand 2-12
2.2.6 Water Demand Forecasting 2-13
3. System Analysis 3-1
3.1 System Design Standards 3-1
3.2 Water Quality Analysis 3-3
3.2.1 Recent Trends 3-4
3.2.2 Future Requirements 3-5
3.3 Water System Description and Analysis 3-6
3.3.1 Water Supply Sources 3-6
3.3.2 Water Treatment 3-7
3.3.3 Water Storage 3-10
3.3.4 Water Transmission 3-12
3.3.5 Water Supply Pipelines 3-14
3.3.6 Water Distribution 3-14
3.3.7 Water Distribution System Hydraulic Model 3-15
3.3.8 Water System ERU Capacity 3-25
3.4 System Improvement Needs 3-25
3.4.1 Water Supply Sources 3-25
3.4.2 Water Treatment 3-25
3.4.3 Water Storage 3-26
3.4.4 Water Transmission 3-26
3.4.5 Water Supply Pipelines 3-26
3.4.6 Water Distribution 3-27
4. Water Use Efficiency, Water Rights, System Reliability, and Interties 4-1
4.1 Water Use Efficiency Program Development and Implementation 4-1
4.1.1 Water Use Efficiency Goals 4-1
4.1.2 Water Use Efficiency Measures 4-1
4.1.3 Analysis of WUE Program 4-3
4.2 Source-of-Supply Analysis 4-4
4.2.1 Enhanced Conservation Measures 4-4
4.2.2 Water Rights Changes 4-4
4.2.3 System Interties 4-4
4.2.4 Artificial Recharge and Recovery 4-4

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

4.2.5 Reclaimed Water and Reuse 4-4
4.3 Water Right Evaluation 4-5
4.3.1 Permits, Certificates, Claims, and Applications 4-5
4.3.2 Water Rights, Current Water Usage, and Projected Needs 4-9
4.3.3 Water Reservations 4-9
4.4 Water System Reliability Analysis 4-9
4.4.1 Water Shortage Response Planning 4-10
4.4.2 Source-of-Supply Monitoring 4-10
4.5 Interties 4-12
4.6 System Improvement Needs 4-12
5. Source Water Protection 5-1
5.1 Watershed Control Program 5-1
5.1.1 Watershed Description and Characteristics 5-1
5.1.2 Activities and Land Use Detrimental to Water Quality 5-6
5.1.3 Watershed Management and Control Measures 5-9
5.1.4 Monitoring Program 5-11
5.1.5 System Operations 5-11
5.1.6 Periodic Updates 5-12
5.2 System Improvement Needs 5-12
6. Operations and Maintenance Program 6-1
6.1 Water System Management and Personnel 6-1
6.2 Operator Certification 6-3
6.3 System Operations and Control 6-4
6.3.1 Major System Components 6-4
6.3.2 Routine System Operation 6-8
6.3.3 Preventive Maintenance 6-9
6.3.4 Equipment, Supplies, and Chemical Listing 6-11
6.4 Comprehensive Monitoring Plan 6-11
6.4.1 Coliform Monitoring 6-12
6.4.2 Future Monitoring Requirements 6-12
6.5 Emergency Response Program 6-12
6.5.1 Water System Personnel Emergency Call-up List and Notification Procedures 6-12
6.5.2 Vulnerability Analysis and Service Reliability 6-14
6.5.3 Contingency Operational Plan 6-17
6.6 Safety Procedures 6-18
6.7 Cross-Connection Control Program 6-18
6.8 Customer Complaint Response Program 6-18
6.9 Record Keeping and Reporting 6-19
6.10 System Improvement Needs 6-19
7. Distribution Facilities Design and Construction Standards 7-1
7.1 Project Review Procedures 7-1
7.2 Policies and Requirements for Outside Parties 7-1

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

7.3 Design Standards 7-2
7.4 Construction Standards 7-2
7.5 Construction Certification and Follow-Up Procedures 7-2
8. Improvement Program 8-1
8.1 System Improvements 8-1
8.1.1 Water Supply Sources 8-1
8.1.2 Water Treatment 8-1
8.1.3 Water Storage 8-2
8.1.4 Water Transmission 8-2
8.1.5 Water Supply Pipelines 8-2
8.1.6 Water Distribution 8-3
8.1.7 Water Use Efficiency 8-4
8.1.8 Water Rights 8-4
8.1.9 System Reliability 8-4
8.1.10 Operations and Maintenance 8-4
8.1.11 Water System Management 8-4
8.1.12 Summary 8-5
8.2 Cost Estimates and Schedule 8-6
9. Financial Program 9-1
9.1 Financial Structure 9-1
9.2 Fiscal Policies 9-2
9.2.1 Reserve Funds 9-2
9.2.2 System Reinvestment 9-2
9.2.3 Debt 9-3
9.3 Past Financial Performance 9-3
9.4 Operating Costs 9-5
9.5 Capital Costs 9-6
9.5.1 Capital Financing Strategy 9-7
9.6 Financial Forecast 9-8
9.6.1 Funds and Reserves 9-10
9.7 Water Utility Rates 9-10
9.7.1 Current Rates 9-10
9.7.2 Projected Future Rate Requirements 9-11
9.8 Affordability 9-13
9.9 Water Utility Resources 9-13
9.9.1 Capital Connection Charges 9-13
9.9.2 Local Facilities Charges 9-14
9.10 External Resources 9-14
9.10.1 Grants and Low Cost Loans 9-14
9.10.2 Bond Financing 9-16
9.11 Financial Program Summary 9-17
10. Limitations 10-1

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

Appendix A: Water Facility Inventory (WFI) Form ..... A
Appendix B: Friday Harbor Municipal Code ..... B
Appendix C: Water Rights C
Appendix D: Water Conservation Plan ..... D
Appendix E: Water Extension Requirements ..... E
Appendix F: Water Shortage Response Plan ..... F
Appendix G: Trout Lake Emergency Action Plan (EAP) ..... G
Appendix H: Cross-Connection Control Plan ..... H
Appendix I: Water Quality Monitoring Plan I
Appendix J: Hydraulic Modeling Documentation ..... J
Appendix K: 2010 WSDOH Sanitary Survey ..... K
Appendix L: WTP O&M Manual L
Appendix M: GAC System O&M Manual ..... M
Appendix N: Material Safety Data Sheets (MSDS) ..... N
Appendix O: Financial Plan Rate Models ..... O
Appendix P: Formal Review Comments, Consistency Determinations, and Public Input ..... P
Appendix Q: SEPA Checklist and Threshold Determination ..... Q
Appendix R: Plan Adoption Resolution and Approvals ..... R

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

List of Figures

Figure 1-1. San Juan County and Friday Harbor vicinity map 1-3
Figure 1-2. Town boundaries and Urban Growth Areas 1-4
Figure 1-3. Adjacent purveyors 1-7
Figure 1-4. Entire water system 1-9
Figure 1-5. Water system facilities and pressure zones 1-11
Figure 1-6. Distribution system facilities 1-13
Figure 1-7. Town zoning map 1-22
Figure 1-8. Town land use map 1-23
Figure 2-1. Town population trend 2-2
Figure 2-2. Unincorporated San Juan County population trend 2-3
Figure 2-3. 2011 service connections by customer class 2-5
Figure 2-4. Average day demand (ADD) 2-6
Figure 2-5. Seasonal variations in water demand, by customer class 2-8
Figure 3-1. Schematic of treatment systems 3-8
Figure 3-2. Calibration test locations 3-16
Figure 3-3. Water system demand allocations 3-18
Figure 3-4. Fire flow nodes 3-19
Figure 3-5. Model pipe diameters 3-21
Figure 3-6. 2030 PHD scenario, with no improvements 3-23
Figure 3-7. 2030 MDD + FF scenario, with no improvements 3-24
Figure 4-1. Average Trout Lake reservoir level by month (2001–11) 4-11
Figure 5-1. Watershed boundaries 5-3
Figure 5-2. Watershed land use 5-5
Figure 6-1. Friday Harbor water system organization chart 6-2
Figure 6-2. Water system schematic 6-5

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

List of Tables

Table 1-1. Water System Staff Certifications 1-2
Table 1-2. Existing Raw Water Sources and Sustainable Yield 1-14
Table 1-3. Town of Friday Harbor Water Rights Summary 1-15
Table 1-4. Pipes in the Friday Harbor Distribution System 1-17
Table 1-5. Water System Storage Capacity 1-17
Table 1-6. Pumping Stations 1-18
Table 1-7. Water Service Policies 1-24
Table 2-1. Town of Friday Harbor Population 2-2
Table 2-2. Unincorporated San Juan County Population 2-2
Table 2-3. 2011 Water Service Connections 2-4
Table 2-4. Water Service Connections by Customer Class, 2006–11 2-4
Table 2-5. Water Production, 2003–11 2-6
Table 2-6. Water Consumption, 2003–11 2-7
Table 2-7. Water Consumption by Customer Class (Average for 2006–11) 2-7
Table 2-8. Maximum Day Demand (MDD), 2003–11 2-9
Table 2-9. Water Distribution System Leakage, 2003–11 2-10
Table 2-10. Equivalent Residential Unit Water Demand, 2006–11 2-10
Table 2-11. Water System ERUs (Average 2006–11) 2-11
Table 2-12. Population Projections 2-11
Table 2-13. Water Rate Schedule 2-13
Table 2-14. Projected ADD, MDD, PHD, and ERUs 2-14
Table 2-15. Projected ADD, MDD, PHD, and ERUs (with WUE measures) 2-14
Table 3-1. System Design Standards 3-2
Table 3-2. Annual Raw Water Supply Capacity 3-6
Table 3-3. Annual Raw Water Supply Deficiencies 3-7
Table 3-4. Peak Water Treatment Plant Supply Capacity/Requirements 3-9
Table 3-5. Peak Water Treatment Plant Supply Deficiencies 3-9
Table 3-6. Entire Water System Storage Requirements 3-11
Table 3-7. Entire Water System Storage Deficiencies 3-11
Table 3-8. 460 Zone Storage Requirements 3-11
Table 3-9. 460 Zone Storage Deficiencies 3-12
Table 3-10. Pump Station Supply Capacity and Projected Deficiencies 3-13
Table 3-11. Hydraulic Model Calibration 3-15

Use of contents on this sheet is subject to the limitations specified at the end of this document.
FH WSP Final.docx

Table 3-12. Hydraulic Model Scenarios 3-17
Table 3-13. Hydraulic Model Tank Drawdown Levels 3-18
Table 3-14. Summary of Hydraulic Modeling Results 3-22
Table 3-15. Water System ERU Capacity 3-25
Table 3-16. Proposed Distribution System Improvements 3-28
Table 4-1. Water Rights Self-Assessment: Existing Status 4-6
Table 4-2. Water Rights Self-Assessment: 6-Year Forecast (2018) 4-7
Table 4-3. Water Rights Self-Assessment: 20-Year Forecast (2032) 4-8
Table 4-4. Water Right Capacity 4-9
Table 4-5. Trout Lake Reservoir Level 4-11
Table 5-1. False Bay Watershed Priority Conditions Identified in the San Juan County Watershed Management Action Plan (2000) 5-6
Table 6-1. Town of Friday Harbor Water Staff Certifications 6-3
Table 6-2. Recommended Preventive Maintenance Program 6-10
Table 6-3. Town of Friday Harbor Current and Future Monitoring Program 6-12
Table 6-4. Emergency Telephone Numbers 6-13
Table 6-5. Town of Friday Harbor Staff Responsibilities During an Emergency 6-14
Table 6-6. Impacts Related to Earthquakes 6-15
Table 6-7. Impacts Related to Water Main Break 6-16
Table 6-8. Impacts Related to Storage Tanks 6-16
Table 6-9. Town of Friday Harbor Record Keeping Requirements 6-19
Table 8-1. Proposed Capital Improvement Projects 8-5
Table 8-2. Schedule and Cost Estimates for Proposed Capital Improvement Projects 8-6
Table 9-1. Summary of Historical Fund Resources and Uses Arising from Cash Transactions 9-4
Table 9-2. 6- and 20-Year CIP Cost Estimate Summary 9-6
Table 9-3. Detailed 6-Year CIP (2012$) Cost Estimates and Scheduling 9-7
Table 9-4. 20-Year Capital Financing Strategy 9-8
Table 9-5. 6-Year Financial Forecast 9-9
Table 9-6. Ending Cash Balance Summary Projection 9-10
Table 9-7. Current Monthly Water Rates 9-11
Table 9-8. 6-Year Projected Monthly Rates Requirements 9-12
Table 9-9. 6-Year Monthly Residential Bill Comparisons 9-12
Table 9-10. Affordability Test 9-13

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List of Abbreviations

°F	degrees Fahrenheit
µg/L	micrograms per liter
AACEI	Advancement of Cost Estimating International
AC	asbestos cement
ac-ft	acre-feet
ADD	average day demand
AUG 1	Augmentation Project 1
AUG 2	Augmentation Project 2
AWWA	American Waterworks Association
BAT	Backflow Assembly Tester
BMP	best management practice
CAD	computer-aided drafting
CC	connection charge
CCC	cross-connection control
CCCS	Cross-Connection Control Specialist
CDBG	Community Development Block Grant
CERB	Community Economic Revitalization Board
CEU	Continuing Education Unit
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIP	capital improvement program
CO	Commercial (zoning classification)
COHP	Conversion Option Harvest Plan
COM	commercial (water system customer class)
CPR	cardiopulmonary resuscitation
CU	concentration unit
DBCP	dibromochloropropane
DI	ductile iron
Dioxin	2,3,7,8-TCDD
DPB	disinfection by-product
DS	dead storage
DSL	distribution system leakage
DWSRF	Drinking Water State Revolving Fund
EAP	Emergency Action Plan
EDB	ethylene dibromide
EPA	U.S. Environmental Protection Agency
ERU	equivalent residential unit
ES	equalizing storage
FHMC	Friday Harbor Municipal Code
FHUGA	Friday Harbor Urban Growth Area
fps	feet per second
FSS	fire suppression storage
GAC	granular activated carbon
GFC	general facilities charge
GMA	Washington State Growth Management Act
GO	General Obligation
gpd	gallons per day
gpm	gallons per minute
gpm/sf	gallons per minute per square foot
GIS	geographic information system
HAA5	five regulated haloacetic acids
HCSD	Health and Community Services Department
HDPE	high-density polyethylene
HGL	hydraulic grade line
IDSE	Initial Distribution System Evaluation
IGEA	Investment Grade Efficiency Audit
IN	Light Industrial (zoning classification)
IND	industrial (water system customer class)
IOC	inorganic chemical
lb	pounds
LF	linear feet
LFC	local facilities charge
LID	Local Improvement District
LM	Light Manufacturing (zoning classification)
LRAA	locational running annual average
LT2ESWTR	Long-Term 2 Enhanced Surface Water Treatment Rule
LUST	leaking underground storage tank
MCL	maximum contaminant level
MDD	maximum day demand
MF	Multifamily Residential (zoning classification)
MFR	multifamily residential (water system customer class)
mgd	million gallons per day
MG/yr	million gallons per year

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MSDS	material safety data sheets
MTBE	methyl tertiary-butyl ether
NRCS	Natural Resources Conservation Service
OFM	Washington State Office of Financial Management
O&M	operations and maintenance
OPALCO	Orcas Power and Light
OS	operational storage
PA	public authority (water system customer class)
PCB	polychlorinated biphenyls
PHD	peak hour demand
PLC	programmable logic controller
PRV	pressure-reducing valve
PS	Professional Service (zoning classification)
psi	pounds per square inch
PU	Public Service (zoning classification)
PVC	polyvinyl chloride
PWTF	Public Works Trust Fund
RAA	running annual average
RCW	Revised Code of Washington
SA	Shoreline Public Accommodation (zoning classification)
SB	standby storage
SCADA	supervisory control and data acquisition
SCBA	self-contained breathing apparatus
sf	square feet
SF	Single Family Residential (zoning classification)
SFR	single-family residential (water system customer class)
Silvex	2,4,5-TP
SOC	synthetic organic chemical
Stage 2 DBPR	Stage 2 Disinfectants and Disinfection By-Products Rule
TOC	total organic carbon
Town	Town of Friday Harbor
TTHM	total trihalomethanes
UGA	urban growth area
ULID	Utility Local Improvement District
UT	Utility (zoning classification)
UV	ultraviolet
UW	University of Washington
VOC	volatile organic chemical
WAC	Washington Administrative Code
WDM	Water Distribution Manager
WDS	Water Distribution Specialist
WETRC	Washington Environmental Training Resources Center
WFI	Water Facilities Inventory
WRIA	Water Resource Inventory Area
WSDOH	Washington State Department of Health
WSDOT	Washington State Department of Transportation
WSP	Water System Plan
WSRP	Water Shortage Response Plan
WSU	Washington State University
WTP	water treatment plant
WTPO	Water Treatment Plant Operator
WUE	water use efficiency

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Executive Summary

Plan Overview

Regular system planning for water utilities is important to facilitate appropriate decisions and management for system resources, infrastructure, assets, staff, and services. This Water System Plan seeks to provide utility system analysis and planning consistent with the Town of Friday Harbor Comprehensive Plan, the state Growth Management Act, and the federal Safe Drinking Water Act to help maintain:

- Water supply and availability in sufficient quantities to meet anticipated community needs
- Responsible and efficient use of water to promote appropriate stewardship of limited natural resources
- Water quality treatment and monitoring as required to provide safe and healthy water supplies above and beyond minimum Washington State Department of Health and U.S. Environmental Protection Agency requirements
- Water delivery and availability consistent with level-of-service requirements in terms of pressure, reliability, and fire suppression needs
- Efficient management of utility assets and staff
- Proactive planning for anticipated future system infrastructure needs
- Efficient/stable utility financial operations

Under Section 246-290-100 of the Washington Administrative Code, the Washington State Department of Health requires all water systems to complete updated water system planning documents every 6 years. Water system plans are to be structured to:

- Demonstrate the system's operational, technical, managerial, and financial capability to achieve and maintain compliance with relevant local, state, and federal plans and regulations
- Demonstrate how the system will address present and future needs in a manner consistent with other relevant plans and local, state, and federal laws, including applicable land use plans
- Establish eligibility for external funding support for needed system and operational improvements

This Water System Plan is intended to meet these requirements, and provide a forward-looking vision for the Town of Friday Harbor water system based on near-term and longer-term planning horizons projected 6 and 20 years into the future. While the plan does not commit the Town of Friday Harbor to any particular actions, it does provide a planning-level overview of the Town's vision to effectively manage water utility needs going forward. Plan content is generally divided into nine core sections, as summarized below:

- Section 1: Water System Description
  - Ownership, management, and background
  - Existing facilities
  - Related plans and documents
  - Service areas, characteristics, agreements, and policies

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- Section 2: Basic Planning Data and Water Demand Forecasting
  - Past population and water use
  - Projected populations and future water use
- Section 3: System Analysis
  - Level of service, design, and operational standards
  - Water supply
  - Water quality and treatment
  - Water storage
  - Water transmission and distribution
  - Overall system capacity, issues, and needs
- Section 4: Water Use Efficiency, Water Rights, and System Reliability
- Section 5: Source Water and Watershed Protection
- Section 6: Operations and Maintenance Program
- Section 7: System Design and Construction Standards
- Section 8: Improvement Program
- Section 9: Financial Program

Planning Conclusions and Summary

The Water System Plan includes the following key findings and assumptions:

- Water system population growth is anticipated to continue to grow at an overall average rate of 1.7 percent annually, consistent with the Town Comprehensive Plan.
- Typical system water use in recent years has trended between an annual average rate of 110 to 130 gallons per day per typical single-family residential household.
- System leakage and lost water in recent years has trended between a high of over 13 percent of total water supplied, to a low of just under 6 percent in recent years.
- Continued upward pressure on system water demands can be expected as a result of anticipated growth, while some downward pressure on water demands can be expected relative to increasing water conservation and water loss prevention ethics.
- Existing water treatment facilities, including the recently completed granular activated carbon treatment system addition, are effective at maintaining a safe and healthy water supply consistent with relevant state and federal water quality requirements.

Overall, the Water System Plan concludes that the capacity and performance of the Town water system appear to be generally good, but some developing system improvement needs are identified:

- Anticipated long-term growth in water system demands continues to have the potential to approach the annual sustainable capacity limits of the Town's existing Trout Lake and associated water supply sources. Supply expansion and/or increased future water conservation may be needed within the next 15 to 20 years to meet projected water supply needs. Long-term water supply needs should be reassessed in the next 6-year Water System Plan update.
- Water quality and treatment performance is good and appears sufficient to comply with existing and anticipated water quality regulatory requirements. Some treatment system components have been in place since the 1990s, and long-term system growth continues to have the potential to approach the treatment system capacity of certain treatment processes. Efforts to evaluate the condition,

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maintenance, and remaining useful life of treatment system components should be completed in parallel with the next 6-year Water System Plan update, or sooner, and recommendations to upgrade, refresh, or replace treatment system components as appropriate should be developed.

- Overall water system storage capacity appears to be adequate through the 20-year planning horizon of this Water System Plan. However, the Hillview Terrace service areas could benefit from additional storage tank capacity, and a new water storage tank is planned to meet this need.
- Overall water pipeline and pumping capacity appears to be generally adequate, although there are some areas where water system pressures are high and where system improvements could be explored to reduce pressures to more appropriate levels. Additionally, the water supply pipelines that deliver water from the Trout Lake supply sources to the water treatment plant, and into the Town, may be approaching the end of their useful service life or be at high risk for failure during seismic or tree fall events. The Town is currently pursuing funding assistance to replace and upgrade these pipelines. Miscellaneous other system piping improvements have also been identified as needed to improve system pressures and fire flow availability in some areas.

The system improvements and efforts identified as needed for the Town water system for the near-term 6-year planning horizon are summarized in Section 8. Funding implications for water system operations and improvement needs are summarized in Section 9.

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Section 1

Water System Description

The Town of Friday Harbor (Town), recognizing the importance of establishing a uniform process to identify present and future water system needs and a means to meet those needs in an efficient and cost-effective manner, has prepared this Water System Plan (WSP). The objective of this section is to provide basic information about the Town water system, including information concerning ownership and management; history; neighboring water systems; regulatory environment; an inventory of existing facilities; and service area agreements, characteristics, and policies.

1.1 Ownership and Management

The Town owns and operates a municipal water system that serves both the Town and portions of unincorporated San Juan County. The system is classified by the State of Washington as a Group A Community public water system. The Washington State Department of Health (WSDOH) water system identification number is 26595 and is listed on the WSDOH sentry database as "Friday Harbor, Town of." A copy of the Water Facilities Inventory (WFI) form for the system is included in Appendix A.

Friday Harbor is governed by a Mayor/Council non-partisan form of government. Voters elect the mayor and five council members to 4-year terms. All represent the community at large rather than individual districts or areas within the Town.

The Town mailing address and general contact information is as follows:

Town of Friday Harbor
60 Second Avenue
P.O. Box 219
Friday Harbor, Washington 98205
Phone: 360-378-2810
Fax: 360-378-5339

The primary contact for the Town water system is the Public Works Director, 360-378-2154.

The Public Works Director and water department staff manage the day-to-day operation of the water system. The Public Works Director, Town Administrator, Finance Officer, and Town Council work together to set water system policies and manage water system finances. Table 1-1 shows the positions that are currently involved in the management and operation of the water system.

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Table 1-1. Water System Staff Certifications

Position	Certifications and licensure
Public Works Director	Washington State Licensed Professional Engineer (Civil and Mechanical Engineering)
Water Department Leadman	WTPO 2 WDM 2 WDS CCCS
Water Treatment Plant Operator	WTPO 1
Water Treatment Plant Operator	WTPO 1 WDM 1
Water Treatment Plant Operator	WTPO 2 CCCS BAT

WTPO = Water Treatment Plant Operator
WDM = Water Distribution Manager
WDS = Water Distribution Specialist
CCCS = Cross-Connection Control Specialist
BAT = Backflow Assembly Tester

1.2 System Background

Friday Harbor is located on San Juan Island in San Juan County, Washington. Figure 1-1 shows the location of the town among the islands that make up San Juan County. Figure 1-2 shows the Town boundaries and the Friday Harbor Urban Growth Area (FHUGA), as established by the Town Comprehensive Plan for Growth Management.

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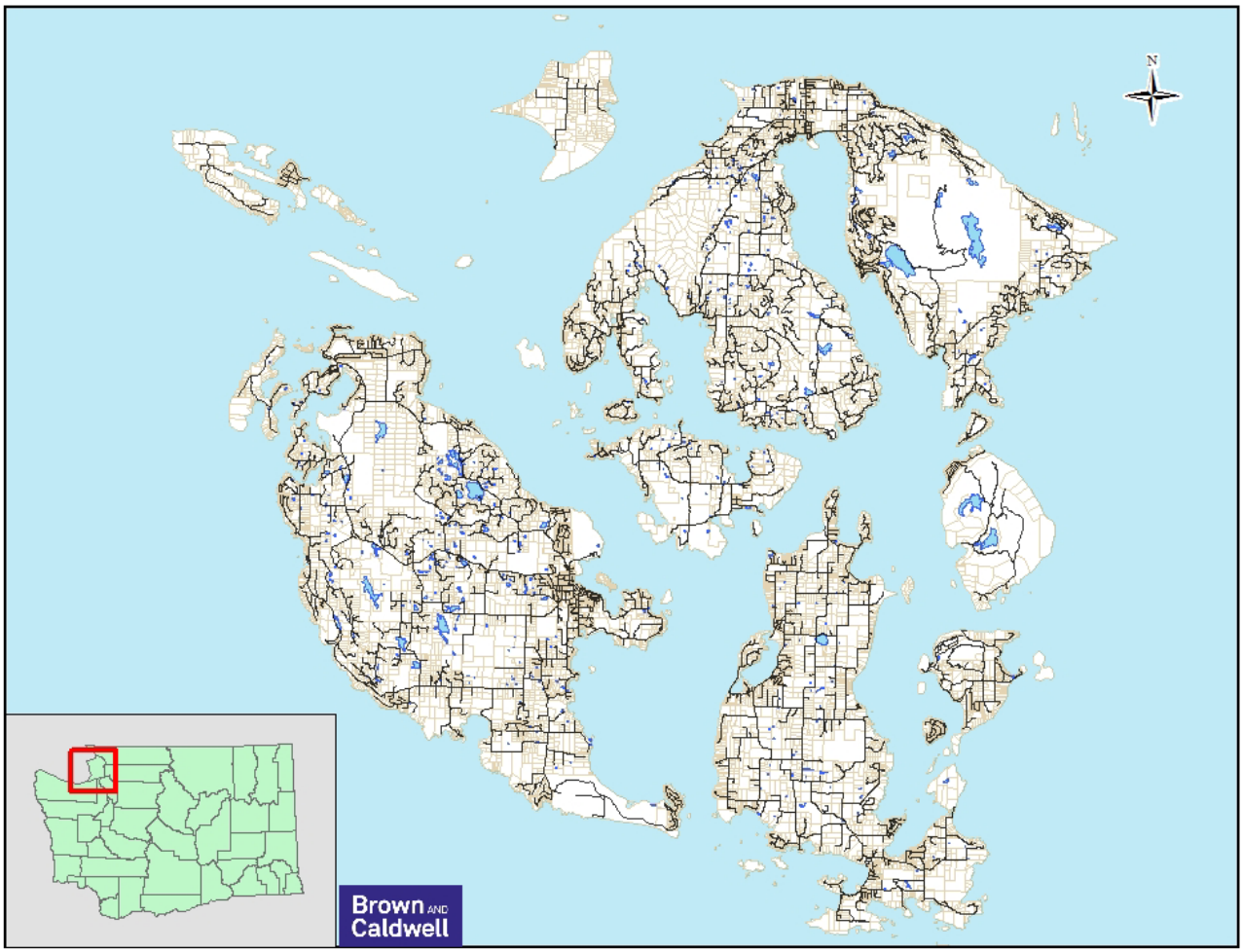

Figure 1-1. San Juan County and Friday Harbor vicinity map

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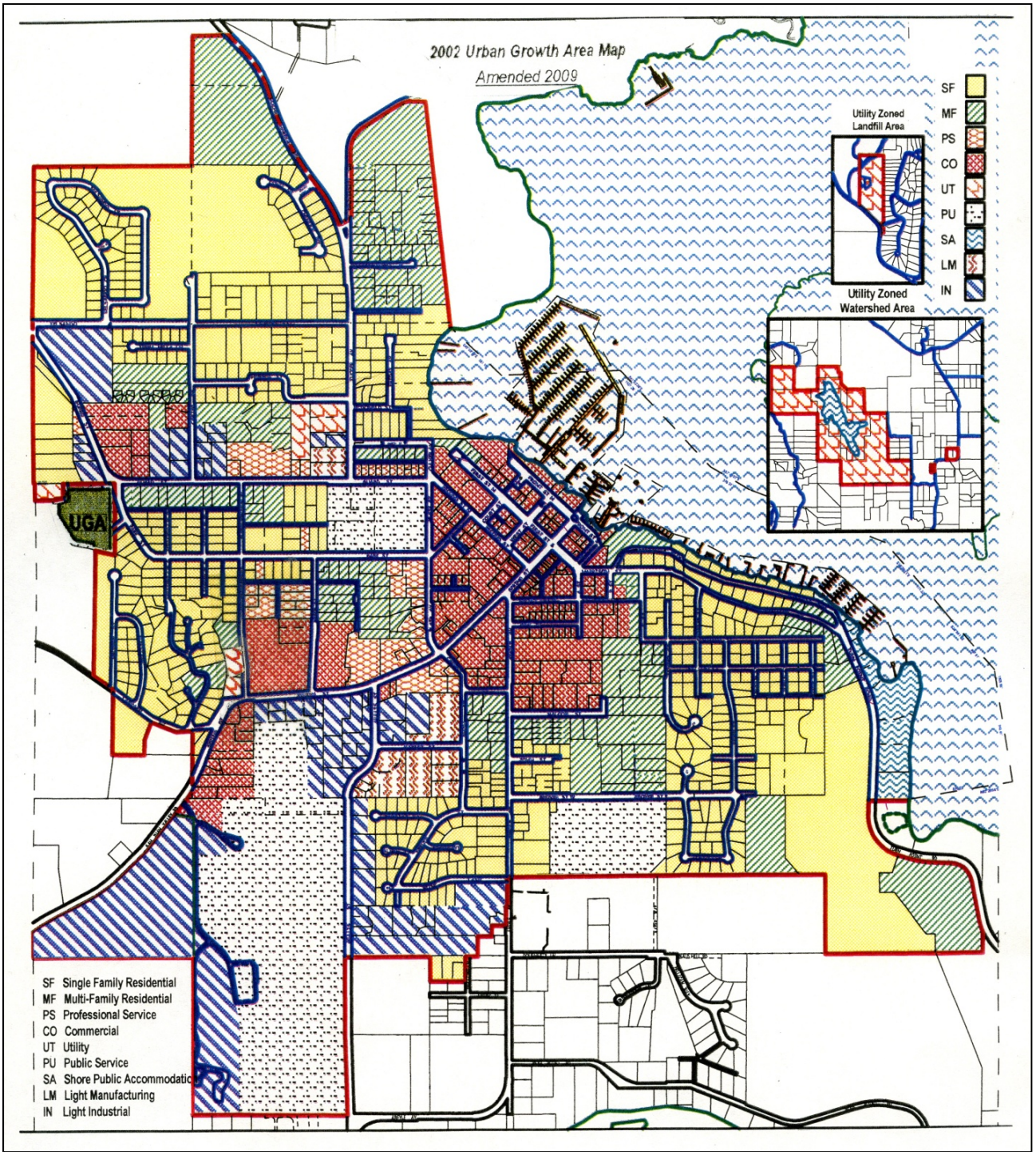

Figure 1-2. Town boundaries and Urban Growth Areas

1.2.1 Water System Development and Growth History

Friday Harbor has been a commercial, social, and cultural hub for the San Juan Islands since the 1890s. Friday Harbor was incorporated in 1909 and became the county seat. By 1909, Friday Harbor was a busy seaport with a commercial center, and a population approaching four hundred. Friday Harbor's

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economy was driven by San Juan County mining and agriculture, which shipped products (e.g., apples, pears, cherries, peas, cream, eggs, poultry, grain, salmon, timber, and lime) to domestic and foreign markets from the Friday Harbor waterfront.

By 1912, it was feared that the economic development and growth of the Town would outpace available water supplies. Soon after, the Town constructed a dam at Trout Lake and a wooden pipeline to transport water into town by gravity flow through Beaverton Valley. The concrete dam and spillway, with a screened outlet pipe at its southeastern abutment, were originally built in 1928. In the early 1950s, a new asbestos cement (AC) main transmission line was installed along San Juan Valley Road to replace the wooden pipeline. In 1958, the system was again upgraded and the Trout Lake dam was raised 11 feet to its present height.

In 1979, the Town acquired additional surface water rights through the Lake 310 Augmentation Project 1 (AUG 1). The AUG 1 project included construction of a dam and spillway near the southeast end of Lake 310 to collect surface drainage from its 190-acre watershed. The AUG 1 pump station and pipeline convey AUG 1 water supply into Trout Lake Creek, which then flows into Trout Lake.

In 1988, the Town again acquired additional surface water rights and constructed a second augmentation project (AUG 2), consisting of a stream diversion, a pumping station, and an additional water supply main. The pump station and diversion structure are located approximately a quarter mile northeast of the Town's water treatment plant (WTP). Water was originally diverted from the stream and pumped to the water treatment plant; however, water pumped directly from the AUG 2 supply proved to be challenging from a water treatment perspective, and limited the effective use of AUG 2. In 1994, the pump station was improved and a new main was constructed to allow pumping of water from the AUG 2 supply directly into Trout Lake for storage and settling.

Friday Harbor population grew at a 0.9 percent average annual rate from 2000–10, less than rates seen in previous decades. According to census results, the town population in 2010 was 2,162. Estimated population in 2011 according to Washington State Office of Financial Management (OFM) records totaled 2,180. The Town water system also provides water service to individual customers outside the Town limits in unincorporated San Juan County. The county population grew at a rate of 1.1 percent from 2000–10. Altogether, the Town provided water service to an estimated population of 3,190 in 2011. The Town has adopted a future growth rate of 1.7 percent for comprehensive planning purposes.

1.2.2 Geography and Topography

The coastline around Friday Harbor is generally steep and rocky, with the immediate shoreline generally varying from sea level up to around 100 feet in elevation. The geology consists of the Roche Rock formation overlain with various types of gravelly silty loams and gravelly sandy loams. Ground surface elevations in the town generally range from 10 to 200 feet above sea level. The shoreline is characterized by narrow beaches, with steep slopes between the beach and upland terrain. Progressing inland from town, the land rises gently to Trout Lake, about 5 miles from the town center. The upland terrain can be described as gently rolling with valleys.

1.2.3 Climate

The climate of the San Juan Islands is influenced by the Olympic Mountains and Vancouver Island, situated southwest and west-northwest of the San Juan Islands, which create a "rain shadow" effect producing less rainfall in the San Juan Islands than is typical for northern Puget Sound. The average annual precipitation for Friday Harbor between 1995 and 2008 was 28.02 inches. Winds can also have a drying effect, pulling moisture from vegetation and surface water, and heightening the impact of low rainfall periods.

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The maritime air surrounding the islands moderates the climate. Summers are relatively short, cool, and dry, and winters are mild and moderately dry compared to other areas of northern Puget Sound. The average high temperature in July is 70 degrees Fahrenheit (°F), and the average low in January is 34°F. Winter temperatures are usually mild, except when cold, arctic air funnels down the Fraser River Valley from Canada and drastically lowers temperatures.

1.2.4 Geology and Hydrology

The geology of the San Juan Islands is typified by two distinct types of geologic landforms. The first consists of bedrock domes thinly covered with late Quaternary (glacial) sediments commonly found on San Juan and Shaw Islands. The second type, common on Lopez, Waldron, and Decatur Islands, is composed of bedrock buried beneath sediments more than 300 feet thick in places. However, neither formation is exclusive to any single island. Portions of Orcas, Lopez, and Waldron have surface exposures of bedrock, and parts of Orcas and San Juan have thick glacial deposits.

Groundwater is stored in the fractures and joints of this variegated assortment of bedrock. The complexity mentioned above makes it difficult to predict the capacity and extent of groundwater resources. However, due to the structural complexity and accretionary nature of the local bedrock, there are no pathways along which groundwater could travel from the mainland.

1.2.5 Neighboring/Adjacent Purveyors

Both surface water and groundwater supplies tend to be limited in San Juan County. Areas around Friday Harbor that are not supplied from the Town water system are served primarily by individual wells. Groundwater sources are subject to intermittent water quality problems, including those related to iron, sulfur, and color. Groundwater sources are typically limited in production capacity. Well capacities on San Juan Island typically range from 3 to 15 gallons per minute (gpm).

According to WSDOH records, the Town is the only system on San Juan Island with more than 400 connections. Group A and B water system wells in the vicinity of the Town are shown on Figure 1-3.

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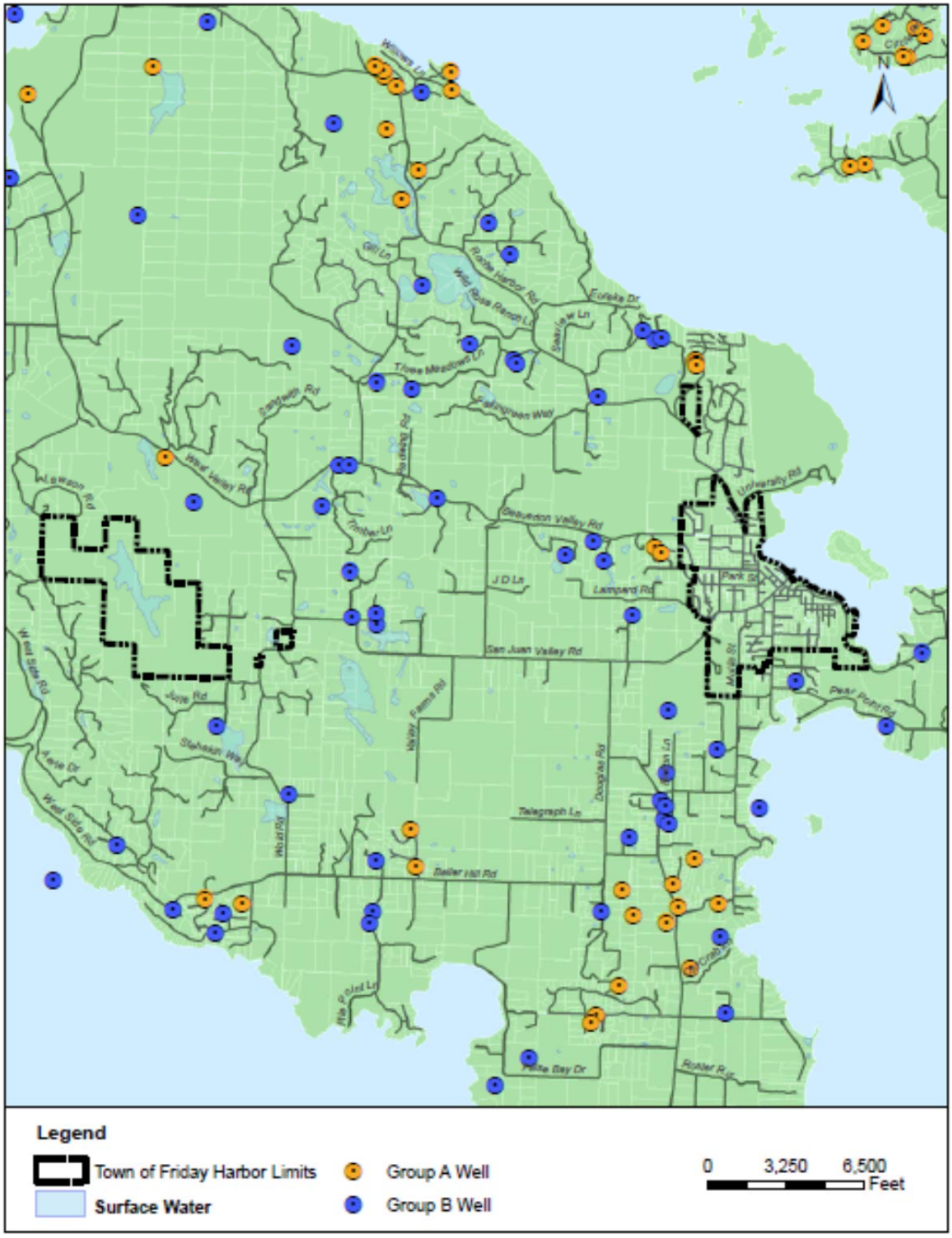

Figure 1-3. Adjacent purveyors

Data source: WSDOH Office of Drinking Water

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1.2.6 Ordinances and Bylaws

Title 13 of the Friday Harbor Municipal Code (FHMC) contains regulations applicable to the water system. The chapters of the FHMC related to water service are included in Appendix B.

1.3 Existing Facilities Inventory

The following section provides an inventory of the Town water system. An in-depth assessment of water system capacities and potential deficiencies is provided in Section 3. This section includes:

- A description of existing system facilities and major components
- Information on current water system service connections

Existing system facilities include the following key components: water supply sources, treatment facilities, booster pump stations, distribution system piping, storage reservoirs, and service connections. A map of the entire water system, including watershed sources of supply to the west, is presented in Figure 1-4. A map showing a closer view of the Town distribution system and pressure zones is included as Figure 1-5. Figure 1-5 presents both the existing water system and pressure zones, and changes after proposed near-term water system improvements currently under design are completed. Improvements include replacement and partial re-route of substantial portions of the water main from the Town water treatment plant, and updates to pipes, valves, and piping to adjust pressure zone boundaries in the southwest portion of the distribution system. Figure 1-6 highlights key facilities in the distribution system.

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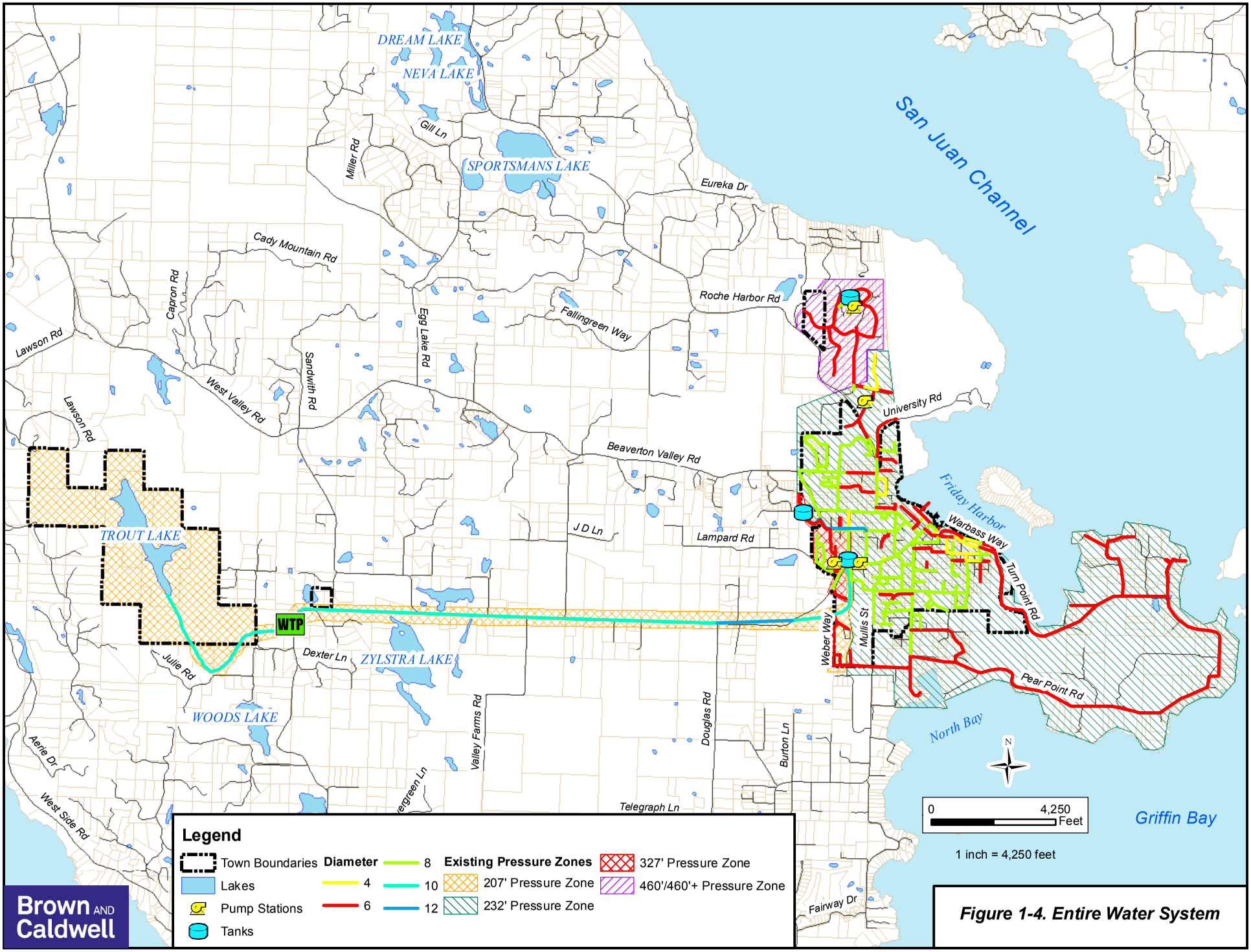

Figure 1-4. Entire Water System

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Existing Water System
Pressure Zones

FROM
WTP

Legend

Tanks
Pumpstations
Control Valves
Existing Pipe

Zone
207
232
327
460/460+

Existing Water System
Plus Near-Term Improvements
Pressure Zones

FROM
WTP

Legend

Tanks
Pumpstations
Control Valves
With Pipe Improvements

Zone
232
240+
327
460/460+

1 inch = 2,500 feet

0 1,250 2,500 5,000 Feet

Brown AND Caldwell

Figure 1-5
Water System Facilities and Pressure Zones

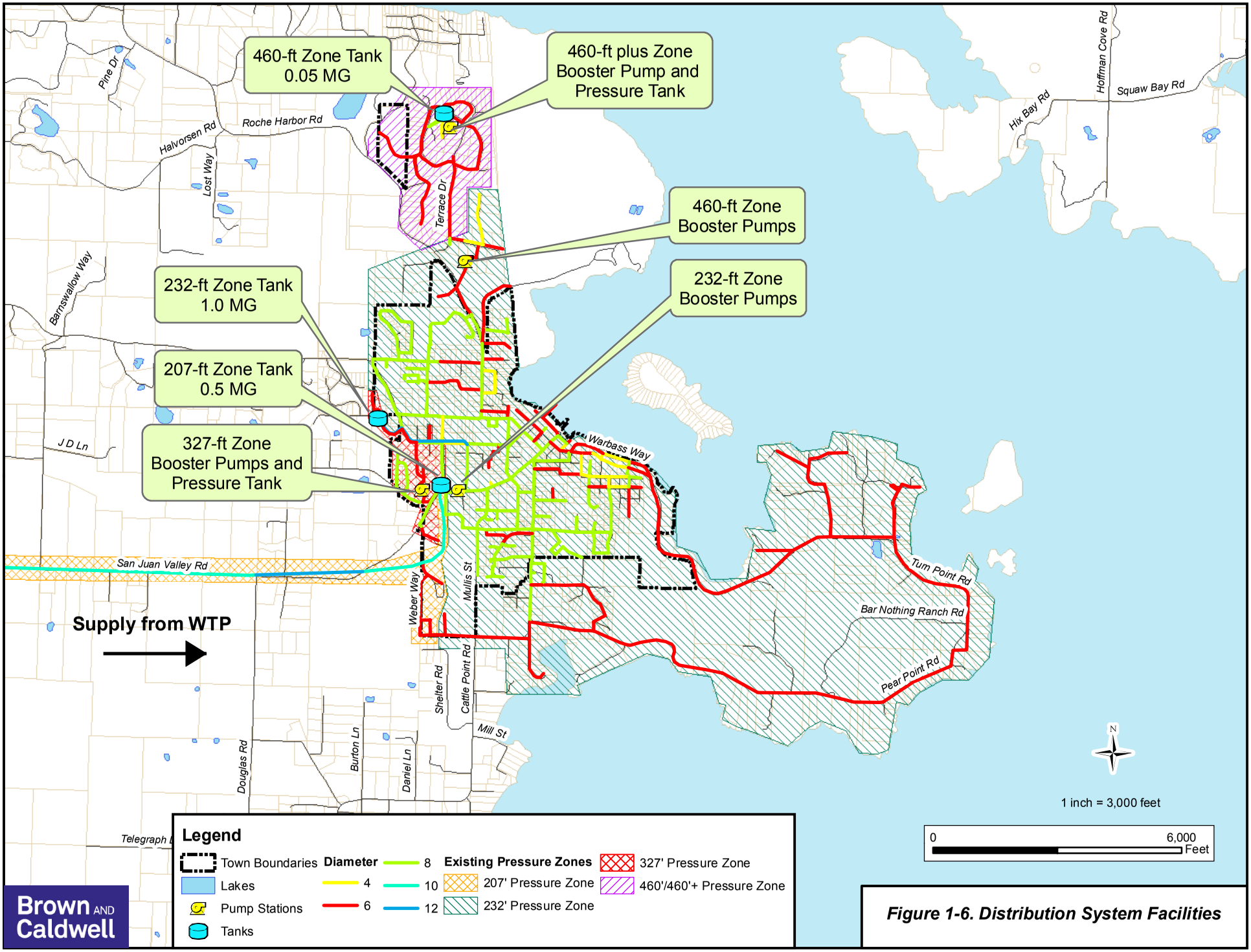

Figure 1-6. Distribution System Facilities

1.3.1 Sources of Supply

Water is supplied to the Town of Friday Harbor from the following three surface water sources:

- Trout Lake
- AUG 1: Overflow from Lake 310 is pumped into the Trout Lake watershed
- AUG 2: Water pumped seasonally to Trout Lake from a stream to the east, in Section 17

Table 1-2 details the estimated sustainable annual yield for each source of supply.

Table 1-2. Existing Raw Water Sources and Sustainable Yield

Source	Annual sustainable yield[a]	
	(MG/yr)	(mgd)
Trout Lake Reservoir	106	0.29
AUG 1	40	0.11
AUG 2	22	0.06
Current total	168	0.46
Emergency total, including Trout Lake dead storage[b]	193	0.53

a. *Annual sustainable yield is based on a 1994 study titled "Town of Friday Harbor Trout Lake Capacity Analysis".*

b. *Dead storage below the Trout Lake dam outlet can be accessed by pumping. However, by Town policy, dead storage will be used only during drought conditions; therefore, the effective total sustainable yield remains 168 million gallons (MG).*

Trout Lake

Until 1979, Friday Harbor's water supply came from only one surface water source, Trout Lake. Trout Lake is located west of town in an isolated, undeveloped area surrounded by a steep drainage basin of approximately 840 acres, of which the Town owns approximately 570 acres. The lake is formed by a concrete dam and spillway with a screened outlet pipe at its southeastern abutment. The dam, originally built in 1928, was raised 11 feet to its present height of 36 feet in 1958.

The total volume of Trout Lake, as determined through a 1994 study titled "Town of Friday Harbor Trout Lake Capacity Analysis," was estimated to be 468 million gallons (MG). The outlet pipe was measured at 288.2 inches below the spillway. According to this study, it was estimated that this outlet could be used until the water level reached 287 inches below the spillway. The volume below the outlet is called "dead storage" because it is not available via gravity flow. The estimated usable volume of Trout Lake is 370 MG. The estimated dead storage volume is 98 MG.

Given the estimated volume of the reservoir, the 1994 study used annual precipitation, water consumption records, and reservoir water level records to estimate the average annual recharge to Trout Lake from rainfall. The purpose was to determine a relationship to predict sustainable water supply capacity during periods of drought. A linear regression analysis method was used to conclude that no effective recharge from runoff to the lake occurred until 18.5 inches of rain had fallen annually. For each additional inch of rainfall over the 18.5-inch annual rate, the report estimated 35 MG of reservoir recharge. These relationships, based on average annual conditions, were applied as a planning tool to make multiple-year projections. The report concluded that the reservoir provides the Town of Friday Harbor with a sustainable annual yield of 168 MG when combined with the yields from the AUG 1 and AUG 2 systems.

In 1995 the Town constructed facilities to allow emergency withdrawal from Trout Lake dead storage by installing a system for siphoning water from the deeper portions of the impoundment. The installation of the siphoning facilities could increase the Town's supply by up to 25 MG. Siphon access to reservoir

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dead storage capacity increases Trout Lake sustainable annual yield to an estimated 193 MG. However, use of dead storage would be condoned only during emergency drought conditions; therefore, the total annual sustainable yield supply capacity for current raw water supply sources remains at 168 million gallons per year (MG/yr) for planning purposes.

Approximately 1.2 miles of raw water pipeline from the Trout Lake Dam supplies the Town's water treatment plant. The raw water pipeline includes sections of 12-inch-diameter cast-iron pipe, 10-inch-diameter welded steel pipe, and 10-inch-diameter AC pipe.

Augmentation 1 (AUG 1)

The Lake 310 augmentation project (AUG 1) was constructed in 1979 to supplement Trout Lake recharge with additional surface water supply capacity. The project entailed building a dam and spillway near the southeast end of Lake 310 to collect overflow water from a 190-acre watershed. Lake 310 overflow water is captured in a small storage impoundment and pumped cross-country into Trout Lake Creek, which drains into Trout Lake.

None of the Lake 310 watershed is owned by the Town; the properties are privately held. As with Trout Lake, it is located in the remote mountainous interior of the island and is therefore protected from significant development.

Augmentation 2 (AUG 2)

In 1988, the Town constructed a second augmentation project (AUG 2), consisting of a stream diversion, a pumping station, and a raw water main. The pump station and diversion structure are located approximately a quarter mile northeast of the water treatment plant and are designed to collect water from a 3,850-acre watershed. Runoff water was originally diverted from a stream in Section 17 and pumped directly to the water treatment plant. Direct supply of water from AUG 2 to the water treatment plant presented challenges in producing an acceptable treated water quality, which significantly limited the use of AUG 2. In 1994, the pump station was improved and a main was added to pump water from AUG 2 up to Trout Lake prior to treatment.

As with the AUG 1 supply, the AUG 2 watershed is primarily under private ownership.

Water Rights

Water rights are often defined in terms of both instantaneous and annual withdrawal limits. The instantaneous limit represents the maximum pumping withdrawal rate of a well or maximum diversion rate for a spring or surface water source. The annual limit represents the total quantity of water that may be withdrawn or diverted during an entire year. A summary of Town water rights is provided in Table 1-3 with further water rights information provided in Section 4. Copies of available water rights documentation are located in Appendix C.

Table 1-3. Town of Friday Harbor Water Rights Summary

Source	Water Right						
	Water Right	Seasonal limitations	Instantaneous withdrawal limit		Annual withdrawal limit		
			(cfs)	(mgd)	(ac-ft/yr)	(MG/yr)	(mgd)
Trout Lake	R1-22004C	None	None	None	497.0	162	0.44
AUG 1	S1-23127C	10/1–4/15 only	0.98	0.63	240.0	78	0.21
AUG 2	S1-23457C	11/1–4/15 only	3.0	1.94	736.5	240	0.66
Total					1,473.5	480	1.32

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There are no seasonal or instantaneous restrictions for withdrawals from Trout Lake, and the annual withdrawal limit is about 162 MG. The water rights for AUG 1 limit water withdrawals to the period from October 1 to April 15, and allow a 440 gpm instantaneous withdrawal and an annual withdrawal of about 78 MG. The water rights for AUG 2 limit water withdrawals to the period from November 1 to April 15 and allow for a 1,350 gpm instantaneous withdrawal with an annual withdrawal of approximately 240 MG. Actual annual withdrawals are limited by the sustainable yield of the sources. Currently, available water rights for each of the Friday Harbor raw water supply sources exceed the annual sustainable capacity by a significant margin.

1.3.2 Water Treatment Facilities

Consistent with federal and state potable water standards and requirements, Friday Harbor operates a water treatment plant to provide potable water treatment of raw surface water supplied from the Trout Lake, AUG 1, and AUG 2 supply sources. The water treatment plant currently employs conventional filtration, followed by granular activated carbon (GAC) adsorption/filtration and chlorine disinfection processes to provide potable water treatment consistent with associated state and federal water quality requirements.

The conventional filtration plant processes are configured with three parallel gravity filter trains. Two filter trains can be operated simultaneously with a third typically reserved for backup. All three filter trains can be operated simultaneously during periods of peak demand. The filters typically operate at a maximum loading rate of 3.6 gallons per minute per square foot (gpm/sf) of filter area.

Water is pumped from the conventional filtration process to supply the GAC processes, which in turn supply a chlorine contact clearwell. The GAC process includes two 10-foot-diameter pressure vessels filled with 20,000 pounds (lb) of GAC media each. The GAC contactors are normally operated in series, but can be operated in parallel for increased peak flow capacity, individually should one contactor need to be taken out of service, or can be bypassed entirely should both contactors require service. The chlorine contact clearwell has a hydraulic contact time capacity of approximately 700 gpm, predicated on water temperature and pH. More detailed information regarding treatment capacity is presented in Section 3.

1.3.3 Distribution System

The Friday Harbor water system includes four main pressure zones in order to provide water service at appropriate service pressures to varied service elevations. The pressure zones are each designated according to the hydraulic grade line (HGL) elevation at which each nominally operates. Pumps at the water treatment plant supply a 207-foot tank and pressure zone via dedicated supply piping. The 232- and 327-foot pressure zones are supplied via water pumped from the 207-foot tank, and the 460-foot pressure zone is supplied via pumping from the 232-foot pressure zone. Figure 1-4 provides an overview of the Friday Harbor water system and existing pressure zones.

Water is distributed in approximately 30 miles of pipeline, ranging from 4 to 12 inches in diameter. Most of the older 4- to 10-inch-diameter pipes are AC or cast iron, while most of the more recently installed pipe is polyvinyl chloride (PVC) and ductile iron (DI). The existing distribution system is shown on Figure 1-6. Table 1-4 provides an inventory of water mains that make up the Friday Harbor water distribution system, including mains that run from the water treatment plant to the Town.

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Table 1-4. Pipes in the Friday Harbor Distribution System	
Diameter (in.)	Approximate total length (ft)
4	9,970
6	78,810
8	62,270
10	32,250
12	2,970

1.3.4 Storage Tanks

The Town water system includes three storage tanks with a total capacity of 1.55 MG. Given the configuration and operation of the tanks, none of the existing storage volume is dead storage. Generally, the tanks supply distinct pressure zones with an HGL established by the reservoir overflow elevation. However, the 327-foot pressure zone does not have a dedicated gravity storage tank. Instead, it relies on a 3,000-gallon hydro-pneumatic pressure tank with supply pumped directly from the 0.5 MG, 207-foot tank. System storage facilities are summarized in Table 1-5 and shown in Figure 1-6.

Table 1-5. Water System Storage Capacity					
Tank	Zones served	Nominal capacity, MG	Floor elevation (ft)	Height (ft)	Diameter (ft)
207 ft tank	207 ft zone	0.5	157	50	41.3
232 ft tank	232 ft zone	1.0	208	24	84.2
460 ft tank	460 ft zone	0.05	442	27	19
Total		1.55			

1.3.5 Pump Stations

The Friday Harbor water system relies on a network of pumps and pipes to provide potable water service. A system of raw water pumps and pipes delivers water from AUG 1 and AUG 2 to Trout Lake. Raw water flows by gravity from Trout Lake to the water treatment plant through approximately 5,000 linear feet (LF) of 10-inch-diameter water main. Finished water from the water treatment plant is then pumped to the 207-foot tank through approximately 21,000 LF of 10- and 12-inch-diameter water supply pipeline.

Two pump stations located at the 207-foot tank site deliver water from the 207-foot tank into the central 232-foot and southwestern 327-foot pressure zones. An additional pump station lifts water from the central 232-foot pressure zone to the northern 460-foot pressure zone. Pump configurations and nominal capacities for each of the system's potable water pump stations are summarized in Table 1-6.

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Table 1-6. Pumping Stations

Pump station	Service	Pump	Nominal capacity		Head (ft)	Horsepower
			(gpm)	(mgd)		
AUG 1 to Trout Lake	Raw water	Pump 1	800	1.15	180	50
		Pump 2	800	1.15	180	50
AUG 2 to Trout Lake	Raw water	Pump 1	1,340	1.93	235	60
		Pump 2	1,340	1.93	235	60
WTP to 207 ft pressure zone (includes auxiliary power)	Potable water	Small pump	200	0.29	130	10
		Large pump 1	350	0.50	25	25
		Large pump 2	350	0.50	25	25
		Large pump 3	350	0.50	25	25
207 to 232 ft pressure zone (includes auxiliary power)	Potable water	Small pump	340	0.49	45	5
		Large pump 1	360	0.52	55	7.5
		Large pump 2	360	0.52	55	7.5
207 to 327 ft pressure zone (includes auxiliary power)	Potable water	Small pump 1	150	0.22	180	20
		Small pump 2	150	0.22	180	20
		Large pump	1,000	1.44	160	60
232 to 460 ft pressure zone	Potable water	Pump 1	120	0.17	365	25
		Pump 2	120	0.17	365	25
460 to 460 ft plus pressure zone	Potable water	Small pump	105	0.15	178	3

207-Foot Pressure Zone

Finished water from the water treatment plant is pumped via 10- and 12-inch-diameter water mains to the Town's 0.5 MG 207-foot tank located at Spring Street and Marguerite Place. During periods of high system demand, three 350 gpm pumps (two duty and one standby) are available at the water treatment plant to maintain supply to the 207-foot tank. During periods of lower system demand, a single 200 gpm pump maintains supply. There are currently 41 connections directly off the 207-foot pressure zone water main between the water treatment plant and the 207-foot tank. To minimize disruption of service to 207-foot pressure zone customers during power outages, emergency power for the WTP pumps is available.

232-Foot Pressure Zone

Much of the Friday Harbor water system is served in the 232-foot pressure zone. A pump station located at the 207-foot tank supplies water to the 232-foot pressure zone and to the 1.0 MG 232-foot tank. Some low-elevation residences along the waterfront are equipped with pressure-reducing valves (PRVs) to protect their internal piping from excess pressure. Emergency power is available for pumps supplying the 232-foot pressure zone.

327-Foot Pressure Zone

A second pump station at the 207-foot tank provides water to the 327-foot pressure zone, located on the hillside west of Marguerite Place. The nominal 327-foot HGL is maintained by two 150 gpm pumps and a 3,000-gallon pressure tank. A 1,000 gpm pump provides fire flow capacity. The 327-foot pressure zone currently serves about 91 connections. The zone may eventually serve approximately 158 connections when all lots within the zone are fully developed. Emergency power is available for pumps supplying the 327-foot pressure zone.

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460-Foot Pressure Zone

A pump station at the north end of the 232-foot pressure zone feeds the 460-foot pressure zone through two 120 gpm pumps. A 50,000-gallon storage tank maintains the nominal 460-foot HGL. The 460-foot pressure zone primarily serves the Hillview Terrace subdivision, which includes 141 single-family lots. In the future, with planned improvements, this zone will also supply an adjacent 327-foot pressure zone via PRV to serve the proposed Friday Cove and Finnegan Ridge developments. A small booster pump station, pressure tank, and dedicated pipe system supplied from the main 460-foot tank serves the uppermost service elevations of Hillview Terrace above approximately elevation 395 feet.

1.3.6 Current Number of Service Connections

In 2011, the Town water system had 1,329 service connections. More detailed information about these connections is presented in Section 2. The Town has existing commitments to provide service to additional customers, totaling approximately 325 new equivalent residential units (ERUs).

1.3.7 Existing Interties

The Friday Harbor water system currently has no interties with neighboring water systems. As previously discussed, other water systems on the island use primarily small individual wells for supply and would have limited capacity to provide water to the Town via intertie.

1.4 Related Plans and Documents

The existing engineering studies and planning documents described below were consulted in the preparation of the WSP.

Town of Friday Harbor 2002 Comprehensive Plan (and Amendments)

The Town's Comprehensive Plan was adopted in 2002 and presents population growth projections, current and future land use distribution, and Town policies related to growth and utility service that are incorporated into this WSP. The Washington State Growth Management Act (GMA) requires that Town codes, procedures, regulations, and utility plans such as this WSP be prepared and/or amended to be consistent with the Comprehensive Plan. Updates to the Plan since adoption have generally been minor and include land use reclassifications, map change requests, and capital improvement program (CIP) updates.

San Juan County Comprehensive Plan, April 2010

The most recent update to the San Juan County Comprehensive Plan was completed in April 2010. The plan documents land use, population projections, build out analyses, planning policies, and other planning information for unincorporated areas of San Juan county adjacent to the Town of Friday Harbor.

Trout Lake Dam Structural Stability Analysis, August 2009

A structural stability analysis of the Trout Lake dam was completed in August 2009. The report concluded that the dam has adequate safety against failure under normal, flood, and seismic conditions.

San Juan County Friday Harbor Urban Growth Area Infrastructure Feasibility Study, August 2008

This feasibility study was completed to evaluate the impact of potential development around the FHUGA. As part of the analysis, water system capacity was assessed relative to the water system demands projected in the 2003 WSP, along with additional demands projected for buildout of a proposed FHUGA expansion as envisioned by San Juan County.

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Town of Friday Harbor Utility Rate Study Update, Final Report, June 2008

The Town's most recent water and sewer rate study recommends increases in water and sewer rates to meet the financial requirements and the cost of service for the Town utilities. It addresses "right-to-connect" charges, "system development" charges, and variable charges structures for water user fees.

Trout Lake Dam Emergency Action Plan, May 2007

This Emergency Action Plan (EAP) defines the responsibilities of key Town personnel during potential emergencies involving the Trout Lake Dam. It also provides procedures designed to accomplish the following:

- Identify unusual and unlikely conditions that may endanger the dam
- Initiate remedial actions to prevent or minimize the downstream impacts of a dam failure
- Initiate emergency actions to warn downstream residents of impending or actual failure of the dam

Town of Friday Harbor, Comprehensive Water System Plan, August 2003

The prior 2003 update to the Friday Harbor WSP provides documentation of the Town water system and operations, projection of future demands, and recommendations for capital improvements and financing through 2008.

Water Conservation Plan, August 2001

The Water Conservation Plan in Appendix D provides background information for the water system, including demographic factors that influence the Town's water supply, and describes ongoing and proposed water conservation and demand management programs.

Trout Lake Capacity Analysis, Final Report, June 1994

This report was prepared in response to a reservoir drawdown event during drought conditions. It summarizes previous reservoir capacity estimates, presents an updated reservoir capacity analysis, estimates the storage available to meet 1994 demands, and makes short-term recommendations to meet the 1994 consumption demands.

Developers Water Extension Requirements, March 1992

Within its capacity, it is the Town's intent to serve new development or redevelopment within the Town. Friday Harbor has adopted Water Extension Requirements, included in Appendix E, which provide information on procedures, contracts, bonds, easements, design standards, and payback agreements. These requirements help ensure that new extensions will be completed according to acceptable workmanship and product quality.

Emergency Water Shortage Response Plan, September 1988

The Town adopted a water shortage response plan in 1988, included in Appendix F.

1.5 Existing Service Area Characteristics

The following section provides a description of the existing areas served by the Town's water system, including land use and zoning regulations.

1.5.1 Existing Service Area Boundaries

The Town of Friday Harbor currently provides water service to all users within the Town limits and some residential, commercial, and light industrial users outside the Town. As of 2011, there are 371 out-of-town connections that include users in the Turn Point/Southern Cross/Pear Point area, Brown Island, Hillview Terrace, Hillside Subdivision, and the University of Washington (UW) Laboratory.

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Although the Town does serve some users outside of the Town limits, the Town water service area for new connections is limited to the Town and FHUGA boundaries. Figure 1-4 shows the extent of the Town's water system, and Figure 1-2 shows the boundaries of the water service area, delineated by the Town and FHUGA boundaries.

Only one large water user is located outside the Town limits: the UW Laboratory, which is a teaching research facility, located north of town. The Port of Friday Harbor, a convalescent center, and the schools are among the large water users within the Town limits. Residential areas to the north, west, and east of town are also served by the Friday Harbor system, as is Brown Island via a submarine pipeline from Friday Harbor.

1.5.2 Existing Zoning and Land Use

Friday Harbor's 2011 Zoning Designation Map, shown in Figure 1-7, consists of nine designations:

- Single Family Residential (SF)
- Multifamily Residential (MF)
- Professional Service (PS)
- Commercial (CO)
- Utility (UT)
- Public Service (PU)
- Shoreline Public Accommodation (SA)
- Light Manufacturing (LM)
- Light Industrial (IN)

No significant industrial users are connected to the system. Public service users include the UW Laboratory and the Port of Friday Harbor. Commercial development generally consists of office buildings, retail stores, medical offices, a convalescent center, a retirement center, and restaurants, which are oriented to support the local residents as well as seasonal visitors and recreational activities. Surrounding the Town is unincorporated San Juan County, consisting largely of single-family residential development.

The 2011 Town Land Use Map is included as Figure 1-8, and essentially includes the residential and nonresidential zoning areas of the Town.

1.6 Future Service Area

The following section provides a description of the potential future areas served by the Town's water system, including land use and zoning considerations.

1.6.1 Future Service Area Boundaries

The future Town water service area is projected to match the current water service area, and includes the incorporated Town and the FHUGA, shown in Figure 1-2.

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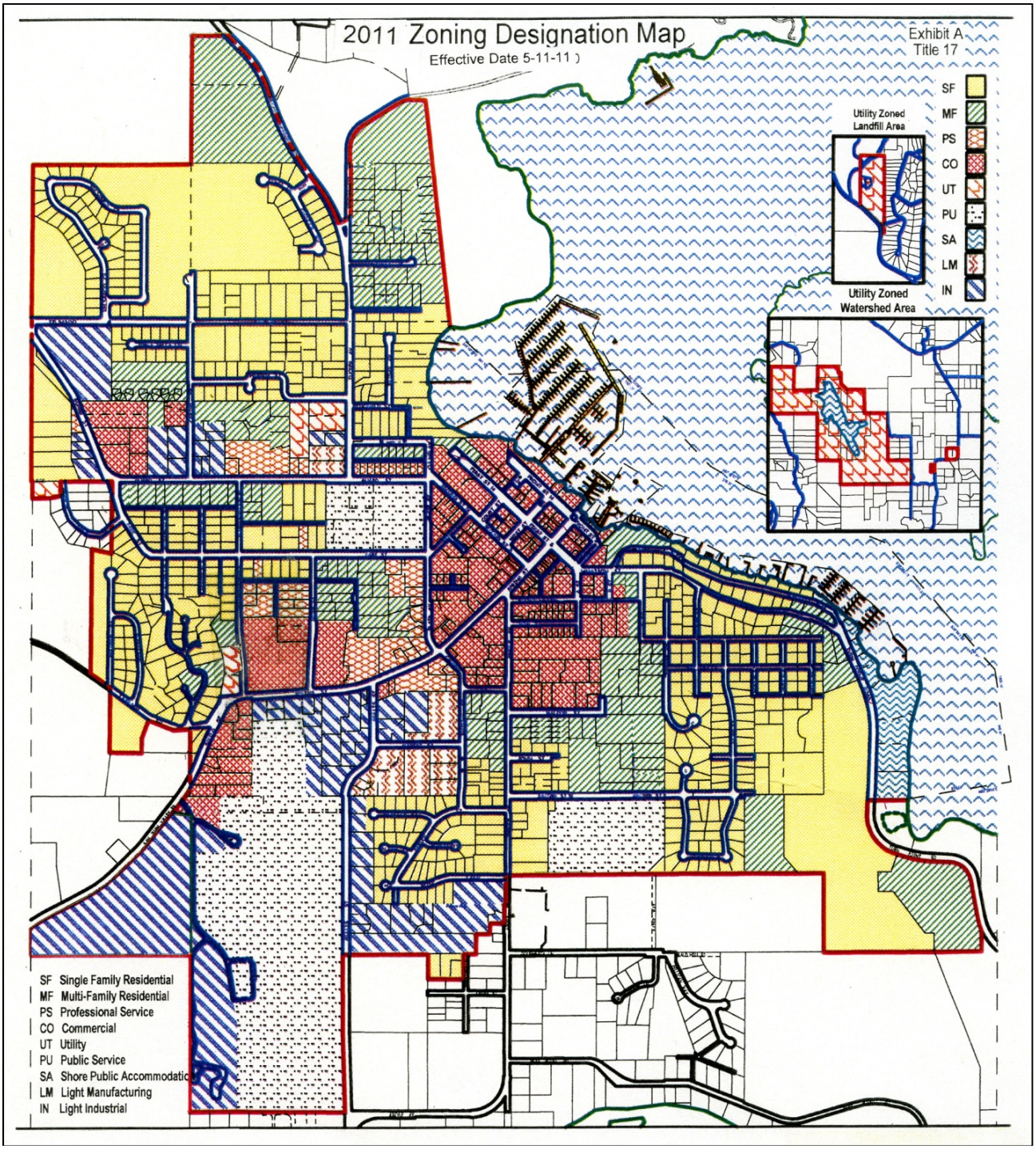

Figure 1-7. Town zoning map

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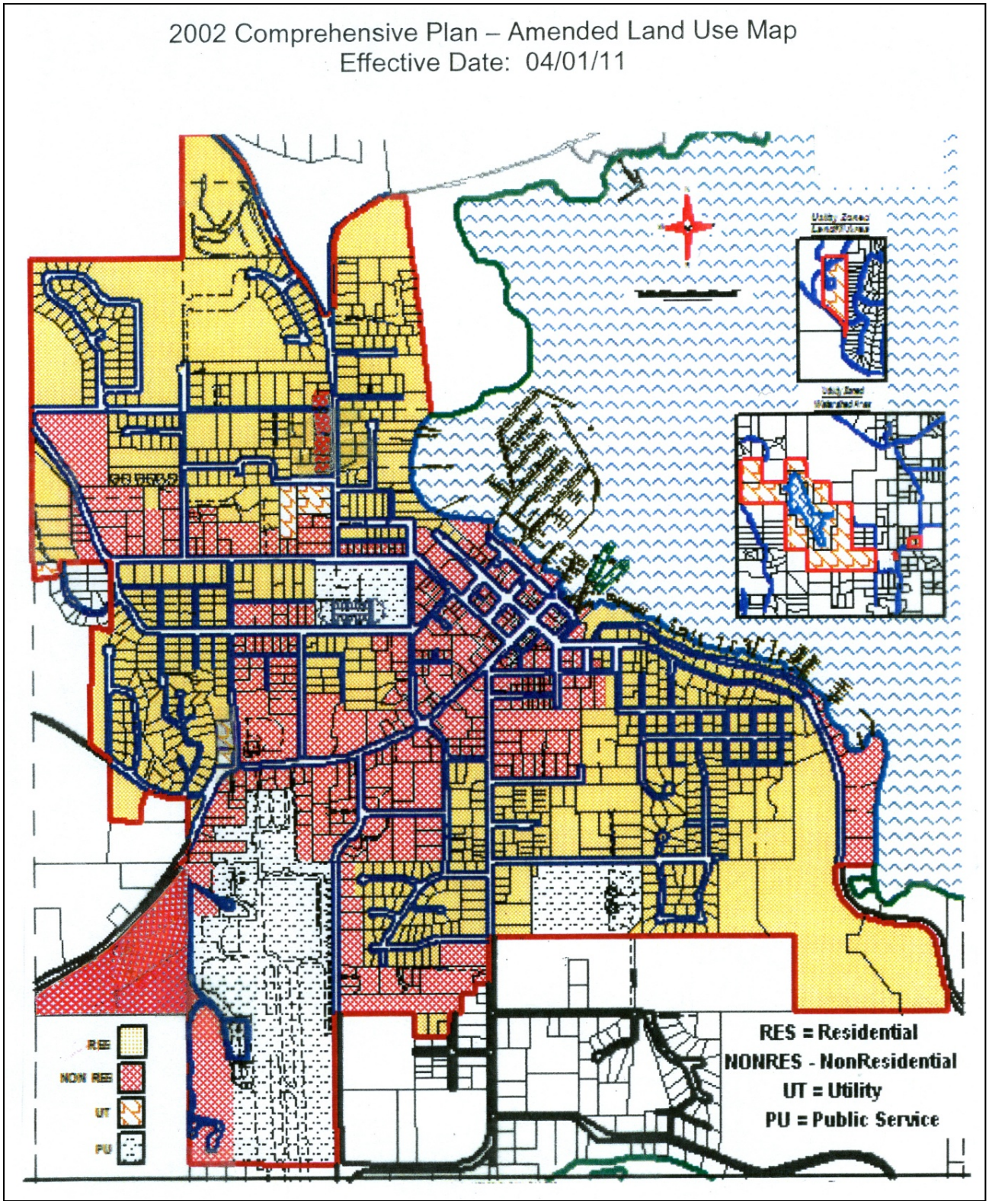

Figure 1-8. Town land use map

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1.6.2 Future Zoning and Land Use

Zoning and land use updates are addressed in the Town Comprehensive Plan. Future planning priorities for the Town and County include maintaining the land use character of the Town, and as such new growth will be channeled toward appropriately zoned areas. The zoning, land use, and urban growth area (UGA) plans described in the Comprehensive Plan and depicted in Figure 1-7, Figure 1-8, and Figure 1-2, respectively, were developed to accommodate growth to the 20-year planning horizon.

1.7 Service Area Agreements

The Town has no service area agreements in place with neighboring water systems. Because there are no other major water systems in the vicinity, service area conflicts are not anticipated.

1.8 Service Area Policies

The Town has established water system management policies to help manage water system growth and development. Policies and ordinances help the Town provide water system users with consistent and adequate levels of water service, and give the Town tools to respond to local drought conditions or other challenges or emergencies.

Standards and criteria identified below are intended to be consistent with federal, state, and local requirements, including Chapter 246-290 of the Washington Administrative Code (WAC), the WSDOH Water System Planning Handbook, and Water System Design Manual. Table 1-7 summarizes Friday Harbor water service policies.

Table 1-7. Water Service Policies

Policy	Addresses	Reference
Direct Connection Policy	Policy establishing conditions applicable to all service connections, including meters, valves, and installation requirements.	FHMC 13.04
Minimum Standards Policy	Policy to establish Town minimum design and performance standards for proposed developments within the Town's existing areas served.	FHMC 13.08
Direct Extension Policy	Policy to establish conditions for main extensions including the application process, preparation of plans and specifications, plan review and inspection, construction, and temporary mains.	FHMC 13.08
Connection Responsibility Policy	Metered water service shall be installed at the expense of the consumer in accordance with a fee schedule established by Town ordinance.	FHMC 13.04
Connection Fee Policy	Policy establishing water service connection fees that shall be charged and collected by the Town. Connection fees are outlined in Section 9 of this document.	FHMC 13.05
Water Rate Policy	Policy concerning monthly water rate charges for customers of the water system.	FHMC 13.05
Meters Policy	Each property serviced by the Town water supply shall be connected by separate metered connection to the Town main.	FHMC 13.04
Materials Policy	Policy stating minimum requirements for materials in providing water service.	FHMC 13.08
Emergency Drought Policy	Policy to establish water use restriction during times of drought.	FHMC 13.16
Drought Water Policy	Policy creating new classification of water rates during times of severe drought.	FHMC 13.16
Cross-Connections Control	Established regulations regarding water system cross connections.	FHMC 13.08
Limitations on New Services	Policy that limits connections for out-of-town services.	FHMC 13.12

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Wholesaling

The Town does not sell water to other utilities, and therefore has no wholesaling policy. The Town does allow for a single water meter to service condominiums or other residential developments. FHMC Section 13.04.090 established regulations related to the responsibility of managing these types of accounts.

Wheeling

Water wheeling is a practice whereby one agency conveys water through another agency's infrastructure. The Town does not currently wheel water, or have any policy providing for it.

Annexation

As established in the Friday Harbor FHUGA Management Agreement between the Town and San Juan County, adopted in July 2008:

- Only areas within the unincorporated FHUGA may be considered for annexation to the Town.
- Urban services and capital facilities may be extended to properties within the unincorporated FHUGA only when those properties are annexed to the Town.
- Property owners seeking annexation to the Town will be required to include in annexation petitions a full description of proposed development and any phasing plans, the specific urban services needs for the project, and all analyses and reports required by the Town.

Direct Connection and Satellite/Remote Systems

New developments within the Town water service area must connect to the Town water system, and are not permitted to be served via satellite or remote systems.

Design and Performance Standards

All water system improvements must be designed and installed in accordance with Town water main extension requirements as adopted in FHMC Chapter 13.08, and consistent with Town design standards (see Appendix E) and applicable WSDOH standards.

Outside Customer Surcharge

Town water customers located outside of the capital town limits are charged a higher monthly base charge than customers within Town limits. Water usage rates are the same for customers within and outside Town limits. The rationale for the increased monthly base cost is that it costs the Town more to provide service to customers outside town limits. Water rates and charges are set forth in FHMC Chapter 13.05.

Formation of Local Improvement Districts outside Legal Boundaries

San Juan County will not authorize the creation of special purpose districts for the provision of utilities, recreation, or other public facilities unless such districts include all of the area within the unincorporated FHUGA and the creation has been approved by the County and the Town.

Urban Growth Areas

The boundary of the FHUGA was selected to ensure that urban services will be available for all future development therein. This includes the provision of water service and other utilities (Comprehensive Plan, Chapter 7, p.1).

Properties within the unincorporated FHUGA proposed for new development that require urban services (including Town water and sewer facilities) shall be annexed before a land use or building permit will be issued.

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Proposed developments that do not require urban services shall be subject to the conditions of an enforceable developer extension agreement to pay for Town services upon the annexation of the subject property. County code requirements for onsite water supply, fire flow, sewage disposal, and stormwater control facilities shall apply only to allowable uses and developments that do not require urban services.

Latecomer Agreements

The Town has a latecomer agreement for water extension improvements. The agreement recoups water extension project costs by dividing costs incurred by the Town and/or a developer among the benefiting parcels. A standard agreement form is available from the Town on request.

Oversizing

The Town may consider contributing funds to help finance oversized water mains in a new development to accommodate future growth on a case-by-case basis.

Cross-Connection Control Program

The Town has an established a cross-connection control program that has been developed and implemented consistent with the requirements of WAC 246-290-490 (see Appendix H). The program and Town's enforcement authority are described in FHMC Chapter 13.08.

System Extension

Town policies for water service extensions are outlined in the Friday Harbor Water System Extension Requirements, and in FHMC Chapter 13.08. These requirements outline the application process, preparation of plans and specifications, plan review, construction, and inspection of improvements to the water system.

1.9 Satellite Management

The Town does not currently participate in satellite management activities.

1.10 Conditions of Service

Purveyor Responsibilities

The Town will supply water service to new customers within town limits provided that the following conditions are met:

- Determination by the Town that water supply and related distribution facilities are both available and adequate for proposed uses. Water supply should be considered "available" when it is demonstrated that water of sufficient quantity and quality for the intended use can be delivered to the proposed development. Water supply should be considered "adequate" when peak demand and the quantities of water necessary to satisfy that demand have been demonstrated.
- The service request is consistent with adopted local plans and development regulations.

Customer Responsibilities

Metered water service shall be installed at the expense of the consumer in accordance with a fee schedule established by town ordinance. The Town's connection responsibility policy is established in FHMC Chapter 13.04.

Connection Fee Schedule

FHMC Chapter 13.05 establishes fee schedules and policies.

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Meter and Materials Specifications

Each property serviced by the Town water supply shall be connected by separate metered connection to the Town main. All water lines and meters shall be designed and installed in accordance with Town water main extension requirements as adopted in FHMC Chapter 13.08, and consistent with Town design standards (see Appendix E) and applicable WSDOH standards.

Consent Agreements for Inspection, Maintenance, and Repair Activities That May Disrupt Water Service

FHMC Chapter 13.04 states, "The water supply may be shut off at any time, without notice, for repair, extension or other necessary purposes. The Town shall not be responsible for any damage incurred on the premises of the water customer by this action. Upon request of the Town, a designated employee shall be allowed access during reasonable hours to all parts of buildings with water service from the Town water system for the purpose of inspecting the condition of the pipes and fixtures and the manner in which the water is used. (FHMC 13.04)."

Latecomer Payback Provisions

The Town has a latecomer agreement for water extension improvements. The agreement recoups water extension project costs by dividing costs incurred by the Town and/or a developer among the benefiting parcels. A standard agreement form is available from the Town on request.

Developer Extension Requirements, Design Standards, Financing Responsibilities, and Engineering Design Requirements

The Town's developer extension requirements and construction standards are detailed in FHMC Chapter 13.08, the Town of Friday Harbor Water and Sewer System Extension Requirements and the Town design standards (see Appendix E).

1.11 Complaints

The Town maintains a public phone number for customer service. Customer calls may include reporting of water main breaks or leaks, low service pressure, or water quality issues. The Town responds immediately to resolve customer complaints. Written complaints are kept on file in accordance with state records retention laws. Work orders are issued to correct major system deficiencies.

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Section 2

Basic Planning Data and Water Demand Forecasting

The following sections present basic planning data and water demand forecasting for the Town water system, including the following information:

- Current population, service connections, and water use
- Projected land use, future population, and water demand

This planning information serves as the basis for the planning analyses and evaluations presented in subsequent sections, where it is used to evaluate the ability of the Town water system to serve existing and anticipated future water supply needs.

2.1 Current Population, Service Connections, Water Use, and Equivalent Residential Units

The following section provides information about the population, service connections, water use, and ERUs as they relate to the water system.

2.1.1 Current Population

The Town of Friday Harbor water system provides water service to existing customers both inside and outside its incorporated limits. Population for the Town incorporated area for 2011 was estimated at 2,180, based on data available from OFM. Historical population data for the Town are presented in Table 2-1 and depicted in Figure 2-1. Historical population data for unincorporated San Juan County as a whole are presented in Table 2-2 and depicted in Figure 2-2. In the period spanning 2000–10, the Town's population grew at a 0.8 percent average annual rate, whereas unincorporated San Juan County population grew at a 1.2 percent average annual rate.

The Town of Friday Harbor water system serves an estimated total population of 3,190 people (both in-town and out-of-town connections) as of 2011.

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Table 2-1. Town of Friday Harbor Population		
Year	Population	Average annual growth rate
1980	1,200	-
1990	1,492	2.2%
2000	1,989	2.9%
2010	2,162	0.8%
2011	2,180	0.8%

Source: Washington State Office of Financial Management (OFM).

Table 2-2. Unincorporated San Juan County Population		
Year	Population	Average annual growth rate
2000	12,088	-
2010	13,607	1.2%
2011	13,720	0.8%

Source: Washington State Office of Financial Management (OFM).

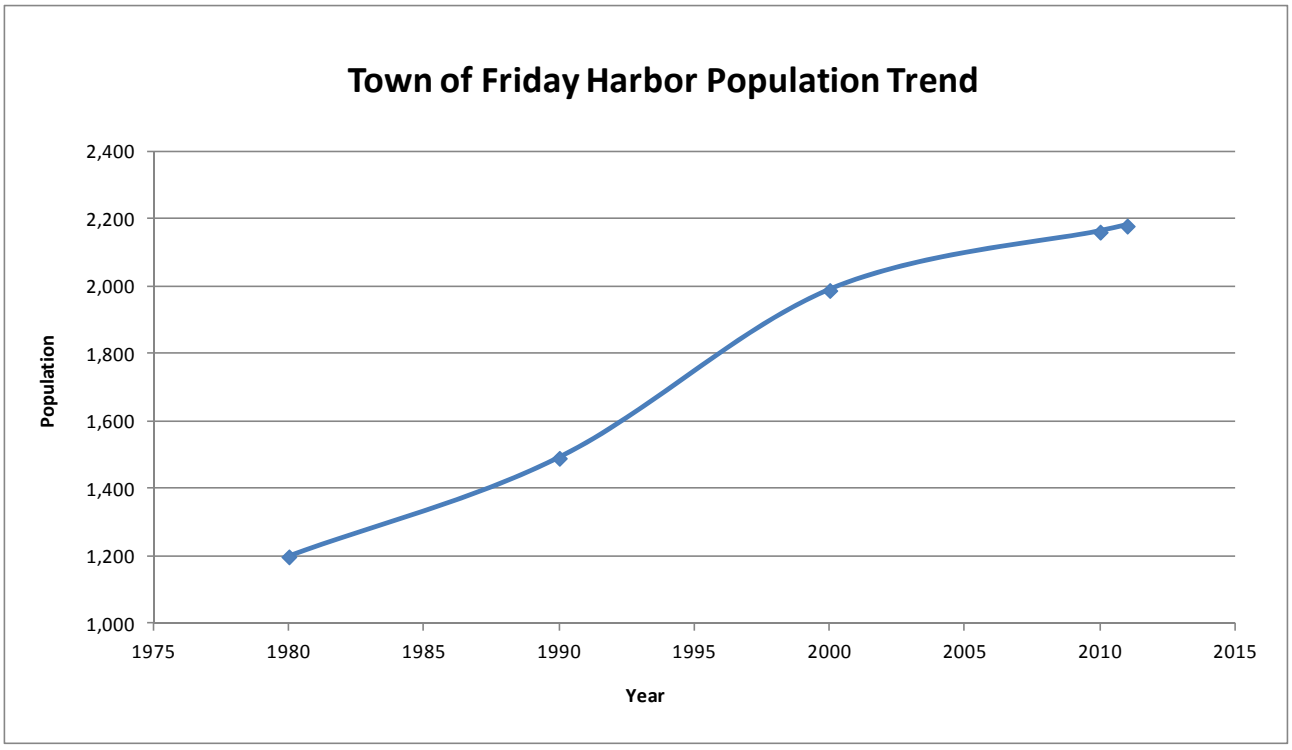

Figure 2-1. Town population trend

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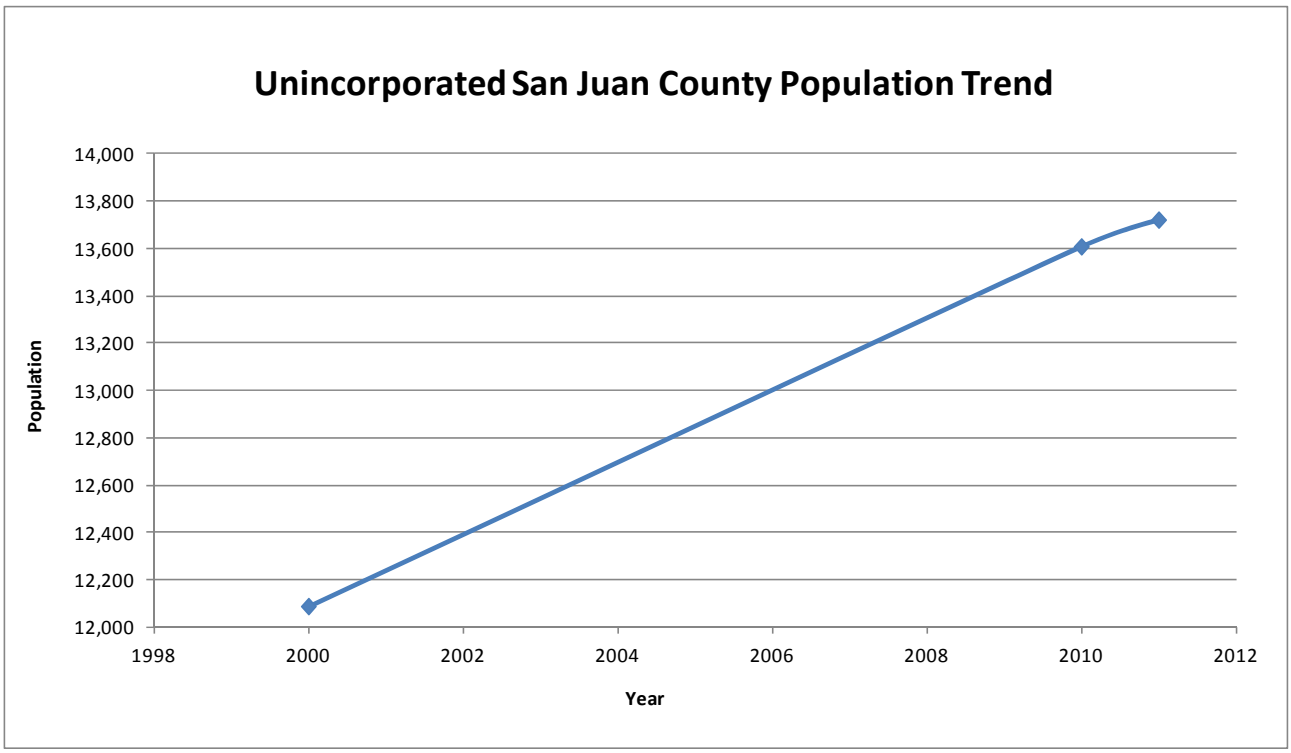

Figure 2-2. Unincorporated San Juan County population trend

2.1.2 Total Service Connections

The Town categorizes its water system customers according to the following classes, typically abbreviated as shown:

- SFR: Single-family residential
- MFR: Multifamily residential
- COM: Commercial
- IND: Industrial
- PA: Public authority
- Special

For 2011, the total number of service connections for the Town water system was 1,329. A complete breakdown of the connections by customer class and location for 2011 is presented in Table 2-3. In Table 2-4, customer connections for 2006–11 are summarized.

Connections by customer type for 2011 are displayed in Figure 2-3.

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Table 2-3. 2011 Water Service Connections	
Class description	Number of connections
Single-family residential (SFR), total	914
• SFR, in town	562
• SFR, out of town	352
Multifamily residential (MFR), total	109
• MFR, in town	104
• MFR, out of town	5
Commercial total	214
• Commercial, in town	210
• Commercial, out of town	4
Industrial total	16
• Industrial in town	13
• Industrial out of town	3
Public authority total	70
• Public authority, in town	65
• Public authority, out of town	5
Special total	6
• Special, in town	4
• Special, out of town	2
Total	1,329

Table 2-4. Water Service Connections by Customer Class, 2006–11							
Year	SFR	MFR	COM	IND	PA	Special	Total
2006	881	117	222	18	47	5	1,290
2007	901	106	222	18	48	4	1,299
2008	910	105	227	18	48	4	1,312
2009	913	107	229	17	50	4	1,320
2010	903	107	220	17	66	6	1,319
2011	914	109	214	16	70	6	1,329

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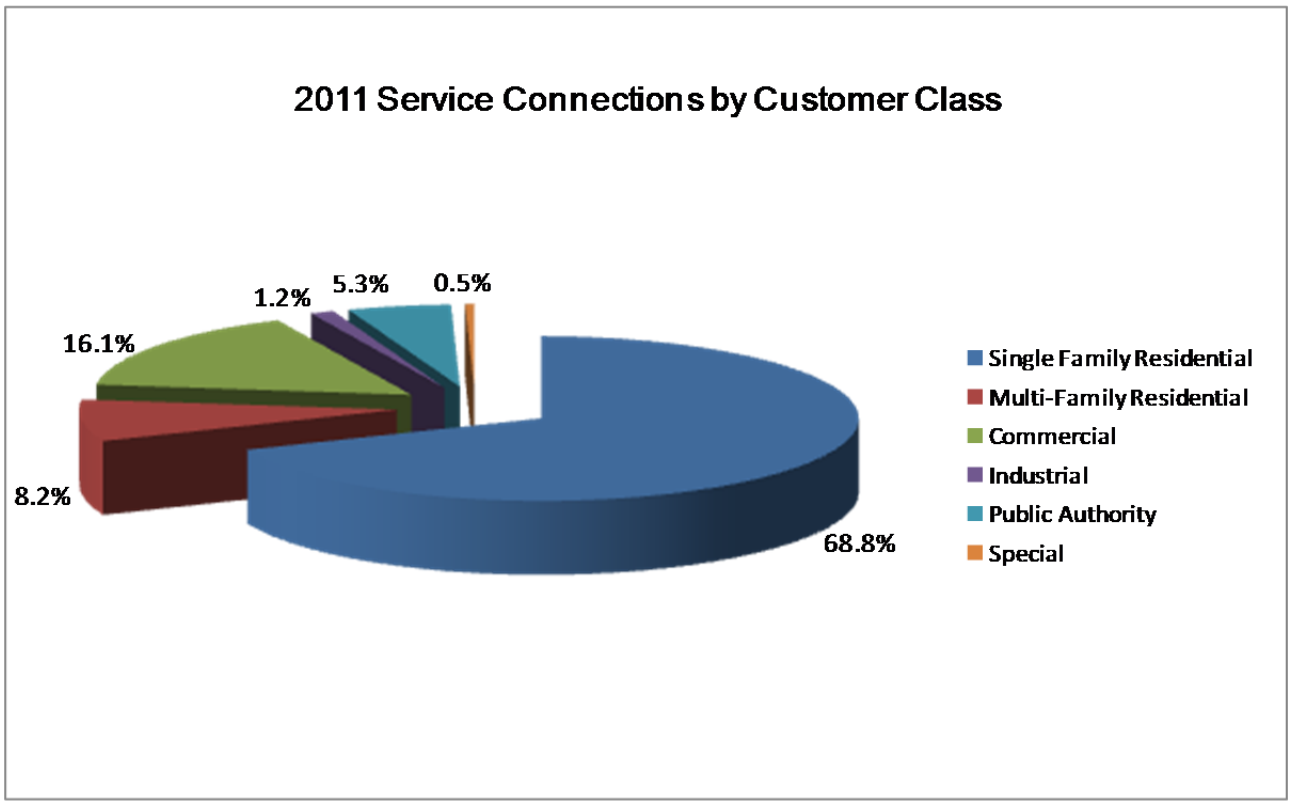

Figure 2-3. 2011 service connections by customer class

2.1.3 Water Use Data Collection

The Town meters water production at the Town water treatment plant. The Town also meters water consumption at all customer service connections.

Production Data

Water production volumes at the water treatment plant are recorded weekly. Monthly production data for 2003–11 are presented in Table 2-5. Annual water demands are frequently expressed in terms of average day demand (ADD) as shown in Figure 2-4, which indicates the average daily water produced by a water system during each year.

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Table 2-5. Water Production, 2003–11														
Year	Jan (MG)	Feb (MG)	Mar (MG)	Apr (MG)	May (MG)	Jun (MG)	Jul (MG)	Aug (MG)	Sep (MG)	Oct (MG)	Nov (MG)	Dec (MG)	Total (MG)	ADD (mgd)
2003	7.33	6.78	6.29	8.00	8.12	12.95	14.64	16.19	12.57	9.30	9.12	8.44	119.74	0.33
2004	10.67	9.34	9.14	10.45	11.51	12.79	15.43	17.09	11.96	9.19	8.86	8.80	135.22	0.37
2005	8.58	8.14	7.58	8.34	9.81	12.06	13.74	17.38	13.55	10.23	9.17	8.51	127.09	0.35
2006	8.49	8.23	8.09	10.02	11.37	13.32	17.00	18.17	14.83	10.56	9.07	8.97	138.11	0.38
2007	8.90	8.31	7.22	9.07	9.51	12.46	16.28	17.00	14.67	9.52	8.47	8.13	129.53	0.35
2008	8.21	8.58	9.01	10.17	10.27	11.70	15.28	16.23	12.17	9.50	8.51	8.73	128.36	0.35
2009	10.20	8.39	7.83	8.89	9.64	14.22	15.54	15.93	12.80	8.76	5.49	5.50	123.18	0.34
2010	7.34	7.07	6.71	7.99	9.47	9.75	12.71	13.74	11.19	8.02	6.97	7.30	108.26	0.30
2011	6.88	6.92	6.70	7.52	7.54	9.49	11.64	12.87	11.80	8.20	7.06	6.85	103.47	0.28

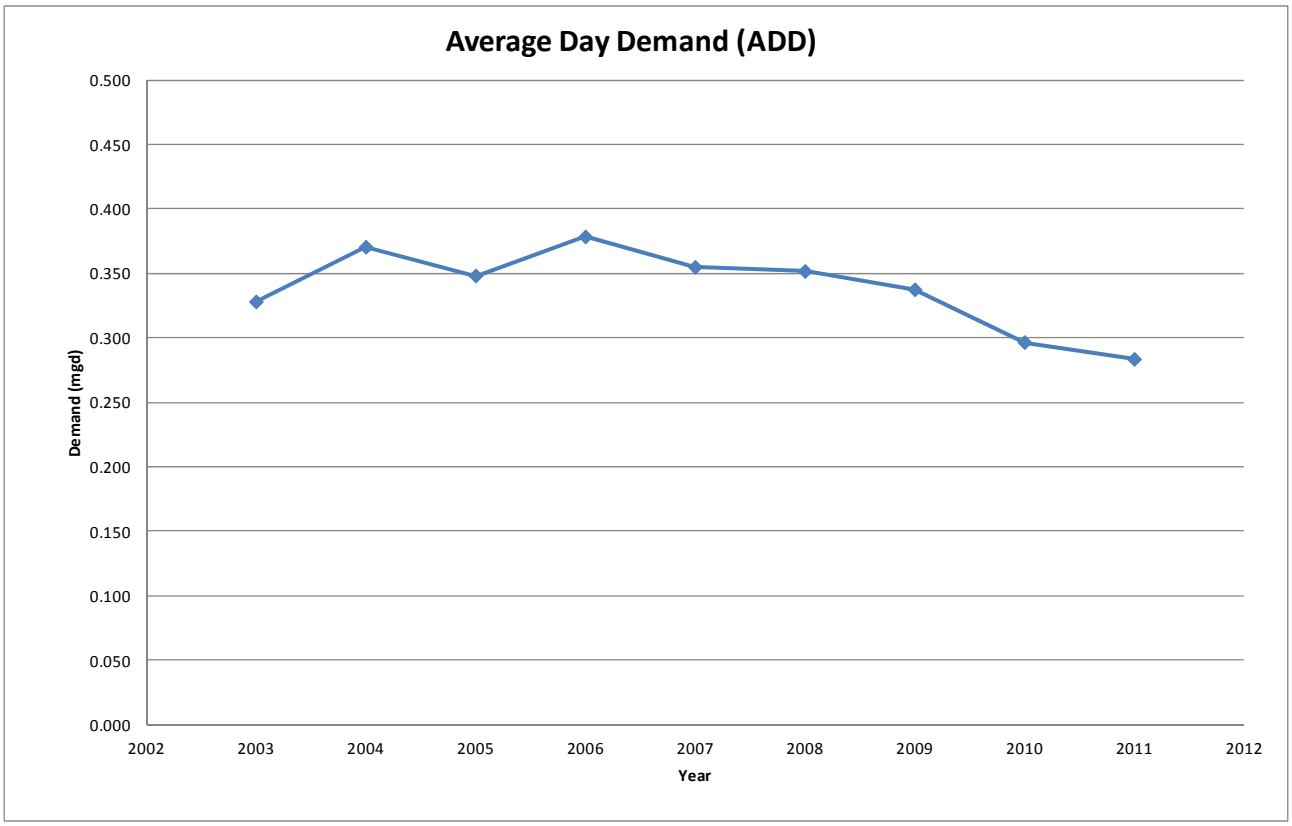

Figure 2-4. Average day demand (ADD)

Consumption Data

The Town meters customer water service connections to measure water consumption. Average day consumption for 2003–11 is shown in Table 2-6. Metered water consumption broken down by customer class for 2006–11 is presented in Table 2-7. Water consumption data are derived from Town billing records; customer water meters are read monthly.

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Table 2-6. Water Consumption, 2003–11		
Year	Annual consumption (MG)	Average day consumption (mgd)
2003	109.94	0.30
2004	117.43	0.32
2005	115.04	0.32
2006	123.41	0.34
2007	115.42	0.32
2008	110.66	0.30
2009	114.10	0.31
2010	101.97	0.28
2011	97.44	0.27

Table 2-7. Water Consumption by Customer Class (Average for 2006–11)					
Parameter	SFR	MFR	COM[a]	Special/other	Total
Average day consumption (gpd)	107,736	53,898	121,473	19,631	302,737
Number of connections	904	109	295	5	1,312
Consumption per connection (gpd)	119	497	412	4,062	254
Percent of total consumption	36%	18%	40%	6%	100.0%

a. The commercial customer class values presented here include industrial and public authority.

Seasonal Variations in Demand

Seasonal variations in consumption by customer class for 2009, which represents peak summer period usage in recent years, are depicted in Figure 2-5. In general, demand peaks are associated with elevated tourism and dry conditions in late summer months.

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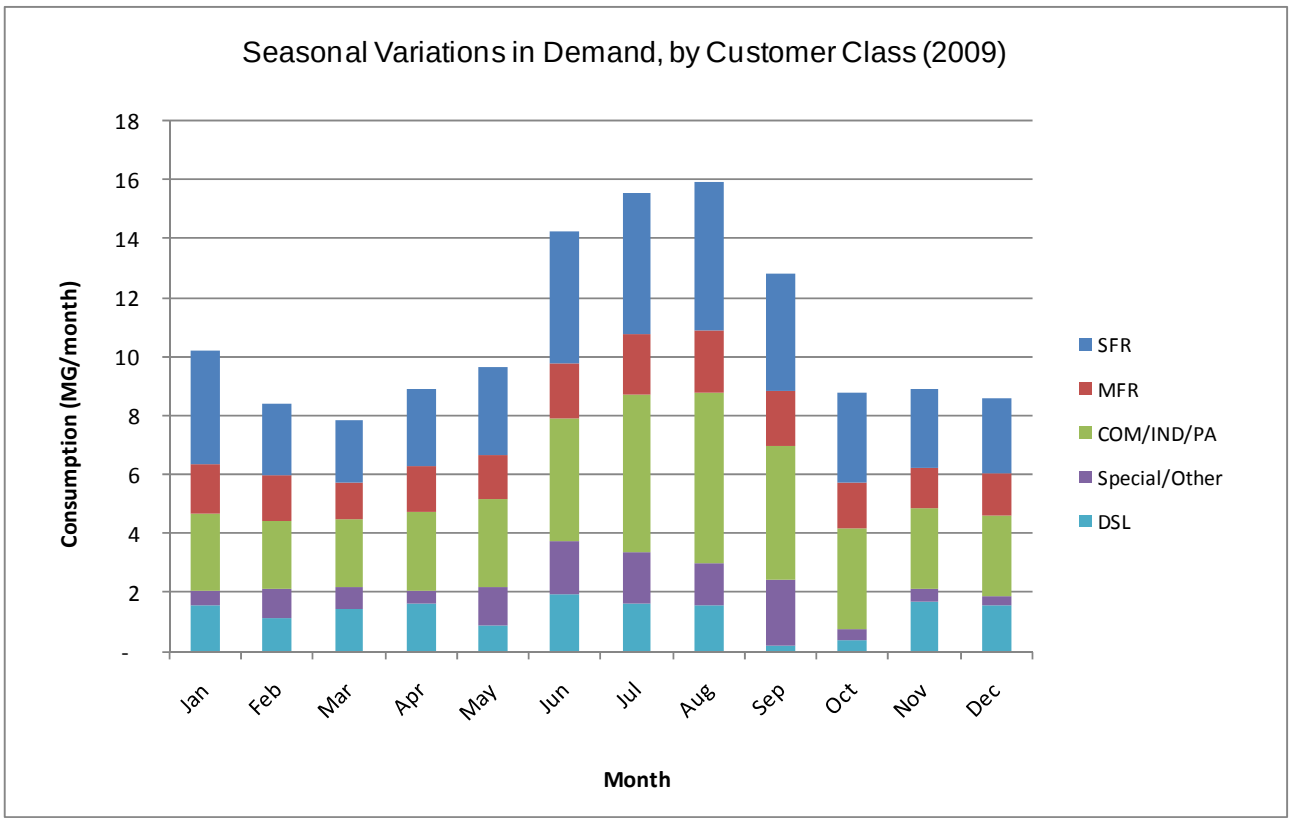

Figure 2-5. Seasonal variations in water demand, by customer class

Peak Water Demands

Maximum day demand (MDD) corresponds to the largest volume of water produced in a single day each year. In the Town of Friday Harbor MDD is typically associated with a hot summer weekend. MDD is frequently described in terms of a peaking factor, which is the ratio of MDD to ADD.

MDD values for 2003–11 are shown in Table 2-8. Record high temperatures for Friday Harbor were recorded in July 2009, contributing to an unusually high MDD recorded during that period. The July 2009 MDD corresponds to a peaking factor of 2.33. This peaking factor is considered representative of likely maximum day usage scenarios, and will be applied to future water demand projections in this WSP.

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Table 2-8. Maximum Day Demand (MDD), 2003–11			
Year	ADD (mgd)	MDD (mgd)	MDD/ADD peaking factor
2003	0.33	0.68	2.06
2004	0.37	0.67	1.80
2005	0.35	0.71	2.03
2006	0.38	0.74	1.96
2007	0.35	0.74	2.10
2008	0.35	0.66	1.86
2009	0.34	0.79	2.33
2010	0.30	0.60	2.02
2011	0.28	0.54	1.90

Peak hour demand (PHD) is the maximum water use during a 1-hour period on the peak demand day. The WSDOH Water System Design Manual presents a methodology for estimating PHD. The generalized equation incorporates ERUs, and is as follows:

$$PHD = \left(\frac{MDD}{1{,}440}\right)[(C)(N) + F] + 18$$

Where:

PHD = Peak hourly demand (gpm)

C = Coefficient associated with ranges of ERUs

N = Number of service connections, ERUs

F = Factor associated with ranges of ERUs

MDD = Maximum day demand (gpd/ERU)

A range of values for C and F are provided in Table 5-1 of the Water System Design Manual, varying with water system size. For systems with greater than 500 ERUs, like Friday Harbor's, C = 1.6 and F = 225.

For 2006–11, the average number of ERUs in the Town system was 2,798, as noted in Table 2-11. MDD is calculated by taking an average ADD per ERU, 119 gallons per day (gpd), times the highest reported MDD/ADD peaking factor (2.33), equaling a MDD of 278 gpd/ERU. The PHD is calculated below, using the values cited:

$$PHD = \left(\frac{278}{1{,}440}\right)[(1.6)(2{,}798) + 225] + 18 = \mathbf{926\ gpm}$$

Distribution System Leakage

Distribution system leakage (DSL) is defined as the difference between the metered source water production and metered water consumption, less any authorized productive uses. DSL may include water lost due to leaks, unauthorized uses such as illegal service connections, accounting errors, and inaccurate source and customer meters. Table 2-9 details DSL for 2003–11.

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Table 2-9. Water Distribution System Leakage, 2003–11				
Year	Annual production (MG)	Annual consumption (MG)	DSL (MG)	Percent DSL
2003	119.74	109.94	9.80	8.2%
2004	135.22	117.43	17.79	13.2%
2005	127.09	115.04	12.05	9.5%
2006	138.11	123.41	14.70	10.6%
2007	129.53	115.42	14.11	10.9%
2008	128.36	110.66	17.71	13.8%
2009	123.18	114.10	9.08	7.4%
2010	108.26	101.97	6.28	5.8%
2011	103.47	97.44	6.04	5.8%

2.1.4 Equivalent Residential Units

ERUs are a way to express water use for an entire water system in terms of equivalent single-family residential units. An ERU is defined as the average day water consumption for a single-family residence. Table 2-10 shows the calculated water consumption per ERU for 2006–11.

Table 2-10. Equivalent Residential Unit Water Demand, 2006–11			
Year	SFR ADD (gpd)	SFR connections	gpd/ERU
2006	115,653	881	131
2007	112,468	901	125
2008	107,212	910	118
2009	110,898	913	122
2010	100,027	903	111
2011	100,159	914	110
Average	107,736	904	119

For purposes of this WSP, the average 2006–11 value of 119 gpd/ERU is used to analyze system capacity for future planning requirements. The total number of ERUs for the Town was calculated by dividing the amount of consumption per connection for each customer class by the amount of consumption per connection for the SFR customer class, and then multiplying that ratio by the number of connections for each respective customer class. Table 2-11 summarizes the average number of ERUs per customer class for 2006–11.

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Table 2-11. Water System ERUs (Average 2006–11)						
Parameter	SFR	MFR	COM[a]	Special/other	DSL	Total
Average day demand (gpd)	107,736	53,898	121,473	19,631	31,012	333,749
Number of connections	904	109	295	5	-	1,312
Consumption per connection (gpd)	119	497	412	4,062	-	254
ERUs per connection	1.0	4.2	3.5	34.0	-	2.1
Total ERUs[b]	904	452	1,018	165	260	2,798

a. *The commercial customer class here includes industrial and public authority connections.*

b. *ERU totals do not match exactly due to rounding.*

2.2 Projected Land Use, Future Population, and Water Demand

The Town has identified a long-term population growth rate of 1.7 percent for future planning purposes, consistent with the Town Comprehensive Plan. This growth rate applies to both incorporated and unincorporated areas of the Town water system. This rate will be applied to future planning projections and forecasts in this WSP.

2.2.1 Projected Land Use

Maps of the recently amended Town UGAs, zoning areas, and land use areas are presented in Section 1. The Town projects that the UGA, zoning, and land use areas identified in the Town Comprehensive Plan are adequate to support future population growth out to the 20-year planning horizon. New annexations and/or the creation of additional UGAs are not anticipated during that time frame. Population within the water system is anticipated to grow through in-fill of existing development.

2.2.2 Projected Population

Population projections for the water system in Table 2-12 include forecasted growth within Town boundaries, and for the entire service area. Annual population growth is projected at 1.7 percent, from an estimated baseline water service area population of 3,190 people in 2011.

Table 2-12. Population Projections		
Year	Town	Water system
2011	2,180	3,190
2012	2,217	3,244
2018	2,453	3,590
2032	3,106	4,545

2.2.3 Projected Nonresidential Water Demand

It is anticipated that growth due to in-fill within the current water system will be similar in character to existing customer classes and water use patterns. Projections are therefore based on the assumption that nonresidential demands will increase in proportion to residential demands, at the identified 1.7 percent annual growth rate.

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2.2.4 Projected Non-Revenue Water

Friday Harbor currently has no metered non-revenue water. Public authority water use is metered and billed.

2.2.5 Water Rates and Rate Impacts on Water Demand

The Town completed a utility rate study in 2008 that assessed revenue requirements, including projected capital costs, through 2015, and made rate-setting recommendations targeted to meet those requirements.

The current water rate schedule is included in Table 2-13. It includes fixed monthly charges for service, a consumption-based charge that escalates with increasing water use for SFR customers, and a non-SFR consumption-based charge that varies seasonally. Low-income elderly or disabled customers pay half the standard fixed fee, plus consumption. The rate schedule includes tiered charges to encourage conservation by water users.

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Table 2-13. Water Rate Schedule							
Customer class	Meter size	In-town fixed fee	Out-of-town fixed fee	Variable charge (per 1,000 gallons)			
				Block 1 (0-3.5)	Block 2 (3.5-7)	Block 3 (7-10.5)	Block 4 (10.5+)
SFR	5/8″	40.00	60.25	7.00	8.75	11.65	14.00
	1″	91.00	136.30	7.00	8.75	11.65	14.00
	1.5″	175.50	263.50	7.00	8.75	11.65	14.00
	2″	277.25	415.80	7.00	8.75	11.65	14.00
				(All others seasonal)		Winter	Summer
MFR	5/8″	40.50	61.00			7.00	8.80
	1″	92.00	138.00			7.00	8.80
	1.5″	178.00	267.00			7.00	8.80
	2″	281.00	421.50			7.00	8.80
	3″	555.85	833.75			7.00	8.80
	4″	865.00	1,297.50			7.00	8.80
COM	5/8″	40.50	61.00			7.00	8.80
	1″	92.00	138.00			7.00	8.80
	1.5″	178.00	267.00			7.00	8.80
	2″	281.00	421.50			7.00	8.80
	3″	555.85	833.75			7.00	8.80
	4″	865.00	1,297.50			7.00	8.80
IND	5/8″	45.50	68.50			7.00	8.80
	1″	105.00	157.35			7.00	8.80
	1.5″	203.50	305.30			7.00	8.80
	2″	322.00	483.00			7.00	8.80
	3″	637.60	956.50			7.00	8.80
	4″	992.80	1,489.15			7.00	8.80
PA	5/8″	40.50	61.00			7.00	8.80
	1″	92.00	138.00			7.00	8.80
	1.5″	178.00	267.00			7.00	8.80
	2″	281.00	421.50			7.00	8.80
	3″	555.85	833.75			7.00	8.80
	4″	865.00	1,297.50			7.00	8.80

2.2.6 Water Demand Forecasting

For the purposes of projecting future water system demands, a 2011 baseline demand projection was developed with consideration to data from several sources. The 2011 ADD baseline projection is determined as the average ADD for 2006–11. The MDD baseline for 2011 is calculated from the baseline ADD using the highest observed recent peaking factor of 2.33 from July 2009. PHD baseline for

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2011 was calculated according to the standard WSDOH formula based on the baseline ADD and MDD values and on average ERUs for 2006–11.

For future planning years, ADD is projected using a 1.7 percent growth rate for water demands. MDD is projected based on a consistent MDD/ADD peaking factor of 2.33. PHD is projected based on a 1.72 PHD/MDD ratio calculated for the 2011 baseline year. ERUs are projected from ADD on the basis of 119 gpd/ERU. Projected ADD, MDD, PHD, and ERUs for 6- and 20-year planning periods are shown in Table 2-14.

Table 2-14. Projected ADD, MDD, PHD, and ERUs

Year	ADD (mgd)	MDD (mgd)	MDD (gpm)	PHD (gpm)	ERUs
2011 (baseline)	0.33	0.78	540	926	2,798
2012	0.34	0.79	549	945	2,845
2018	0.38	0.88	608	1,045	3,148
2032	0.48	1.11	769	1,323	3,986

Water demand projections including water use efficiency (WUE) measures were developed consistent with WUE goals outlined in Section 4. Water demand projections including WUE measures assume a future goal of 9 percent DSL, instead of the 9.1 percent DSL included in baseline projections, as documented in Table 2-14. WUE goals were set several years ago to target 9 percent DSL, and improvements in Town water system performance for DSL have brought the Town below its DSL target for the last 3 years. This is reflected in the similarity of the Town WUE goal and projections relative to actual 6-year average performance. WUE efficiency projections are presented in Table 2-15.

Table 2-15. Projected ADD, MDD, PHD, and ERUs (with WUE measures)

Year	ADD (mgd)	MDD (mgd)	MDD (gpm)	PHD (gpm)	ERUs
2011 (baseline)	0.33	0.78	540	926	2,798
2012	0.34	0.79	549	944	2,842
2018	0.38	0.87	607	1,044	3,145
2032	0.48	1.11	769	1,322	3,982

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Section 3

System Analysis

This section presents an analysis of water system capacity and performance relative to anticipated regulations, demands, and service requirements. The following sections include evaluations of Town water supply sources, water treatment, water storage, and system piping and hydraulics relative to applicable regulatory frameworks, criteria, and requirements; existing water supply needs; and the anticipated additional demands of future growth and development, as projected previously in Section 2. System improvements needed to correct existing and anticipated system deficiencies and support projected future growth and water system expansion are identified, assessed, and prioritized in subsequent sections.

3.1 System Design Standards

System design standards identify performance and design criteria that are applicable to the Town of Friday Harbor. Performance and design criteria typically address water system sizing and reliability requirements for source, storage, piping hydraulics, and water quality. Construction standards set forth material requirements and construction methods that contractors, developers, and the Town shall adhere to when constructing water system improvements.

The system design standards applied in the system analyses and evaluations summarized in this section are detailed in Table 3-1. These standards are generally consistent with applicable local, county, state, and federal requirements for the Town water system, including WSDOH and U.S. Environmental Protection Agency (EPA) criteria, as detailed in the applicable sections of the Washington Administrative Code (WAC), WSDOH Water System Design Manual, and Code of Federal Regulations (CFR). A more detailed set of service area policies is included in Appendix B.

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Table 3-1. System Design Standards

Parameter	Standard
Water quality and treatment	Provide water quality and treatment consistent with applicable state (WSDOH) and federal (EPA) requirements
ADD	119 gpd/ERU per recent system water use records and customer counts, as detailed in Section 2
MDD	MDD = (2.33)(ADD), consistent with recent highest observed peaking factor, as detailed in Section 2
PHD	PHD = (MDD/1440)[(C)(N)+F]+18, consistent with the WSDOH standard design formula in which: PHD is expressed in gpm MDD is expressed in gpd/ERU N = analysis area ERUs C and F vary according to analysis area ERUs as summarized below: ERUs C F <50 3.0 0 51–100 2.5 25 101–250 2.0 75 251–500 1.8 125 >500 1.6 225
Fire flow rate and duration	Single-family residential: 500 gpm for 30 minutes Commercial/multifamily residential: 750 gpm for 60 minutes Industrial: 1,000 gpm for 60 minutes
Water system pumping capacity	Sufficient to supply MDD with the largest pump out of service, where PHD and fire flows are supported by available gravity equalizing and fire suppression storage. Sufficient to supply PHD and fire flows with the largest pump out of service, where PHD and fire flows are supported directly via pumping.
Storage volumes	Sufficient to support the sum of operational, equalizing, standby and fire suppression, and dead storage volumes
Operational storage (OS)	OS = Volumes stored between pump on and pump off levels OS is to be located within the overall storage volume at a level such that it can support 30 psi minimum PHD service pressure
Equalizing storage (ES)	ES = (PHD - Qs)(150 minutes) consistent with WSDOH standard design formula in which: PHD is expressed in gpm and is calculated for each analysis area according to anticipated ERUs as indicated above Qs = analysis area active source of supply or booster pumping capacity, because Qs should generally be greater than MDD, as summarized above, MDD may be substituted for Qs for analysis planning purposes ES is to be located within the overall storage volume at a level such that it can support 30 psi minimum PHD service pressure
Standby storage (SB)	Analysis areas with single sources of direct hydraulic source of supply: SB = (2)(ADD)(N) where: ADD is expressed in gpd/ERU N = analysis area ERUs Analysis areas with multiple sources of direct hydraulic source of supply: SB = (2)(ADD)(N) - Qr where: ADD is expressed in gpd/ERU N = analysis area ERUs Qr = Analysis area source-of-supply capacity with largest source out of service, because Qr should generally be greater than ADD as summarized above ADD may be substituted for Qr for analysis planning purposes SB shall also not be less than 200 gallons/ERU, SB is to be located within the overall storage volume at a level such that it can support 20 psi minimum service pressures
Fire suppression storage	Single-family residential: (500 gpm)(30 minutes) = 0.015 MG

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Table 3-1. System Design Standards	
Parameter	Standard
(FSS)	Multifamily residential/Commercial: (750 gpm)(60 minutes) = 0.045 MG Industrial: (1,000 gpm)(60 minutes) = 0.06 MG FSS is to be located within the overall storage volume at a level such that it can support 20 psi minimum MDD plus fire flow service pressures
Dead storage (DS)	Storage within the overall storage volume below the level necessary to maintain 20 psi minimum gravity service pressure to associated service connections
Minimum system pressure	Distribution system piping: 30 psi minimum under PHD conditions 20 psi minimum under MDD plus fire flow conditions Transmission system piping: Maintain positive system pressure under all hydraulic conditions for transmission pipes that do not include direct service or fire hydrant connections
Maximum system pressure	Distribution and transmission system piping: Target of 80 psi maximum during normal conditions (recommend individual service connection PRVs in areas that exceed 80 psi)
Telemetry system	Automated telemetry and control system in place, telemetry control should be added for new installed facilities
Minimum pipe sizes	Minimum 8-inch pipe diameter except for 6-inch minimum in single-family cul-de-sacs.
Maximum pipe flow velocity	Goal of no more than 5 feet per second (fps) under PHD conditions Goal of no more than 8 fps under MDD plus fire flow conditions
Backup power	Onsite backup power equipment or gravity standby storage shall be provided unless the power grid meets the minimum reliability criteria established in Section 7.7, "Water System Design Manual". Gravity storage provided for pressure zone 232, other zones provide a minimum of 50 percent of peak demand with largest pump out of service, with auxiliary power provided.
Fire hydrant spacing and locations	In Town: Target spacing of every 600 ft, maximum of 1,000 ft, with a valve off of the main line. Out of Town: No specific standard
Isolation valve spacing and locations	Located wherever necessary to allow individual pipelines to be shut down for repair or service installation. In general, a minimum of three valves shall be placed at intersections and tees. Maximum spacing is 1,000 ft in Town. Out–of- Town spacing is evaluated on a case-by-case basis.
Pipe looping	Dead-end lines are avoided whenever practically possible, mains are to be looped where practical to do so.

3.2 Water Quality Analysis

The Town conducts routine water quality sampling of the water system and its water supply sources to determine compliance with WSDOH water quality standards, which implement both federal and state regulations. These standards are generally developed around water treatment technique requirements and water quality maximum contaminant levels (MCLs), which place upper limits on acceptable concentrations of a variety of potential water quality constituents and contaminants. Regulated constituents are divided into two general categories:

- Primary contaminants regulated as compounds that pose known, established, and likely risks to human health
- Secondary contaminants regulated according to aesthetic water quality concerns where there are otherwise no known adverse human health effects

There are several classes of regulated water quality constituents, each with a unique regulatory framework detailing associated minimum water quality and monitoring requirements. These include:

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- Bacteriological: fecal coliform and E. coli
- Inorganic chemicals (IOCs) and physical parameters: antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, nitrate (as N), nitrite (as N), selenium, sodium, thallium, and turbidity regulated as primary contaminants; and chloride, color, hardness, iron, manganese, specific conductivity, silver, sulfate, total dissolved solids, and zinc regulated as secondary contaminants
- Lead and copper
- Disinfection by-products (DPBs) and disinfectant residuals: total trihalomethanes (TTHM); five regulated haloacetic acids (HAA5); bromate; chlorite; and disinfectant residual levels for chlorine, chloramines, and chlorine dioxide
- Organic chemicals including volatile and synthetic organic chemicals (VOCs and SOCs): more than 50 individual identified organic chemicals and groups of organic chemical types including alachlor, aldicarb, aldicarb sulfone, aldicarb sulfoxide, atrazine, benzene, benzo[a]pyrene, carbofuran, carbon tetrachloride, chlordane, dalapon, 2,4-D, di (2-ethylhexyl) adipate, di (2-ethylhexyl) phthalate, dibromochloropropane (DBCP), o-dichlorobenzene, para-dichlorobenzene, 1,2-dichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, dichloromethane, 1,2-dichloropropane, dinoseb, diquat, endothall, endrin, ethylbenzene, ethylene dibromide (EDB), gylphosate, heptachlor, heptachlor epoxide, hexachlorobenzene, hexachlorocyclopentadiene, lindane, methoxychlor, monochlorobenzene, oxamyl (vydate), pentachlorophenol, picloram, polychlorinated biphenyls (PCB), simazine, styrene, 2,3,7,8-TCDD (Dioxin), tetrachloroethylene, toluene, toxaphene, 2,4,5-TP (Silvex), 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, vinyl chloride, and xylene
- Radionuclides: radium-226 and -228, gross alpha particle activity, beta particle and photon radioactivity, and uranium

Water quality monitoring is conducted on a schedule that varies according to regulated compounds, parameters, and treatment approaches, and may include both source-of-supply and distribution system testing. Water systems are required to maintain a current monitoring plan that documents their sampling schedule. The current Town monitoring plan, including a Coliform Monitoring Plan and a 2012 Water Quality Monitoring Report, is included in Appendix I.

Results of past water quality monitoring are detailed in this section to include water quality trends for source of supply and distribution system water quality. A discussion of anticipated future regulatory requirements relevant to source and distribution system water quality is also included.

3.2.1 Recent Trends

Over the past 10 years, two major water quality trends and related Town responses can be identified, one early in the decade, and another more recently.

From 2001–04, the Town experienced a series of 11 analyte sampling results that exceeded primary or secondary MCLs, including results for TTHM, HAA5, color, iron, and manganese. TTHM and HAA5 levels were recorded at levels as high as 128 and 82 micrograms per liter (µg/L) compared to MCLs of 80 µg/L and 60 µg/L, respectively. Color was recorded at levels as high as 50 color units (CU) compared to an MCL of 15 CU. Iron and manganese were recorded at levels as high as 0.37 mg/L and 0.054 mg/L compared to MCLs of 0.30 mg/L and 0.050 mg/L, respectively.

In response to these sample results and associated water quality challenges, the Town implemented operational changes at the water treatment plant. Process modifications included reducing pre-chlorination to limit the formation of DBPs, and adding potassium permanganate at the front of the treatment process to oxidize iron, manganese, and organic compounds that contribute to color and DBP

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formation. These operational improvements were sufficient to avoid further exceedances until early 2010.

More recently, the Town experienced running annual averages (RAAs) for DBPs that approached or exceeded the primary MCLs for those compounds (up to 80.4 µg/L for TTHM and 44.9 µg/L for HAA5, compared to MCLs of 80 µg/L and 60 µg/L, respectively). In June 2011, the Town completed water treatment process upgrades and added a GAC adsorption/filtration system at the existing water treatment plant designed to remove DBP precursors and reduce DBP formation consistent with water quality regulatory requirements. The GAC system has effectively limited DBP formation and reduced DBP concentrations to levels well within the associated MCLs.

3.2.2 Future Requirements

State drinking water regulations, as codified in WAC 246-290 and enforced by WSDOH, incorporate federal and state water quality mandates. Federal standards are continually reviewed and updated, and as a result, state regulations are regularly updated to remain in compliance. New and forthcoming WSDOH regulations reflect new and changing EPA rules regarding surface water treatment, disinfection, public notification, radionuclides, lead, and copper.

A number of additional new or anticipated federal drinking water regulations are likely to come into effect over the next 10 years. These regulations define new or additional water quality requirements for many contaminants found in drinking water, including arsenic, radon, methyl tertiary-butyl ether (MTBE), and aldicarb, as well as monitoring and reporting requirements, which may potentially affect the Town of Friday Harbor. Information and updates concerning these federal regulations can be found on the EPA Web site: www.epa.gov/safewater/regs.html.

Specific new and future water quality regulations with potential to impact Friday Harbor include the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), and the Stage 2 Disinfectants and Disinfection By-Products Rule (Stage 2 DBPR). The LT2ESWTR is aimed at providing appropriate control, mitigation, and treatment for cryptosporidium that may be present in surface water supplies. The Stage 2 DBPR targets tighter control on disinfectant levels and potential DBP formation in water systems.

Long-Term 2 Enhanced Surface Water Treatment Rule

The LT2ESWTR requires a period of rigorous water quality monitoring for E. Coli and cryptosporidium, to determine levels of each in raw water. The Town has conducted water quality monitoring of its Trout Lake source in the past for these microbial parameters, and was able to grandfather those data in lieu of conducting new tests. Based on the past monitoring results, no additional treatment to further control, remove, and/or inactivate cryptosporidium that could potentially be present in the Trout Lake water supply is required at this time. A second round of source water monitoring will be required under the rule in 2017. Should subsequent monitoring suggest the potential for higher levels of cryptosporidium in Trout Lake, additional control, treatment, and/or mitigation for cryptosporidium could be required. If subsequent monitoring results indicate that likely cryptosporidium levels remain low, no additional treatment would be required.

Stage 2 Disinfectants and Disinfection By-Products Rule

Consistent with DBP regulations, the Town conducts quarterly water quality monitoring at consistent locations within its distribution system. Under preexisting DBP regulations, DBP MCL compliance was based on the system RAA of quarterly concentrations for samples collected from locations around the system. Under the new Stage 2 DBPR, DBP MCL compliance is based on the locational running annual average (LRAA) for each individual sampling location, and not the RAA of the quarterly system averages. This creates more stringent controls on DPB levels in the distribution system, in which each individual location, and not the system averaged as a whole, must comply with MCL limits for TTHM and HAA5.

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In order to determine appropriate Stage 2 DBPR water system monitoring locations, the Town recently completed and submitted to WSDOH an Initial Distribution System Evaluation (IDSE) report. Official monitoring under the Stage 2 DBPR will begin in 2013.

Prior to the implementation of GAC treatment, routine water quality monitoring for DBPs, both TTHM and HAA5, had shown significant occurrences of both parameters at levels nearing or exceeding the MCLs. With the new GAC treatment system online, DBP levels have been greatly reduced and are now maintained at levels below the associated MCLs in keeping with associated water quality regulations.

3.3 Water System Description and Analysis

The objective of this section is to determine if existing system facilities have sufficient capacity to meet existing and projected demands as identified in Section 2. Demands applied in this section include both average and peak demands for current and future planning horizons. Demand projections and metrics are summarized in Table 2-14.

3.3.1 Water Supply Sources

As described in Section 1, raw water supply for the Town is obtained from Trout Lake, including water volumes collected within the Trout Lake watershed and supplemental flows from the AUG 1 and AUG 2 seasonal stream diversions.

Two factors have the potential to limit source-of-supply capacity: water rights, and sustainable annual withdrawal limits from Trout Lake. Table 3-2 presents annual source capacity based on each factor, and compares them to projected ADD. Table 3-3 translates this comparison into projected water supply deficiencies.

As shown in Table 3-2, the annual sustainable raw water supply capacity of the Friday Harbor water sources is currently limited to an estimated 0.46 million gallons per day (mgd), compared to a 0.48 mgd ADD projection in 2032. This indicates that water demand growth within the 20-year planning horizon could bring the water system beyond its limit in terms of annual sustainable raw water supply capacity. As noted in the 1994 capacity analysis for Trout Lake, an approximate 7-foot increase in the dam and reservoir level could increase annual sustainable raw water supply capacity by about 37 MG/yr, or approximately 0.1 mgd on an equivalent average daily basis. This would increase overall annual sustainable raw water supply capacity to 205 MG/yr and 0.56 mgd, which would be adequate to meet projected 2032 ADD. Another potential option to increase sustainable water supply availability is seawater desalinization via reverse-osmosis treatment processes. Alternately, the Town can seek to further limit demand through further water conservation efforts and water use reductions.

Table 3-2. Annual Raw Water Supply Capacity

Capacity/projection	Annual sustainable raw water supply	Water right annual withdrawal limit
ADD capacity (mgd)	0.46	1.32
2011 baseline projection ADD (mgd)	0.33	
2018 projected ADD (mgd)	0.38	
2032 projected ADD (mgd)	0.48	

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Table 3-3. Annual Raw Water Supply Deficiencies		
Capacity/projection	Annual sustainable raw water supply	Water right annual withdrawal limit
ADD capacity (mgd)	0.46	1.32
2011 baseline projection deficiency (mgd)	None	None
2018 projected deficiency (mgd)	None	None
2032 projected deficiency (mgd)	0.02	None

Water Source ERU Capacity

Source capacity can be compared to demands on a per ERU basis to determine the maximum number of ERUs that can be served by existing source facilities:

- ADD basis: Sustainable yield ADD of 0.46 mgd / 119 gpd/ERU = 3,866 ERUs
- MDD basis: Peak capacity is not currently considered a limiting factor for the Trout Lake source, based on the following factors:
  - Trout Lake does not have an instantaneous water rights withdrawal limit.
  - Hydraulic capacity of the existing raw water pipeline from Trout Lake to the water treatment plant, estimated at over 800 gpm or 1.2 mgd, exceeds the treatment capacity of the plant.

3.3.2 Water Treatment

Raw water supplied from Trout Lake, AUG 1, and AUG 2 is treated at the Town water treatment plant prior to entering the distribution system. The water treatment plant currently employs conventional filtration, followed by GAC adsorption/ filtration, and a chlorine contact disinfection clearwell. Together these processes provide appropriate potable water treatment consistent with associated state and federal water quality and surface water supply treatment requirements.

A simplified schematic of water treatment processes employed by the Town is included as Figure 3-1.

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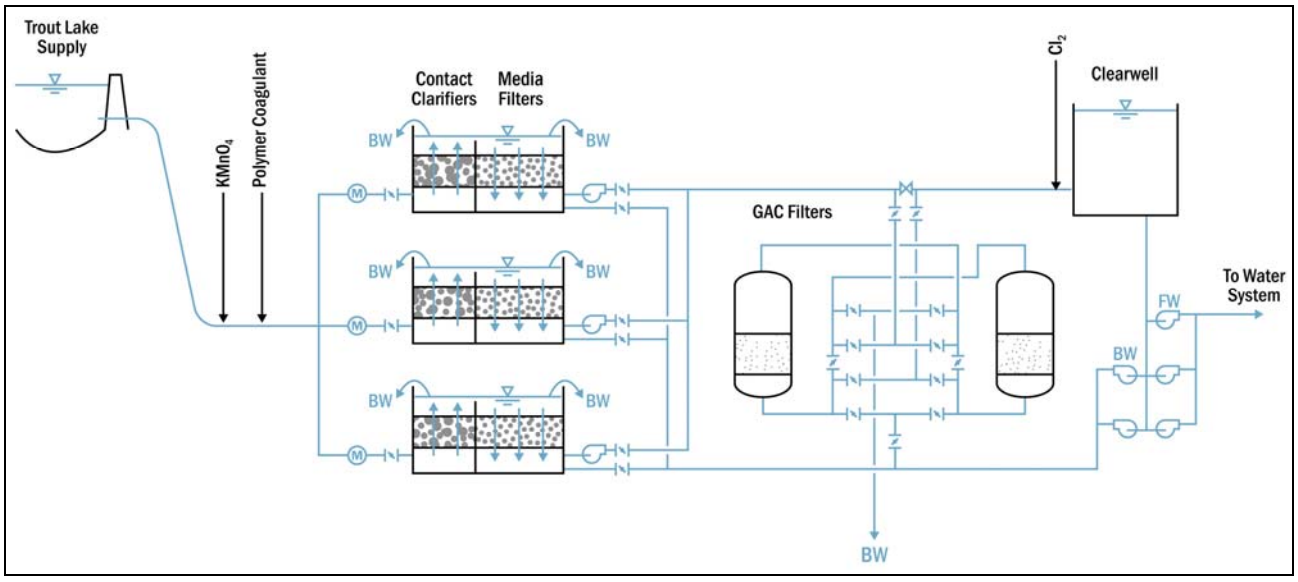

Figure 3-1. Schematic of treatment systems

The plant is configured with three parallel contact clarifier and gravity filter treatment trains. Two of these filter treatment trains can typically be operated simultaneously with a third reserved for backup. However, during periods of peak demand all three filter trains can be operated simultaneously. Each filter unit has a surface area of approximately 96 square feet (sf). Town operations staff report normal and peak filter loading rates of 2.9 gpm/sf and 3.6 gpm/sf, respectively. This peak loading rate is consistent with the manufacturer's recommendation of 350 gpm per unit. However, Town operators report that finished water quality is most easily maintained at optimal levels when flows are below 300 gpm per filter. The filters deliver flow to twin GAC contactor process units via three pumps. The maximum throughput capacity for the GAC system is approximately 700 to 750 gpm, depending on series/parallel GAC contactor operational configuration, and GAC media differential head losses.

The GAC process is followed by a chlorine contact clearwell, with a summertime/warm weather peak capacity of approximately 700 gpm. Chlorine disinfection effectiveness is predicated on hydraulic contact time, water temperature, pH, and chlorine application dosage, demand, and residuals. Disinfection effectiveness is reduced with decreasing temperature and chlorine dosage, decreasing hydraulic contact time and increasing process flows, and increasing water pH. Given this, more so than with other treatment processes, WTP chlorine contact disinfection capacity varies seasonally and with supply water conditions. During cold weather periods, chlorine contact disinfection capacity at the water treatment plant may decline below 700 gpm. Fortunately system water demands and WTP water supply rates are also typically reduced during cold weather periods. WTP operations staff actively track disinfection performance to ensure that adequate treatment is provided year round under all operating conditions.

Approximate MDD unit process treatment capacities for the water treatment plant are summarized in Table 3-4 in terms of gpm and mgd. As shown in the table, the GAC filtration and chorine contact clearwell capacities could limit the overall WTP supply to approximately 1.01 mgd, relative to a 1.11 mgd projected MDD for 2032. Thus, water demand growth within the 20-year planning horizon could push the water system beyond its existing WTP MDD supply capacity. In order to increase WTP MDD supply capacity beyond current limits, GAC system and chlorine contact clearwell throughput capacity would need to be increased. GAC system capacity is hydraulically limited by the capacity of the three pumps that deliver water from the conventional filtration processes, through the GAC contactors, and on to the

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clearwell. GAC system capacity can thus be incrementally increased by upsizing each of the three feed pumps. Clearwell capacity would be most effectively increased through construction of additional clearwell contact volume.

Finished water pumping at the water treatment plant supplies water to the Town's existing 207-foot zone via four pumps. The capacity of those pumps (with the largest pump out of service) is 1.30 mgd. Pumping capacity at the water treatment plant is therefore not considered the limiting factor for treatment capacity. Subsequent sections include detailed evaluations of pumping capacity throughout the Town water system.

Projected water treatment capacity deficiencies are summarized in Table 3-5.

Table 3-4. Peak Water Treatment Plant Supply Capacity/Requirements

Capacity/projection	Three filters at normal loading rate of 2.9 gpm/sf	Three filters at preferred peak of 3.1 gpm/sf	Two filters at nominal filter peak of 350 gpm (3.6 gpm/sf)	GAC hydraulic loading at 700 gpm	Chlorine contact clearwell
MDD capacity (mgd)	1.20	1.29	1.01	1.01	1.01
2011 baseline projection MDD (mgd)	0.78				
2018 projected MDD (mgd)	0.88				
2032 projected MDD (mgd)	1.11				

Table 3-5. Peak Water Treatment Plant Supply Deficiencies

Capacity/projection	Three filters at normal loading rate of 2.9 gpm/sf	Three filters at preferred peak of 3.1 gpm/sf	Two filters at nominal filter peak of 3.6 gpm/sf	GAC hydraulic loading at 700 gpm	Chlorine contact clearwell
MDD capacity (mgd)	1.20	1.29	1.01	1.01	1.01
2011 baseline projection deficiency (mgd)	None	None	None	None	None
2018 projected deficiency (mgd)	None	None	None	None	None
2032 projected deficiency (mgd)	None	None	0.10	0.10	0.10

Beyond capacity issues, other important considerations at the WTP include process equipment age and condition and water treatment chemical supply for chlorine disinfection systems. Both of these issues will likely require some attention in coming years. With the exception of the recently installed GAC treatment system processes, much of the core WTP process equipment is now approximately 20 years old, and some major components could be in need of significant maintenance/renewal or replacement in coming years. The WTP currently uses a chlorine gas based disinfection system, and requirements for secure transportation of chlorine gas cylinders to the island are growing increasingly complex and challenging.

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Water Treatment ERU Capacity

Because the WTP filters, GAC contactors, and intervening feed pumps have a number of potentially viable operating regimes, the chlorine contact clearwell is considered the limiting factor for treatment capacity:

- ADD basis: ADD is not considered the limiting factor for treatment capacity.
- MDD basis: Full capacity MDD 1.01 mgd / 278 gpd/ERU = 3,633 ERUs

3.3.3 Water Storage

The Friday Harbor water system maintains direct gravity storage facilities for each of its existing pressure zones, with the exception of the 327-foot zone. Pressure zone descriptions, tank capacities, and tank physical characteristics are summarized in Section 1.

Due to the water system configuration, two different analyses are useful for assessing system storage: an overall system analysis, and a 460-foot zone analysis.

An overall system analysis is appropriate due to the relationships between the various pressure zones. The 207-, 232-, and 327-foot pressure zones are strongly interrelated through dedicated pump stations equipped with backup power generation. The existing 207-foot zone has only a limited number of connections, such that the 207-foot tank currently serves primarily as storage for finished water prior to pumping into the 232- and 327-foot zones. The 232-foot zone storage provides water to users in the 232-foot zone, and serves as a source for pumping into the 460-foot pressure zone. Storage for the 327-foot zone, which has no tank, is provided in the 207- and 232-foot zones, and is available via pumping (including a pump capable of providing fire flow) with installed backup power. Because of these operational relationships, and redundancy provided by backup power installations, these zones are most usefully evaluated together relative to total storage requirements.

The 460-foot zone does, however, operate more independently and on a less interrelated basis than the other pressure zones, and maintains its own dedicated storage volumes. Therefore, the 460-foot zone is also evaluated for storage capacity separately from the rest of the system.

As detailed in Table 3-1, the various components of system water storage are as follows:

- Operational storage (OS): The volume contained between pump on and pump off levels.
- Equalizing storage (ES): The volume necessary to supply diurnal demands that exceed the overall daily average demand as available from sources of supply.
- Standby storage (SB): The volume reserved for emergency storage.
- Fire suppression storage (FSS): The volume reserved for supplying fire flows.
- Dead storage (DS): The volume necessary to maintain 20-pound-per-square-inch (psi) minimum system service pressures.

Required storage components are calculated according to demand projections as summarized in Section 2, and the level-of-service criteria described in Table 3-1. Total storage requirements are calculated as the sum of component volumes. Based on pumping and water service elevation configurations in the water system, there is no DS associated with the various tanks. Estimated water storage volume requirements for the overall system are summarized in Table 3-6.

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Table 3-6. Entire Water System Storage Requirements					
Capacity projection	Operating storage (MG)[a]	Equalizing storage (MG)[b]	Fire suppression storage (MG)[c]	Standby storage (MG)[d]	Total storage required (MG)[e]
2011 baseline projection	0.34	0.06	0.135	0.67	1.20
2018 projected system	0.34	0.07	0.165	0.75	1.32
2032 projected system	0.34	0.08	0.165	0.95	1.54

a. *Operating storage is quantified as the volume of water depleted before pumps are called to refill the tank. OS for the 207 ft tank is 0.125 MG, for the 232 ft tank is 0.2 MG, and for the 460 ft tank is 0.015 MG, for a total of 0.34 MG.*

b. *Equalizing storage is calculated as (PHD – MDD)(150 min).*

c. *Fire suppression storage is based on fire flow requirements documented in Table 3-1. Current FSS is 1,000 gpm x 60 min for each of the 232 and 327 zones, and 500 gpm x 30 min for the 460 zone. Future projections assume multifamily developments served by the 460 zone, and a resulting FSS escalation to 750 gpm x 60 min.*

d. *Standby storage is calculated as ADD x 2 days.*

e. *The total storage requirement assumes no nesting of fire suppression and standby storage components.*

The water system currently includes approximately 1.55 MG of water storage capacity, which exceeds the storage requirements for the existing system and future projections, as presented in Table 3-7.

Table 3-7. Entire Water System Storage Deficiencies			
Capacity projection	Current volume (MG)	System requirement (MG)	Projected deficiency (MG)
2011 baseline projection	1.55	1.20	None
2018 projected system	1.55	1.32	None
2032 projected system	1.55	1.54	None

Because the 460-foot zone is the most hydraulically remote zone in the water system and is supplied by a pump station without backup power generation, the zone is assessed for storage requirements separately, as presented in Table 3-8.

Table 3-8. 460 Zone Storage Requirements					
Capacity projection	Operating storage (MG)	Equalizing storage (MG)	Fire suppression storage (MG)[a]	Standby storage (MG)	Total storage required (MG)[b]
2011 baseline projection	0.015	0.008	0.015	0.030	0.068
2018 projected 460 zone	0.015	0.009	0.045	0.033	0.102
2032 projected 460 zone	0.015	0.010	0.045	0.042	0.112

a. *Fire suppression storage is projected to increase based on multifamily construction in the proposed Friday Cove and Finnegan Ridge developments, increasing fire flow requirements from single family to multifamily.*

b. *Total storage requirement assumes no nesting of fire suppression and standby storage components.*

The 460-foot tank has a theoretical capacity based on tank dimensions of approximately 0.057 MG. Current level settings result in an operational capacity of 0.049 MG, which is less than the current and projected storage requirements, as presented in Table 3-9 (assuming no nesting of fire suppression and standby storage components).

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Table 3-9. 460 Zone Storage Deficiencies			
Capacity projection	Current volume (MG)	System requirement (MG)	Projected deficiency (MG)
2011 baseline projection	0.049	0.068	0.019
2018 projected 460 zone	0.049	0.102	0.053
2032 projected 460 zone	0.049	0.112	0.063

A recent study completed by the Town for possible expansion of areas served by the 460-foot tank noted the need for additional storage capacity to accommodate current needs and future growth. An additional storage tank similar in size or larger than the existing 460-foot tank is recommended for construction adjacent to the existing tank. To meet future demands through the planning period, construction of a 70,000-gallon tank is documented in the improvement program.

Storage ERU Capacity

The operating storage component is essentially fixed relative to growth, being based on tank operating regimes. ES and SB, however, are projected to increase with demand growth and with the introduction of new building types with elevated fire flow requirements in the 460-foot zone.

System storage capacity in terms of ERUs was determined by comparing projected requirements to available capacity. Projected water demands for 2032 (3,986 ERUs) result in storage requirements slightly below existing storage capacity. ERUs and associated storage requirements would be projected to exceed available storage capacity slightly above 3,986 ERUs and shortly after 2032.

3.3.4 Water Transmission

The Friday Harbor water system relies on gravity flow through raw water mains to deliver water from Trout Lake to the water treatment plant. The estimated current capacity of the raw water transmission main from Trout Lake exceeds 1.2 mgd. Water system improvements currently under consideration include replacement of this raw water main. Under current replacement scenarios the estimated capacity would be increased to upwards of 2.2 mgd. The capacity of this raw water main is not considered to be a limiting factor for water supply in either the current or future improvement scenario, relative to source of supply and water treatment capacity limitations.

The water system also relies on pumping to deliver water from the water treatment plant to the 207-foot pressure zone, and to lift water from the 207-foot tank into the 232- and 327-foot pressure zones. The 232-foot pressure zone also supplies the 460-foot pressure zone via a pump station.

Water transmission capacity is evaluated relative to the ability of each pump station to support the projected peak water demands of downstream pressure zones. Based on this approach, the WTP to 207-foot pressure zone pumps need to have sufficient capacity to support the projected MDDs of the entire system. Similarly, the 207- to 232-foot pressure zone pumps would need to have sufficient capacity to support the projected MDDs of the 232- and 460-foot pressure zones. Given the lack of direct gravity storage in the 327-foot pressure zone, the 207- to 327-foot pressure zone pumps need to have sufficient capacity to support the projected peak hour water demands and fire flow requirements of the 327-foot pressure zone.

A comparison between estimated pumping demands and existing pump station capacities is presented in Table 3-10. Corresponding pump station deficiencies are also indicated. As noted in Table 3-1, the Town's level-of-service criteria require that pump station capacities be calculated assuming that the

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largest pump is out of service for MDD scenarios, and for PHD and fire flow scenarios if no gravity storage is provided in a given zone.

Table 3-10. Pump Station Supply Capacity and Projected Deficiencies

Category	Demand type	Pumping capacity (mgd)[a]	Pumping demands (mgd)	Projected deficiency (mgd)
2011 demands				
WTP to 207 ft pressure zone	System MDD	1.30	0.78	None
207 to 232 ft pressure zone	232/460 MDD	1.01	0.71	None
207 to 327 ft pressure zone	327 PHD + FF[b]	0.22	0.16	None
232 to 460 ft pressure zone	460 MDD	0.17	0.03	None
2018 demands				
WTP to 207 ft pressure zone	System MDD	1.30	0.88	None
207 to 232 ft pressure zone	232/460 MDD	1.01	0.79	None
207 to 327 ft pressure zone	327 PHD + FF[b]	0.22	0.18	None
232 to 460 ft pressure zone	460 MDD	0.17	0.04	None
2032 demands				
WTP to 207 ft pressure zone	System MDD	1.30	1.11	None
207 to 232 ft pressure zone	232/460 MDD	1.01	1.01	At capacity
207 to 327 ft pressure zone	327 PHD + FF[b]	0.22	0.21	None
232 to 460 ft pressure zone	460 MDD	0.17	0.05	None

a. *Pumping capacity shown assumes the largest pump out of service.*

b. *A 1,000 gpm pump serves the 327 ft zone. This pump is assumed to provide fire flow, and is sufficient for that purpose. PHD can be provided exclusive of this pump by either of the two smaller 150 gpm pumps operating individually.*

Pumping demands for each pressure zone were developed based on number of connections in each zone, from which current and future ERU and demand distributions between pressure zones were estimated. Most pump stations have capacity in excess of projected demands for 2032 when operating with the largest pump out of service. The 207- to 232-foot pump station is projected to reach its capacity in 2032. However, this capacity limit is based on projected demands that exceed current treatment capacity. Future changes to the water system configuration, including potential future source and treatment alternatives (i.e., alternate future sources of water supply), may mitigate this projected deficit. Planned water supply pipeline improvements as described in subsequent sections would also mitigate this deficiency by altering the nature of connections between tanks and pressure zones in the vicinity of the 207-foot tank, such that the 232-foot pressure zone would receive direct hydraulic supply and would no longer depend on the 207- to 232-foot pump station for supply.

Water Transmission ERU Capacity

Water system transmission capacity is currently limited by the two largest and most critical pump stations: the WTP to 207-foot pump station and the 207- to 232-foot pump station. The ERU capacity for the system based on the capacity of each pump station is presented below. The 207- to 232-foot pump station currently serves approximately 91 percent of the water system ERUs, and is evaluated relative to that metric (i.e., the ERUs listed are the total water system ERUs that can be served if the 207- to 232-

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foot pump station continues to serve 91 percent of water demands). Firm capacity refers to the largest pump out of service.

- WTP to 207-foot pump station: Firm capacity MDD 1.3 mgd / 278 gpd/ERU = 4,676 ERUs
- 207- to 232-foot pump station: Firm capacity MDD 1.01 mgd / 278 gpd/ERU / 0.91 = 3,992 ERUs

3.3.5 Water Supply Pipelines

An existing 5-mile pipeline system conveys water to the Town water system from its existing water supply sources at Trout Lake. The first section of pipeline conveys raw water from Trout Lake to the water treatment plant, while the second section conveys finished water from the water treatment plant to the 270-foot tank, which in turn supplies the 232- and 327-foot zones and the rest of the system via associated pump stations.

The Town has identified risks associated with the existing pipeline. A substantial portion of the pipeline is AC main that is nearing the end of its useful service life expectancy. Sections of the pipeline are supported above ground crossing steep and forested terrain and could be subject to catastrophic tree fall damage. In addition, much of the pipeline is difficult to access for operations and maintenance (O&M) or repair.

Level-of-service considerations also exist. Finished water flow is delivered to 23 existing customer connections from the finished water pipeline along San Juan Valley Road. At the time the Town agreed to supply water to such customers, it made no commitment to deliver water at any minimum service pressure. Some customers have consequently installed their own booster pumps to improve their water service pressures.

WSDOH regulations, however, require that customers be provided water at a minimum of 30 psi at the connection to the public water supply distribution pipeline under all normal operating conditions. Hydraulic analysis of the finished water pipeline suggests that 30 psi minimum pressure may not be maintained under some normal service conditions.

Additionally, given the limitations of the WTP chlorine contact clearwell, maintaining adequate disinfection levels for some customers served from the finished water pipeline could be challenging under certain operating conditions.

To reduce the risks of failure and to address level-of-service considerations for customers with connections to the water supply pipeline, the Town has assessed alternatives for pipeline replacement, selected preferred alternatives, and developed a preliminary design for the pipeline improvements. Specific improvements are described in subsequent sections.

3.3.6 Water Distribution

The Friday Harbor water distribution system consists of a collection of water mains that are designed to convey both domestic water demands and fire flows. Distribution system capacity is typically evaluated with the aid of computer hydraulic models. A preexisting EPANET hydraulic model of the Town water system was imported into the hydraulic modeling program WaterGEMS version 8i, then updated, enhanced, and translated from a skeletonized representation of the water system to a more detailed representation using available Town system mapping.

The WaterGEMS program calculates service pressures and water flows in pipes throughout the system subject to system input data including expected water demands and operational constraints. Input data include pipe lengths, sizes, roughness coefficients, ground elevations, tank information, pump information, PRV parameters, and system demand values.

The Town water system was modeled using a steady-state analysis, which examines a snapshot of the system at a moment in time (e.g., during PHD or under MDD at the end of a fire event) to evaluate water

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system performance against desired levels of service. The levels of service adopted by the Town are based on regulatory standards for minimum system service pressures: 30 psi minimum pressure under PHD conditions, and 20 psi minimum pressure under MDD conditions plus a fire flow event.

The model is used to evaluate the water system under the scenarios described to ensure appropriately sized water mains and adequate system pressures. Low system pressures can result from undersized water mains, which can limit the ability of the water system to meet pressure levels of service under projected system water demands. Other factors, including pressure zone boundaries, dead-end mains, pump and tank locations and performance, transient/surge conditions, and water system demands, can also affect system operating pressures.

3.3.7 Water Distribution System Hydraulic Model

The following sections describe activities associated with water system hydraulic model calibration and analysis.

Hydraulic Model Calibration

Once the original Town EPANET distribution system model data were transferred to the WaterGEMS modeling platform and updated to more accurately reflect the existing physical piping network and utility infrastructure, the hydraulic model results were compared to actual system field tests as recorded over time with system field testing that has been performed by Town water utility staff. A series of model calibration iterations, including trial runs, adjustments, and corrections, were completed until model output simulated actual system performance to a reasonable degree. Verifications and adjustments included pump curves and status, tank levels, pipe roughness coefficients, PRV settings, and service elevations. Adjustments were made until a satisfactory model fit was achieved. Results of the model calibration effort comparing model output to actual field water system performance are presented in Table 3-11.

Table 3-11. Hydraulic Model Calibration

Test	Test location	207 to 232 pump status	Model node	Field static pressure (psi)	Model static pressure (psi)	Model results variance	Field residual pressure (psi)	Model residual pressure (psi)	Model results variance
1	Grover Street	Off	83	41	45	+10%	35	33	-6%
2	Linder Street	Off	J-218	55	48	-13%	33	36	+9%
3	Argyle/Mullis	Active	J-173	80	73	-9%	48	49	+2%
4	Rose Lane	Off	87	60	58	-3%	45	42	-7%
5	Mullis Street	Active	J-45	55	57	+4%	40	44	+10%
6	University Road	Active	J-221	48	43	-10%	25	25	0%
7	Front Street	Active	13	87	85	-2%	78	73	-6%
8	West Street	Off	104	69	66	-4%	40	42	+5%
9	Spring Street	Off	J-226	68	65	-4%	55	52	-5%
10	Market Street	Active	J-50	57	56	-2%	55	50	-9%
11	East of Marguerite on Spring	Off	J-224	36	32	-11%	26	25	-4%
12	Grover/Hunt Street	Active	72	50	45	-10%	44	37	-16%

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The model calibration nodes and locations are presented in Figure 3-2 (in red).

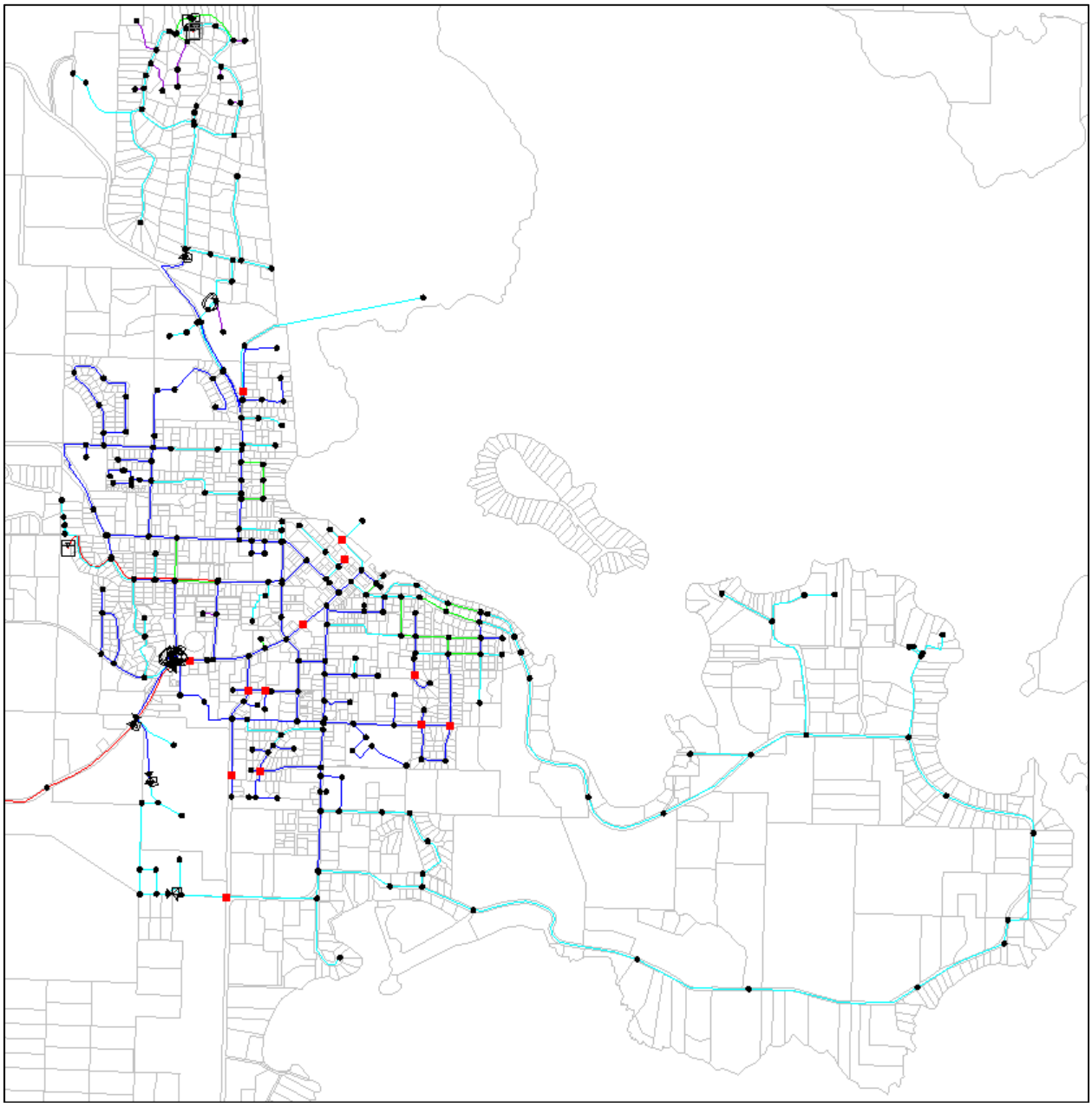

Figure 3-2. Calibration test locations

As summarized in Table 3-11, the model calibration results demonstrate reasonable agreement overall with field test results. Where results differ, the model generally suggests more conservative results and system performance (i.e., lower pressures) than were observed in the field. Differences between modeled and field test results may result from remaining inaccuracies in the model or unknown/different field conditions as compared to modeled system operations. As the Town hydraulic

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model continues to develop through future use and analyses, additional calibration efforts are recommended to further improve model accuracy.

Hydraulic Model Analysis

Hydraulic model system analyses were conducted for six scenarios, as documented in Table 3-12, to assess normal and potential water system operations exclusive of potential momentary transient/surge conditions. Modeling analyses were conducted using an earlier set of projected water demands for 2010, 2016, and 2030, using recent water demands through 2009 as a projection baseline. Lower water system demands in 2010 and 2011 have reduced projected water demands. The water demand projections used for modeling scenarios for 2010, 2016, and 2030 were each about 8 percent higher than current demand projection for 2012, 2018, and 2032 respectively and are thus slightly conservative relative to current demand levels, and projected demands for the 6- and 20-year planning horizons through 2018 and 2032.

Table 3-12. Hydraulic Model Scenarios

Scenario	System improvements	System demands[a]	System settings	Fire flow analysis
2010 PHD	Existing system	Projected 2010 PHD	Tank level draw downs based on storage calculations specific to year and demand alternative. WTP pumps and distribution system pumps active for all scenarios.	Fire flow availability assessed at all model nodes individually in addition to MDD system demands. Fire flow of 500 gpm residential, 750 gpm for nodes identified as serving commercial and multifamily zoned areas, and 1,000 gpm for nodes identified as serving industrial, manufacturing, or utility zoned areas.
2010 MDD-FF		Projected 2010 MDD		
2016 PHD	Proposed CIP improvements: • Transmission main upgrades from WTP to Town, including modifications to control valves prior to the 207 ft tank • PRV and pipeline to serve new 327 ft zone around proposed Friday Cove and Finnegan Ridge developments • New piping and revised zone boundaries to serve "Southern Cross" area from the existing 327 ft zone	Projected 2016 PHD		
2016 MDD-FF		Projected 2016 MDD		
2030 PHD		Projected 2030 PHD		
2030 MDD-FF		Projected 2030 MDD		

a. *Demand alternatives were applied to the model in the following way: a base distribution based on recent annual water use for each parcel was developed, with parcel demands applied to the nearest model node. Future projected demands were then applied consistent with that base distribution.*

Demands were distributed according to historical water use billing data from a recent typical water use year. Total water use associated with each parcel was applied to the nearest hydraulic model node. Demands were scaled for future projections consistent with the historical demand distribution. Demand distributions are documented in Figure 3-3. A limited number of nodes were added for system improvements after demands were distributed in the model. Those nodes are excluded from the demand distribution.

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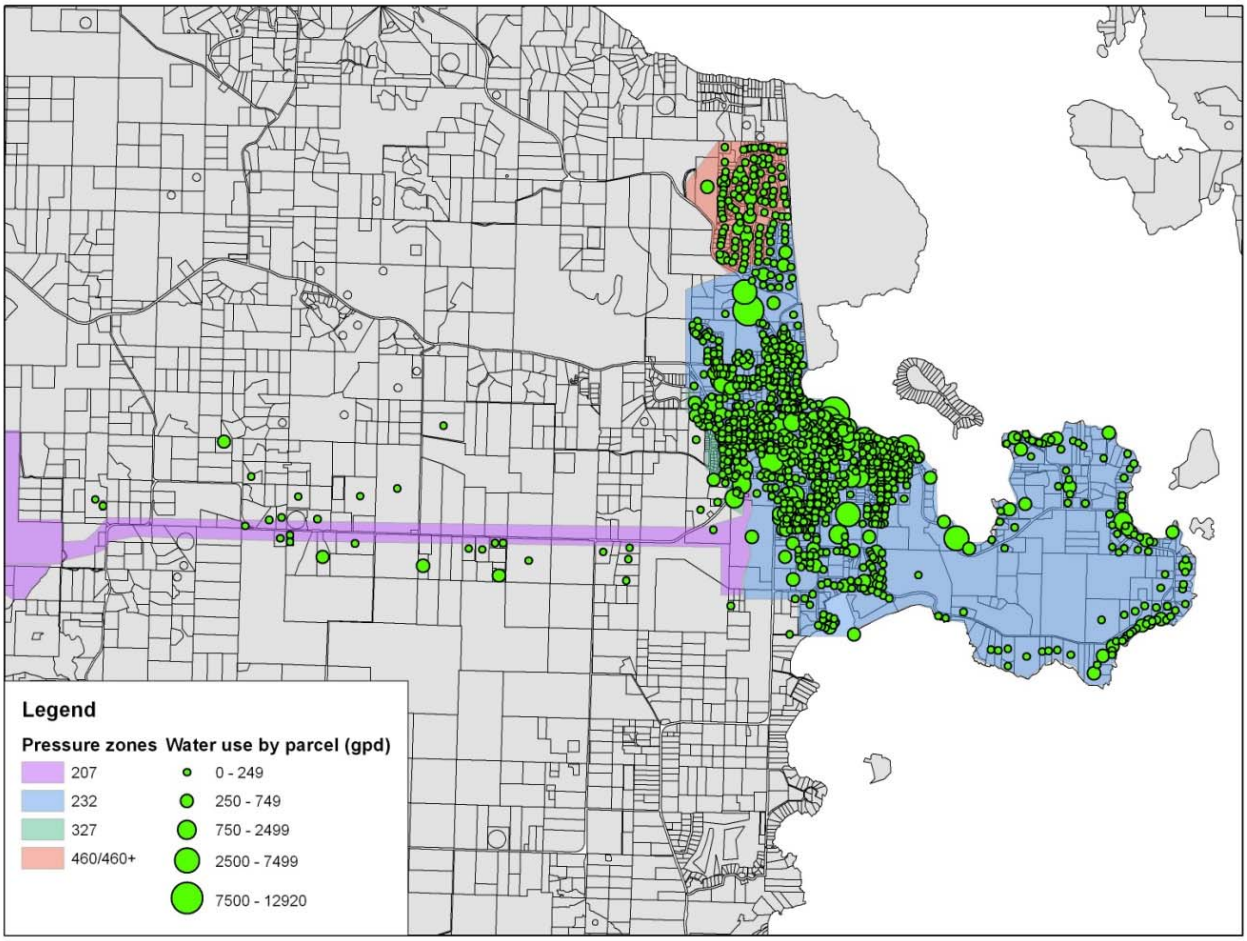

Figure 3-3. Water system demand allocations

Initial tank levels were determined for each scenario based on storage calculations and required storage depletion for MDD plus FF and PHD scenarios, respectively. Tank level settings are documented in Table 3-13.

Table 3-13. Hydraulic Model Tank Drawdown Levels

Tank	Total capacity (MG)[a]	2010[b]		2016[b]		2030[b]	
		PHD (MG)	MDD + FF (MG)	PHD (MG)	MDD + FF (MG)	PHD (MG)	MDD + FF (MG)
207 ft tank	0.5	0.060	0.030	0.070	0.035	0.090	0.045
232 ft tank	1.0	0.060	0.150	0.070	0.155	0.090	0.165
Existing 460 ft tank	0.057	0.015	0.015	0.015	0.023	0.015	0.023
Proposed 460 ft tank[c]	0.057			0.015	0.023	0.015	0.023

a. *The 460 ft tank has physical dimensions for a capacity of about 57,000 gallons; however, the tank is not currently typically operated to utilize that full capacity. The full capacity was used for this analysis.*

b. *For MDD plus FF scenarios, ES and FSS are assumed to be depleted. For PHD scenarios, ES and a portion of OS equal to ES (or at least 2 x ES total) are assumed to be depleted.*

c. *A second 460 ft tank matching or exceeding the capacity of the existing tank has been recommended by past studies, and is recommended in this WSP.*

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Fire flow requirements were identified for each model node according to available zoning maps, and corresponding fire flow needs. Fire flow requirements are identified in Figure 3-4. For some nodes with no service connections, or where no hydrant exists (such as off of 2-inch spur mains), no fire flow was modeled. These nodes are orange in the figure. Single-family areas (500 gpm fire flow requirement) are indicated by yellow nodes. Multifamily or commercial areas (750 gpm fire flow requirement) are indicated by green nodes. Industrial, manufacturing, and utility areas (1,000 fire flow gpm requirement) are indicated by magenta nodes.

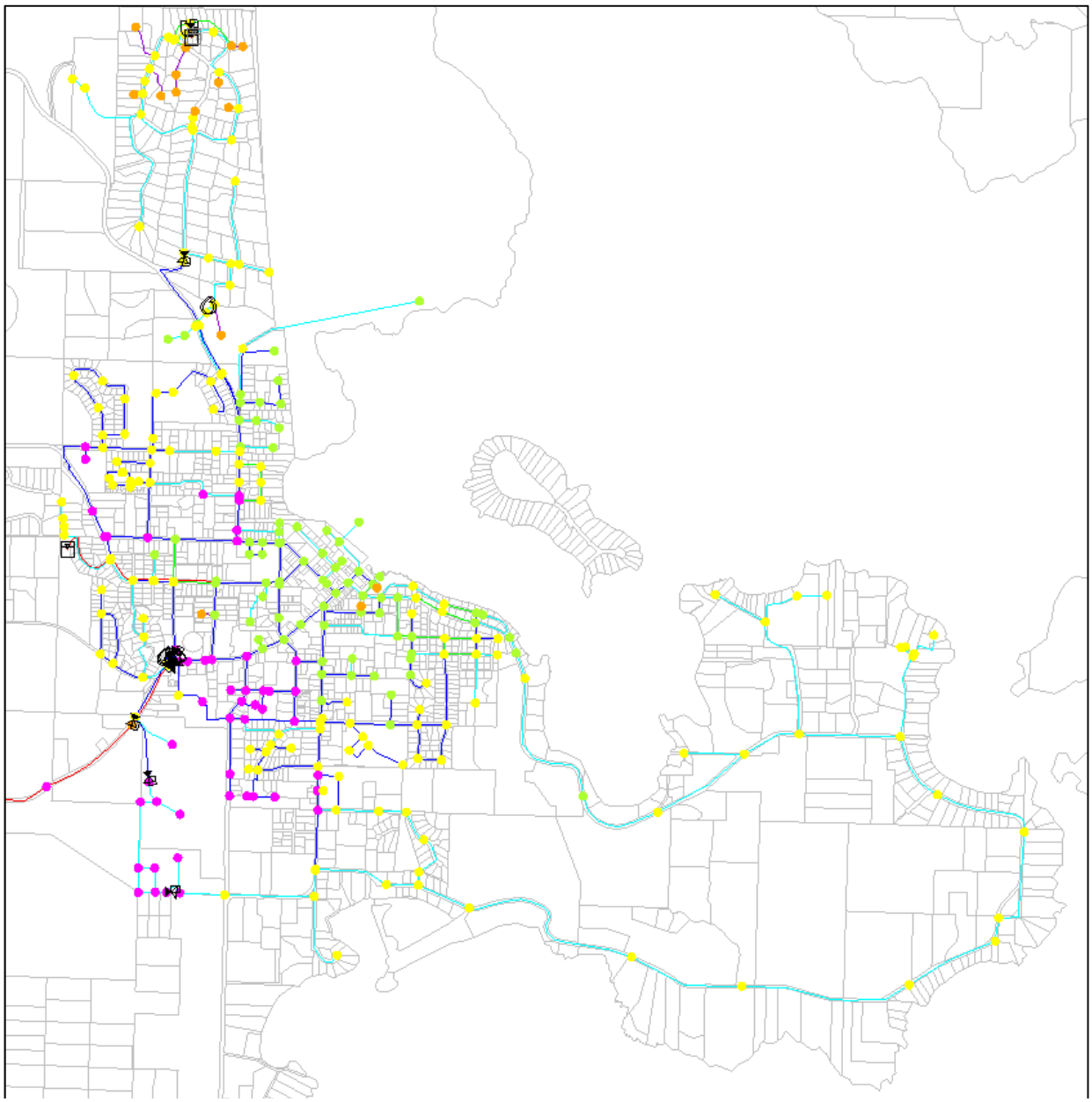

Figure 3-4. Fire flow nodes

Orange = 0 gpm "no fire flow service"; yellow = 500 gpm "single family"; green = 750 gpm "multifamily or commercial"; magenta = 1,000 gpm "industrial, manufacturing, or utility".

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Water distribution system pipe diameters are shown in Figure 3-5. Pipes associated with proposed future improvements in the northern portion of the 232-foot zone are shown in gray. The proposed 460-foot tank is also shown in gray. Design of water supply pipeline improvements between the water treatment plant and the Town includes revisions to pressure zone boundaries and water supply routing in the vicinity of the 207-foot tank. Rather than routing all water supply flow to the Town through the 207-foot tank, planned system updates will establish a direct hydraulic supply connection from the water supply pipeline to the 232-foot zone, allowing the existing 207- to 232-foot pump station to be bypassed. New PRV, pressure-sustaining valve, and altitude valve installations are also planned to maintain minimum pressures and supply for customers along the water supply pipeline, and in areas to the east of the airport. The upgraded water supply pipeline will be connected to supply the existing 232-foot pressure zone piping via a pressure-sustaining valve that will function to maintain a nominal HGL of 240 feet or above in the water supply pipeline. Water supply to the 207-foot tank will be provided via an altitude valve connection to the upgraded water supply pipeline. To maintain water supply pipeline pressures during periods when the WTP pumps may not be operating, a secondary PRV connection is planned that will allow the pipeline to be supplied from the existing 327-foot zone. Each of these improvements is included in the model for assessment of 2016 and 2030 system performance.

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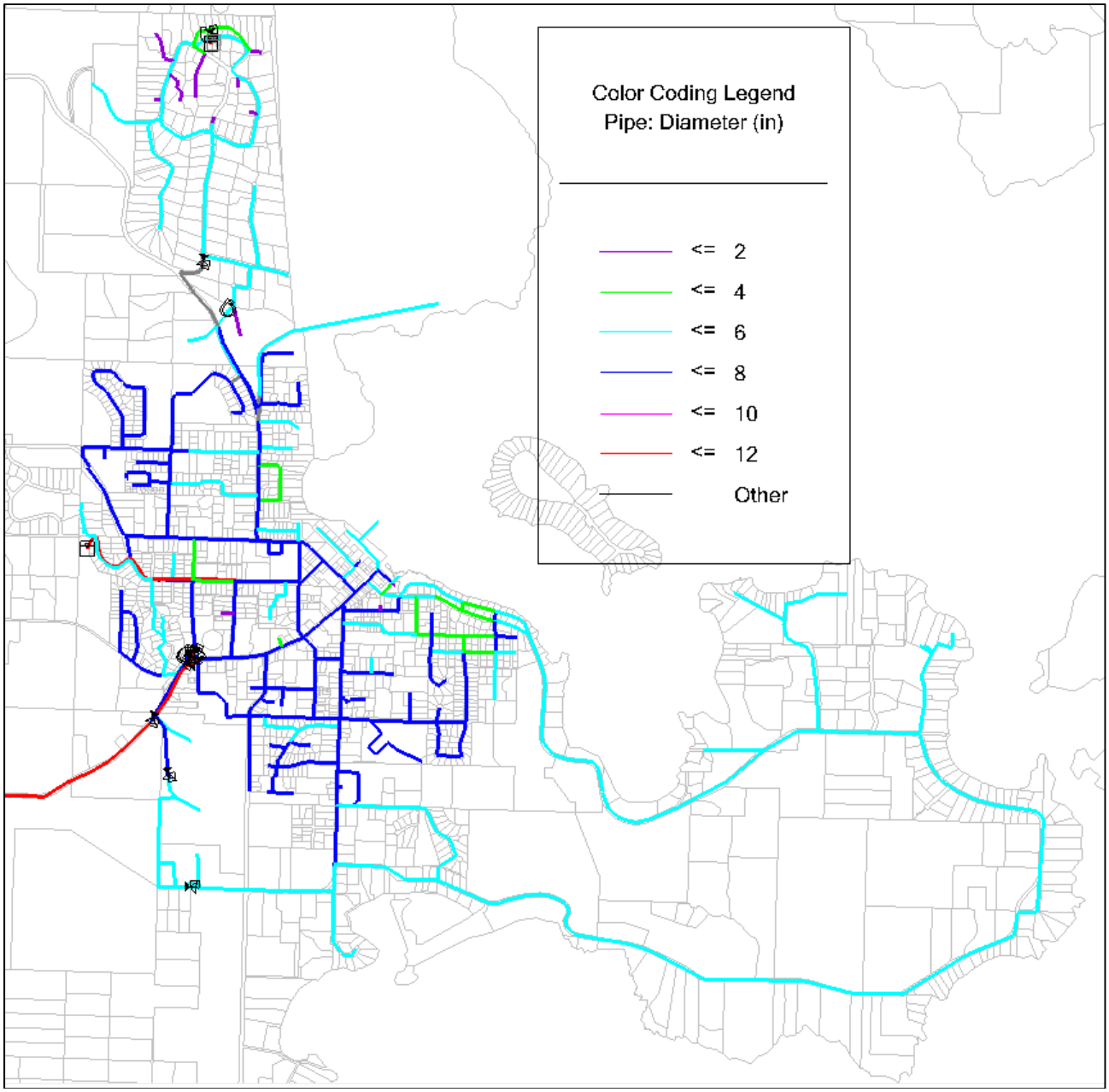

Figure 3-5. Model pipe diameters

Modeling results for PHD and MDD plus fire flow simulations are summarized in Table 3-14.

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Table 3-14. Summary of Hydraulic Modeling Results

Scenario	Deficiencies	Comments
2010 PHD	Two borderline deficient (≤ 30 psi) nodes under 2016 and 2030 PHD	• Service pressures range from 26 psi at high point of 327 ft zone to 159 psi at lowest point in 460 ft zone. High service pressures above 80 psi are present in certain lower-elevation areas of the 232- and 460-foot zones. • 327 ft zone: Jennifer Place north of Charles Place experiences 26 psi under 2030 PHD. • 232 ft zone: Intersection of Nelson Street and Maple Street experiences 30 psi under 2030 PHD. • Maximum flow velocity is 4.6 fps.
2016 PHD		
2030 PHD		
2010 MDD-FF	Nine areas have challenges meeting required fire flow under 2016 and 2030 MDD + FF	Areas of deficient fire flow include: • Trailer park area off of Roche Harbor Road. Due to small-diameter mains and high elevations. (380–435 gpm available, 750 gpm required) • UW Friday Harbor Laboratories. Due to small-diameter mains and dead-end water main length. (504 gpm available, 750 gpm required) • Dead-end main off Salmonberry Road, north of the 232 ft tank. Due to small-diameter dead-end main. (482 gpm available, 500 gpm required) • Jennifer Place north of Charles Place in 327 ft zone. Due to high elevation. (458 gpm available, 500 gpm required) • Vicinity of Skagit Valley College, east of airport. Due to small-diameter mains. (720–740 gpm available, 1,000 gpm required) • Vicinity of Warbass Way and Harrison Street meeting Turn Point Road. Due to small-diameter mains and multifamily fire flow requirements. (727–743 gpm, 750 gpm required) • Vicinity of marina and shipyard on Turn Point Road. Due to small-diameter mains and commercial fire flow requirements. (700 gpm available, 750 gpm required) • Carter Beach Road off of Turn Point Road. Due to small-diameter mains and dead-end water main length. (470–480 gpm available, 500 gpm required) • Vicinity of proposed Finnegan Ridge and Friday Cove developments. Due to high elevation. (560–608 gpm available for existing connections, 750 gpm required)
2016 MDD-FF		
2030 MDD-FF		

Model runs for projected 2010, 2016, and 2030 PHD scenarios resulted in limited identified distribution system deficiencies. The color-coded pressure results of a model run using 2030 PHD demands and no new improvements are shown in Figure 3-6, and are representative of the three PHD scenarios. Pressures for service nodes (excluding those at tanks, wells, or other non-service locations) range from 26 to 159 psi in this scenario. Most nodes experience pressure in the ranges of 30 to 80 psi.

Orange nodes representing less than 20 psi in the northern part of the 460-foot zone have no service connections at those locations (area is served by the pumped 460-foot-plus zone). Yellow and magenta nodes represent pressures exceeding 80 and 100 psi respectively in lower-elevation areas of the 460-foot zone, and in areas of the 232-foot zone near sea level. These are the only areas of the water system to experience pressures exceeding 80 psi. Orange and light blue nodes in the proposed Finnegan Ridge development do not currently provide water service; new higher-pressure water service via PRV from the 460-foot zone has been identified as a provision for development to proceed in this area. Light blue nodes in the 232- and 327-foot zones are high-elevation areas, identified in Table 3-14.

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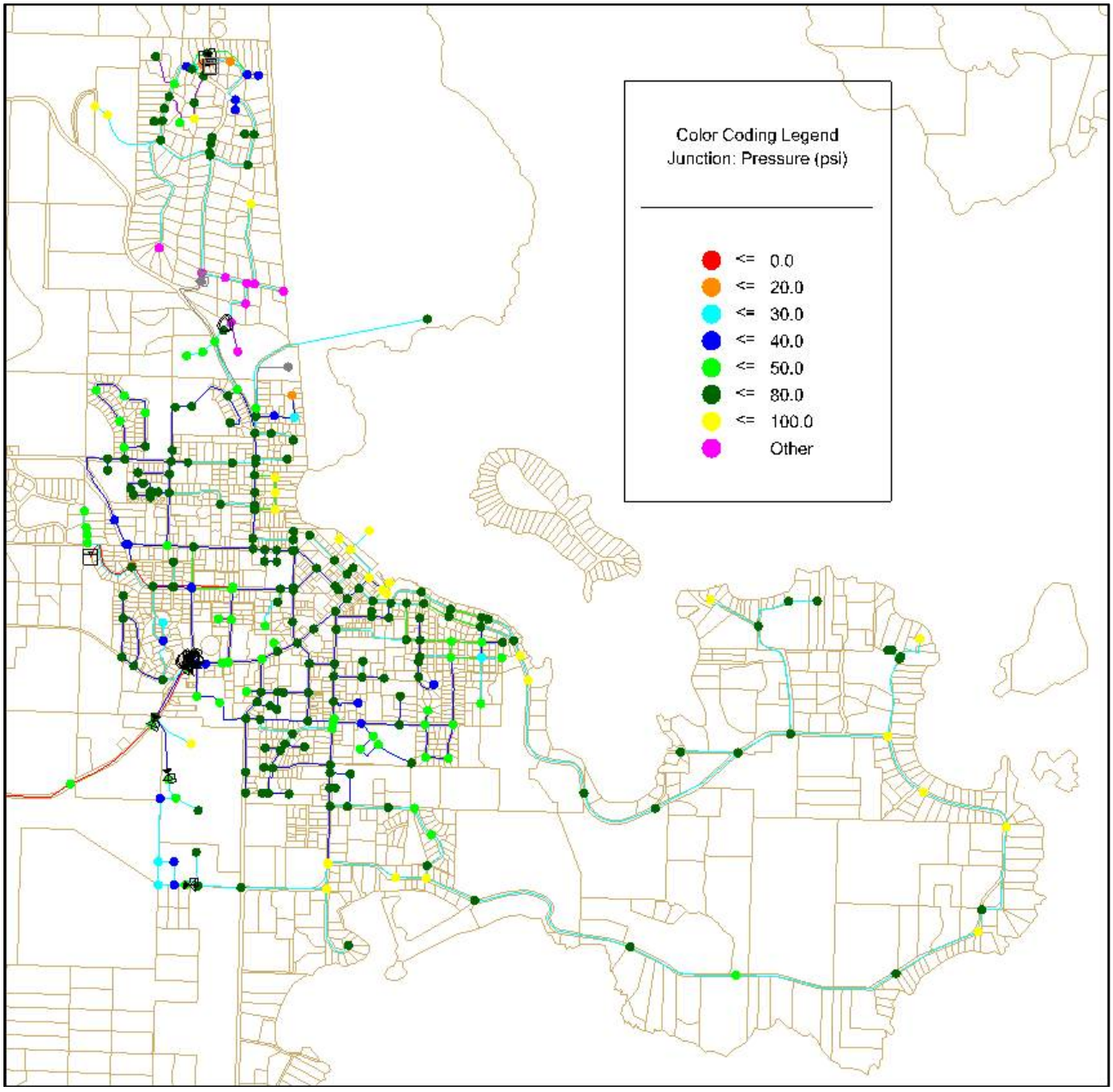

Figure 3-6. 2030 PHD scenario, with no improvements

Model runs for projected 2010, 2016, and 2030 MDD plus fire flow scenarios resulted in identified distribution system deficiencies in a number of areas across the water system. Deficiencies are summarized in Table 3-14. Fire flow deficiencies are generally consistent among the three scenarios, and are shown in Figure 3-7. Refer to the hydraulic model output tables in Appendix J for details of specific fire flow deficiencies.

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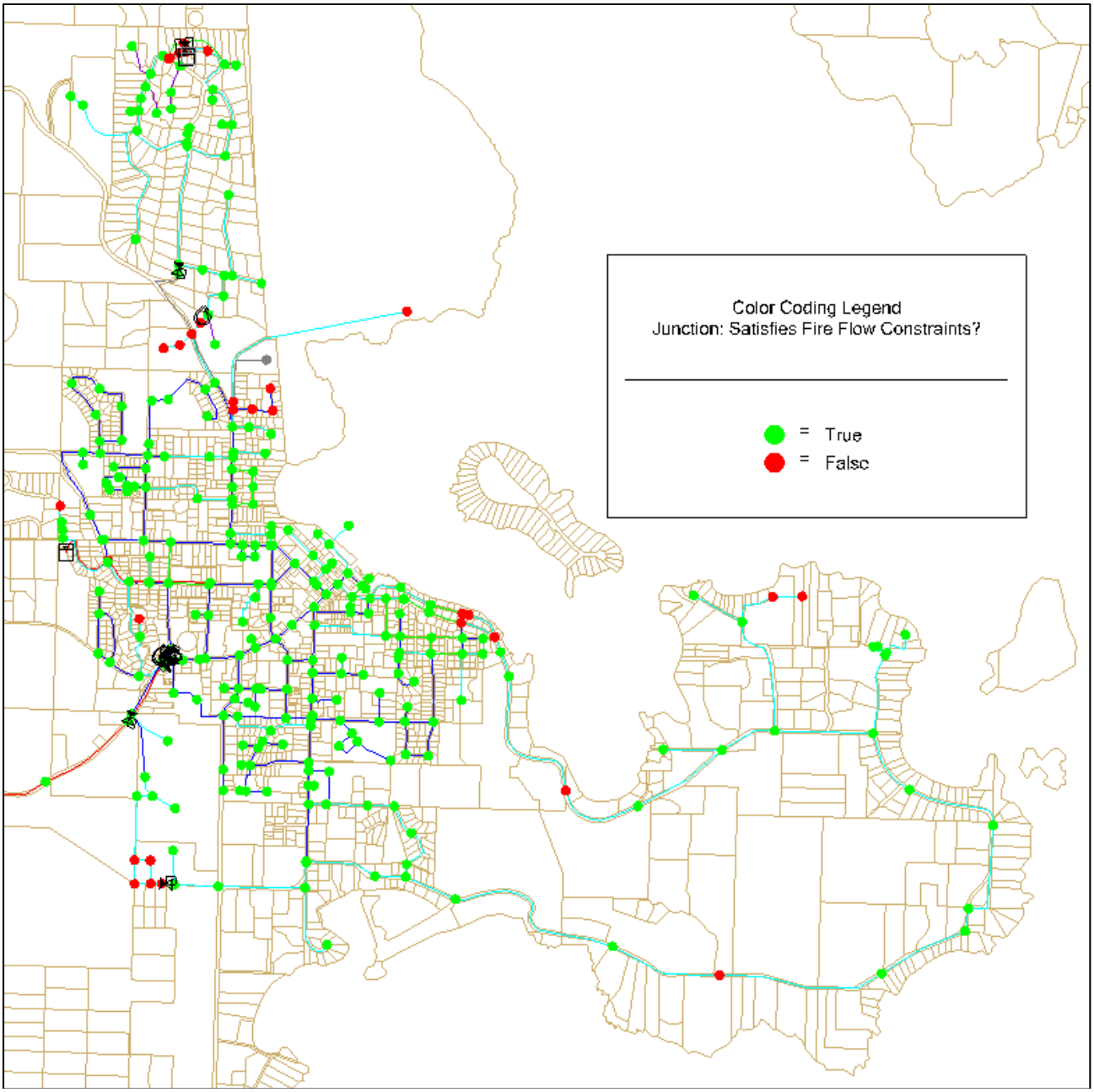

Figure 3-7. 2030 MDD + FF scenario, with no improvements

In addition to pressure- and flow-related fire flow deficiencies, several locations east of the airport would experience flow velocities higher than 10 feet per second (fps) to meet their required fire flows. Specific distribution system improvements to address deficiencies noted in this analysis are described in subsequent sections.

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3.3.8 Water System ERU Capacity

Table 3-15 summarizes system ERU capacities based on the calculations presented in preceding sections. Currently WTP capacity appears to be the limiting factor for overall water system capacity.

Table 3-15. Water System ERU Capacity

Existing system components	Basis	ERU capacity
Source	Sustainable yield ADD	3,866
Treatment	Chlorine contact well MDD	3,633
Storage	System storage capacity	3,986
Transmission[a]	207 to 232 ft pump station capacity	3,992
Distribution	n/a	No definable limit
Water system ERU capacity	Limited by WTP capacity	3,633

a. *Changes envisioned.*

3.4 System Improvement Needs

The following sections outline proposed source, water treatment, storage, and distribution system improvements. System improvement needs are identified for a 20-year projection period. The need for improvements beyond 2032 can be better assessed in the future.

3.4.1 Water Supply Sources

Current approved water supply sources have a sustainable annual yield that is adequate to supply projected ADD until 2029. If water system demand growth develops consistent with projections, the Town should begin to explore potential source-of-supply modifications at the Trout Lake reservoir or alternative water supply development no later than 2025. Options to expand the Town source of supply could include:

- Modifications to Trout Lake Dam to increase storage capacity and annual sustainable yield from the Trout Lake water supply. A 1994 KCM report indicated that a 7-foot increase in dam elevation was feasible.
- Development of alternative sources of water supply. Alternative sources could include new surface water or groundwater sources, which could require new water rights and/or source and treatment facilities, or seawater sources requiring advanced desalination treatment.

Time frame: Begin exploring by 2025, projected to reach capacity in 2029.

3.4.2 Water Treatment

The Town water treatment plant is projected to reach its rated capacity in 2027 and associated equipment and systems are aging. The limiting elements in terms of treatment system capacity are the chlorine contact clearwell and finished water pumping capacity. Beginning no later than 2023, the Town should explore modifications and upgrades to the water treatment plant to refresh/replace aging equipment as appropriate and expand capacity to meet future water demands. Alternatively, development of an alternative water supply as described above could avoid the need for WTP capacity upgrades.

The WTP currently uses a chlorine gas disinfection system. Requirements for secure transportation of chlorine gas cylinders to the island are growing increasingly complex and challenging, and the Town

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wishes to explore alternative chlorine disinfection approaches, as have been similarly implemented recently at the Town wastewater treatment facilities.

Proposed CIP activities include:

- Exploration of possible modifications to the existing Town water treatment plant to increase treatment capacity and replace aging process equipment as appropriate. Capacity-limiting processes include the chlorine contact clearwell and finished water pumping, although other processes could also be targeted for capacity enhancement as part of WTP upgrades.
- Exploration of alternative chlorine disinfection approaches for the WTP to replace the existing chlorine gas based disinfection system.

Time frame: Begin exploring WTP capacity and equipment renewal/replacement needs by 2023; the WTP is projected to reach capacity in 2027. Evaluate options to replace the chlorine gas disinfection system with an alternate chlorine disinfectant immediately.

3.4.3 Water Storage

Overall Town water storage capacity is generally sufficient to meet projected needs during the 20-year planning period. A zone-specific storage deficiency has been identified for the 460-foot zone. Consistent with the findings of previous studies, additional storage should be constructed in the 460-foot zone in the immediate future. Proposed storage improvements include:

- Construction of a new 460-foot zone storage tank adjacent to the existing tank with a 70,000-gallon recommended capacity. Alternatively, construct a new 125,000-gallon replacement tank.

Time frame: Begin predesign activities immediately; 460-foot zone storage capacity is already deficient.

3.4.4 Water Transmission

The Town water system has sufficient transmission and pumping capacity to meet projected water demands throughout the 20-year planning period. The 207- to 232-foot zone pump station is projected to reach capacity in 2032. Beginning in 2029, the Town may need to explore capacity upgrades to that pump station, noting that alternative approaches to solving projected water source and water treatment deficits could avert the need for a transmission capacity upgrade. Additionally, the water supply pipeline improvements described in subsequent sections may also mitigate this projected deficiency by altering the nature of connections between tanks and pressure zones in the vicinity of the 207-foot tank, such that the 232-foot pressure zone would receive direct hydraulic supply and would no longer depend on the 207- to 232-foot pump station for supply.

Because of the time frame for this potential deficiency, and because other considerations may mitigate it in the meantime, no specific actions related to the deficiency are proposed.

3.4.5 Water Supply Pipelines

The Town has identified risks associated with its existing water supply pipelines. A substantial portion of the pipeline is AC main that is nearing the end of its useful service life expectancy. Sections of the raw water supply portions of the pipeline are supported above ground, crossing steep and forested terrain, and could be subject to catastrophic tree fall damage. In addition, much of the pipeline is difficult to access for O&M or repair.

Level-of-service considerations also exist. Finished water flow is delivered to 23 existing customer connections from the finished water pipeline along San Juan Valley Road. Minimum 30 psi service pressures may not be maintained for these customers under all conditions. Additionally, given the limitations of the WTP chlorine contact clearwell, maintaining adequate disinfection levels for some

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customers served from the finished water pipeline may be challenging under certain operating conditions.

To reduce the risks of water supply pipeline failures and to address level-of-service considerations for customers with service connections along the water supply pipeline alignment, the Town has assessed alternatives for pipeline replacement, selected preferred alternatives, and developed a preliminary design for improvements. Specific improvements would include:

- Approximately 19,700 LF of 12-inch-diameter water main
- Approximately 4,740 LF of 12-inch-diameter high-density polyethylene (HDPE) water main
- Several valve replacements
- An altitude valve supply connection into the existing 207-foot tank
- A direct supply connection to the existing 232-foot pressure zone via a pressure-sustaining valve configured to maintain a 240-foot plus HGL in the water supply pipeline and allowing the existing 207- to 232-foot pump station to be bypassed
- A PRV connection from the existing 327-foot pressure zone to maintain pressures in the water supply pipeline during periods when the WTP pumps may not be operating
- Service adjustments, including a potential dedicated chlorine contact pipe chamber and second smaller-diameter feed line, to ensure that adequate chlorine disinfection levels are well maintained for customers near the water treatment plant along the finished water pipeline alignment.
- Environmental mitigation related to wetlands
- The pipeline improvements are divided into two sections, as identified in Section 8.

Time frame: Construction in 2015–17, subject to funding availability.

3.4.6 Water Distribution

System hydraulic modeling suggests that some areas of the Town water distribution system could be deficient in their ability to maintain required 30 psi minimum service pressures under PHD conditions and 20 psi minimum service pressures under MDD plus fire flow conditions. Proposed improvements to address noted deficiencies are presented in Table 3-16. Improvements include construction of piping and PRV improvements to improve distribution system capacity in two areas: the north end of the 232-foot zone, and the vicinity of the airport and Skagit Valley College.

Time frame: Begin exploring improvements during 6-year planning period; areas noted are currently deficient.

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Table 3-16. Proposed Distribution System Improvements

Deficiencies	Descriptions	Proposed improvements
Two borderline deficient (≤ 30 psi) nodes under 2016 and 2030 PHD	• 327 ft zone: Jennifer Place north of Charles Place experiences 26 psi under 2030 PHD. Due to high elevation.	No improvement proposed. This is a nominal deficiency, but the 327 ft zone actually operates within a normal range of 327–375 ft HGL depending on operating conditions. The low end of the pressure range is intermittent, and unlikely to be associated with the operational conditions (i.e., pumping approach) during high demand periods.
	• 232 ft zone: Intersection of Nelson Street and Maple Street experiences 30 psi under 2030 PHD.	None: borderline deficient only
Nine areas have challenges meeting required fire flow under 2016 and 2030 MDD + FF	• Trailer park area off of Roche Harbor Road. Due to small-diameter mains and high elevations. (380–435 gpm available, 750 gpm required)	Design and construct piping improvements running from a new PRV south along Terrace Drive to Roche Harbor Road, along Roche Harbor Road to University Road, and north along University Road along the frontage of the proposed Finnegan Ridge and Friday Cove developments. Includes approximately 3,700 LF of 8" DI water main and related appurtenances.
	• UW Friday Harbor Laboratories. Due to small-diameter mains and dead-end water main length. (504 gpm available, 750 gpm required)	
	• Vicinity of proposed Finnegan Ridge and Friday Cove developments. Due to high elevation. (560–608 gpm available for existing connections, 750 gpm required)	
	• Dead-end main off Salmonberry Road, north of the 232 ft tank. Due to small-diameter dead-end main. (482 gpm available, 500 gpm required)	Upsize water mains serving this area when time to replace.
	• Jennifer Place north of Charles Place in 327 ft zone. Due to high elevation. (458 gpm available, 500 gpm required)	No improvement proposed. This is a nominal deficiency, but the 327 ft zone actually operates within a normal range of 327–375 ft HGL depending on operating conditions. The low end of the pressure range is intermittent, and unlikely to be associated with the operational conditions (i.e., pumping approach) during high demand periods.
	• Vicinity of Skagit Valley College, east of airport. Due to small-diameter mains. (720–740 gpm available, 1,000 gpm required)	Design and construct piping improvements in vicinity of the airport and Skagit Valley College to improve fire flow performance. Includes approximately 1,800 LF of 12" DI water main and related appurtenances.
	• Vicinity of Warbass Way and Harrison Street meeting Turn Point Road. Due to small-diameter mains and multifamily fire flow requirements. (727–743 gpm, 750 gpm required)	Upsize water mains serving this area when time to replace.
	• Vicinity of marina and shipyard on Turn Point Road. Due to small-diameter mains and commercial fire flow requirements. (700 gpm available, 750 gpm required)	Upsize water mains serving this area when time to replace.
	• Carter Beach Road off of Turn Point Road. Due to small-diameter mains and dead-end water main length. (470–480 gpm available, 500 gpm required)	Upsize water mains serving this area when time to replace.

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Section 4

Water Use Efficiency, Water Rights, System Reliability, and Interties

The objective of this section is to summarize Town WUE programs, review water rights adequacy relative to existing and future needs, assess system reliability, and describe potential for system interties.

4.1 Water Use Efficiency Program Development and Implementation

Friday Harbor established a water conservation program in September 2001. WSDOH planning guidelines required the Town to develop a conservation program consistent with specific WSDOH Conservation Planning Requirements then in place. The Town's previous WSP described Friday Harbor's compliance with those guidelines.

Since 2007, an updated set of WUE regulations have been in effect that supersede the former conservation program requirements. WSDOH requires that all Group A municipal water systems develop a WUE program under updated guidelines to plan for conservation. The WSDOH Water Use Efficiency Guidebook (updated January 2011) summarizes program requirements. WUE Programs typically include:

- Data collection and analysis to characterize water production and consumption
- Water demand projections
- Analysis of DSL
- Goals and measures to promote conservation and WUE
- Analysis of established WUE measures

A detailed review of Friday Harbor water usage and projections of future water demands is presented in Section 2. Consistent with the requirements of WSDOH's Water Use Efficiency Guidebook, the Town has adopted its specific WUE goals. WUE goal-setting was conducted as a part of a public process before the Town Council, including a public forum to present the proposed goals and receive public comments.

4.1.1 Water Use Efficiency Goals

Friday Harbor has established two specific WUE goals:

- Reduce DSL to 9 percent of total water system production by the end of 2010. This goal has been achieved.
- Replace or recalibrate 80 water service customer meters each year. This goal is being met.
- Although Friday Harbor has established no specific demand-side water savings goals, the Town recognizes the importance of reducing and managing overall water demands and has established measures to limit DSL, encourage conservation, and reduce authorized consumption. These measures are summarized in the following sections.

4.1.2 Water Use Efficiency Measures

A WUE measure is defined as the specific activities and programs that are evaluated or implemented to achieve WUE goals. The number of required measures in a WUE program depends on the water system

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size and type. Based on the number of connections, Friday Harbor is required to implement or evaluate at least five measures.

Required Measures

In order to meet WUE requirements, systems must implement certain basic required measures. These measures correspond to both demand-side and supply-side goals and do not count toward the minimum WUE measures that must be established. The measures described below are required by WSDOH.

Install Production (Source) Meters: WAC 246-290-496(1). The Town has meters installed at several source and WTP locations to identify water production volumes. Flow meters are located on the pipelines from AUG 1 and AUG 2, at the WTP inlet and outlet, and on backwash pipes within the water treatment plant.

Install Consumption (Service) Meters: WAC 246-290-496(2). All Friday Harbor water system customers are currently metered. FHMC Title 13, Water Line Specifications, requires a water service meter to be installed at the edge of the public right-of-way, and a shutoff valve for each building on the parcel.

Perform Meter Calibration: WAC 246-290-496(3). Approximately every 2 years, supply source and treatment flow meters are sent for a factory calibration.

Measure DSL and, if Necessary, Implement a Water Loss Control Action Plan to Control Leakage: WAC 246-290-496(4). WSDOH has established a maximum DSL standard for water systems of 10 percent based on a 3-year rolling average. If a water system fails to meet this standard, it is required to develop a Water Loss Control Action Plan. Based on data from 2009–11, the average DSL for Friday Harbor was 6.3 percent. Town DSL is published in Water System Utility Reports produced monthly by the Town's System Administration Department.

Educate Customers about Water Use Efficiency Practices: WAC 246-290-496(4)(f). Aspects of the Town's water conservation program are posted on the Town of Friday Harbor Web site, including the 2001 Water Conservation Plan. When possible, Web sites linked from the Town's Web page are asked to include at least the simple message "Water is a precious Islands' resource, please use it wisely." Further information on water conservation is provided when appropriate.

Additionally, the Town prepares handouts encouraging conservation. These handouts are distributed to the following locations:

- Town Offices: main reception areas, and Water Conservation Office
- County Courthouse
- San Juan County Health and Community Services
- San Juan County Planning Department
- San Juan Public Library

Additional WUE Measures

In addition to the required measures summarized above, the Town has developed measures that help to address WUE program requirements. Several of these measures are described below.

Reclaimed Water. Given likely implementation and management costs, the Town does not consider reclaimed water utility service for commercial/retail use to be a viable option at this time. The Town does recycle and reuse some wastewater flows internally as appropriate at its wastewater treatment facility.

Conservation Rate Structures. As part of the WUE process, evaluation of a rate structure that encourages conservation is required. The Town currently encourages conservation by charging for water use based on consumption, with rates that increase as water usage increases. The current inclined-

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block-rate structure was evaluated as part of a utility rate study completed in 2008, and is described in Section 9.

School Outreach Program. Town staff members have conducted Water and Wastewater System Tours for fifth-grade classes each fall since 1989. Classroom presentations are combined with tours of the Trout Lake Watershed, the Water Treatment Facility, and the Wastewater Treatment Facility. The outreach program emphasizes both water resource stewardship and the importance of responsible water use.

Annual Master Gardeners Workshop. A daylong event organized by Washington State University (WSU) Master Gardeners is held each spring. The Town distributes a brochure focusing on gardening and landscaping.

Rebate Program. The Town has implemented the following rebate programs to provide incentives for customers to use less water:

- Toilet rebates: In 2000 the Town initiated a Toilet Rebate Program offering $75 per toilet to water customers that replace existing toilets with 1.6-gallon ultra-low flush models.
- Clothes washing machine rebates: $50 rebates were offered to customers upgrading to low-flow models in 1998. The program has not been funded since.

Showerhead and Faucet Aerator Retrofits. Showers, faucet use, and bathtub use generally rank prominently in indoor water use. In 1997 the Town began a partnership with Orcas Power and Light (OPALCO), the area electrical utility, to retrofit all single-family residential (SFR) and multifamily residential (MFR) units with low-flow showerheads, kitchen faucet heads, and other faucet aerators. Free aerators are available at all customer service desks.

Leak Detection Surveys. The Town performs in-house leak detection surveys on a case-by-case basis. The Town also budgets to conduct system-wide leak detection surveys using an outside contractor. Outside leak detection services are targeted about every 5 years. Because this is a supply-side measure, it is not counted toward the required WUE measures.

The 2001 Water Conservation Plan identified many other potential measures to reduce consumption and promote conservation, and the Town may choose to implement these in the future. These potential measures are listed below:

- Partner with WSU Extension Master Gardeners and local landscaping professionals to design and implement a Landscape and Irrigation Audits Program and Awards Program with focus on responsible water use. Once up and running, this program would be ongoing as techniques and technologies continually improve.
- Partner with the San Juan Stewardship Network and Washington State Ferries to fund and implement an onboard visitor education program covering responsible water use and conservation issues.
- Designate the second week of May as Seek Out Leaks Week, which corresponds to National Drinking Water Week. Advertise in local papers, describing how to spot leaks, and approach local hardware stores about the possibility of offering discounts on specific plumbing supplies. This would be an ongoing program on an annual basis.
- Include consumption history on water bills to allow comparison and awareness of water use.

4.1.3 Analysis of WUE Program

Demand projections summarized in Section 2 present demands which include a DSL of 9.1 percent, based on a 6-year average from 2006–11. More recently, the Town has achieved a 3-year DSL RAA of 6.8 percent, surpassing the Town's goal of 9 percent DSL. Should future DSL exceed 10 percent on a 3-

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year RAA, the Town would be required to develop and submit a Water Loss Control Plan to WSDOH, as outlined in the Water Use Efficiency Guidebook.

4.2 Source-of-Supply Analysis

The WSDOH Planning Handbook requires a source-of-supply analysis for water systems pursuing new or expanded water rights within the next 20 years. The purpose of a source-of-supply analysis is to evaluate alternatives to optimize use of existing sources, and evaluate whether other methods to meet water needs are feasible in lieu of pursuing new water rights. The water rights analysis presented in subsequent sections shows that the Town has adequate water rights to meet projected demands over the next 20 years. Consequently, a formal source-of-supply analysis is not required. However, because the sustainable yield of Trout Lake is less than the water rights, the Town may choose to pursue water rights at another location in the future.

4.2.1 Enhanced Conservation Measures

The Town established a water conservation program in 2001. WSDOH planning guidelines required the Town to develop a conservation program consistent with specific WSDOH Conservation Planning Requirements then in effect. The Town's previous WSP showed how Friday Harbor was complying with those guidelines. Since that time, the WSDOH Water Use Efficiency Guidebook has replaced the Conservation Planning Requirements. Friday Harbor is in compliance with WSDOH requirements related to WUE, as described in the previous section.

4.2.2 Water Rights Changes

The Town has no plans to transfer or alter water rights within the next 20 years. The Town's existing water rights exceed projected demands, and there are currently no plans to transfer or alter water rights. However, demands are projected to exceed the sustainable yield from existing sources within the 20-year planning period. In order to ensure that existing sources are operated within their sustainable yield and to increase reliability, the Town might choose to pursue water rights at another location in the future.

4.2.3 System Interties

The Town of Friday Harbor water system currently has no system interties with adjacent water systems. There are no other water systems of significant size in close proximity to the town.

4.2.4 Artificial Recharge and Recovery

Artificial recharge is the injection or infiltration of available water into underground aquifers to augment groundwater supplies and allow for subsequent withdrawal. The hydrogeology of the San Juan Islands is not generally suitable for groundwater recharge and recovery. Shallow bedrock and complex, fractured layers may limit the effectiveness of groundwater supplies.

4.2.5 Reclaimed Water and Reuse

Given likely implementation and management costs, the Town does not consider reclaimed water utility service for commercial/retail use to be a viable option at this time. The Town does recycle and reuse some wastewater flows internally as appropriate at its wastewater treatment facility.

WSDOH requires that when additional sources of supply are being pursued as a result of water quality problems with existing sources, purveyors first evaluate the cost of treating the current source. Friday Harbor sources have no water quality problems that would require acquisition of alternate sources. The Town's water treatment capacity and water quality testing results are described in Section 3. Water quality monitoring requirements and procedures are described in Section 6.

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4.3 Water Right Evaluation

This section summarizes and evaluates water rights held by the Town.

4.3.1 Permits, Certificates, Claims, and Applications

Existing Town of Friday Harbor water rights are presented in Table 4-1 and described below. Copies of available water right documentation are provided in Appendix C.

Trout Lake (Certificate R1-22004C). The Town of Friday Harbor relies exclusively on surface water sources for potable water supply. Trout Lake Reservoir, the initial and primary source, lies approximately 5 miles west of the town within an isolated, undeveloped watershed. The Trout Lake water right has a priority date of July 8, 1974, with a permitted maximum annual withdrawal of 497.0 acre-feet (ac-ft), which equates to an average annual daily rate of 0.44 mgd. The purpose of use identified on the certificate is "municipal water system." The certificate does not place any restrictions on the time of use or any other condition.

AUG 1 (Certificate S1-23127C). Augmentation 1 (AUG 1) was constructed in 1979 to supplement the Trout Lake reservoir and watershed with additional surface water supply. A dam was built near the southeast end of Lake 310 to collect overflow water from a 190-acre watershed. Water is captured in a small impoundment and pumped cross-country into Trout Lake Creek, which drains into the northwest end of Trout Lake. The water right associated with AUG 1 has a priority date of June 7, 1978. The permitted instantaneous withdrawal is 0.98 cubic foot per second (cfs) and the maximum annual withdrawal is 240.0 ac-ft, which equates to an average annual daily rate of 0.21 mgd. The purpose of use identified on the certificate is "municipal and industrial supply." The water right includes the following limitations:

- Withdrawal is permitted only between October 1 and April 15.
- Diversion shall cease when the overflow from the point of diversion catch basin drops to 225 gpm.

AUG 2 (Certificate SI-23457 C). Augmentation 2 (AUG 2) includes a stream diversion, pump station, and force main. Water from a 3,850-acre watershed is funneled through a weir and pumped to the Trout Lake reservoir just above the dam. The AUG 2 water right has a priority date of July 16, 1979. The right is for 1,346 gpm (0.98 cfs) and 736.5 ac-ft per year, which equates to an average annual daily rate of 0.66 mgd. Withdrawal is limited to November 1 through April 15. Water right provisions stipulate that diversions shall cease when the overflow from the point of diversion catch basin drops to 343 gpm (0.765 cfs). The purpose of use identified on the certificate is "municipal supply."

Forecasted Water Rights. Water rights self-assessment forms for the 6- and 20-year planning horizons are presented in Table 4-2 and Table 4-3, respectively. Projected demands shown in these tables are taken from the projections developed in Section 2 and the maximum instantaneous pumping capacity used in the Section 3 source capacity analysis.

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Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 4-1

WATER SYSTEM PLAN - 2011
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates										
1. RI-22004C	Town of Friday Harbor	7/8/1974	Unnamed Stream (Trout Lake)	No	Not defined	497.0 ac-ft				
2. SI-23127C	Town of Friday Harbor	6/7/1978	Unnamed Stream	No	0.98 cfs (440 gpm)	240.0 ac-ft				
3. SI-23457 C	Town of Friday Harbor	7/16/1979	Unnamed Stream	No	3.0 cfs (1,346 gpm)	736.5 ac-ft				
Claims 1.										
2.										
3.										
TOTAL	**********	*********	*********	**********	Not defined	1,473.5 ac-ft(1)	700 gpm(2)	374 ac-ft	NA	+1,099.5 ac-ft

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. NONE							
2.							
3.							
4.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. NONE					
2.					
3.					
4.					

Footnotes:

(1) Water right certificate states that annual quantity of water allocated to the Town of Friday Harbor under all existing rights shall not exceed 1,473.5 acre-feet.

(2) Maximum source pumping capacity at the treatment plant.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 4-2
WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST - 2018

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/certificates 1. RI-22004C	Town of Friday Harbor	7/8/1974	Unnamed Stream (Trout Lake)	No	Not Defined	497.0 ac-ft				
2. SI-23127C	Town of Friday Harbor	6/7/1978	Unnamed Stream	No	0.98 cfs (440 gpm)	240.0 ac-ft				
3. SI-23457 C	Town of Friday Harbor	7/16/1979	Unnamed Stream	No	3.0 cfs (1,346 gpm)	736.5 ac-ft				
4.										
Claims 1.										
2.										
3.										
4.										
TOTAL	**********	*********	*********	**********	N/A	1,473.5 ac-ft(1)	700 gpm(2)	420.5 ac-ft	N/A	+1,053 ac-ft

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. None							
2.							
3.							
4.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. None					
2.					
3.					
4.					

(1) See existing status, Table 4-1. Water right certificate states that annual quantity of water allocated to the Town of Friday Harbor under all existing rights shall not exceed 1,473.5 acre-feet.
(2) See existing status, Table 4-1. Maximum source pumping capacity at the treatment plant.

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DOH Form #331-372 (09/07)

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 4-3
WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST - 2032

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/certificates 1. RI-22004C	Town of Friday Harbor	7/8/1974	Unnamed Stream (Trout Lake)	No	Not Defined	497.0 ac-ft				
2. SI-23127C	Town of Friday Harbor	6/7/1978	Unnamed Stream	No	0.98 cfs (440 gpm)	240.0 ac-ft				
3. SI-23457 C	Town of Friday Harbor	7/16/1979	Unnamed Stream	No	3.0 cfs (1,346 gpm)	736.5 ac-ft				
4.										
Claims 1.										
2.										
3.										
4.										
TOTAL	**********	*********	*********	**********	N/A	1,473.5 ac-ft(1)	700 gpm(2)	532.5 ac-ft	N/A	+941 ac-ft

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. None							
2.							
3.							
4.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. None					
2.					
3.					
4.					

(1) See existing status, Table 4-1. Water right certificate states that annual quantity of water allocated to the Town of Friday Harbor under all existing rights shall not exceed 1,473.5 acre-feet.
(2) See existing status, Table 4-1. Maximum source pumping capacity at the treatment plant.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388). For additional copies of this form, call 1-800-521-0323. This and other forms are available at http://www.doh.wa.gov/ehp/dw

DOH Form #331-372 (09/07)

To return form, please see reverse side.

4.3.2 Water Rights, Current Water Usage, and Projected Needs

The water rights self-assessment forms show that the Town has adequate water rights to meet projected demands through the end of the 20-year planning horizon in 2032. In 2032, the projected annual demand is 0.48 mgd, or approximately 533 ac-ft, compared to an authorized annual water rights limit for all sources of 1,473.5 ac-ft. There is no instantaneous withdrawal limit on the Trout Lake supply, such that water rights are not a limiting factor in providing MDD. Table 4-4 presents projected water demands in the 6- and 20-year planning horizons compared to Town total annual water right limits.

Table 4-4. Water Right Capacity

Current water right	2011 demand (existing)	2018 projected demand	2032 projected demand
1,437.5 ac-ft	374 ac-ft	421 ac-ft	533 ac-ft
10,789 ERUs	2,798 ERUs	3,148 ERUs	3,986 ERUs

4.3.3 Water Reservations

No Washington State Department of Ecology (Ecology)-granted water reservations are associated with the Town water system.

4.4 Water System Reliability Analysis

This section provides a summary of efforts previously undertaken and planned for the future to ensure that an adequate quantity of water can be provided at all times.

Source Reliability

Section 3 presents an analysis of the capability of Friday Harbor's existing sources to meet existing and projected demands. The capacity analysis indicates that the Town is expected to reach the limit of the available source capacity within the 20-year planning horizon. The Town's plans to increase future source capacity and reliability are summarized in Section 8. Presently, there is adequate supply to meet existing demand. Additionally, in 1995, Friday Harbor constructed facilities to allow emergency withdrawal from Trout Lake dead storage volumes via a siphon system. This additional dead storage emergency supply capacity increases total sustainable yield by an estimated 25 MG/yr, from 168 MG/yr to 193 MG/yr. Although the use of dead storage is reserved for emergency drought conditions, the siphon system increases source reliability and allows the Town to meet demands during droughts.

Because all of the Town's water is pumped directly from the Trout Lake reservoir, contamination of this water source would affect the Town's entire water supply. Because the watershed is a mountainous, sparsely developed area, it is unlikely that the area would become contaminated. Measures that the Town has taken to protect the watershed and sources are summarized in the Watershed Protection strategy presented in Section 5.

Water Right Adequacy

Previous sections describe the status of Friday Harbor's water rights. The Town's existing water rights portfolio is adequate to meet projected demands through the 20-year planning horizon.

Facility Reliability

Section 3 evaluates existing system reliability relative to source, treatment, storage, pumping, and distribution facilities. No specific projects to increase water facility reliability have been identified.

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4.4.1 Water Shortage Response Planning

Given area hydrology and available water resources, the Town's water supply can be vulnerable to cyclical droughts. During the last 30 years, the Town experienced three 50-year droughts. A 50-year drought is statistically expected to occur once every 50 years, or to have a 2 percent chance of occurring in any given year, based on historical rainfall data. Local droughts of this magnitude occurred in 1978, 1988, and 1993–94, the last of which was declared a state-level emergency.

Water Shortage Response Plans (WSRPs) help utilities conserve available water supplies and determine where additional sources of supply should be considered. The WSRP should contain a practical, realistic action plan to respond to water shortage conditions, including defining specific triggers for stages of water shortages and establishing demand reduction and/or supply augmentation options, an implementation schedule, and a monitoring program. Additionally, a public information program should be defined to keep customers aware of water reduction requirements.

The Town WSRP, which defines levels of emergencies and measures to be taken, was adopted in 1988. The WSRP, included in Appendix F, provides water shortage severity definitions, lists the steps the Town should take to inform the public during water shortages, and outlines limited and/or prohibited public water use during water shortages as well as fines and enforcement procedures. The Town provides water alerts on the Friday Harbor Web site to keep customers informed of drought conditions.

To implement the WSRP, the Town enacted FHMC Chapter 13.16, Emergency Water Restrictions. The FHMC was revised in 1998. A copy of the relevant FHMC chapter is included with the WSRP in Appendix B.

4.4.2 Source-of-Supply Monitoring

As part of ensuring water system reliability, purveyors with groundwater sources are required to have a monitoring program for well levels. The Town of Friday Harbor does not have any groundwater sources or monitoring wells. However, the water level in Trout Lake Reservoir is measured at the end of each month, and as often as daily during peak demands seasonally. Results, presented in Table 4-5, show that water level trends in the reservoir have not changed significantly over the last decade. Typical water level trending in Trout Lake is summarized in Figure 4-1.

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Table 4-5. Trout Lake Reservoir Level

Period	Water Level: inches above/(below) spillway										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
January	1.50	1.50	(61.00)	0	0	0	1.63	(17.75)	0.50	0	1.00
February	1.50	1.00	(42.00)	0	0	0	(0.75)	0	0	0	0
March	11.25	1.75	(13.50)	0	0	0	0	8.50	0.50	7.25	0
April	10.00	(10.50)	10.25	(3.00)	0	0	0	7.75	(0.50)	7.50	9.00
May	2.00	0	1.75	(8.00)	0	(0.50)	(0.50)	1.50	(2.00)	2.00	9.00
June	(5.50)	(6.75)	(9.25)	(21.50)	(11.00)	(15.00)	(9.50)	(9.50)	(11.25)	(5.50)	0.25
July	(20.00)	(22.50)	(26.00)	(36.75)	(25.50)	(30.75)	(24.50)	(25.25)	(26.50)	(17.75)	(9.50)
August	(33.00)	(36.75)	(42.50)	(48.75)	(41.50)	(48.00)	(39.50)	(36.00)	(29.50)	(33.50)	(24.00)
September	(42.50)	(49.50)	(53.00)	(55.50)	(53.00)	(59.50)	(50.25)	(47.50)	(51.50)	(37.75)	(34.5)
October	(48.00)	(57.00)	(29.50)	(60.50)	(58.75)	(68.00)	(56.75)	(54.25)	(54.50)	(43.50)	(39.75)
November	(45.00)	(62.50)	2.00	(41.75)	(55.50)	(34.00)	(60.75)	(51.00)	(10.75)	(46.28)	(38.75)
December	1.50	(66.00)	0	0	(37.00)	0	(47.75)	(36.50)	0	0	(39.50)
Average	(13.85)	(25.60)	(21.90)	(22.98)	(23.52)	(21.31)	(24.05)	(21.67)	(15.89)	(13.96)	(13.90)

Note: Months with positive levels may reflect periods where a removable 10.5-inch riser has been added to the top of the original spillway. The outlet pipe for the reservoir is 288 inches, or 24 ft, below the spillway.

Source: Town of Friday Harbor Web site: http://www.fridayharbor.org/Utilities/lake_level.htm.

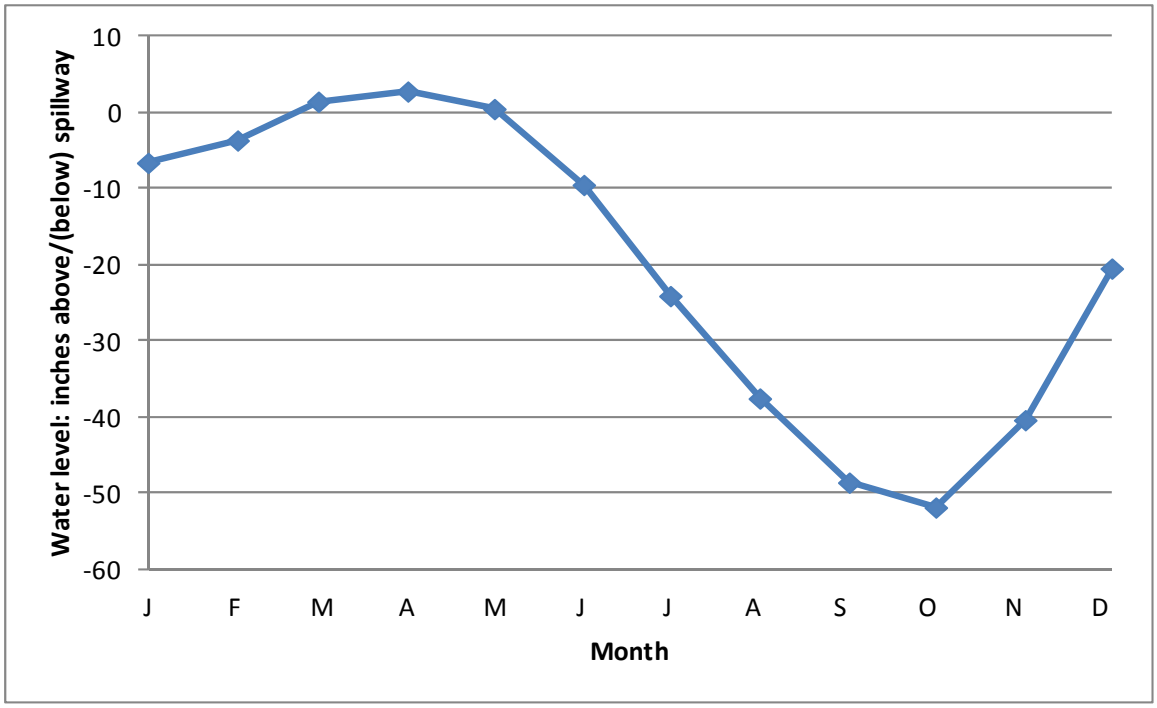

Figure 4-1. Average Trout Lake reservoir level by month (2001–11)

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4.5 Interties

The Town water system does not have any existing water system interties. Additionally, no water systems in the vicinity of the Town have the capacity or water rights necessary to support a reliable system intertie with the Friday Harbor water system. As discussed in previous sections, most surrounding communities on the island are supplied by small wells that serve only limited numbers of connections. Therefore, no future interties are anticipated.

4.6 System Improvement Needs

No specific water system improvement needs related to WUE have been identified.

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Section 5

Source Water Protection

This section details source water protection for Town of Friday Harbor supplies.

5.1 Watershed Control Program

The Town of Friday Harbor relies on surface water for its water supply. To protect surface water supplies, WSDOH requires public water utilities to develop and implement watershed control programs as a component of their water system plans under (WAC 246-290-135.

The purpose of a watershed control program is to provide water purveyors with proactive programs for preventing source water contamination. A successful watershed control program consists of a number of components, which must be developed before the plan can be fully implemented. The major components of the plan are described below and form the basis of the following sections:

- A delineated source water protection area defined by the entire watershed up-gradient of the intake point. This includes the initial watershed plus any open conveyance mechanism and/or any storage reservoirs.
- An inventory within each source water protection area of potential sources of contamination.
- Watershed control measures to reduce the likelihood that potential contaminant sources will pollute the drinking water supply.
- A description of emergency provisions.
- Documentation of water quality trends.

Friday Harbor monitors activities in its source watersheds that could affect source water quality. The watershed control program is scheduled to be reevaluated at least once every 6 years. Changes that could affect the source water quality are documented and recommendations made for improved watershed control.

5.1.1 Watershed Description and Characteristics

The watershed description and inventory provides site-specific information including location, hydrology, land ownership, and activities that could adversely affect source water quality.

Location

The Town of Friday Harbor diverts surface water from watersheds in San Juan County, approximately 5 miles west of the town. Friday Harbor has three surface water sources and corresponding watersheds: Trout Lake, an overflow from Lake 310 pumped into the Trout Lake watershed (AUG 1), and a seasonal diversion of water from a creek in Section 17 east of Trout Lake (AUG 2). All watersheds are located within the state Water Resource Inventory Area (WRIA) 02. Surface elevations range from 100 feet to 1,036 feet at Mt. Dallas, which is the highest point on San Juan Island. Figure 5-1 presents these three watersheds.

Trout Lake. The primary water supply source for Friday Harbor is Trout Lake. A concrete dam, originally constructed in 1928, forms the lake impoundment. The dam was raised to its present height of 37 feet in the 1950s, and the lake has a surface area of approximately 60 acres when full. The Trout Lake watershed is located west of Friday Harbor in an isolated, sparsely developed area, and is surrounded by

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a steep drainage basin totaling approximately 840 acres. The Town of Friday Harbor owns approximately 570 acres in the Trout Lake watershed and prohibits development in the watershed.

Augmentation 1 (AUG 1). In 1979, the Lake 310 augmentation project (AUG 1) was constructed to supplement the Trout Lake watershed with additional surface water supply. The project involved construction of a small impoundment and pump station near the south end of Lake 310. Overflow from Lake 310 is captured in the impoundment and pumped cross-country into Trout Lake Creek, which subsequently drains to Trout Lake. The Lake 310 watershed includes approximately 190 acres of privately owned land. The watershed is in the remote mountainous interior of the island in an area where significant development is impractical and unlikely.

Augmentation 2 (AUG 2). In 1988, the Town constructed a second augmentation project (AUG 2), consisting of a stream diversion, a pump station, and a raw water main. The diversion and pump station are located approximately a quarter mile northeast of the Town of Friday Harbor water treatment plant. Originally AUG 2 raw water was pumped directly to the water treatment plant. In 1994, the pump station was improved and a raw water main was constructed to allow the AUG 2 water supply to be pumped into the Trout Lake reservoir. The AUG 2 watershed includes approximately 3,850 acres, of which the Town owns very little.

Hydrology

Annual recharge of Trout Lake, AUG 1, and AUG 2 is primarily dependent on precipitation within the watersheds. The Town has historically experienced periods of drought that have severely tested the capacity of the Trout Lake surface water supplies. Average monthly rainfall ranges from approximately 0.60 to 5 inches with an annual average of 28 inches (period of record: 1995–09).

Surface water runoff in San Juan County is lower than is typical for western Washington due to limited rainfall, small catchment areas, and the prevalence of coarse, porous glacial sediment over bedrock. Runoff occurs primarily from December through March when soils are saturated and rainfall is heaviest. Runoff estimates indicate that approximately 28 percent of average annual precipitation is not retained and is mobilized as runoff. The watersheds utilized by the Town of Friday Harbor for water supply are located within the San Juan Island False Bay watershed, which has the greatest volume of runoff for any basin in the county at more than 3,154 ac-ft per year.

The Trout Lake watershed includes only seasonal active streams and watercourses. The AUG 1 and AUG 2 catchment areas draw from seasonal streams that flow from west to east. Small dams at each catchment area establish pools that supply the augmentation pump stations.

The AUG 1 pump station pipeline terminates just beyond the crest of the Trout Lake watershed. Water supplied from the pump station flows down a seasonal creek channel (Trout Lake Creek) to the Trout Lake reservoir below. The AUG 2 pipeline also terminates just beyond the crest of the Trout Lake watershed, with water then draining as open-channel gravity flow down to the reservoir.

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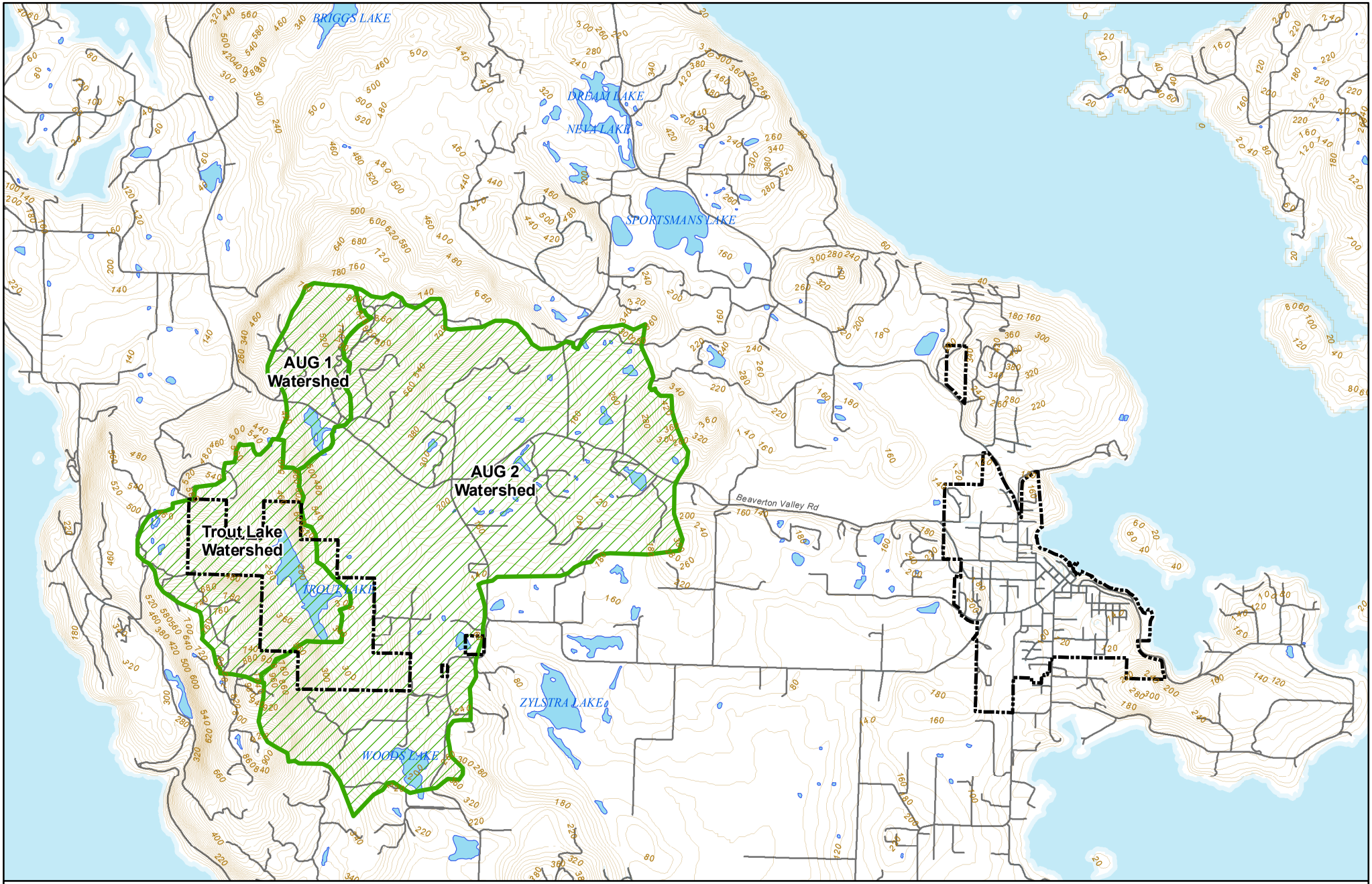

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Figure 5-1. Watershed Boundaries

Land Ownership

The Town of Friday Harbor owns a significant portion of the watershed lands within its source water protection areas. The following section summarizes the land ownership within these areas (see Figure 5-2).

Trout Lake. The Town of Friday Harbor owns approximately 570 acres (70 percent) of the Trout Lake watershed adjacent to Trout Lake. The remaining watershed areas, totaling approximately 270 acres, are privately owned and sparsely developed. The Town does not have the resources to purchase additional land within the watershed at this time. If future development presents a threat to water quality in Trout Lake, the Town may consider purchasing additional land. The San Juan County designated land uses in the Trout Lake watershed include Natural, Forest Resource, and Rural Farm Forest (San Juan County Planning Department, 2000 – Official Maps):

- Natural: Protects, conserves, and manages existing natural conditions and preserves the ecosystem in a natural state for the benefit of future generations without precluding compatible human uses.
- Forest Resource: Recognizes and protects the physical condition of forest resource lands that are conducive to the use of such lands for long-term commercial production. Residential density is limited to 1 unit per 20 acres.
- Rural Farm-Forest: Provides for rural living opportunity with parcel sizes generally 5 to 10 acres. Commercial and industrial uses are not allowed.

Augmentation 1 (AUG 1). The Town of Friday Harbor does not own any land in the AUG 1 watershed. This watershed is privately owned and designated land use includes a combination of Forest Resource and Rural Farm-Forest.

Augmentation 2 (AUG 2). The Town of Friday Harbor does not own any land in the AUG 2 watershed except for 10 acres around the diversion area. This watershed is privately owned and designated land use includes a combination of Natural, Forest Resource, Rural Farm-Forest, and Agricultural Resource, with limits of one unit per 5 acres and one unit per 10 acres:

- Agricultural Resource: Designated and protected lands that are determined locally to be of long-term commercial significance for resource production. This land use class recognizes and protects the physical conditions and characteristics of agricultural lands that are conducive to the use of such lands for long-term commercial production.

Water Quality and Ongoing Monitoring

A detailed description of the Town of Friday Harbor water quality monitoring program, including raw water source monitoring, is included in Section 6.

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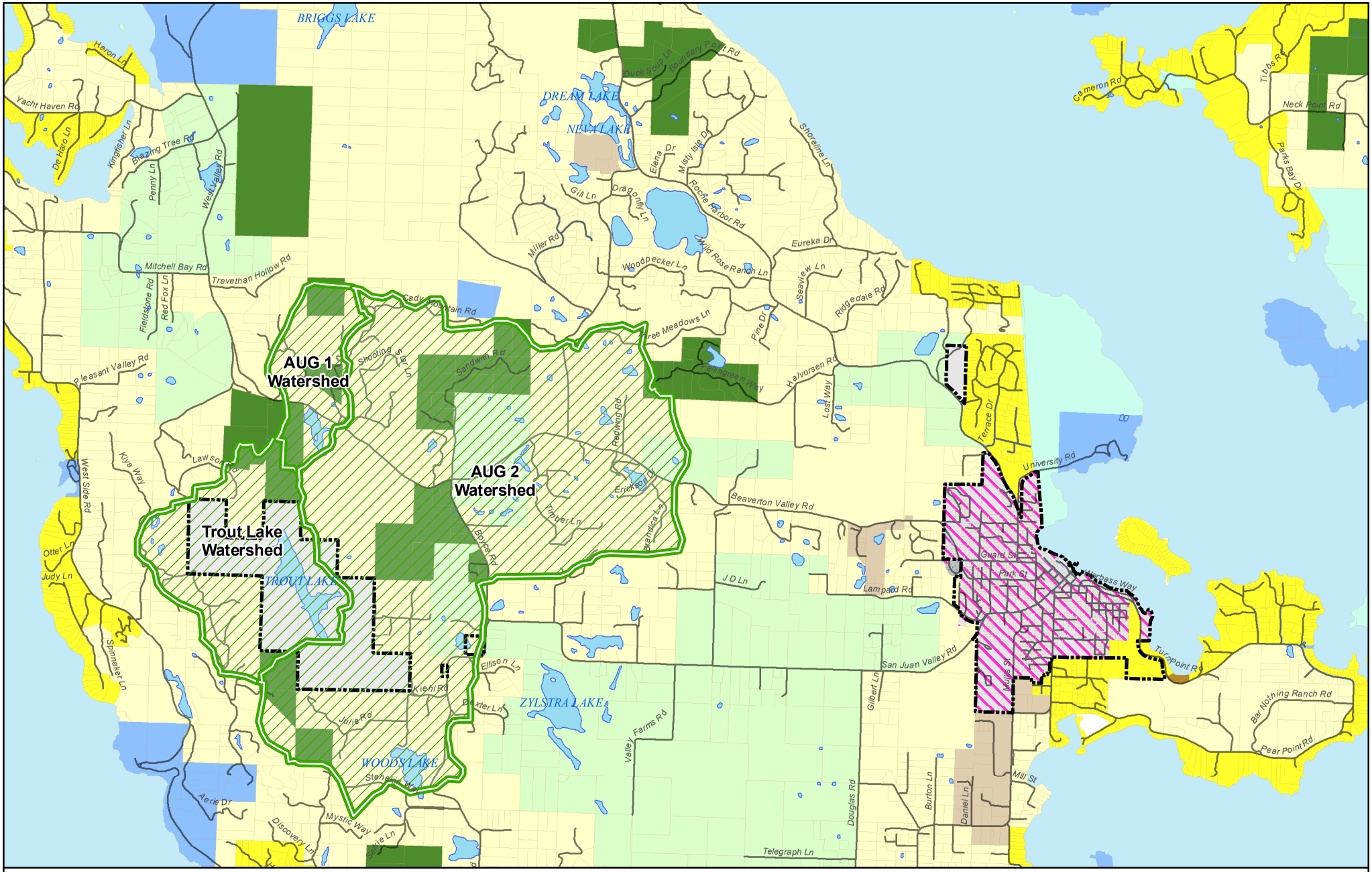

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Figure 5-2. Watershed Land Use

5.1.2 Activities and Land Use Detrimental to Water Quality

An essential element of a watershed control program is an inventory of past, present, and potential future activities that may pose a contamination threat to water quality within watershed protection areas. The contaminant source inventory considers existing and potential sources of contamination related to watershed activities and land use. This includes both point and nonpoint pollution sources.

Within a watershed protection area, there are many diverse activities that could pose a contamination risk to associated water supply resources. It is important that these activities are properly inventoried and, if necessary, regulated to prevent degradation of water supplies. Activities that may pose a threat to water quality typically relate to land use and zoning practices and are often associated with solid waste handling, illegal dumping, wastewater and stormwater discharges, agricultural practices, underground storage tanks, septic tanks, accidental spills, and other sources of contamination. More detailed information related to the watershed inventory is presented in the San Juan County Watershed Management Action Plan and Characterization Report completed in 2000.

As summarized in Table 5-1, the San Juan County Watershed Management Action Plan and Characterization Report documents land use, critical management areas, nonpoint source pollution risk, and management priorities for the False Bay watershed, which includes the Town of Friday Harbor watershed protection areas.

Table 5-1. False Bay Watershed Priority Conditions Identified in the San Juan County Watershed Management Action Plan (2000)

Current land use	False Bay
Agriculture	12%
Timber land	30%
Conservation	18%
Residential parcels	23%
Public lands	n/a
Critical management areas	**False Bay**
Designated growth areas	No
Upland native ecosystem	Yes
Critical marine habitat	Yes
Surface water resource area	Yes
Research/education areas	Yes
Nonpoint source pollution risk	**False Bay**
Onsite sewage systems	Medium
Agricultural practices	High
Forestry practices	Medium
Conversion of resource lands	High
Marinas and recreational boating	Medium
Stormwater runoff	High
Solid/hazardous waste	Medium

Note: This information corresponds to a larger watershed that includes the Town of Friday Harbor's watershed protection area. Watershed conditions are as documented in the 2000 San Juan County Watershed Management Action Plan, and are based on a watershed evaluation of beneficial uses and pollution risks.

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Figure 5-2 details land ownership and uses for the watershed areas the Town of Friday Harbor depends on for water supply. Due to their nature, WSDOH designates all surface water supplies as highly susceptible to contamination. The Friday Harbor watersheds are relatively isolated and sparsely developed. Based on land ownership and zoned uses within the watersheds, the primary potential contaminant concerns relate to agricultural land use, residential development, and septic systems. A discussion of potential watershed contamination sources and their potential impact on Friday Harbor's water supply is included in the following sections.

Recreation

The Town restricts access to Trout Lake. There is a locked gate on the road to the lake. No recreational activities are allowed or sanctioned in the Trout Lake watershed.

Septic Tanks

Contamination from onsite septic systems in the watershed is of potential concern. Properties with failing septic systems located near stream channels and natural drainages present the greatest potential for sewage and septic contamination (bacterial, chemical, and nutrient agents) to impact surface waters that drain into Trout Lake or the augmentation water supplies.

The San Juan County Health and Community Services Department (HCSD) regulates onsite septage activities. Overall, the drainage basin contains fairly shallow soils with high clay and rock content. Many of the older septic systems in the drainage basin are gravity systems, which are generally not the most suitable type of system for shallow clay soils. Onsite systems installed prior to 1972 did not require permits, which makes these systems the most difficult to locate and assess. The HCSD is currently working to update septic permit records and has developed an onsite septage O&M program to ensure that systems are properly designed, installed, and maintained in the future.

Development

Nonpoint pollutants commonly associated with residential land use include sediment, nutrients, oxygen-demanding substances, pathogens, hydrocarbons, heavy metals, and toxins. Common household pollutants include paints, solvents, lawn and garden care products, detergents and cleansers, and automotive products such as antifreeze and motor oil. Improper use and disposal of these products can be chronic sources of pollution. The care of landscaped areas through the application of fertilizers and pesticides can be detrimental to surface waters and receiving marine waters.

Although development within the Friday Harbor watersheds is limited, development-related contamination remains a possibility.

Agriculture

Agricultural land use does exist in the False Bay watershed, which includes the Friday Harbor watersheds and lands south of the Friday Harbor watersheds, and the AUG 2 watershed includes Agricultural Resource lands. Generally, however, more land is being converted to rural-residential land use with limited agriculture on smaller acreages. If not properly managed, agriculture operations can contaminate surface water. Contaminants can include, but are not limited to, sediment from soil erosion, nutrient loading, and both microbiological and chemical constituents. Farming activities that can have a high potential to contribute to water quality problems include poor pasture management, chemical uses, poor management of animal wastes, animal access to surface waters, and overgrazing in wetlands and other sensitive terrestrial habitats.

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Forestry

Forestlands comprise more than 70 percent of the land area in San Juan County and a large portion of the Town's watersheds. Without proper management, timber harvesting of forestlands and subsequent site preparation activities have the potential to adversely affect water quality through increased soil erosion and sedimentation, soil compaction, and water temperature increases, as thermal cover is removed.

Erosion

Elevated erosion and increased sediment loading result from the movement of soil by water and wind. Contamination concerns related to soil erosion include migration and deposition of soils and sediments into surface waters, with subsequent stream channel and substrate degradation. Sediment from nonpoint sources is the most widespread pollutant of surface water. Total suspended solids and turbidity are water quality indicators relating to sediment, but the effects of sediment on ecosystems can also be characterized. In addition, pollutants such as bacteria, nutrients, and organic material can adhere to suspended particles.

The erosion potential within the Friday Harbor watersheds is dependent on the local soil characteristics and underlying geology of the area. Many watershed areas have a high potential for erosion due to local physical features relating to topography, altitude, slope exposure, and vegetative cover. The San Juan County Watershed Management Action Plan also noted that upland areas in the False Bay watershed, which includes the Friday Harbor watersheds, may have high erosion potential, but specific areas were not identified.

Roads

Roads can be sources of surface water contamination given potential spills, construction and maintenance activities, and chemical and sediment contamination as a result of vehicular traffic. Erosion and sedimentation along roadways can introduce suspended solids, nutrients, and metals into adjacent water bodies. Normal vehicular traffic can contribute oil and grease, gasoline, and other petroleum and chemical contamination into watersheds.

The Friday Harbor watersheds include few roadways, and traffic volumes are generally small, such that the potential for roadway-related contamination of water supply resources is relatively small.

Solid and Hazardous Waste

Waste products, if not managed correctly, can pollute surface water and groundwater with metals, toxic chemicals and hydrocarbons, and/or pathogens. Solid waste includes garbage, rubbish, ashes, industrial wastes, demolition and construction debris, and abandoned vehicles. Proper waste management is essential for reducing or eliminating potential water quality pollution from these waste streams. Waste management includes proper use, collection, storage, transportation, transfer, treatment, and disposal of waste materials. San Juan County collects and stores solid waste at designated waste transfer stations, and then transports solid waste off the islands for disposal.

Hazardous wastes are defined as all flammable, toxic, corrosive, and reactive waste generated by residences and businesses. San Juan County and the Town of Friday Harbor offer regular hazardous waste roundups, allowing individuals to properly dispose of these wastes for free or at minimal cost.

Accidental Spills

Accidental spills or releases of contaminants can potentially impact water supplies. Potential sources of spills and leaks include underground storage tanks, accidents, and poor disposal practices. Currently no commercial or industrial activities are located within the Friday Harbor watersheds, and Beaverton

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Valley, Westside, Egglake, and Wold Roads are the only major transportation corridors that pass through the watersheds. As a result, accidental spills are likely to be a minimal threat.

Confirmed and Suspected Contamination Sites

Under the Model Toxics Control Act Cleanup, WAC 173-340, Ecology is responsible for ensuring that all hazardous waste sites are properly remediated. This includes confirmed and suspected sites of contamination as well as leaking underground storage tanks (LUSTs). A separate inventory for each, which includes the status of cleanup efforts, is maintained by Ecology. No confirmed or suspected contamination sites are located within the Friday Harbor watersheds.

Inventory Data Sources

Inventories of potential contaminant sources are compiled using the following data sources, and are periodically updated to provide an accurate reflection of current conditions:

- San Juan County Watershed Management Action Plan and Characterization Report, June 2000.
- Washington Department of Health, Division of Information Resource Management Geographic Information System Data. This source maintains information from regulatory programs, including Department of Ecology databases.
- San Juan County Comprehensive Plan, Land Use and Shoreline Master Program, October 2000.

5.1.3 Watershed Management and Control Measures

This section of the WSP Update describes how the Town of Friday Harbor, in coordination with other local agencies, monitors and manages activities and land use to minimize or eliminate source water quality impacts. Friday Harbor does not own all the land within its watershed and must also rely on other local entities with land use authority.

Land Use Restrictions

The Town of Friday Harbor restricts access to and prohibits recreation on Trout Lake. San Juan County limits land use within the Friday Harbor watershed areas according to the following categories:

- Natural: Protects, conserves, and manages existing natural conditions and preserves the ecosystem in a natural state for the benefit of future generations without precluding compatible human uses.
- Forest Resource: Recognizes and protects the physical condition of forest resource lands that are conducive to the use of such lands for long-term commercial production. Residential density is limited to one unit per 20 acres.
- Rural Farm-Forest: Provides for rural living opportunity with parcel sizes generally 5 to 10 acres. Commercial and industrial uses are not allowed.
- Agricultural Resource: Designated and protected lands that are determined locally to be of long-term commercial significance for resource production. This land use class recognizes and protects the physical conditions and characteristics of agricultural lands that are conducive to the use of such lands for long-term commercial production.

Regulation of Agriculture, Timber Harvesting, and Construction Practices

Ecology assumes the primary enforcement role to ensure that agricultural operations do not degrade water quality. Ecology's enforcement is triggered by documented water quality degradation, and usually initiated by a complaint. Generally, enforcement actions are used as a last resort only. Farm owners are encouraged to work with the Natural Resources Conservation Service (NRCS) and the local Conservation District to develop and implement farm plans and best management practices (BMPs) to protect water quality.

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Under Revised Code of Washington (RCW) Chapter 84.34, the County has the authority to regulate timber harvest under the Timber-Open Space program. The County also has land use authority in the conversion of forestland to residential and other uses.

Washington State's Forest Practices Rules and Regulations are written to address logging operations statewide. However, the San Juan Islands have unique characteristics that are worth noting. First, WAC 222-3-110, Timber Harvesting on Islands, applies to all of San Juan County. This regulation restricts clearcut harvesting within 200 feet of a marine shoreline and limits clearcuts to a maximum of 40 acres with 200 feet between adjacent harvest units in the San Juan Islands. Many of the streams and creeks in the San Juan Islands did not meet the Forest Practice Act minimum protections based upon stream types. According to the Forest Practices division of the Washington State Department of Natural Resources, emergency rules governing Class IV and V streams are currently in effect. These rules require that all Class IV and V waters that are at least 2 feet wide between ordinary high water marks and have a gradient of less than 16 percent be treated as Class III streams.

Inspection, Surveillance, and Monitoring

Friday Harbor conducts daily water quality monitoring in the Trout Lake watershed, primarily at the raw water intakes. A complete description of the water quality monitoring program is included in Section 6; water quality results are summarized in Section 3.

Contamination Source Controls

In 1998, the County adopted Ecology's *Stormwater Management Manual for Puget Sound Basin* as part of the County's Unified Development Code. Under County regulations, all new development and redevelopment must conform with the stormwater manual. Class IV General and Conversion Option Harvest Plan (COHP) forest practices must meet the stormwater requirements of the County's Unified Development Code. "Small parcel developments" that create less than 5,000 sf of impervious surface must develop an erosion and sediment control plan or illustration, and utilize BMPs to deal with stormwater. All other regulated developments under County jurisdiction are required to prepare and submit to the County a Stormwater Site Plan that analyzes potential water quality impacts, the effectiveness of proposed BMPs, and an erosion and sediment control plan.

Additionally, the Town of Friday Harbor formed a stormwater utility in 1992 and adopted a Stormwater Management Plan in 1997. This plan, updated in 2005, describes deficiencies in the existing stormwater system, recommends system improvements, and identifies BMPs for new developments. The Town funds improvements to the stormwater system through an assessment of landowners with developed parcels.

Public Education

Friday Harbor leads the following community education programs relative to its water supply source watersheds:

- The San Juan County Extension Service implements education programs to provide information on farm and home water quality problems and management (FarmAssist, HomeAssist).
- The Stewardship Network Coalition coordinates educational and environmental groups, projects, monitoring, and data sharing.
- Town staff members conduct Water and Wastewater System Tours for local schoolchildren. Classroom presentations have been combined with tours of the Trout Lake watershed, the water treatment plant, and the wastewater treatment facility. More information on the current and future school programs can be found in the Town's 2001 Water Conservation Plan.

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- The Town Water Conservation Office provides display materials and other information and advertising at several community events throughout the year. More information on these community events can be found in the Town's 2001 Water Conservation Plan.
- The Town publishes water conservation messages and information in local newspapers and community brochures.

Watershed Control Activities

San Juan County identified the following watershed control activities in its 1997 Watershed Control Program:

- Establish sanitary control area adjacent to the AUG 1 and AUG 2 diversions. Identify other potential high-risk areas in the watersheds that can be designated as part of a sanitary control area. Establish buffer areas (from 50 to 100 feet) to protect the diversions and other vulnerable areas in the watershed.
- Establish startup procedures for the AUG 1 and AUG 2 pump stations that include water quality monitoring criteria.
- Establish communication with San Juan County to keep abreast of commercial and residential development within the watersheds.
- Contact landowners in the watershed with an informational letter identifying Town use of water resources in their area and detailing activities that could potentially affect water quality for water resources within the watershed and for Town of Friday Harbor water supplies.
- Conduct a sanitary survey of the watersheds through a combination of direct inspection and questionnaires to area landowners. Establish a map of potential sources of contamination.
- Develop a public awareness program to educate landowners about activities in the watershed that could be detrimental to the water quality.

In addition to the above activities, the County adopted a Water Resources Management Plan in 2004 that establishes goals to provide additional protection for the County's watersheds.

5.1.4 Monitoring Program

The Town of Friday Harbor monitors physical, inorganic, and organic constituents in its source water supply. Sections 3 and 6 presents more detail on the source water monitoring.

5.1.5 System Operations

The following section summarizes the operation, maintenance, and emergency provisions enacted for the Town of Friday Harbor watersheds and water supply systems. System operations are structured to help ensure that drinking water supplies are maintained consistent at all times with associated water quality regulations.

Emergency Response

The Town prepared a Trout Lake EAP in 2007 that outlines emergency response operations procedures, including triggers of watershed emergencies. The EAP also describes responsibilities of personnel during an emergency. A copy of the Trout Lake EAP is included in Appendix G.

In order for emergency response procedures to be executed effectively, coordination, cooperation, and communication among the responding agencies, organizations, and individuals is imperative. There are emergency response organizations at the local, state, and federal levels. Depending on the magnitude and type of the release, any of the following organizations may be involved in emergency response for a watershed protection area in Washington State:

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- Local fire district: Initial response to a hazardous spill will be from the local fire district. The following contacts can be used for emergency situations:
  - San Juan Island Fire District No. 3: 360-378-5334
- Washington State Patrol: The Washington State Patrol is responsible for managing spills on interstate and state highways. Response will be initiated through the local fire district.
- Washington State Department of Ecology: According to Washington State law, all hazardous material and oil spills must be reported immediately by the spiller. Two 24-hour spill notification numbers are required for reporting spills:
  - Washington Emergency Management Division: 800-258-5990
  - National Response Center: 800-424-8802
- In addition, the Ecology regional office must be notified for the county in which the spill occurred. The Northwest Regional office number is 425-649-7000.
- Washington State Department of Health: WSDOH has developed an Emergency Response Information Packet that can be downloaded from its Web site or ordered in hard copy. WSDOH also provides assistance through laboratory support and services if necessary to the cleanup effort. The WSDOH After Hours Hotline for drinking water emergencies is 877-481-4901. Other inquiries can be directed to the WSDOH's Northwest Drinking Water Operations Office: 253-395-6750.
- Washington State Department of Transportation (WSDOT): The WSDOT can provide spill response assistance through traffic control, equipment, and personnel for non-hazardous cleanup activities on state and interstate highways. The WSDOT Environmental Program Office can be reached at 360-705-7482.

5.1.6 Periodic Updates

Watershed evaluations must be conducted at least every 6 years and included in WSP updates. Since the watershed evaluation performed as part of the previous WSP, there have been no significant changes in land use patterns or conditions with the potential to adversely impact source water quality. Water quality data, as summarized in Section 3, indicate that there has not been any deterioration in the condition of the water supply.

5.2 System Improvement Needs

The Town and San Juan County will continue to work toward implementation of the watershed control activities and protection measures outlined in the San Juan County Watershed Management Action Plan and Water Resource Management Plan.

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Section 6

Operations and Maintenance Program

The purpose of an O&M program is to ensure satisfactory management of a water system's operations in accordance with the pertinent requirements of WAC 246-290 and 246-292. An O&M program provides guidance for water system personnel to identify the necessary tasks required to ensure that the system and utility asset life is maximized, utility costs are appropriately managed, and safe and reliable public water supply is maintained.

The following elements are included as part of the O&M program:

- Water system management and personnel
- Operator certification
- System operation and control
- Comprehensive monitoring plan
- Emergency response program
- Safety procedures
- Cross-connection control (CCC) program
- Customer complaint response program
- Record keeping and reporting
- O&M deficiencies and improvements

6.1 Water System Management and Personnel

Town of Friday Harbor staff manage, operate, and maintain the Town water system as a local government function under Town governance. Town governance is organized under a Town Council, composed of five elected members, and an elected Mayor, charged with executing policies set forth by the Council. The day-to-day management is the responsibility of the Water Department Leadman, supported by staff members in maintenance, clerical services, and billing. The water system organizational chart is shown in Figure 6-1. A general synopsis of the responsibilities of each staff member follows.

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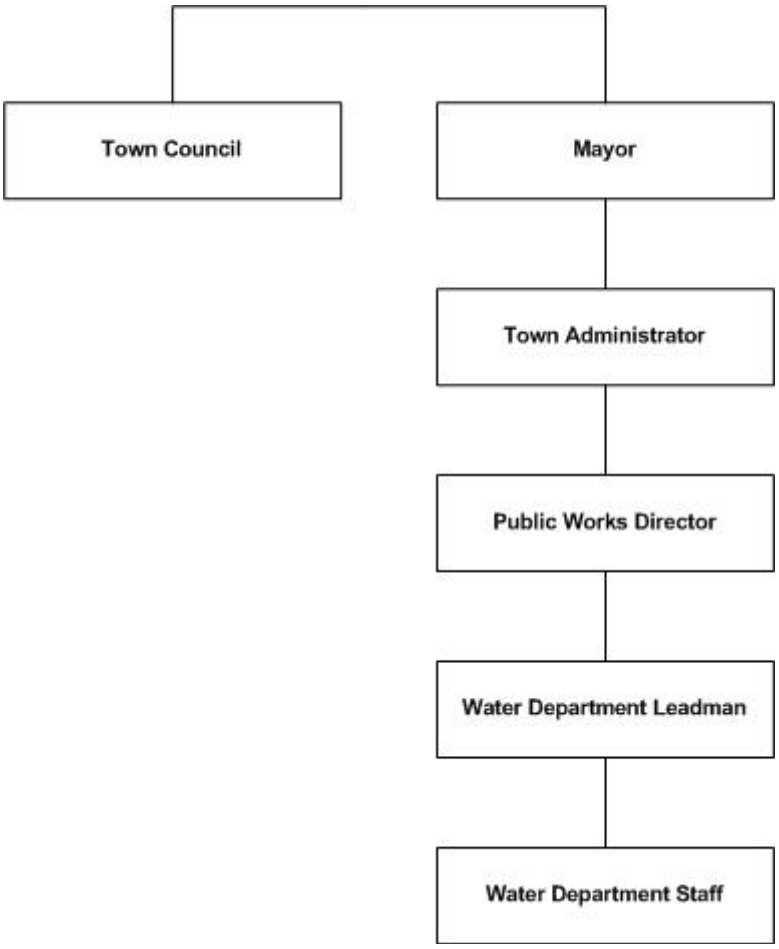

Figure 6-1. Friday Harbor water system organization chart

Town Council. The Town Council sets policy and water system rate schedules; approves ordinances; and serves as a sounding board for public response, feedback, and guidance. The Council also approves the water system budgets, sets Town-wide priorities, and provides funding and support for water system projects.

Town Administrator. The Town Administrator works with the Utility Superintendent and Mayor regarding policy development, project issues, and annual water system budget preparation, and with funding agencies to fund system improvements.

Public Works Director. The Public Works Director works directly with staff to ensure that the system is operated efficiently. The Public Works Director and Water Department Leadman work together to develop the annual operating budget. Additional responsibilities include staff oversight, plan review for new projects, and responding to customer complaints.

Water Department Staff. Water Department staff conduct the day-to-day work necessary to maintain, operate, test, analyze, and maintain the water system to ensure proper function and system longevity. The staff perform monthly meter reading for use in preparing the monthly water bills. The staff work with the Water Department Leadman to coordinate work items and to schedule necessary repair and maintenance tasks. Operations staff are responsible for managing system and WTP operations, issuing water meters for new customers, ensuring that sufficient supplies and tools are available, ordering water

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treatment chemical supplies, performing preventive maintenance operations, conducting water quality monitoring, and checking that the monthly billing information is correct.

Cross-Connection Control Specialist. The CCCS is responsible for implementing the CCC Plan. This person is responsible for testing, monitoring, repairing, and recording the necessary information pertaining to CCC, as well as preparing the annual Cross-Connection Report due to WSDOH. The CCCS also works with the building inspector to review plans to ensure that approved CCC devices are installed during construction.

6.2 Operator Certification

Waterworks Operator Certification, required under WAC 246-292, mandates that public water systems retain in their employment individuals who are certified by examination as competent in water supply operation and management. The WSDOH determines the required level and number of certified positions based upon the population and complexity of the water system. Because the Town operates a conventional water treatment plant, a certified Water Treatment Plant Operator (WTPO) and a Water Distribution Manager (WDM) are required. The Town exceeds the minimum certification requirements. Relevant professional licenses and operator certifications held by Town Staff are presented in Table 6-1.

Table 6-1. Town of Friday Harbor Water Staff Certifications

Position	Certifications and licensure
Public Works Director	Washington State Licensed Professional Engineer (Civil and Mechanical Engineering)
Water Department Leadman	WTPO 2 WDM 2 WDS CCCS
Water Treatment Plan Operator	WTPO 1
Water Treatment Plant Operator	WTPO 1 WDM 1
Water Treatment Plant Operator	WTPO 2 CCCS BAT

WTPO = Water Treatment Plant Operator
WDM = Water Distribution Manager
WDS = Water Distribution Specialist
CCCS = Cross-Connection Control Specialist
BAT = Backflow Assembly Tester

Training

In order to promote and maintain expertise for the various grades of operator certification, WSDOH requires that certified operators complete not less than three Continuing Education Units (CEUs) annually. Programs sponsored by the Washington Environmental Training Resources Center (WETRC) and the American Waterworks Association (AWWA) Pacific Northwest Subsection are the most popular sources for CEUs.

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6.3 System Operations and Control

This section of the O&M document includes the following:

- Identification of major system components
- Routine system operation
- Preventive maintenance program
- Equipment, supplies, and chemical listing

A description of the major components of the water system is presented in Section 1 and summarized in the following sections.

6.3.1 Major System Components

In this section the facilities that make up the Friday Harbor water system and the utility's normal operating procedures are reviewed. Major water system components are shown on Figure 1-4; a schematic showing normal operation of the water system is shown in Figure 6-2. Water system capacity, infrastructure, and major facilities are detailed in Sections 1 and 3 of this WSP. Planned future facilities and system improvements are described in Section 8.

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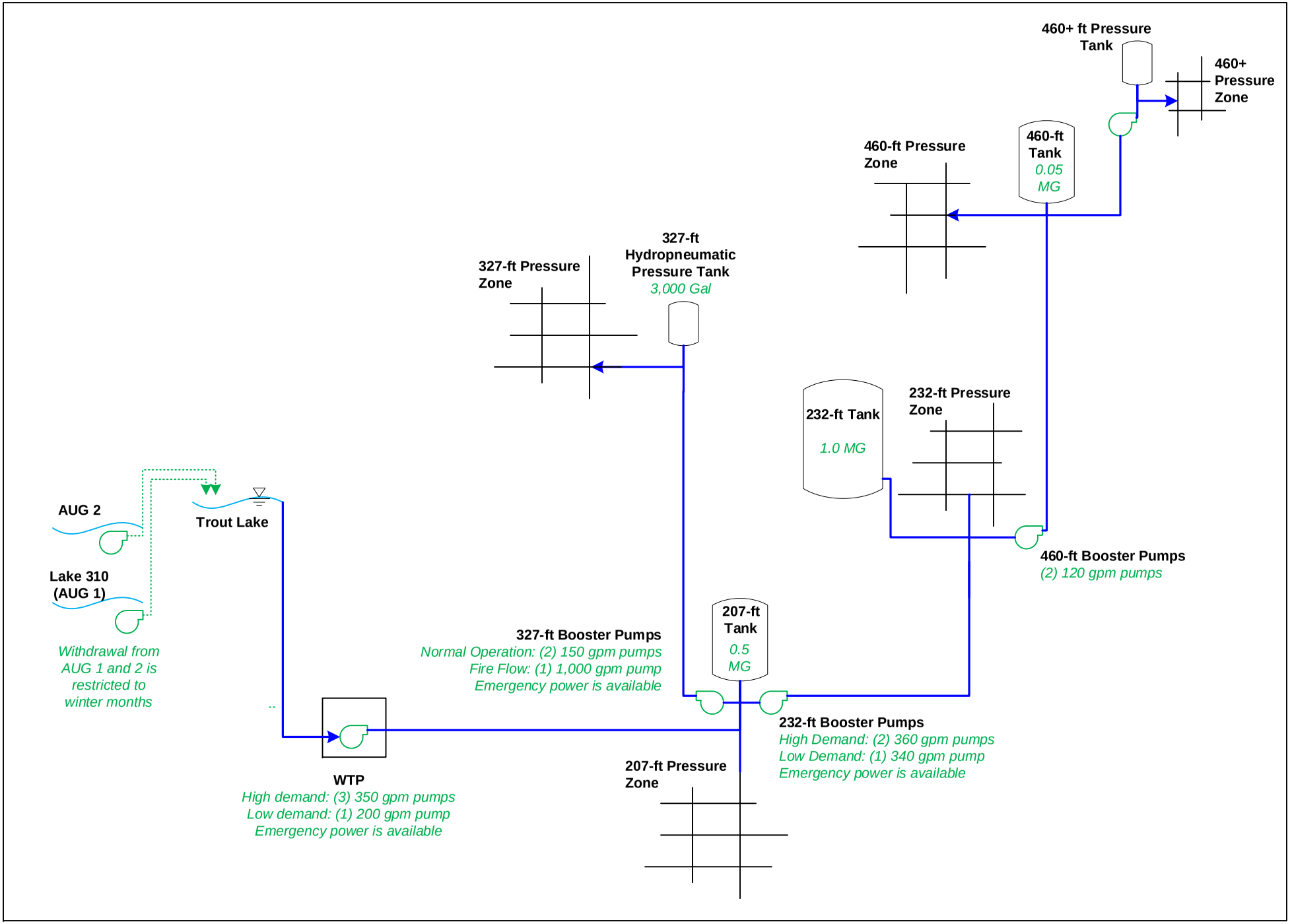

Figure 6-2. Water System Schematic

Water Supply Sources

Water supply is sourced from the Trout Lake basin and reservoir, AUG 1, and AUG 2. The sources are located about 5 miles west of the town limits.

Treatment Facilities

Raw water from Trout Lake supplies the Town water treatment plant, which is located about 1.2 miles downstream of the Trout Lake Dam. The nominal treatment capacity of the water treatment plant is currently approximately 700 gpm, limited primarily by clearwell capacity. The treatment process sequence includes package filter units, dedicated filter pumps, recently installed GAC filtration processes, a chlorine contact clearwell, and finished water pumps.

From the water treatment plant, water is pumped through a 10- and 12-inch-diameter water supply pipeline to the 0.5 MG, 207-foot tank located at Spring Street and Marguerite Place. During high system demands, three 350 gpm pumps are available at the water treatment plant to maintain water supply. During lower system demands, supply is provided via a single 200 gpm pump.

The Town operates and maintains the water treatment plant in accordance with the practices documented in the Water Treatment Plant Operations and Maintenance Manual, a copy of which is provided in Appendix L.

The water treatment plant is staffed daily for routine operations. Total staff time spent on WTP operation averages about 8 hours per day, during which process control and equipment inspection functions are performed. The following parameters are recorded daily:

- Flow rate and volume
- Temperature
- Chlorine use
- Chlorine residual
- Raw and filtered water turbidity
- GAC filter pressures and differential head loss
- pH
- Weather

In addition, ultraviolet (UV) transmittance through the GAC process is assessed every few days, finished water total organic carbon (TOC) is measured weekly, and the settleable solids concentration and pH of the backwash pond water are measured weekly. Raw water is also sampled quarterly for bacteriological analysis, and annually for inorganic analysis.

The WTP filters are automatically backwashed according to a 24- to 36-hour cycle. Each filter is removed from operation for the backwash cycle. The Town operates in a range generally consistent with the following backwash parameters, subject to operational changes and adjustments:

- Air scour (flocculators): 5 minutes
- Rinse cycle (flocculators): 5 minutes
- Filter-to-waste (flocculators): 5 minutes
- Air scour (filters): 2 minutes
- Backwash cycle (filters): 7 minutes
- Rinse cycle (filters): 32 minutes

The GAC filters may also be backwashed infrequently as necessitated by media replacement or differential head loss accumulation, but on a far less frequent basis than for the primary filters. GAC

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system backwashing and O&M protocols are detailed in the Friday Harbor GAC Adsorption System Operations Manual, a copy of which is included in Appendix M.

Improvements to chemical feed equipment and laboratory testing have recently been made at the plant. Flow-paced chemical feed pumps have been installed to appropriately meter water treatment chemicals into the process flow, and tests to assess the most effective treatment chemicals and dosages have been performed. Laboratory testing equipment includes a Hach spectrophotometer, an alkalinity test kit, and jar test apparatus.

Storage Reservoirs and Pump Stations

Water supply from the water treatment plant is pumped to the Town's 0.5 MG storage tank, which operates at a nominal HGL of 207 feet. From this pressure zone, water is pumped to either the 327-foot pressure zone or the 232-foot pressure zone.

232-Foot Pressure Zone. The majority of the Town is served from the 232-foot pressure zone. Two 360 gpm pumps and one 340 gpm pump deliver water from the 0.5 MG, 207-foot tank to the 232-foot pressure zone and its 1.0 MG tank. Some residences along the waterfront are equipped with PRVs to protect onsite plumbing from high pressures.

327-Foot Pressure Zone. Customers in the 327-foot pressure zone are served via booster pumps at the 207-foot tank and a 3,000-gallon pressure tank. This pressure zone is located on the hillside west of Marguerite Place.

460-Foot Pressure Zone. The existing 460-foot pressure zone currently serves the Hillview Terrace development and includes a 0.05 MG tank. A 6-inch-diameter supply line feeds the 460-foot pressure zone via two 120 gpm pumps drawing from the 232-foot pressure zone. A small booster pump station, pressure tank, and dedicated pipe system supplied from the main 460-foot tank serve the uppermost service elevations of Hillview Terrace above approximately 395 feet.

Distribution System

The distribution system is made up of AC, cast iron, and PVC pipelines. Pipe diameters range from 2 to 12 inches. Hydrants are generally spaced approximately 400 feet apart in the Town business areas and average about 600 feet apart in residential areas.

Standby Power Supply

Power is provided and distributed by the regional power grid. No power is produced locally. Backup power is available for the WTP finished water pumps, and the 232- and 327-foot pressure zone pump stations via dedicated standby generators. The 460-foot pressure zone pump station is not equipped with standby power capability.

SCADA System

Two programmable logic controllers (PLCs) provide supervisory control and data acquisition (SCADA) control for the Town water system. One PLC is located at the water treatment plant and provides control of treatment and supply processes, including WTP set points, chemical dosing, and filter operations. This PLC also monitors level in the 207-foot tank to provide feedback for WTP operations and finished water pumping. Adjustments to set points and filter run schedules are completed manually, but chemical dosing and filter backwashing is automated based on those set points. Alarms are configured to electronically page WTP staff based on exceedance of a variety of water quality and process parameters. The PLC can also shut down the water treatment plant if certain conditions develop.

A second PLC is located in the 327-foot pump station, and provides control for the distribution system. This PLC controls pump operation from the 207-foot tank to the 232- and 327-foot pressure zones, and also pump operation from the 232- to 460-foot pressure zone. The building housing the 327-foot pump

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station is also the water department headquarters, so the system is monitored by water department staff throughout the day. A camera records and transmits digital readouts in the pump house for remote monitoring by water department staff.

Alarm settings are configured to alert staff if any pump fails to activate when called, or if the 1,000 gpm pump to the 327-foot zone is activated, which would tend to indicate a main break or fire flow event. Tank levels are monitored, but not alarmed for low level. The water department shares a radio frequency with the fire district, and thereby has early notice of fire events.

The Town maintains a manual for the SCADA system, with a hard copy located at the water treatment plant.

6.3.2 Routine System Operation

Routine system operation is predominantly maintained via SCADA control of the water treatment plant, finished water pumping, and distribution system pumping based on system monitoring feedback and staff inputs. WTP staff are generally present at the water treatment plant during regular business hours, with additional 2-hour shifts every evening, and two shifts of 2 hours each on weekends. Water department staff monitor the 327-foot pump station operations on a similar schedule.

Staff monitor water level in the 207-foot tank as a surrogate for water system demands, and set WTP operations accordingly. Based on those manual inputs, the SCADA system operates the various WTP processes automatically, including filter runs and backwashes, and calls finished water pumps to maintain target clearwell levels.

The SCADA system monitors certain water quality parameters continuously, including turbidity and chlorine concentration.

The distribution system operates under SCADA control, and pumps are called based on tank level monitoring. Distribution system operation is monitored by water department staff, but is automated such that limited manual input is required.

Startup and Shutdown Procedures

Water Treatment Plant. Refer to the associated O&M manuals in Appendix L for information on WTP operations.

Pumps. Pumps are normally operated and controlled by the SCADA system according to predetermined set points. Prior to starting pumps under manual or automatic control, all line valves should be open. If pumps require maintenance, the electric power disconnection switch is locked out and tagged out in accordance with Washington State Department of Labor and Industries code requirements.

Standby Generators. Startup and shutdown procedures for standby generators should be completed in accordance with the manufacturer's recommendations. During maintenance activities, steps are taken to prevent the generators from starting.

Safety Procedures

Besides annual training for the purpose of maintaining required CEUs, all Town operators are required to complete a course in the following safety-related areas:

- Chlorination O&M
- Self-Contained Breathing Apparatus (SCBA)
- Trench Safety/Cave-in Protection
- Confined Space Entry
- Asbestos Pipe Handling

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- Backhoe Safety
- Safety Awareness
- Cardiopulmonary Resuscitation (CPR)/First Aid
- Defensive Driving/Vehicle Inspections
- Flagging/Work Zone Safety

Meter Reading

Source and production meters are located at key source and treatment locations. Metered WTP process flows include raw water supply, finished water output to the distribution system, and water consumed for filter backwashing. WTP filter-to-waste flows are not metered, but can be determined volumetrically using the other metered WTP flows. AUG 1 supply to Trout Lake is metered at the AUG 1 pump house, and AUG 2 is metered on the WTP site as the dedicated AUG 2 supply pipeline passes through on its way to Trout Lake).

Customer service meter readings are performed monthly by water department staff, on or near the same day of the month for consistency of billing. Handheld devices are used to enter readings by hand. A warning is triggered if the entry is outside of an expected range for a given account to help avoid erroneous readings.

System Performance Evaluation

Routine system performance is evaluated daily for parameters including:

- Finished water quality, including turbidity and chlorine residual
- Normal pump operations and performance
- Clearwell and storage tank levels within expected norms
- Customer complaints, if applicable

System performance is evaluated regularly for finished water and distribution system water quality (scheduled tests associated with comprehensive monitoring plan).System performance is evaluated annually for:

- DSL
- Main breaks and other repairs
- Annual water demands relative to water rights and Trout Lake sustainable yield

6.3.3 Preventive Maintenance

Preventive maintenance is a proactive maintenance approach that limits infrastructure and equipment failures and reduces the need for reactive repairs of system components. A preventive maintenance program is important to maximize the life span of water system components.

The Trout Lake reservoir, storage tank facilities, water main valves, fire hydrants, pump stations, and the water treatment plant are monitored on an ongoing basis. Records of maintenance or equipment are generally limited to receipts for items purchased to repair equipment, because the Town tracks only the cost of parts, not the labor needed to make repairs.

The Town has begun replacing customer service meters on an ongoing basis, at a rate of about 80–100 per year. This program will result in an average service life for customer service meters of around 15 years. Consideration is also given to usage; higher-use meters are replaced as they approach a target service life.

A recommended preventive maintenance program for the Friday Harbor water system is shown in Table 6-2.

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Table 6-2. Recommended Preventive Maintenance Program

System component	Routine maintenance	Estimated frequency
Storage	• Inspect screens, hatches, ladders, cages, safety devices, roofs and gutters, concrete and steel integrity, exterior coatings, fencing and gates	• Twice annually
	• Inspect interior coatings	• Every 5 years
Chlorination system	• Inspect for leaks	• Weekly
	• Calibrate chemical feed system	• Every 3 months
	• Overhaul chemical feed system, including cleaning and repair of all parts; replace worn out parts	• Annually
	• Inspect and chemical feed piping	• Annually
	• Inspect chemical safety equipment and repair or replace as needed	• Annually
Pump stations	• Inspect pump stations for leaks	• Weekly
	• Inspect and operate isolation valves	• Twice a year
	• Inspect fencing and gates	• Twice a year
	• Inspect, clean, and repair control panels	• Annually
	• Check running amps on pump motors (electrician to perform)	• Annually
	• Service and rebuild, as necessary, pumps and motors	• Every 20,000 hours of pump operation
Meters	• Test regularly and repair, recalibrate or replace as necessary	• 6-inch and larger: test every 2 to 5 years
		• 2-inch to 4-inch: test every 1 to 3 years
Pressure reducing valves	• Inspect for proper operation, note set points and adjust as needed, repair or replace worn or damaged parts	• Every 3 years
Altitude valves	• Inspect for proper operation, note set points and adjust as needed, repair or replace worn or damaged parts	• Every 3 years
Distribution system, valves and hydrants	• Exercise valves and replace as necessary	• 1 person can inspect approximately 35 valves/day
		• 3-person crew can replace approximately 1.5 valves/day
		• Perform ongoing valve exercising program
	• Inspect hydrants and exercise hydrant isolation valves	• 1 person can flow and check approximately 30 hydrants/day
		• Perform ongoing hydrant inspection
	• Perform distribution system flushing	• Annually
Emergency generators	• Service and check load bank on generator and service engine	• Annually, operate monthly for 30 minutes

The Town field crew completes preventive maintenance and emergency response activities, such as pipe flushing and repair of main breaks. Major system improvements or extensions are designed by consultants and constructed under contract.

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6.3.4 Equipment, Supplies, and Chemical Listing

The material safety data sheets (MSDS) for the chemicals stored at the water system facilities are included in Appendix N. Chemicals that are necessary to ensure continuous operation of the water system include:

- Chlorine gas: 150 lb cylinders, up to 20 cylinders on hand
- Potassium permanganate: up to 2,000 lb
- Two polymers:
  - Sumaclear 801B: up to 15 55-gallon barrels (liquid)
  - Sumaclear P10: up to six 55-gallon barrels (liquid)
- Soda ash for pH adjustment: up to 5,000 lb
- Bleach and dry chlorine for field disinfection: small amounts
- De-chlorination tablets: small amounts

A supply of spare parts is kept on hand for routine maintenance and emergency repair. This includes an inventory of pipes, valves, fittings, and repair couplings for every pipe material and diameter used in the system.

Individual equipment manuals and operations documents are kept near associated equipment.

6.4 Comprehensive Monitoring Plan

Water quality sampling requirements are primarily established by federal rule, adopted by the state, and enforced by WSDOH. WSDOH requires water system purveyors to collect, transport, and submit water quality monitoring samples for analysis according to department-approved methods as detailed in WAC 246-290-300.

Water quality monitoring activities conducted by the Town are identified in two documents: the Water Quality Monitoring Report issued annually for the Town by WSDOH, and the Town Coliform Monitoring Plan, both included in Appendix I. The monitoring activities identified in those documents are summarized in Table 6-3, including sampling locations and frequency. Specific sampling requirements and water quality testing history is provided in Section 3.

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Table 6-3. Town of Friday Harbor Current and Future Monitoring Program			
Type of sample	Sample location	Frequency	Sample schedule
Asbestos	Distribution system	Every 9 years	Next sample in 2018
Bacteriological	Coliform monitoring occurs at representative points throughout distribution system. See Coliform Monitoring Plan in Appendix I.	50 fecal coliform samples required annually in 2012; see Water Quality Monitoring Report in Appendix I.	Coliform monitoring schedule varies monthly; see Water Quality Monitoring Report in Appendix I.
Inorganic contaminants	Source, after treatment, and prior to entry into the distribution system	Annually	Annually
Lead/ Copper	Targeted sample tap locations	Every 3 years	Next sample in 2013
Nitrate/ Nitrite	Source, after treatment, and prior to entry into the distribution system	Annually (part of IOC)	Annually
Turbidity	Before entry point to distribution system	Daily	Daily
Disinfection By-Products	Selected locations in the distribution system. See map in Appendix I.	Quarterly	Quarterly
Radionuclides	Source	Two samples every 3 years	Next sample in 2012
Volatile Organic Contaminants	Source, after treatment, and prior to entry into the distribution system	Annually	Annually
Synthetic Organic Contaminants (pesticides, herbicides)	Source, after treatment, and prior to entry into the distribution system	Every 3 years	Next sample in 2012

6.4.1 Coliform Monitoring

The Friday Harbor Coliform Monitoring Program is included in Appendix I. The number of samples required to represent a distribution system depends on the number of service connections the system supports. For 2012, the number of required samples per month varies to accommodate the transient population associated with increased tourism in the summer. The number of required samples fluctuates from three in the winter months to five during peak visitor months. Samples are taken from 12 site group locations throughout the distribution system. Sampling locations are alternated throughout the year.

6.4.2 Future Monitoring Requirements

Anticipated future monitoring requirements are summarized in Section 3.

6.5 Emergency Response Program

Emergency planning provides an opportunity for utilities to identify and prioritize procedures to be used in the event of an emergency. Emergency situations may include major water supply line breaks, earthquakes, droughts, or damage to key facilities.

The Town has an existing Water Shortage Response Plan (1988) and Trout Lake EAP (2007) that include additional information on emergency response planning for the water system.

6.5.1 Water System Personnel Emergency Call-up List and Notification Procedures

Emergency contact to Friday Harbor utilities staff is maintained through the San Juan County Sherriff Department dispatch center when utilities offices are closed. At least one Town utility staff employee remains in pager contact during off hours. Table 6-4 provides numbers for reporting an emergency to the Town.

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Table 6-4. Emergency Telephone Numbers	
Town Water Department	360-378-8353
Town Maintenance Shop	360-378-2154
Sheriff Department	911 or 360-378-4151
Fire District	911 or 360-378-5334

In the event of a water system emergency, the extent of public notification required is determined by the Town Administrator, consistent with applicable regulations. The Town Administrator will immediately notify WSDOH at 253-395-6750 in the event that water shutdown is threatened or required for more than 24 hours, water quality is determined to be unacceptable, or the public health is threatened. Public notifications related to acute public-health concerns and issues with potential to have adverse effects on human health are to be made consistent with WAC 246-290-71001 and 40 CFR 141.201 through 208, to include appropriate consultation with WSDOH.

Communications and public notices about the water system can be made public via the following means as appropriate to each specific situation:

- San Juan County Department of Emergency Management (DEM) systems:
  - Emergency alert system: An automated system that can deliver geographically targeted emergency notifications by e-mail, text message, and telephone to County residents.
  - Media call list: Notifies area radio stations, Web site, and print newspapers.
  - Web presence: DEM has its own Web site and is member of MyStateUSA.com. Both of these Web sites display emergency notifications.
- Town of Friday Harbor Web site
- Local cable TV (Channel 21)
- Door-to-door and in-person communication by Town staff and/or emergency responders (police/fire)
- Door hangers and posted notices

For internal utility and emergency communications purposes, telephones are located in all key water system facility locations and connected through the regular public system. Hand-held radios enable personnel to communicate when in the field. The radio base stations are located in the Town Hall building at 60 2nd Street and in the public works shop building located at 425 Marguerite Place; mobile units are provided in each utility truck and with key personnel.

Table 6-5 summarizes the key Town personnel responsible for dealing with water system emergencies, their contact information, and their specific areas of responsibility during emergencies.

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Table 6-5. Town of Friday Harbor Staff Responsibilities During an Emergency		
Staff	**Key responsibilities**	**Contact information**
Mayor	• Keep public informed	
Town Administrator	• Public information • Oversee operations	Office: 360-378-2390
Utility Superintendent	• Assess emergency • Direct warnings to users • Assess facility integrity • Contact utility crews • Establish control actions • Prioritize emergency operations • Direct documentation operations • Maintain contact with Town Administrator	Office: 360-378-2154 Mobile: 360-317-8162
Lead Water Supervisor	• Assemble utility crew • Assess equipment and supplies • Assess system issues/damage • Establish repair/corrective procedures • Execute repairs/corrections • Maintain contact with Utility Superintendent	Office: 360-378-8353 Mobile: 360-472-1229
Office Staff	• Contact County and other agencies • Answer calls • Maintain radio contact with crew	Town Water Department: 360-378-8353 Public Works Department: 360-378-2154
Sheriff	• Emergencies • Traffic control	911 360-378-4151
Fire Chief	• Fire control	911 or 360-378-4183

6.5.2 Vulnerability Analysis and Service Reliability

Vulnerability analysis consists of four components, summarized below:

- Identification of critical water system components.
- Disaster characterization and potential impact evaluation.
- Definition of system expectations and performance goals for system components.
- Identification of improvements and mitigations that lessen the potential impacts.

These components are summarized in the following sections.

Critical Components

The critical components of the Friday Harbor water system include the Trout Lake Dam, the water treatment plant, and the 5.3 miles of water supply pipeline between the Trout Lake supply and the Town.

Disaster Characterization and Corrective Measures

A general review of the local and regional situation suggests that the following types of disasters merit consideration:

Earthquake. The Puget Sound region is considered "~Zone 3 - Major Damage" among U.S. Seismic Risk Zones. This is characterized by potential intensity of 8 and higher on the Modified Mercalli Scale.

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Intensity 8 on the Modified Mercalli Scale is approximately equal to intensity 6 on the Richter Scale. The effects of an earthquake of this intensity would include considerable damage and partial collapse of some buildings, displacement from foundations, ground cracks, and underground pipe damage. Likely impacts of a major earthquake on the Town water system are outlined in Table 6-6.

Table 6-6. Impacts Related to Earthquakes

Components	Impact			Type	Corrective measures
	None	Partial	Total		
Source		✓		Structural damage	Assess and coordinate repairs and emergency response measures and/or operational revisions.
Transmission			✓	Pipe breaks, storage loss, pump loss	Isolate pipe breaks. Shift operation to alternative pumps.
Treatment		✓		Plant damage	Disinfect stored water as needed.
Distribution			✓	Pipe breaks	Isolate breaks.
Personnel		✓		Injury	Call on other water systems for assistance.
Power		✓		Loss of power	Distribute stored water as needed.
Material and supplies	✓				
Communications	✓			Possible communications outages	Coordinate with Town staff and local emergency responders.

Drought. Refer to the Town's Water Shortage Response Plan, which includes ordinance language outlining triggers and actions for drought response activities.

Major Water Main Break within the System. A large break in a main supply line could interrupt water service and cause water shortages in other areas on the system. Potential water system impacts are summarized in Table 6-7.

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Table 6-7. Impacts Related to Water Main Break					
Components	Impact			Type	Corrective measures
	None	Partial	Total		
Source	✓				
Transmission		✓		Damage to water main, low pressure, flooding	Isolate, repair, and disinfect, assess flooding damage.
Treatment	✓				
Distribution		✓		Damage to water main, low pressure, flooding	Isolate, repair, and disinfect, assess flooding damage.
Personnel		✓		Personnel call-out	Document cause of break.
Power	✓				
Material and supplies		✓		Use of material inventory	Replenish materials inventory as needed.
Communications		✓		Coordination with Town staff and possibly police and fire district.	

Damage to Storage Reservoirs. Damage to reservoirs would require the system to function as it did prior to construction of the reservoirs. If reservoir damage occurred during peak usage times (June through August), customer peak demand charges could be imposed to control demand and encourage conservation. Impacts related to storage tank damage are summarized in Table 6-8.

Table 6-8. Impacts Related to Storage Tanks					
Components	Impact			Type	Corrective measures
	None	Partial	Total		
Source	✓				• Isolate damaged tank • Operate pumps manually as required • Repair damaged tank • Utilize other storage facilities until damaged tank can be brought back online
Transmission		✓		Damage to tank, low pressure, flooding	
Treatment	✓				
Distribution		✓		Supplied by pumping and other reservoirs	
Personnel		✓		May require additional personnel and time	
Power	✓				
Material and supplies	✓				
Communications		✓		Coordination with Town staff and possibly police and fire district	

Water Requirements and System Capacity. Demand on the water treatment plant during a disaster could be high until damaged mains or facilities could be isolated. Firefighting demands could also be very high. System capacity could be impaired for an extended period while repairs are completed. Isolating reservoirs could be an important consideration, so as not to deplete remaining stored volumes.

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6.5.3 Contingency Operational Plan

A contingency plan is a backup plan for operating the system when normal operations are not possible. The following sections outline general contingency operations for key water infrastructure.

Source of Supply

Emergency conditions at Trout Lake, along the water pipelines that supply the water treatment plant and the Town, or at the water treatment plant itself could impair water supply to the Town distribution system. Conditions could include source contamination, dam failure, pipeline failure, or damage or process failure at the water treatment plant.

There are no neighboring water systems that would be feasible emergency intertie partners, and as stated in Section 1, groundwater on the island is limited. The Town does not have any groundwater wells, and due to the limited available groundwater on the island, the Town does not have plans to construct any wells or other emergency sources. In the event of a water shortage, the measures identified in the Water Shortage Response Plan would be initiated. Available water would be distributed according to the following priorities:

- Firefighting (life-threatening)
- Drinking
- Firefighting (property threatening)
- Sanitary
- Industrial
- Commercial
- When used for drinking, the water quality should meet minimum state standards.

Pump Stations

Pump stations provide water supply from the 207-foot tank to the higher-elevation 232-, 327-, and 460-foot pressure zones. Damage or failure of storage facilities, tank level sensors, or system SCADA controls could impair the automated operation of pumps. In this scenario, pumps may need to be operated manually by water department staff in order to maintain water supply to the affected zone or zones.

Pump stations supplying the 232- and 327-foot zones are equipped with backup power generators. In the event of extended loss of power to the 460-zone pump station, 460-foot zone customers may need to be directed to ration water to conserve available supplies in the 460-foot tank until power can be restored.

Storage Facilities

Damage or loss of function at any of the Town water storage tanks would impair operation of the water system. Loss of the 207-foot tank would require careful coordination of pumping between the finished water pumps at the water treatment plant and the pumps serving both the 232- and 327-foot zones, to maintain water supply to those zones. Loss of the 232-foot tank would require careful manual control of pumps feeding the 232-foot zone to maintain distribution system pressures. Loss of the 460-foot zone tank would require careful manual control of pumps feeding the 460-foot zone to maintain distribution system pressures.

Distribution System

If a main break or other impairment of the distribution system creates a hazardous situation or otherwise requires repair, the area will need to be isolated as quickly as possible so that repairs can be made.

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6.6 Safety Procedures

Worker safety is the responsibility of all water system employees, and the best way to prevent injuries is to provide the necessary training for workers to identify and respond to dangerous situations. Areas of concern for water system employees include:

- Chlorine gas hazards
- Trench excavation
- Electrical hazards
- AC pipe work and repair hazards
- Pressured pipeline dangers
- Confined-space entry
- Chemical danger
- Traffic control procedures
- Animal control methods and procedures

Training that water system personnel receive related to safety is summarized in previous sections. Safety procedures related to chemical handling are summarized in the Water Treatment Plant Operations and Maintenance Manual, in Appendix L.

6.7 Cross-Connection Control Program

The Cross-Connection Control Program seeks to prevent possible contamination of the water supply resulting from backflow into the system. An ordinance was adopted in 1995 and a written program was developed in 1996. Copies of the Town's cross-connection program and ordinance are in Appendix H.

The Town provides water service primarily to single-family homes in a semi-urban and rural setting. Other consumers include restaurants, business offices, and schools. These types of users pose a low potential risk of contamination of the water system. Owners of buildings using sprinkler systems for fire protection are required to install and maintain at their own expense approved backflow prevention devices. The type of device required can be found in the latest edition of the Cross-Connection Control Manual, Accepted Procedure and Practice, published by the Cross-Connection Control Committee, Pacific Northwest Section, AWWA.

New installations are reviewed for compliance and proper functioning of backflow prevention devices. Inspections of existing backflow prevention devices are prioritized according to an evaluation of potential health risks, with higher priorities for schools and other sensitive facilities. Periodic surveillance inspections of premises served check for potential cross-connection risks. If any are found corrections are ordered, or, in the case of immediate hazard, service is discontinued.

Members of the field staff have been trained and certified as cross-connection specialists.

6.8 Customer Complaint Response Program

The Town maintains a public phone number for customer service: 360-378-2810. Customer calls may include reporting of water main breaks or leaks, low service pressure, or water quality issues. The Town responds immediately to resolve customer complaints. Written complaints are kept on file in accordance with state records retention laws. Work orders are issued to correct major system deficiencies.

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6.9 Record Keeping and Reporting

Table 6-9 summarizes the operations and water quality test records the Town is required to retain, and the time periods for which the records must be kept in accordance with WAC 246-290-480.

Table 6-9. Town of Friday Harbor Record Keeping Requirements

Report	Record keeping
Bacteriological analysis	5 years (minimum)
Turbidity analysis	5 years (minimum)
Chemical analysis	Duration of operation
Other operations and analyses	3 years (minimum)
Corrective actions	3 years
Reports, sanitary surveys, and communication with local, state, and federal authorities	10 years
Project reports, construction documents, and inspections	Duration of operation
Chlorine residuals, fluoride levels	3 years
WTP chemicals used, volume of water tracked, turbidity, etc.	3 years

6.10 System Improvement Needs

No major improvement needs were identified during the analysis of the Town's O&M program.

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Section 7

Distribution Facilities Design and Construction Standards

The objective of this section is to describe the water system distribution facilities design and construction standards that enable the Town to utilize an alternative approval process and implement certain improvements and repairs to the water system without having to first solicit formal review and approval from WSDOH. With advanced approval of design and construction standards along with an approved WSP, the Town does not need to obtain written WSDOH approval of individual project reports and construction documents for projects relating to distribution mains and other distribution-related facilities. The Town must still comply with all applicable sections of the regulations, including project report and construction document requirements listed under WAC 246-290, whether or not documents are submitted to WSDOH for approval. The Town verifies the applicability of this submittal exception process for each project.

Distribution-related projects eligible under the alternative approval process include storage tanks and reservoirs, booster pump facilities, transmission mains, distribution mains, pipe linings, and tank coatings. Sources of supply and water quality treatment projects are not eligible under this alternative review process. Such projects must be submitted to WSDOH for review and approval prior to construction. Source-of-supply projects refer to all work involving the development of a new source or redevelopment of an existing source at the wellhead, interties, and/or any project that would result in source capacity changes.

Town design and construction standards are consistent with WSDOH design guidance, generally accepted engineering practices and principles, and WAC 246-290.

7.1 Project Review Procedures

The Town has developed standards and requirements pertaining to water line projects. These standards are utilized in the Town's project review process. During the review process, the Town Engineer, the Town Administrator, or a consulting engineer appointed by the Town typically will review the plans of the proposed project to verify that the project plans and specifications are consistent with the Town's construction and development standards as well as this WSP. The Town's development and construction standards for its water system are defined in the Town of Friday Harbor's WSDOH-approved Developer's Extension Agreement, included in Appendix E. FHMC Chapter 13.08 adopts these specifications.

The Developer's Extension Agreement and Friday Harbor Municipal Code include the process by which a new service is requested and provided.

7.2 Policies and Requirements for Outside Parties

The Town has established policies and requirements for development/extension of the water system by outside parties, such as developers. Outside parties making alterations to the system are required to comply with the policies and requirements included in this WSP and the following documents:

- Town's Developer Extension Agreement
- Town of Friday Harbor Ordinances: Chapter 13, Public Services

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The above policies include various requirements for system performance and development standards including but not limited to rights-of-way, looping requirements, minimum fire flow requirements, Coordinated Water System Plans, and level-of-service standards according to the GMA.

7.3 Design Standards

The water system levels of service and sizing criteria identified in Table 3-1 are intended to maintain a system performance in accordance with WAC 246-290 and the WSDOH Group A Public Water Systems Waterworks Standards. The following hydraulic and sizing criteria apply to developers proposing to extend the Town's water system:

- Maintain 30 psi minimum pressure throughout the distribution system during PHD conditions
- Maintain 20 psi minimum pressure throughout the distribution system during fire flow under MDD conditions
- Limit pipe velocities to approximately 8 fps
- Limit main pressures in the distribution system to 100 psi
- The minimum line size is 8 inches for dead-end lines and 6 inches for looped lines

It is the responsibility of the prospective developer to perform water system modeling necessary to show that these criteria are met. The Town maintains a model of the existing water system to serve as the basis for this modeling. Water line sizes for projects within the existing system will be determined on a case-by-case basis relative to the above requirements.

7.4 Construction Standards

The Town's Developer Extension Agreement (Appendix E) specifically addresses the accepted materials and construction methods for water system improvements and repairs. This includes equipment and material for the following components:

- Piping
- Fittings, valves, couplings, and hydrants
- Bedding and backfill
- Water line sterilization and flushing

7.5 Construction Certification and Follow-Up Procedures

The Town ensures that water system distribution projects are constructed in accordance with the water utility's construction standards by inspecting the construction, observing testing, and collecting bacteriological test results. As described in the Town's Developer Extension Agreement, prior to installing a meter on a new water line or service, the extension must pass pressure and bacteriological tests, as-built records must be submitted, and the Town must complete a final inspection. Projects in public rights-of-way are conveyed to the Town upon completion.

A WSDOH Construction Completion Report for Public Water System Projects is completed at the end of each water system project involving construction of source or treatment system improvements, booster pumps, reservoirs, transmission mains, distribution-related improvements, or the coating of water system tanks, and is submitted to WSDOH along with as-built construction records consistent with WAC 246-290-120. The maps of the existing system included in this document have been updated to reflect recent changes. In the future these maps will be updated periodically as water system projects and developer extensions are completed.

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Section 8

Improvement Program

The following sections outline a proposed CIP for the Friday Harbor water system. Improvements are proposed consistent with issues and deficiencies identified in the preceding sections, and scheduled according to priority for the water system. Planning-level cost estimates are presented for each proposed improvement and projects are schedule through the planning period to distribute costs impacts such that they can be effectively managed.

8.1 System Improvements

The following sections outline system improvements identified in previous sections. In all cases, time frames are identified based on water demand projections developed for this WSP. Actual water demand growth may come more rapidly or slowly than projected. The Town should track future growth in water demands relative to the capacity thresholds identified previously for each major water system component, and evaluate options to increase capacity accordingly.

8.1.1 Water Supply Sources

Current approved sources have a sustainable annual yield that is adequate to supply projected ADDs until 2029. If water system demand growth develops consistent with WSP projections, the Town should begin to explore potential source-of-supply modifications at the Trout Lake reservoir or alternative water supply development no later than 2025. Options to expand the Town source of supply could include:

- Modifications to Trout Lake Dam to increase storage capacity and annual sustainable yield from the Trout Lake water supply. A 1994 KCM report indicated that a 7-foot increase in dam elevation was feasible.
- Development of alternative sources of water supply. Alternative sources could include new surface water or groundwater sources, which could require new water rights and/or source and treatment facilities, or seawater sources requiring advanced desalination treatment.

Time frame: Begin exploring by 2025, projected to reach capacity in 2029.

Proposed source improvements are summarized as follows:

- Source – 1: Evaluate modifications to the Trout Lake Dam or alternative sources of supply to increase the available sustainable annual water supply yield available to the Town.

8.1.2 Water Treatment

The Town water treatment plant is projected to reach its rated capacity in 2027 and associated equipment and systems are aging. The limiting elements in terms of treatment system capacity are the chlorine contact clearwell and finished water pumping capacity. Beginning no later than 2023, the Town should explore modifications and upgrades to the water treatment plant to refresh/replace aging equipment as appropriate and expand capacity to meet future water demands. Alternatively, development of an alternative water supply as described above could avoid the need for WTP capacity upgrades.

The WTP currently uses a chlorine gas disinfection system. Requirements for secure transportation of chlorine gas cylinders to the island are growing increasingly complex and challenging, and the Town

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wishes to explore alternative chlorine disinfection approaches, as have been similarly implemented recently at the Town wastewater treatment facilities.

Time frame: Begin exploring WTP capacity and equipment renewal/replacement needs by 2023; the WTP is projected to reach capacity in 2027. Evaluate options to replace the chlorine gas disinfection system with an alternate chlorine disinfectant immediately.

Proposed treatment improvements are summarized as follows:

- Treatment – 1: Evaluate the condition, maintenance, and remaining useful life of water treatment plant equipment. Evaluate modifications and upgrades to the existing Town water treatment plant to refresh/replace equipment as appropriate and increase treatment capacity. The chlorine contact clearwell and finished water pumping are the most capacity-limited processes, although other processes could also be targeted for capacity enhancement as part of WTP upgrades. WTP capacity upgrades are conditional on future capacity needs and evaluations of source-of-supply alternatives, and may not be required if alternative sources of supply are developed or if system and demand growth is not realized to the extent currently envisioned.
- Treatment – 2: Explore alternative chlorine disinfection approaches for the WTP to replace the existing chlorine gas based disinfection system.

8.1.3 Water Storage

Overall Town water storage capacity is generally sufficient to meet projected needs during the 20-year planning period. A zone-specific storage deficiency has been identified for the 460-foot zone. Consistent with the findings of previous studies, additional storage should be constructed in the 460-foot zone in the immediate future.

Time frame: Begin exploring improvements during the 6-year planning period; 460-foot zone storage capacity is already deficient.

Proposed storage improvements are summarized as follows:

- Storage – 1: Construct a new 460-foot zone storage tank adjacent to the existing tank with a 70,000-gallon recommended capacity. Alternatively, construct a new 125,000-gallon replacement tank.

8.1.4 Water Transmission

The Town water system has sufficient transmission pumping capacity to meet projected water demands throughout the 20-year planning period. The 207- to 232-foot zone pump station is projected to reach capacity in 2032. Beginning in 2029, the Town may need to explore capacity upgrades to that pump station, noting that alternative approaches to solving projected water source and water treatment deficits could avert the need for a transmission capacity upgrade. Additionally, the water supply pipeline improvements described in subsequent sections may also mitigate this projected deficiency by altering the nature of connections between tanks and pressure zones in the vicinity of the 207-foot tank, such that the 232-foot pressure zone would receive direct hydraulic supply and would no longer depend on the 207- to 232-foot pump station for supply.

Because of the time frame for this potential deficiency, and because other considerations may mitigate it in the meantime, no specific actions related to the deficiency are proposed.

8.1.5 Water Supply Pipelines

To reduce the risks of failure for the existing water supply pipelines and address level-of-service considerations for customers with service connections along the water supply pipeline alignment, the

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Town has assessed alternatives for pipeline replacement, selected preferred alternatives, and developed a preliminary design for improvements.

Time frame: Construction in 2015–17, subject to funding availability.

Proposed water supply pipeline improvements are summarized as follows:

- Water Supply Pipeline – 1: Design and construct water supply line improvements from the water treatment plant to the Town 0.5 MG storage tank. Includes approximately 19,500 LF of 12-inch-diameter DI water main and related appurtenances. Implement service adjustments to ensure that adequate chlorine disinfection levels are maintained for customers along the finished water pipeline alignment. Construct new PRV, pressure-sustaining valve, and altitude valve stations and associated piping to interconnect the new water supply pipeline to the existing 232- and 327-foot zones and 207-foot tank, and to establish a new 240-foot plus pressure zone along the water supply pipeline.
- Water Supply Pipeline – 2: Design and construct water supply line improvements from Trout Lake Dam to the water treatment plant. Includes approximately 4,800 LF of 12-inch-diameter HDPE water main, 200 LF of 12-inch-diameter DI water main, and related appurtenances. Includes environmental mitigation related to wetlands.

8.1.6 Water Distribution

System hydraulic modeling suggests that some areas of the Town water distribution system could be deficient in their ability to maintain 30 psi minimum service pressures under PHD conditions and 20 psi minimum service pressures under MDD plus fire flow conditions. Improvements include construction of piping and PRV improvements to improve distribution system capacity in two areas: the north end of the 232-foot zone, and the vicinity of the airport and Skagit Valley College. Some areas of the distribution system also experience higher than optimal pressures, as summarized in Section 3. To the extent that funding allows, the Town will also endeavor to identify and implement improvements to manage, mitigate, and reduce high system pressure areas.

Time frame: Begin exploring improvements during 6-year planning period; areas noted are currently deficient.

Proposed distribution improvements are summarized as follows:

- Distribution – 1: Design and construct piping improvements in the vicinity of the airport and Skagit Valley College to improve fire flow performance. Includes approximately 1,800 LF of 12-inch-diameter DI water main and related appurtenances.
- Distribution – 2: Design and construct piping improvements running from a new PRV (see Distribution – 3) south along Terrace Drive to Roche Harbor Road, along Roche Harbor Road to University Road, and north along University Road along the frontage of the proposed Finnegan Ridge and Friday Cove developments. Includes approximately 3,700 LF of 8-inch-diameter DI water main and related appurtenances.
- Distribution – 3: Design and construct a new PRV at the intersection of Terrace Drive and University/Tuesday Way set to maintain a 327-foot downstream HGL and fed from the existing 6-inch-diameter mains along Terrace Drive and University/Tuesday Way.
- Additional distribution improvements have been identified by the Town to address areas with aging water mains that have experienced an increasing frequency of main breaks.

Time frame: Begin exploring improvements early in 6-year planning period.

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Proposed distribution improvements are summarized as follows:

- Distribution – 4: Design and construct piping improvements on Marguerite Place from Guard Street to Park Street, and on Park Street from Marguerite Place to Price Street. Replace approximately 1,250 LF of 4-inch-diameter AC water main with 8-inch-diameter DI water main.
- Distribution – 5: Design and construct piping improvements on Spring Street from Front Street to 1st Street, and from 2nd Street to Argyle Avenue. Approximately 530 LF of 8-inch-diameter DI water main.
- Distribution – 6: Design and construct piping improvements on Pear Point Road from Argyle Avenue to Jackson Beach Road. Replace approximately 2,400 LF of parallel 4- and 6-inch-diameter water mains with 8-inch-diameter DI water main.
- Distribution – 7: Design and construct piping improvements on Harrison Street from Spring Street to Warbass Way. Replace approximately 2,600 LF of 4- and 6-inch-diameter water mains with 8-inch-diameter DI water main.

8.1.7 Water Use Efficiency

No WUE improvement needs have been identified.

8.1.8 Water Rights

No water rights improvement needs have been identified.

8.1.9 System Reliability

No system reliability improvement needs have been identified.

8.1.10 Operations and Maintenance

No O&M improvement needs have been identified.

8.1.11 Water System Management

WSDOH requires a WSP update to be completed every 6 years, counted from the approval date of the previous WSP. Approval of this WSP will likely take place in 2013; subsequent WSP updates would be scheduled for 2019, 2025, and 2031, and are noted in the CIP. In addition to a continued focus on potential future source-of-supply and treatment process needs, the 2019 WSP should likely include significant focus on distribution pressure management, and seek to identify and implement improvements to reduce and eliminate system high- and low-pressure areas to the extent practical.

Proposed water system management improvements are summarized as follows:

- Management – 1: Complete Water System Plan updates on a 6-year rolling schedule (2019, 2025, 2031).

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8.1.12 Summary

Table 8-1 summarizes proposed capital improvement projects as detailed in the preceding sections.

Table 8-1. Proposed Capital Improvement Projects

Improvement	Description
Source – 1	Evaluate modifications to the Trout Lake Dam or alternative sources of supply to increase the available sustainable annual water supply yield available to the Town.
Treatment – 1	Evaluate the condition, maintenance, and remaining useful life of water treatment plant equipment. Evaluate modifications and upgrades to the existing Town WTP to refresh/replace equipment as appropriate and increase treatment capacity. The chlorine contact clearwell and finished water pumping are the most capacity-limited processes, although other processes could also be targeted for capacity enhancement as part of WTP upgrades. WTP capacity upgrades are conditional on future capacity needs and evaluations of source-of-supply alternatives, and may not be required if alternative sources of supply are developed or if system and demand growth is not realized to the extent currently envisioned.
Treatment – 2	Explore alternative chlorine disinfection approaches for the WTP to replace the existing chlorine gas based disinfection system.
Storage – 1	Construct a new 460 zone storage tank adjacent to the existing tank with a 70,000-gallon recommended capacity. Alternatively, construct a new 125,000-gallon replacement tank.
Water Supply Pipeline – 1	Design and construct water supply line improvements from the WTP to the Town 0.5 MG storage tank. Includes approximately 19,500 LF of 12" DI water main and related appurtenances. Implement service adjustments to ensure that adequate chlorine disinfection levels are maintained for customers along the finished water pipeline alignment. Construct new PRV, pressure-sustaining valve, and altitude valve stations and associated piping to interconnect the new water supply pipeline to the existing 232- and 327-foot zones and 207-foot tank, and to establish a new 240-foot plus pressure zone along the water supply pipeline.
Water Supply Pipeline – 2	Design and construct water supply line improvements from Trout Lake Dam to the WTP. Includes approximately 4,800 LF of 12" HDPE water main, 200 LF of 12" DI water main and related appurtenances. Includes environmental mitigation related to wetlands.
Distribution – 1	Design and construct piping improvements in vicinity of the airport and Skagit Valley College to improve fire flow performance. Includes approximately 1,800 LF of 12" DI water main and related appurtenances.
Distribution – 2	Design and construct piping improvements running from a new PRV (see Distribution – 3) south along Terrace Drive to Roche Harbor Road, along Roche Harbor Road to University Road, and north along University Road along the frontage of the proposed Finnegan Ridge and Friday Cove developments. Includes approximately 3,700 LF of 8" DI water main and related appurtenances.
Distribution – 3	Design and construct a new PRV at the intersection of Terrace Drive and University/Tuesday Way set to maintain a 327-foot downstream HGL and fed from the existing 6" mains along Terrace Drive and University/Tuesday Way.
Distribution – 4	Design and construct piping improvements on Marguerite Place from Guard Street to Park Street, and on Park Street from Marguerite Place to Price Street. Replace approximately 1,250 LF of 4" AC water main with 8" DI water main.
Distribution – 5	Design and construct pipe replacement improvements on Spring Street from Front Street to 1st Street, and from 2nd Street to Argyle Avenue. Approximately 530 LF of 8" DI water main.
Distribution – 6	Design and construct piping improvements on Pear Point Road from Argyle Avenue to Jackson Beach Road. Replace approximately 2,400 LF of parallel 4" and 6" water mains with 8" DI water main.
Distribution – 7	Design and construct piping improvements on Harrison Street from Spring Street to Warbass Way. Replace approximately 2,600 LF of 4" and 6" water mains with 8" DI water main.
Management – 1	Complete Water System Plan updates on a 6-year rolling schedule (2019, 2025, 2031).

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8.2 Cost Estimates and Schedule

Table 8-2 summarizes proposed schedule and estimated costs for proposed capital improvement projects. For project planning and funding estimate purposes, contingency levels for capital construction cost allowances are estimated at 30 percent of the total estimated capital construction costs. Costs for project administration, planning, design and engineering, construction management, and permitting, as appropriate, are estimated at 30 percent of the total estimated capital construction costs including contingency allowance.

Items that do not include construction elements do not include these markups. Estimates are in October 2012 dollars.

Table 8-2. Schedule and Cost Estimates for Proposed Capital Improvement Projects

Improvement	Cost[a]	2013	2014	2015	2016	2017	2018	2019–22[b]	2023–32[b]
Source – 1	$150,000								$150,000
Treatment – 1	$150,000								$150,000
Treatment – 2[c]	$75,000	$75,000							
Storage – 1	$355,000					$355,000			
Water Supply Pipeline – 1[d]	$7,287,000	$65,000		$3,611,000	$3,611,000				
Water Supply Pipeline – 2[d]	$3,049,000	$65,000			$1,492,000	$1,492,000			
Distribution – 1	$731,000			$731,000					
Distribution – 2	$1,251,000						$1,251,000		
Distribution – 3	$169,000						$169,000		
Distribution – 4[e]	$320,000	$160,000	$160,000						
Distribution – 5	$180,000	$90,000	$90,000						
Distribution – 6	$812,000			$812,000					
Distribution – 7	$879,000				$879,000				
Management – 1	$200,000 each							$200,000	$400,000
Total	$16,008,000	$455,000	$250,000	$5,154,000	$5,982,000	$1,847,000	$1,420,000	$200,000	$700,000

a. *All cost estimate allowances are expressed on a 2012 cost basis and generally include a 30 percent contingency allowance and an additional 30 percent allowance for project administration, planning, design and engineering, construction management, and permitting, as appropriate. No markup is allocated for planning studies or management activities.*

b. *Includes only those system needs that are currently anticipated and identified. Additional future needs as a result of subsequent system assessment and planning efforts may be considered likely.*

c. *Values presented represent rough estimates developed for budgetary purposes only, no detailed or formal cost estimating has been developed for this improvement project.*

d. *Scheduled subject to available project funding. Water supply pipeline cost estimates include cost allowances that are additive to those presented in the prior construction cost estimates for the water supply pipeline. Costs for potential environmental mitigation needs and for planned PRV, pressure-sustaining valve, and altitude valve stations have been added into the cost estimate totals for the water supply pipeline projects.*

e. *Cost estimating assumes economies of scale and coordination/cost synergies with other utility improvements (street and sewer) that the Town plans to construct along with these improvements.*

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Project cost estimate allowances have been developed for each water system improvement element according to consistent criteria, and include allowances for construction activities, site restoration, construction contractor general conditions, overhead, profit, bonding, insurance, and associated materials shipping and handling. Pipeline cost allowances are estimated based on fully restrained joint DI pipe water main installation to include fire hydrants and isolation valves at typical spacing. Actual project costs may vary significantly from the allowances presented herein depending on scope, schedule, complexity, and economic variability.

All project cost estimates have been developed as allowances according to the 2012 Pacific Northwest economic construction climate consistent with Class 4 cost estimating according to the Association for the Advancement of Cost Estimating International (AACEI) criteria. A Class 4 estimate is defined as a planning-level or technical feasibility estimate, where project engineering and design is between 1 and 20 percent complete. Such estimates are typically developed for planning level cost scopes or to evaluate design alternatives where further design and cost estimate refinement can be completed as project planning moves forward. Expected accuracy for Class 4 estimates typically ranges from -30 percent on the low side to +50 percent on the high side, depending on technological complexity, appropriate reference information, and the inclusion of appropriate contingency estimation.

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Section 9

Financial Program

The primary goal of the financial program is to develop a multi-year rate strategy that will provide stable revenue to meet the total costs of providing water service, including anticipated capital and operating costs. Financial program development encompasses the following elements:

- Financial structure
- Fiscal policies
- Past financial performance and obligations
- Operating costs
- Capital costs and financing
- Anticipated financial forecasts
- Utility funds reserves and rates
- Financial resources
- Potential funding assistance

In particular, the financial program evaluates financial impacts related to implementation of the water system CIP and develops rate strategies for meeting associated future capital and operations costs.

9.1 Financial Structure

The Town maintains water system operations and implements improvements through a water utility fund. The water utility is responsible for funding all of its related utility costs through user fees. The water utility does not depend on general tax revenues or general fund resources. Ongoing monthly user charges for water service provide the primary revenue source for water utility funding, with additional revenues derived from installation charges, reconnection fees, and labor and material charges. The Town establishes utility user charges by ordinance and, subject to statutory authority, can adjust user charges as needed to meet financial objectives.

The Town maintains fund structures and implements financial policies that target management of a financially viable and fiscally responsible enterprise fund utility. The water system financial program addresses the following water utility funds:

- Operating Fund: Designated to cover operating costs
- Capital Projects Fund: Designated to cover capital costs
- Debt Reserve Fund: Set aside to cover bond reserve requirements and used to pay off bond retirement
- Study Reserve Fund: Used to fund studies beneficial to the water system
- Land Acquisition Reserve Fund: Used to purchase land benefiting the water system

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9.2 Fiscal Policies

The Financial Program and associated analyses are based on a framework of fiscal policies that promote the financial integrity and stability of the Town water utility. A brief summary of the key financial policies employed by the Town, as well as those recommended and incorporated in the financial program, is provided below.

9.2.1 Reserve Funds

Like any business, a municipal utility requires certain minimum levels of cash reserves to operate. These reserves address variability and timing of expenditures and receipts, as well as occasional disruptions in activities, costs, or revenues. Given the responsibility of a water utility to provide an essential service in conformance with specific and expected standards, protection against financial disruption is even more important for a water utility than it would be for many private-sector or non-essential counterparts.

In addition to protecting the utility against financial disruption, a defined reserve structure serves to maintain appropriate segregations of funds and to promote the use of resources for their intended purposes. The Town water utility maintains the following reserve funds:

- Operating Reserve: Designed to provide a liquidity cushion to ensure that adequate cash working capital will be maintained to deal with significant cash balance fluctuations such as unanticipated cash expenses or lower-than-expected revenue collections. The current Town policy is to maintain a minimum balance in the Operating Fund equal to 60 days of typical O&M expenses. This target is within industry standards for a water utility.
- Capital Projects Reserve: An amount of cash set aside in case of an emergency should a piece of equipment or a portion of the utility's infrastructure fail unexpectedly. The reserve could also be used for other unanticipated capital needs, including capital project cost overruns. Industry practice ranges from maintaining a balance equal to 1 to 2 percent of fixed assets, an amount equal to a 5-year rolling average of CIP costs, or an amount determined sufficient to fund an equipment failure (other than catastrophic failure). The final target level should balance industry standards with the Town risk tolerance; a target of 2 percent of fixed assets has been used for Financial Program analyses, ranging from $205,000 in 2013 to $547,000 in 2018, as completed CIP projects increase the total value of fixed assets.
- Debt Reserve Fund: Generally set according to debt covenant requirements and described in greater detail in the Debt section below. The Town uses this fund to cover bond reserve requirements and to retire bonds.
- Study Reserve Fund: Used to fund studies beneficial to the water system.
- Land Acquisition Reserve Fund: Used to purchase land benefiting the water system.

9.2.2 System Reinvestment

The purpose of system reinvestment funding is to provide for the replacement of aging system facilities in order to ensure sustainability of the system for ongoing operation. Each year, utility assets lose value, and as their condition and remaining useful service life deteriorates, they will eventually need to be renewed, refreshed, or replaced. The accumulating loss in asset value and likely future liability is often measured for reporting purposes through an annual depreciation expense, which is based on the original cost of the asset. While this reported expense reflects the consumption of the existing asset and its original investment, the replacement of that asset will likely cost much more, factoring in inflation and construction conditions. Therefore, the added annual replacement liability is even greater than the annual depreciation expense.

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The Town currently operates on a "cash basis" and does not calculate depreciation. Based only on the improvements proposed in the current water system CIP, depreciation expenses would be anticipated to reach $360,000 by the end of the planning period. The Town has historically funded system reinvestment at varying levels. In this analysis, the system reinvestment expense remains at $500,000 per year throughout the forecast period. These monies are put directly into the Capital Projects Fund and are made available for capital project costs.

9.2.3 Debt

As part of broader utility financial policy structures, it is prudent to consider policies related to debt management. As a security condition of issuance for some debt such as revenue bonds, the Town would be required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other utility expenditures. The only outlays with a higher lien level would be O&M expenses.

Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.0 coverage factor would imply that no additional cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses and annual revenue bond debt service payments, plus an additional 25 percent of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for any utility purpose, including funding capital projects. Targeting higher debt coverage factors can help the Town achieve a better credit rating and provide lower interest rates for future debt issues. Existing Town bond covenants require a 1.25 debt coverage factor.

9.3 Past Financial Performance

A summary of fund resources and uses arising from Town water utility cash transactions for the previous 6 years, 2006 through 2011, is shown in Table 9-1. Noteworthy findings and trends are discussed below to demonstrate the historical performance and condition of the utility.

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Table 9-1. Summary of Historical Fund Resources and Uses Arising from Cash Transactions

Resources and Uses	2006	2007	2008	2009	2010	2011
Revenue						
• Revenue usage charge	$739,189	$748,010	$758,801	$820,648	$747,175	$707,753
• Base charge	699,479	759,267	820,873	910,401	946,385	950,274
• Other revenue	60,655	30,083	55,037	14,802	6,740	42,156
Total revenue	$1,499,323	$1,537,360	$1,634,711	$1,745,851	$1,700,299	$1,700,183
Operating expenditures						
• Utilities administration	$105,678	$111,162	$119,195	$125,694	$122,425	$118,191
• Administration planning	34,293	24,223	20,071	20,763	20,521	21,598
• Sys tem administrator	16,649	18,756	19,256	18,954	18,206	18,679
• Finance/customer service	40,961	39,199	43,361	46,432	46,909	52,926
• Meter reading	21,961	21,437	17,114	16,576	19,484	14,616
• Treatment	450,139	349,900	386,429	384,627	377,944	381,821
• Distribution	242,903	251,662	242,587	236,037	238,112	277,178
• Cross connection	50,821	53,983	57,287	44,977	42,944	45,956
• Watershed	-	-	-	13,071	2,221	10,981
• Other operating	24,534	34,215	51,335	31,251	33,103	124,786
• Debt	38,376	38,014	37,652	37,290	36,928	36,566
• Bond redemption	140,100	137,300	134,538	135,600	136,500	132,100
• Main extension	3,635	30,986	11,179	2,210	3,820	2,355
• Connection costs	4,014	2,813	15,382	1,988	999	2,669
• Improvements	2,017	6,287	3,222	11,721	2,800	-
Total operating expenditures	$1,176,080	$1,119,937	$1,158,608	$1,127,192	$1,102,914	$1,240,421
Operating surplus (deficit)	$323,243	$417,423	$476,103	$618,659	$597,385	$459,762
Transfers						
• To separation reserve	$2,350	$1,500	$1,500	$6,800	$6,800	$6,800
• Argyle loan redemption	8,921	-	-	-	-	-
• To public works fund	-	-	-	-	-	16,000
• To water capital reserve fund	226,000	301,000	416,000	366,000	466,000	659,500
• To equipment reserve	43,700	43,700	35,400	25,600	25,600	25,600
• To study reserve	10,000	10,000	20,000	100,000	25,000	-
• To repair reserve	19,500	19,500	19,500	19,500	19,500	-
• To land reserve	-	-	-	-	-	-
Total transfers	$310,471	$375,700	$492,400	$517,900	$542,900	$707,900
Total cash outlay	$1,486,551	$1,495,637	$1,651,008	$1,645,092	$1,645,814	$1,948,321
Surplus (deficit)	$12,772	$41,723	$(16,297)	$100,759	$54,485	$(248,138)

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Given the Town's past 6 years of water utility financial transactions, the following trends and conditions are evident:

- Water sales revenue still appears to be increasing, although usage charge revenue began to decrease in 2009. Base charge revenue continued to increase through 2011, and although the increases have been smaller in recent years, overall water sales revenue ended 2011 nearly $220,000 higher than 2006. Expenditures fluctuated a bit more and ended 2011 approximately $64,000 higher than 2006. Total cash outlay has increased $462,000 over the 6-year period
- The O&M Coverage Ratio (water sales revenues divided by total operating expenses) began 2006 at 1.22, increased to 1.54 in 2009 and 2010, and decreased to 1.34 in 2011. Anything over 1.00 shows that water sales can independently cover operating expenses.
- The Operating Ratio (total operating expenses divided by total operating revenues) began 2006 at 76.44 percent, decreased to a low of 64.56 percent in 2009, and increased to 72.96 percent in 2011. A ratio greater than 90 percent would indicate that there is little room for new debt service and capital replacement without additional rate increases. A ratio greater than 100 percent would indicate that operating expenses exceed operating revenues and would be indicative of an unsustainable financial condition.

9.4 Operating Costs

A financial program can provide qualified assurance of financial feasibility only if it considers the total system costs of providing water service, including both operating and capital costs. The operating costs identify ongoing annual non-capital costs associated with the operation, maintenance, and administration of the Town water system.

Town water system operating costs are initially developed from 2013 budget documents. Future costs are adjusted annually for inflationary increases. Any known future changes, such as new or enhanced programs, increased operating costs, and/or additional staffing needs, are added in the years they are planned. The following is a list of the key expense factors and assumptions used to develop financial forecasts:

- Annual inflation factors: General and labor escalation begins at 2.07 percent and increases to 3.0 percent by 2015; benefits remain at 10.0 percent; construction cost escalation begins at 3.19 percent and increases to 4.0 percent by 2015.
- Existing debt: The Town currently has one outstanding revenue bond, which will expire in 2013. The final payment of $163,000 will be made from the debt reserve fund.
- Revenue bond assumptions: The forecast assumes a revenue bond interest rate of 5.0 percent, an issuance cost of 2.0 percent and a term of 20 years for all revenue bonds.
- Future debt and transfers to capital: These are described in greater detail in the Capital Costs section.
- Additional O&M costs: Transfers to the Studies Reserve are expected to increase by $13,000 in 2014 to ensure that the fund is able to cover the costs of completing WSP updates every 6 years.

Annual operating costs are funded through ongoing revenues received from user fees and charges. The following is a list of the key revenue factors and assumptions.

- Revenue: The Town has two general revenue sources: revenue from charges for service (rate revenue) and miscellaneous (non-rate) revenue. Rate revenue is expected to increase with growth. In the event of a forecasted annual shortfall, rates can be increased to meet the annual revenue requirement. Non-rate revenues are forecast to increase with inflation or growth, depending on the source.

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- Growth: Although a 1.7 percent growth rate is used for engineering planning purposes to determine CIP projects for this WSP, rate revenue was escalated based on a 0.4 percent growth rate estimated by the Town. The lower growth rate is based on recent experience in light of the recent economic downturn, and will more conservatively project future revenue.
- General facilities charge (GFC): This represents a one-time charge to new customers connecting to the system. The GFC revenue for this plan is based on the Town's current GFC of $10,124 for 5/8-inch and 3/4-inch meters, which is inflated annually. New ERUs increase from 11 to 12 per year. The fee is anticipated to generate revenue of $115,000 in 2013, increasing to $135,000 in 2018. GFC revenue will go into the capital projects fund.

9.5 Capital Costs

The CIP presented in Section 8 identifies the total anticipated and planned capital obligations of the planning period. Once these capital costs are identified, a capital funding plan defines a strategy for funding the CIP considering available funding sources such as existing reserves, right-to-connect charges, external contributions from grants/developers, and new debt proceeds, as appropriate and required.

The CIP identifies approximately $15.1 million in CIP project costs over a near-term 6-year planning horizon. This CIP consists of both replacement and expansion projects. Additional projects are expected in the 20-year horizon, but have not yet been identified. Currently the 20-year horizon budgets $200,000 for comprehensive plans every 6 years as well as two $150,000 projects in 2023 to evaluate modifications to increase available annual water supply and treatment capacity, and assess potential major maintenance, renewal, and replacement needs at the Town water treatment plant. Costs are stated in 2012 dollars and are escalated by construction cost inflation to the year of planned spending for financing projections.

A summary of the 20-year CIP project costs as currently anticipated, identified, and planned is shown in Table 9-2, to include other minor additional costs currently budgeted for 2013. As shown, each year has varied capital cost obligations depending on construction schedules and infrastructure planning needs. Currently 94.4 percent (2012 dollars) of the capital costs are included in the 6-year planning period. The Water Supply Pipeline projects account for 68.3 percent of the 6-year CIP. Table 9-3 provides detail for the 6-year CIP.

Table 9-2. 6- and 20-Year CIP Cost Estimate Summary

Year	2012	Inflated,
2013	$470,500	$485,524
2014	250,000	267,806
2015	5,154,000	5,797,549
2016	5,982,000	6,998,094
2017	1,847,000	2,247,158
2018	1,420,000	1,796,753
6-year total	$15,123,500	$17,592,884
2019 – 2032	$900,000	$1,479,407
20-year total	$16,023,500	$19,072,292

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Table 9-3. Detailed 6-Year CIP (2012$) Cost Estimates and Scheduling						
Project	2013	2014	2015	2016	2017	2018
Capital From 2013 Budget						
• Water system improvement advertising	$500					
• Media change (repairs)	1,000					
• Leak detection (repairs)	1,000					
• Complete comprehensive plan	13,000					
Planned Capital Improvement Projects						
• Treatment – 2	75,000					
• Storage – 1					$355,000	
• Water supply pipeline – 1	65,000		$3,611,000	$3,611,000		
• Water supply pipeline – 2	65,000			1,492,000	1,492,000	
• Distribution – 1			731,000			
• Distribution – 2						$1,251,000
• Distribution – 3						169,000
• Distribution – 4	160,000	$160,000				
• Distribution – 5	90,000	90,000				
• Distribution – 6			812,000			
• Distribution – 7				879,000		
Total	$470,500	$250,000	$5,154,000	$5,982,000	$1,847,000	$1,420,000

9.5.1 Capital Financing Strategy

An ideal capital funding strategy would include the use of grants and low-cost loans when debt issuance is required. However, these funding avenues are currently very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It has been recommended that the Town pursue these funding avenues, but assume bond financing to meet any critical needs for which the Town's available cash resources are insufficient. The Town prefers to pursue low-cost loan options for funding certain CIP projects, including the proposed Water Supply Pipeline projects. As such, low-cost loan financing has been assumed as the debt funding instrument in a primary financial program scenario. However, a backup scenario has also been evaluated assuming use of revenue bond financing in lieu of low-cost loan options to show how the financial results and impacts might compare.

The capital financing strategy developed to fund the water utility CIP assumes the following funding resources:

- Accumulated capital cash reserves
- Annual revenue collections from GFCs
- Annual cash from rates earmarked for system reinvestment funding
- Annual transfers of excess cash (over minimum balance targets) from the operating fund, if any
- Low-cost loan or revenue bond financing (depending on scenario)

Based on information provided by the Town, the Capital Projects Fund began 2013 with $2.87 million in cash reserves (including funds listed under Major Repairs Reserve), the Study Reserve began with $37,000, and the Land Acquisition Reserve began with $224,000. Transfers of $20,000 from the Major

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Repairs Reserve and $13,000 from the Study Reserve are assumed to be made to the Capital Projects Fund to help fund upcoming capital needs.

System reinvestment funding of $500,000 annually is used to help fund capital projects. This amount must be supported with the ongoing rates of the system. GFC revenue collections are budgeted at an annual amount of $115,000 in 2013 and increasing to $135,000 in 2018, with new connections ranging from 11 to 12 per year.

The capital funding strategy developed for this financial program forecasts the need to issue $11.8 million in new debt by 2017 to cover the estimated new water supply pipeline project costs. The Town plans to receive half of this in Public Works Trust Fund (PWTF) loans and the other half in Drinking Water State Revolving Fund (DWSRF) loans. The annual debt service associated with these loans ranges from $139,000 in 2015 to $712,000 in 2018 and must also be supported by the ongoing rates of the system.

The resources described above are forecasted to fund 100 percent of the 20-year CIP. Table 9-4 presents the corresponding 20-year capital financing strategy.

Table 9-4. 20-Year Capital Financing Strategy

Year	Capital expenditures 2012	Capital expenditures escalated	Low-cost loan financing	Cash funding	Total financial resources
2013	$470,500	$485,524	-	$485,524	$485,524
2014	250,000	267,806	-	267,806	267,806
2015	5,154,000	5,797,549	$4,062,000	1,735,549	5,797,549
2016	5,982,000	6,998,094	5,970,000	1,028,094	6,998,094
2017	1,847,000	2,247,158	1,816,000	431,158	2,247,158
2018	1,420,000	1,796,753	-	1,796,753	1,796,753
Subtotal	$15,123,500	$17,592,884	$11,848,000	$5,744,884	$17,592,884
2019 - 2032	900,000	1,479,407	-	1,479,407	1,479,407
Total	$16,023,500	$19,072,292	$11,848,000	$7,224,292	$19,072,292

The capital financing strategy is developed separate from the evaluation of ongoing revenue needs of the utility. As shown in Table 9-4, the system's capital needs are inconsistent from year to year. To minimize the impact this year-to-year variability will have on cash flow and ultimately on utility rates, the capital funding plan assumes that capital is funded from cash available in reserves and from annual rate funding. New debt financing is assumed only when other resources are depleted. Treating capital funding in this manner minimizes rate impacts from annual capital funding needs. Capital funding directly impacts rates only through the level of rate-funded system reinvestment assumed and through annual debt service as a result of new debt being issued.

9.6 Financial Forecast

The financial program, or revenue requirement analysis, forecasts the amount of operating and capital costs to determine the annual revenue required. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates in meeting the total revenue requirements anticipated for the water utility. In addition to annual operating costs, the revenue of the utility must also meet debt covenant requirements and minimum reserve level targets.

Although the CIP identified minimal projects in the 20-year time horizon of this WSP, the rate strategy focuses on the shorter-term planning period of 2013 through 2018. It is imperative that the Town review

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the proposed rates and rate assumptions annually to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 9-5 summarizes the annual revenue requirements for the 6-year planning horizon based on a forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding from low-cost loans.

Table 9-5. 6-Year Financial Forecast

Projection	2013	2014	2015	2016	2017	2018
Revenues						
• Rate revenues under existing rate	$1,737,000	$1,743,948	$1,750,924	$1,757,927	$1,764,959	$1,772,019
• Non-rate revenues	9,020	9,238	9,986	10,781	11,621	11,775
Total revenues	$1,746,020	$1,753,186	$1,760,910	$1,768,709	$1,776,580	$1,783,794
Expenses						
• Cash operating expenses	$1,256,017	$1,284,045	$1,328,614	$1,375,550	$1,425,027	$1,477,234
• Existing debt service	-	-	-	-	-	-
• New debt service	-	-	138,607	449,215	667,219	712,368
• Rate funded system reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
Total expenses	$1,756,017	$1,784,045	$1,967,221	$2,324,765	$2,592,246	$2,689,603
Net surplus (deficiency)	$(9,997)	$(30,859)	$(206,311)	$(556,056)	$(815,665)	$(905,809)
Percent of rate revenue	0.58%	1.77%	11.78%	31.63%	46.21%	51.12%
Annual rate adjustment	7.00%	9.00%	9.00%	9.00%	9.00%	3.00%
Cumulative annual rate adjustment	7.00%	16.63%	27.13%	38.57%	51.04%	55.57%
Rate revenues after rate increase	$1,797,795	$2,033,967	$2,225,892	$2,435,927	$2,665,781	$2,756,737
Additional taxes from rate increase	3,057	14,585	23,886	34,097	45,302	49,521
Net cash flow after rate increase	$47,741	$244,574	$244,771	$87,846	$39,854	$29,388
Coverage after rate increases	3.37	n/a	n/a	n/a	n/a	n/a

The financial forecast indicates the need for a 7.0 percent rate increase in 2013, 9.0 percent annual increases in 2014 through 2017, and a 3.0 percent increase in 2018, which would result in a cumulative rate increase of 55.6 percent. The rate increases are needed to cover the existing level of O&M expenses, cover the debt service payments related to the capital program, and maintain adequate ending fund balance targets. Rates are increased more than needed in 2013 and 2014 in order to avoid very large rate increases later as new debt service begins to climb in 2015.

A backup scenario has also been created using revenue bonds to show what the requirements would be to implement the full CIP if the low-cost loans are not received. In this scenario the Town would need to issue revenue bonds to finance capital project costs in excess of available cash resources, for a total of $11.5 million in 2015. This slightly lower loan amount is due to using additional reserves. Revenue bonds require higher debt service payments, which would result in higher rate increases. This type of financing would indicate the need for a 7.0 percent rate increase in 2013, 25.0 percent increases in both 2014 and 2015, and 3.0 percent annual increases in 2016 through 2018, which would result in a cumulative rate increase of 82.7 percent.

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The full rate model for the low-cost loan scenario can be found in the appendices, along with the full rate model for the revenue bond scenario.

9.6.1 Funds and Reserves

Table 9-6 shows a summary of the projected Operating, Capital, and Reserve Fund ending balances through 2018 based on the rate forecasts presented in the previous section and assuming capital funding from low-cost loans to cover the full cost of the water supply pipeline projects. As discussed earlier, the Operating Fund has a minimum target of 60 days of O&M expenses and the Capital Projects Fund target balance is set at 2 percent of fixed assets. All funds remain well above their minimum targets through 2018.

Table 9-6. Ending Cash Balance Summary Projection

Ending balances	2013	2014	2015	2016	2017	2018
• Operating	$206,469	$211,076	$218,402	$226,118	$234,251	$242,833
• Capital projects	3,061,448	3,679,201	2,841,473	2,560,979	2,837,633	1,745,012
• Reserve	326,840	360,419	395,478	432,072	470,260	509,954
Total	$3,594,757	$4,250,696	$3,455,353	$3,219,170	$3,542,144	$2,497,798
Combined minimum target balance	411,313	421,276	544,554	692,231	745,307	789,824

9.7 Water Utility Rates

Existing and projected future water utility rate requirements based on the CIP and the low-cost loan funding strategy for the water supply pipeline project are summarized in the following sections.

9.7.1 Current Rates

The Town's current rate structure is composed of a fixed monthly charge by meter size and a variable charge per 1,000 gallons. There are three separate fixed charge structures, described below:

- Single-Family Residential class starts at $40.00 per 5/8-inch meter and functions on an inverted block structure. Four blocks are based on monthly usage:
  - Block 1 is 0–3,500 gallons and is $7.00 per 1,000 gallons.
  - Block 2 is 3,500–7,000 gallons and is $8.75 per 1,000 gallons.
  - Block 3 is 7,000–10,500 gallons and is $11.65 per 1,000 gallons.
  - Block 4 is 10,500 gallons and above and is $14.00 per 1,000 gallons.
- Multifamily/Commercial/Public Authority starts at $40.50 per 5/8-inch meter and has a seasonal structure with different variable rates in winter and summer:
  - The winter rate is $7.00 per 1,000 gallons.
  - The summer rate is $8.80 per 1,000 gallons.
- Industrial/Light Manufacturing starts at $45.50 per 5/8-inch meter and has a seasonal structure with different variable rates in winter and summer:
  - The winter rate is $7.00 per 1,000 gallons.
  - The summer rate is $8.80 per 1,000 gallons.

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The Town also provides service to "Out of Town" customers. An approximately 50 percent surcharge is applied on the fixed charges for these customers based on meter size, while the variable charge remains the same as for all other customers.

The Town also offers a Low Income Senior/Disabled customer rate. This class pays the same volume charge as the Town's Single-Family Residential customers, but receives a discount of 50 percent on its fixed monthly charges. Table 9-7 provides a summary of the Town's current water utility rate structure.

Table 9-7. Current Monthly Water Rates

Classification	In town	Out of town
Residential		
Low income	$20.00	$30.13
5/8"	40.00	60.25
1"	91.00	136.30
1.5"	175.50	263.50
2"	277.25	415.80
Block 1 (0 – 3,500 gallons)	7.00	7.00
Block 2 (3,500 – 7,000 gallons)	8.75	8.75
Block 3 (7,000 – 10,500 gallons)	11.65	11.65
Block 4 (10,500+ gallons)	14.00	14.00
Multi family/commercial/public authority		
5/8"	$40.50	$61.00
1"	92.00	138.00
1.5"	178.00	267.00
2"	281.00	421.50
3"	555.85	833.75
4"	865.00	1,297.50
Winter	7.00	7.00
Summer	8.80	8.80
Industrial/light manufacturing		
5/8"	$45.50	$68.50
1"	105.00	157.35
1.5"	203.50	305.30
2"	322.00	483.00
3"	637.60	956.50
4"	992.80	1,489.15
Winter	7.00	7.00
Summer	8.80	8.80

9.7.2 Projected Future Rate Requirements

The analysis in this financial program indicates a need for a 7.0 percent rate increase in 2013, 9.0 percent annual increases in 2014 through 2017, and a 3.0 percent increase in 2018 to cover all costs and meet targets assuming low-cost loan financing for the proposed water supply pipeline improvements. It is assumed that the proposed rate increases would be applied equally to all classes and to each rate component (fixed and variable). Table 9-8 shows the projected monthly rates for the 6-year planning period based on these increase levels.

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Table 9-8. 6-Year Projected Monthly Rates Requirements						
Classification	2013	2014	2015	2016	2017	2018
Residential						
5/8"	$42.80	$46.65	$50.85	$55.43	$60.42	$62.23
1"	97.37	106.13	115.69	126.10	137.45	141.57
1.5"	187.79	204.69	223.11	243.19	265.07	273.03
2"	296.66	323.36	352.46	384.18	418.76	431.32
Block 1	7.49	8.16	8.90	9.70	10.57	10.89
Block 2	9.36	10.21	11.12	12.12	13.22	13.61
Block 3	12.47	13.59	14.81	16.14	17.60	18.12
Block 4	14.98	16.33	17.80	19.40	21.15	21.78
Multi family/ commercial / public authority						
5/8"	$43.34	$47.24	$51.49	$56.12	$61.17	$63.01
1"	98.44	107.30	116.96	127.48	138.96	143.12
1.5"	190.46	207.60	226.29	246.65	268.85	276.92
2"	300.67	327.73	357.23	389.38	424.42	437.15
3"	594.76	648.29	706.63	770.23	839.55	864.74
4"	925.55	1,008.85	1,099.65	1,198.61	1,306.49	1,345.68
Winter	7.49	8.16	8.90	9.70	10.57	10.89
Summer	9.42	10.26	11.19	12.19	13.29	13.69
Industrial/Light manufacturing						
5/8"	$48.69	$53.07	$57.84	$63.05	$68.72	$70.78
1"	112.35	122.46	133.48	145.50	158.59	163.35
1.5"	217.75	237.34	258.70	281.99	307.36	316.59
2"	344.54	375.55	409.35	446.19	486.35	500.94
3"	682.23	743.63	810.56	883.51	963.03	991.92
4"	1,062.30	1,157.90	1,262.11	1,375.70	1,499.52	1,544.50
Winter	7.49	8.16	8.90	9.70	10.57	10.89
Summer	9.42	10.26	11.19	12.19	13.29	13.69

Note: Low-income residential customers pay 50 percent of the residential fixed charge; out-of-town customers pay a 50 percent surcharge on the fixed charge based on meter size and customer class.

Table 9-9 shows monthly residential bill comparisons for the 6-year planning period with projected annual increases.

Table 9-9. 6-Year Monthly Residential Bill Comparisons							
Residential	Current	2013	2014	2015	2016	2017	2018
Monthly bill	$69.75	$74.63	$81.35	$88.67	$96.65	$105.35	$108.51
Difference		$4.88	$6.72	$7.32	$7.98	$8.70	$3.16
Increase		7.00%	9.00%	9.00%	9.00%	9.00%	3.00%

Note: Assumes 4,100 gallons monthly usage.

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9.8 Affordability

WSDOH and the Public Works Board use an affordability index to prioritize low-cost loan awards depending on whether rates exceed 2.0 percent of the median household income for the service area. The median household income for the Town of Friday Harbor was $37,645 according to the U.S. Census Bureau's 2007–11 American Community Survey 5-Year Estimates. It is assumed that this median household income level has remained relatively constant through 2011 and will then escalate at the same assumed rate as general cost inflation, which increases from 2.07 to 3.00 percent, to project median household income for future years. Table 9-10 presents the Town's rates with the projected rate increases for the forecast period based on the low-cost loan scenario, tested against the 2.0 percent monthly affordability threshold.

Table 9-10. Affordability Test

Year	Inflation	Median household income	Projected monthly bill	Percent of median household income
2011		$37,645		
2012	2.07%	38,424		
2013	2.07%	39,220	$74.63	2.28%
2014	2.50%	40,200	81.35	2.43%
2015	3.00%	41,406	88.67	2.57%
2016	3.00%	42,648	96.65	2.72%
2017	3.00%	43,928	105.35	2.88%
2018	3.00%	45,246	108.51	2.88%

Applying the 2.0 percent test, the Town's rates are forecasted to exceed the indicated affordability range, but will remain under 3.0 percent of the median household income through 2018.

9.9 Water Utility Resources

Feasible long-term capital funding strategies must be defined to ensure that adequate resources are available to fund needed system CIP projects. In addition to the utility's resources such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes, capital needs can be met from outside sources such as grants, low-interest loans, and bond financing. The following sections present summaries of the Town's internal water utility resources and outside resources.

Water utility resources appropriate for funding capital needs include accumulated cash in the capital reserve, rate revenues designated for capital spending purposes, and capital-related charges such as connection charges and other connection fees. The first two resources have been summarized in previous sections. Capital-related charges are discussed below.

9.9.1 Capital Connection Charges

A connection charge (CC), as provided for by RCW 35.92.025, refers to a one-time charge imposed on new customers as a condition of connecting to the utility system. The purpose of the CC is twofold: to promote equity between new and existing customers and to provide a source of revenue to fund capital projects. Revenue can be used only to fund utility capital projects or to pay debt service incurred to finance those projects.

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9.9.2 Local Facilities Charges

While a CC is the manner in which new customers pay their share of general facilities costs, local facilities funding is used to pay the costs associated with local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in rate forecasting because it is funded up front by either connecting customers or developers, or through an assessment to properties, but never from rates.

A number of mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs: (a) the utility charges a connection fee based on the cost of the local facilities (under the same authority as the CC); (b) a developer funds extension of the system to its development and turns those facilities over to the utility (contributed capital); or (c) a local assessment is set up called a Utility Local Improvement District (ULID/LID), which collects tax revenue from benefited properties.

A local facilities charge (LFC) is a variation of the CC authorized through RCW 35.92.025. It is a Town-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of the main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to a Town for the cost of a local facility that directly serves a property. It is a form of CC and thus can accumulate up to 10 years of interest. It typically applies in instances when no developer-installed facilities are needed through developer extension due to the prior existence of available mains already serving the developing property.

The developer extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the CC required and must be built to Town standards. The Town is authorized to enter into developer extension agreements under RCW 35.91.020. Part of the agreement between the Town and the developer planning to extend service might include a latecomer agreement, resulting in a latecomer charge to new connections to the developer extension.

Latecomer charges are a variation of developer extensions whereby new customers connecting to a developer-installed improvement make a payment to the Town based on their share of the developer's cost, as detailed under RCW 35.91.020. The Town passes this charge on to the developer who installed the facilities. As part of the developer extension process, this defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement cannot exceed 20 years in duration.

LID/ULID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities, as detailed under RCW 35.43.042. Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

9.10 External Resources

This section outlines various grant, loan, and bond opportunities available to the Town through federal and state agencies to fund the CIP identified in this WSP.

9.10.1 Grants and Low Cost Loans

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. Grants and low-cost loans for Washington State utilities are

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available from various Washington State departments. There are four grant and loan programs that Town water system improvement projects might be eligible for as described in greater detail below.

Community Development Block Grant (CDBG) General Purpose Grant. These grants are made available through a competitive application process to assist small cities, towns, and counties in Washington State in carrying out significant community and economic development projects that principally benefit low- and moderate-income persons.

Eligible applicants are Washington State cities and towns with populations of less than 50,000 and counties with populations of less than 200,000 that are not participating in a CDBG Entitlement Urban County Consortium.

Eligible projects include public utilities/facilities such as water, wastewater, and streets. Approximately $9.5 million is available in 2013 with a maximum single grant amount of $750,000 or $1 million if higher funding criteria are met. The 2013 application cycle closed on January 31, 2013.

Further details are available at http://www.commerce.wa.gov.

Community Economic Revitalization Board (CERB) Loans and Grants. CERB is a Washington economic development resource focused on creating private-sector jobs in partnership with local governments. The Board has the authority to finance public infrastructure improvements that encourage new private business development and expansion. In addition to funding construction projects, CERB provides limited funding for studies that evaluate high-priority economic development projects. The Board receives administrative services from the Washington State Department of Commerce.

The CERB Board oversees three financing programs: Committed Private Partner Program, Prospective Development Construction Program, and Planning Projects. In addition to these programs, two temporary grant programs were approved when the 2012 state legislature demonstrated its commitment to increasing economic activity in Washington by authorizing CERB to award approximately $12 million in competitive grant funds for Economic Development and Community Revitalization.

Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes, and municipal corporations. Before submitting a project, prospective applicants should contact CERB staff to discuss the project and evaluate their eligibility. A relationship with staff early in the project's development is key to presenting proposed projects in such a way that potential funding eligibility can be maximized.

The Community Revitalization Grant Program is a temporary grant program for cities, towns, counties, ports, and innovation partnership zones for public infrastructure, facilities, and related improvements that enable and encourage private-sector business creation or expansion and the redevelopment of brownfields, and to enhance the vitality and livability of the community. This program was created in the 2012 Capital Budget. The Community Revitalization maximum award amount is $500,000.

The Economic Development Grant Program is a temporary grant program for cities, towns, counties, ports, and innovation partnership zones for public infrastructure, facilities, and related improvements that enable and encourage private-sector business creation or expansion and the redevelopment of brownfields, and to enhance the vitality and livability of the community. This program was created in the 2012 Capital Budget. The Economic Development Grant maximum award amount is $1 million.

Eligible applicants may submit one application per grant program. The 2012 Capital Budget contains a $12 million appropriation for the creation of a competitive grant programs for CERB. Community Revitalization grants require a 5 percent local match for grant requests of $100,000 or more. Economic Development grants require a 10 percent local match for grant requests of $250,000 or more. Phase I applications were due August 16, 2012, and Phase II applications were due October 24, 2012.

Further detail is available at http://www.commerce.wa.gov.

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Public Works Trust Fund (PWTF) Construction Loans. Cities, towns, counties, and special-purpose districts are eligible to receive loans from the PWTF for water, sewer, stormwater, roads, bridges, and solid waste/recycling construction projects to address critical needs. Due to current funding restrictions and funding allocations, the Public Works Board has suspended the non-construction programs. As the economy builds, the Board will attempt to re-institute these programs. Currently, construction loans are available only for drinking water, sanitary sewer, stormwater, and solid waste/recycling projects.

PWTF construction loans are available at interest rates ranging from 0.50 to 2.00 percent depending on the repayment term. The standard loan offer is 1.00 percent interest repaid over a 20-year term. Loan recipients with a higher affordability index rating qualify to "buy down" the set interest rates. All loan terms are subject to negotiation and Board approval. Due to changes in 2012, a local match is no longer required. The new loan limit is $5 million per jurisdiction.

The 2014 Construction Loan application cycle closed in May 2012. The 2015 application cycle will open March 1, 2013. The deadline has not yet been set for the next cycle and will depend on the amount available for loans when the application becomes available.

Further detail is available at http://www.pwb.wa.gov.

Drinking Water State Revolving Fund (DWSRF) Loan Program. Funding under this program historically targets protection of public health, compliance with drinking water regulations, and assistance for small and disadvantaged communities. Low interest rates provided are 1.0 to 1.5 percent and no local match is required. The Town's water system currently has an affordability index between 2.01 and 3.5 percent and would be eligible for 30 percent principal loan forgiveness.

A 2012 Washington State law requires all public water systems that receive loans or grants for infrastructure to complete an Investment Grade Efficiency Audit (IGEA). This is an effort to apply energy efficiency to water systems, similar to WSDOH's Green Projects that was started in 2009, and may be financed as part of the DWSRF loan.

In 2012 there were 105 applicants requesting over $218 million. After the scoring and ranking process that addressed the most serious risks to public health, 54 applicants were approved for $130 million, including 13 approved to receive principal forgiveness. The 2013 DWSRF Loan application period is January 1 through March 1, 2013. The WSDOH will review, score, and rank applications prior to publishing a draft funding list in summer 2013. The Public Works Board will approve the final funding list in fall 2013.

Further detail is available at http://www.pwb.wa.gov and http://www.doh.wa.gov.

9.10.2 Bond Financing

Water utility project bond financing options that may be applicable to planned Town water system improvements are summarized below.

General Obligation (GO) Bonds. GO bonds are secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, GO bonds have relatively low interest rates and few financial restrictions. However, the authority to issue GO bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

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RCW 39.36.020 states:

> (ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.
>
> (b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein.

While bonding capacity can limit availability of GO bonds for utility purposes, these can sometimes play a valuable role in project financing. A rate savings may be realized through two avenues: the lower interest rate and related bond costs, and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an *ad valorem* property tax levy.

Revenue Bonds. Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility and the debt obligation does not extend to the Town's other revenue sources. With this limited commitment, revenue bonds typically bear higher interest rates than GO bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The Town agrees to satisfy these requirements by ordinance as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

9.11 Financial Program Summary

The results of the financial program analyses indicate that rate increases are necessary to fund ongoing operating needs and future debt requirements to fund the planned water utility CIP. Implementation of the proposed rate increases should provide for continued financial viability.

It is recommended that the Town regularly review and update the key underlying assumptions that compose the multi-year financial plan to ensure that adequate revenues are collected to meet the total water utility financial obligations.

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Section 10

Limitations

This document was prepared solely for the Town of Friday Harbor in accordance with professional standards at the time the services were performed and in accordance with the associated contract between the Town of Friday Harbor and Brown and Caldwell. This document is governed by the specific scope of work authorized by the Town of Friday Harbor; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the Town of Friday Harbor and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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Appendix A: Water Facility Inventory (WFI) Form

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 07/12/2011
Printed: 08/03/2011
WFI Printed For: On-Demand
Submission Reason: Treatment Update

RETURN TO: Northwest Regional Office, 20435 72nd Ave S STE 200, Kent, WA, 98032

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
26595 0	FRIDAY HARBOR, TOWN OF	SAN JUAN	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

MICHAEL B. WILKS [UTILITIES SUPERINTEN]
PO BOX 219
FRIDAY HARBOR, WA 98250

TOWN OF FRIDAY HARBOR
RECEIVED
AUG 08 2011
FINANCE OFFICE

7. OWNER NAME & MAILING ADDRESS — **8. Owner Number** 002054

FRIDAY HARBOR, TOWN OF
C KING FITCH
PO BOX 219
FRIDAY HARBOR, WA 98250
TITLE: OWNER ORG - PRIMAR

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN ATTN: MICHAEL B WILKS
ADDRESS 501 MARGURITE ST
CITY FRIDAY HARBOR STATE WA ZIP 98250

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION

Primary Contact Daytime Phone:	(360) 378-2154
Primary Contact Mobile/Cell Phone:	(360) 317-8162
Primary Contact Evening Phone:	(360) 378-4272
Fax: (360) 378-5065	E-mail: mikew@fridayharbor.org

10. OWNER CONTACT INFORMATION

Owner Daytime Phone:	(360) 378-2390
Owner Mobile/Cell Phone:	
Owner Evening Phone:	
Fax: (360) 378-5339	E-mail: ckf@fridayharbor.org

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: _____ SMA Number: _____

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

- [x] Agricultural
- [x] Commercial / Business
- [x] Day Care
- [x] Food Service/Food Permit
- [x] 1,000 or more person event for 2 or more days per year
- [ ] Hospital/Clinic
- [x] Industrial
- [x] Licensed Residential Facility
- [x] Lodging
- [ ] Recreational / RV Park
- [x] Residential
- [x] School
- [ ] Temporary Farm Worker
- [x] Other (church, fire station, etc.): _____

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [x] City / Town
- [ ] County
- [ ] Federal
- [ ] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons)

1,500,000

15	16	17	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	TROUT LAKE+AUG 1&2									X			X					X	X			X		700	NW SW	18	35N	03W

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
26595 0	FRIDAY HARBOR, TOWN OF	SAN JUAN	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)	0	1463	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or *more* per year)	898		
B. Part Time Single Family Residences (Occupied *less than* 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	106		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180 days/year	565		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *less than* 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	288	288	
28. TOTAL SERVICE CONNECTIONS		1751	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or *more* days per year? 3190

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?			654	644	904	1119	1319	1175	524	1294	1139	
B. How many days per month is water accessible to the public?			1	1	1	1	1	1	1	1	1	

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	3	3	4	4	4	5	5	5	4	5	5	3

35. Reason for Submitting WFI:

☐ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____ DATE: _____

PRINT NAME: _____ TITLE: _____

Appendix B: Friday Harbor Municipal Code

Title 13

PUBLIC SERVICES

Chapters:

13.04 Water Regulations
13.05 Water Rates and Charges
13.08 Water Line Specifications
13.12 Limitations on New Services
13.16 Water Use Restrictions

Chapter 13.04

WATER REGULATIONS

Sections:

13.04.010 Purpose.
13.04.020 Definitions.
13.04.030 Water service application.
13.04.040 Water service disconnection application.
13.04.050 Design and installation requirements.
13.04.060 Meters – Installation and location.
13.04.070 Shut off for repairs.
13.04.080 Inspection authority.
13.04.090 Account responsibility.
13.04.100 Prohibited acts.
13.04.110 Violation and enforcement.

13.04.010 Purpose.

The purpose of this chapter is to provide for the regulation and use of town supplied water. (Ord. 1080 § 1, 1998)

13.04.020 Definitions.

For the purposes of Chapters 13.04 through 13.16 FHMC the terms set out in this section shall have the meanings indicated.

A. "Backflow" means the flow, other than the intended direction of flow, of any foreign liquids, gases, or substances into the distribution system of the public drinking water system.

B. "Cross connection" means any physical arrangement whereby a public water supply is connected, directly or indirectly, with a source of water not approved for the system, or any nonpotable supply, which may be capable of contaminating the public drinking system as a result of backflow.

C. "Person" means and includes persons of either sex, associations, partnerships, and corporations whether acting by themselves or through authorized representatives; the singular number shall include the plural and the masculine shall include the feminine.

D. "Town water system" means the water resources, storage tanks, distribution lines, fire hydrants, meters, pumps and all other appurtenances necessary for the supply of domestic water. (Ord. 1080 § 2, 1998)

13.04.030 Water service application.

A. It is unlawful for any person to connect to the town water system without first obtaining approval of a water service application.

B. No person shall alter their connection to or use of the town water system without obtaining approval of a new water service application.

C. The water service application shall be filed with the town administrator, stating the name and address of the owner of the property to be connected, the address of the property and the purpose for which the water is to be used. The application shall include a statement that all facts are true and correct, and that the applicant agrees to conform to the rules and regulations of water use.

D. The permit application shall be signed by the owner or his/her authorized agent.

E. The connection charges called for in FHMC 13.05.020 shall be collected by the town prior to approval of a water service application. (Ord. 1080 § 3, 1998)

13.04.040 Water service disconnection application.

A. Any person wishing to disconnect from the town water system shall first obtain approval of a water service disconnection application. Applications for disconnection shall be submitted to the town administrator and, pending approval, all applicable water charges shall continue to be assessed.

B. Once disconnected, a property will not be served by the town's water system until a new water service application has been approved and the new connection charge has been paid. (Ord. 1080 § 4, 1998)

13.04.050 Design and installation requirements.

All water lines shall be designed and installed in accordance with town water main extension requirements as adopted in Chapter 13.08 FHMC. (Ord. 1080 § 5, 1998)

13.04.060 Meters – Installation and location.

A. All meter installations shall be accomplished by the town, and shall be completed as soon as practical after all the required charges and fees have been paid and the requirements of all applicable ordinances have been met.

B. All water meters shall be installed at a location which is immediately adjacent to the edge of the public right-of-way within which the town's water main is located. (Ord. 1080 § 6, 1998)

13.04.070 Shut off for repairs.

The water supply may be shut off at any time, without notice, for repair, extension or other necessary purposes. The town shall not be responsible for any damage incurred on the premises of the water customer by this action. (Ord. 1080 § 7, 1998)

13.04.080 Inspection authority.

Upon request of the town a designated employee shall be allowed access during reasonable hours to all parts of buildings with water service from the town water system for the purpose of inspecting the condition of the pipes and fixtures and the manner in which the water is used. (Ord. 1080 § 8, 1998)

13.04.090 Account responsibility.

All accounts for water shall be kept in the name and address of the legal property owner and not in the name of the tenant, and the owner shall be responsible for all water service charges. (Ord. 1080 § 9, 1998)

13.04.100 Prohibited acts.

The following acts are prohibited:

A. To allow water to run when not in use for the purpose intended;

B. To allow the existence of defective or leaking faucets, toilets or other fixtures;

C. To wash any motor vehicle, boat, travel trailer, airplane, sidewalk, walkway, driveway, parking lot or other impervious surfaced area using a hose if such hose is not equipped with a shutoff or spring-type pistol grip nozzle;

D. To install or maintain any actual or potential cross connection;

E. To open, close, turn or interfere with, to attach to, or connect with, any water meter, fire hydrant, stop valve, or stopcock that is part of the town water system;

F. To reconnect pipes that have been disconnected, or to turn water on without written permission from the town when the water has been turned off for failure to pay the monthly utility bill;

G. To introduce any substance or deleterious matter into Trout Lake or its watershed;

H. To use water supplied from the town water system for any purpose other than that stated in the application, and/or for which the person pays water rates; and

I. To refuse to allow access to a building, as required under FHMC 13.04.080, for inspection. (Ord. 1080 § 10, 1998)

13.04.110 Violation and enforcement.

A. Water service to any premises receiving its water from the town public drinking water system shall be contingent upon compliance with all rules and regulations of the Washington State Department of Health and the town. Service shall be discontinued to any premises for failure to comply with the rules and regulations of the Washington State Department of Health and the town.

B. A violation of this chapter shall be and hereby is declared both a public nuisance and a Class 1 civil infraction, as defined in Chapter 1.18 FHMC, except that a violation of FHMC 13.04.100(A), (B) or (C) shall be a Class 3 civil infraction. Each day that a violation of this chapter exists may be treated as a separate infraction.

C. Except in circumstances where there is a serious and imminent threat to public health or safety, prior to filing a public nuisance abatement action in San Juan County superior court, the town shall attempt to gain compliance by use of the civil infraction procedures set forth in Chapter 1.18 FHMC.

D. The penalty for committing a civil infraction under this chapter shall be as set forth in Chapter 1.18 FHMC. (Ord. 1080 § 11, 1998)

Chapter 13.05

WATER RATES AND CHARGES

Sections:

13.05.010 Definitions.
13.05.020 Connection charges.
13.05.030 Water service charge.
13.05.040 Charges – Commencement.
13.05.050 Reconnection charges.
13.05.060 Drought water rates.

13.05.010 Definitions.

A. "Base charge" means the monthly cost to provide services allocated to a particular class.

B. "Customer" means any person(s), firm, or corporation that is furnished drinking water through a legal service connection to the public drinking water system.

C. "Customer classes" means the various classes of customers that the domestic water system serves. These classes are distinguished both by their use classification and their location within or outside the town limits. They are as follows:

1. Class I – Single-Family Residential (SFR). A building within the town limits whose principal use is residential, designed for one family and connected to the town domestic water system.

2. Class I – Multifamily Residential (MFR). A building located within the town limits whose principal use is residential, designed for two or more families and connected to the town domestic water system.

3. Class I – Commercial (COM). A building located within the town limits whose principal use is for the providing of goods or services for compensation and connected to the town domestic water system.

4. Class I – Light Manufacturing (LMF). A building located within the town limits whose principal use is for research and development and light manufacturing not requiring outdoor storage and connected to the town domestic water system.

5. Class I – Industrial (IND). A building located within the town limits whose principal use is for manufacturing and/or uses requiring outdoor storage and connected to the town domestic water system.

6. Class I – Public Authority (PA). A building located within the town limits owned or operated by a public entity and connected to the town domestic water system.

7. Class II – Single-Family Residential (SFR). A building outside the town limits whose principal use is residential, designed for one family and connected to the town domestic water system.

8. Class II – Multifamily Residential (MFR). A building located outside the town limits whose principal use is residential, designed for two or more families and connected to the town domestic water system.

9. Class II – Commercial (COM). A building located outside the town limits whose principal use is for the providing of goods or services for compensation and connected to the town domestic water system.

10. Class II – Light Manufacturing (LMF). A building located outside the town limits whose principal use is for research and development and light manufacturing not requiring outdoor storage and connected to the town domestic water system.

11. Class II – Industrial (IND). A building located outside the town limits whose principal use is for manufacturing and/or uses requiring outdoor storage and connected to the town domestic water system.

12. Class II – Public Authority (PA). A building located outside the town limits owned or operated by a public entity and connected to the town domestic water system.

These classes of customers are further distinguished by the size of their individual water meters. Currently these meter sizes range from five-eighths inch to four inches.

D. "Use charge" means the monthly charge for water delivered to an approved water service connection.

E. "Water service charge" means the combination of base charge and use charge. (Ord. 1084 § 1, 1998)

13.05.020 Connection charges.

A. Connection Charge.

1. The connection charge is comprised of two components: a general facilities charge (GFC) and a systems development charge (SDC).

a. A general facilities charge is hereby imposed in order that new users of the water system shall bear their equitable share of the cost of the system. The general facilities charge is the current "owner's" net investment in the estimated original cost of nondonated system assets and all accumulated interest on the investment.

b. A systems development charge is hereby imposed in order that new users of the water system shall contribute their equitable share of the cost of planned improvements to the system that benefit all users of the system.

2. The connection charge varies, based on water meter size, to reflect the capital costs associated with the higher potential peak demands of larger meter sizes on all capital facilities as provided for in the design of the water system. The required water meter size shall be determined by the building official.

3. The connection charge for all classes of use shall be as follows:

Meter Size	Charge
5/8" x 3/4"	$3,602
1"	$9,004
1 1/2"	$18,004
2"	$28,807
3"	$57,614
4"	$90,022

4. The connection charge shall be adjusted annually each January 1st by the average percentage increase or decrease of the Seattle Consumer Price Index (CPI) as reported for the first half of the previous year.

B. Installation Charge.

1. In addition to the connection charge, an installation charge shall be assessed and paid at the time of application for a connection permit to cover the costs to the town for digging up and restoring the streets to their original condition.

2. Installation charge for all classes of uses shall be as follows:

Meter Size	Charge
5/8" x 3/4"	$1,422
1"	$2,130
1 1/2"	$2,842
2"	$3,788
3"	$5,039
4"	$6,336
4" compound	$7,846
Fire hydrants	Labor & materials

3. For service inside the town the installation charge shall include all labor and materials from the water main to and including the meter and stopcock on the customer's property. The meter and stopcock shall be installed by the town, and shall be located as designated by the town and kept within the town's exclusive control.

4. For service outside of town, the applicant shall be responsible for trenching from the main to the property line, and must obtain proper permits from the county to perform such work and assume all liability. The county permit shall accompany the town application for water hookup. The meter and stopcock shall be installed by the town, and shall be located as designated by the town and kept within the town's exclusive control.

5. The installation charge shall be adjusted annually each January 1st by the average percentage increase or decrease of the Seattle Consumer Price Index (CPI) as reported for the first half of the previous year. (Ord. 1150 §§ 1, 2, 2000; Ord. 1120 § 1, 1999; Ord. 1084 § 2, 1998)

13.05.030 Water service charge.

A. Base Charge. The monthly water base charge shall be as follows:

Class I

Meter Size	SFR	MFR	COM	LMF	IND	PA
5/8"	21.75	22.00	22.00	24.76	24.76	22.00
1"	49.26	49.90	49.90	56.83	56.83	49.90
1 1/2"	95.15	96.42	96.42	110.27	110.27	96.42
2"	150.20	152.25	152.25	174.41	174.41	152.25
3"	NA	301.12	301.12	345.42	345.42	301.12
4"	NA	468.58	468.58	537.81	537.81	468.58

Class II

Meter Size	SFR	MFR	COM	LMF	IND	PA
5/8"	32.61	32.99	32.99	37.14	37.14	32.99
1"	73.89	74.84	74.84	85.24	85.24	74.84
1 1/2"	142.72	144.64	144.64	165.41	165.41	144.64
2"	225.31	228.36	228.36	261.60	261.60	228.36
3"	NA	451.67	451.67	518.12	518.12	451.67
4"	NA	702.88	702.88	813.33	813.33	702.88

B. Use Charge. The monthly water use charge shall be as follows:

1. Use Charge – SFR – Class I and Class II.

Volume of Use	Charge per Thousand Gallons
First 3,500 gallons	$3.80
3,501 to 7,000 gallons	$4.75
7,001 to 10,500 gallons	$6.32
Over 10,501 gallons	$7.58

2. Use Charge for All Other Uses – Class I and Class II.

November Bill through June Bill	July Bill through October Bill
$3.80 per thousand gallons	$4.75 per thousand gallons

C. The charge for water taken by tank load shall be as follows:

	October through May	June through September
Base Charge	$32.61	$32.61
Charge per Thousand Gallons	$3.80	$4.75

D. All water service billings are due and payable by the tenth of the month following billing. Service to accounts will be disconnected on the fiftieth day following the billing date unless the account is paid in full.

E. The water service charge shall be increased or decreased so as to derive the required revenue to accomplish the tasks as outlined in the water budget as adopted by the town council. (Ord. 1150 §§ 1, 2, 2000; Ord. 1120 § 1, 1999; Ord. 1084 § 3, 1998)

13.05.040 Charges – Commencement.

Water service charges shall begin on the first of the month following the meter installation and shall continue until the meter is removed. (Ord. 1084 § 4, 1998)

13.05.050 Reconnection charges.

When it is necessary for the town to shut off the water for nonpayment of a water, sewer, storm water or refuse bill, when water and sewer services are provided, a $30.00 charge shall be paid to turn it on. (Ord. 1084 § 5, 1998)

13.05.060 Drought water rates.

A. Upon passage of a resolution by the town council that a moderate drought condition exists, the use charge shall be increased as follows:

1. For Class I – single-family residential (SFR) and Class II – single-family residential (SFR), use of metered water that exceeds 7,000 gallons in two successive billing cycles shall be deemed nonessential use. Users shall be charged the published rate per 1,000 gallons used during the first billing cycle and in addition notified by letter of the excessive use over 7,000 gallons. Users shall be charged 200 percent of the published rate per 1,000 gallons used if during the second successive billing cycle they exceed 7,000 gallons used.

2. For Class I – multifamily residential (MFR) and Class II – multifamily residential (MFR), use of metered water that exceeds 7,000 gallons in two successive billing cycles for each multifamily dwelling unit shall be deemed nonessential use. Users shall be charged the published rate per 1,000 gallons used for each multifamily dwelling unit during the first billing cycle and in addition notified by letter of the excessive use over 7,000 gallons. Users shall be charged 200 percent of the published rate per 1,000 gallons used for each multifamily dwelling unit if during the second successive billing cycle they exceed 7,000 gallons used.

3. For Class I and II – commercial (COM), Class I and II – industrial (IND), and Class I and II – public authority (PA), users of metered water shall be charged 115 percent of the published rate per 1,000 gallons used during each billing cycle.

B. Upon passage of a resolution by the town council that a severe drought condition exists, the use charge shall be increased as follows:

1. For Class I – single-family residential (SFR) and Class II – single-family residential (SFR), use of metered water that exceeds 50 gallons per day per person residing within the dwelling unit in two successive billing cycles shall be deemed nonessential use. Users shall be charged the published rate per 1,000 gallons used during the first billing cycle and in addition notified by letter of the excessive use over the amount equal to 50 gallons per day per person. Users shall be charged 200 percent of the published rate per 1,000 gallons used if during the second successive billing cycle they exceed 50 gallons per day per person.

2. For Class I – multifamily residential (MFR) and Class II – multifamily residential (MFR), use of metered water that exceeds 50 gallons per day per person residing within the dwelling unit in two successive billing cycles for each multifamily dwelling unit shall be deemed nonessential use. Users shall be charged the published rate per 1,000 gallons used for each multifamily dwelling unit during the first billing cycle and in addition notified by letter of the excessive use over the amount equal to 50 gallons per day per person. Users shall be charged 200 percent of the published rate per 1,000 gallons used for each multifamily dwelling unit if during the second successive billing cycle they exceed 50 gallons per day per person.

3. For Class I and II – commercial (COM), Class I and II – Industrial (IND), and Class I and II – public authority (PA), users of metered water shall be charged 150 percent of the published rate per 1,000 gallons used during each billing cycle.

C. Upon passage of a resolution by the town council that a critical drought condition exists, all classes of users of metered water shall be charged 200 percent of the published rate per 1,000 gallons used during each billing cycle.

D. The council shall comprise a water review board whose purpose shall be to approve, modify, or deny requests for variances, presented to the town in writing, of the above stated conditions or rates being charged due to special circumstances or hardships unique to the individual user.

E. All other applicable terms and conditions of this chapter shall apply to these drought water rates. (Ord. 1084 § 6, 1998)

Chapter 13.08

WATER LINE SPECIFICATIONS

Sections:

13.08.010 Adoption of water main extension requirements.
13.08.020 Copies on file.
13.08.030 Private service lines.
13.08.040 System requirements.
13.08.050 Special regulations for properties with high service pressures.
13.08.060 Violation and enforcement.

13.08.010 Adoption of water main extension requirements.

The "Town of Friday Harbor Water and Sewer System Extension Requirements" as published by the engineering firm of Kramer, Chin and Mayo, Inc., is adopted as the conditions and construction standards to be adhered to in any and all extensions to the town water system. (Ord. 1081 § 1, 1998)

13.08.020 Copies on file.

The publication entitled "Town of Friday Harbor Water and Sewer System Extension Requirements" shall be available for public review in the office of the town clerk. (Ord. 1081 § 2, 1998)

13.08.030 Private service lines.

A. "Private service lines" shall be defined as the line that is installed between the water meter and the user.

B. All private service lines, located inside and outside of town, shall be required to comply with the following standards:

1. Private service lines shall be constructed of grade Schedule 40 PVC or better.

2. Private service lines shall not exceed 300 feet in length and, for single-family residential use, shall not exceed three-quarter inch inside diameter, except where the town administrator determines that a greater length or larger size is necessary in order to provide the user with the same level of service which is provided to the majority of other users of the same classification. Any such necessity shall be clearly documented by specifications and

drawings from a state-licensed engineer, who shall also provide the specifications and drawings for the particular service line being proposed, all at no expense to the town.

3. Pipe bedding for private service lines shall be Class B bedding type, with bedding material to satisfy the gradations of sand, pea gravel, gravel, or gravel sand as defined in APWA standard specifications. Bedding material shall be placed to a minimum depth of six inches below the pipe and shall also be used as initial backfill to a minimum depth of six inches over the pipe.

4. Private service lines shall be placed at a minimum depth of 30 inches below finished grade.

C. There shall be no storage tanks, pumps, pressure tanks, or other devices of any nature attached to any private service line, except as approved by the town. (Ord. 1081 § 3, 1998)

13.08.040 System requirements.

A. Water service into each separate building shall have a shutoff valve, except for buildings which are within the town and designed and used exclusively for purposes which are accessory to a single-family residence.

B. Piping must be kept in repair and protected from freezing by the owner, and the owner or occupant shall be responsible for all damages resulting from leaks and breaks from the shutoff valve to the building.

C. No person shall install or maintain any actual or potential cross connection to the town water system unless approved by the town. Any such cross connection now existing is hereby declared unlawful and shall be removed immediately.

D. The approval or elimination of cross connections shall be in accordance with the State of Washington Administrative Code (WAC 248-54-285) or any superseding WAC, and the policies, procedures, and criteria for determining appropriate levels of protection shall be in accordance with the "Accepted Procedure and Practice in Cross Connection Control Manual – Pacific Northwest Section – American Waterworks Association, Fourth Edition", or any superseding editions.

E. Backflow prevention assemblies, if required, shall:

1. Be a model approved by the Washington State Department of Health.

2. Be installed under the direction of a designated town employee.

3. Be tested at least annually at the owner's expense. Completed test reports shall be returned to the town within 30 days after receipt of the yearly test notification. Tests and inspections may be required on a more frequent basis at the discretion of the town. Authorized employees of the town with proper identification shall have free access at reasonable hours of the day to all parts of a premises or within buildings to which water is supplied. Water service shall be refused or terminated to any premises for failure to allow necessary inspections. (Ord. 1081 § 4, 1998)

13.08.050 Special regulations for properties with high service pressures.

The water service to all properties where the service pressure exceeds 80 pounds per square inch shall be installed, at the owner's expense, with an approved pressure regulating device, reducing the pressure on the user side of the device to between 40 and 50 pounds per square inch. (Ord. 1081 § 5, 1998)

13.08.060 Violation and enforcement.

A. A violation of this chapter shall be and hereby is declared both a public nuisance and a Class 1 civil infraction, as defined in Chapter 1.18 FHMC. Each day that a violation of this chapter exists may be treated as a separate infraction.

B. Except in circumstances where there is a serious and imminent threat to public health or safety, prior to filing a public nuisance abatement action in San Juan County superior court, the town shall attempt to gain compliance by use of the civil infraction procedures set forth in Chapter 1.18 FHMC.

C. The penalty for committing a civil infraction under this chapter shall be as set forth in Chapter 1.18 FHMC. (Ord. 1081 § 6, 1998)

Chapter 13.12

LIMITATIONS ON NEW SERVICES

Sections:

13.12.010 Limitation on out-of-town services.
13.12.040 Limitation on use of water.

13.12.010 Limitation on out-of-town services.

A. No new water main lines and no new extensions of existing water main lines shall be allowed outside the town; provided, however, this shall not preclude the town from extending existing mains for the sole purpose of establishing appropriate tie-ins between existing mains.

B. Existing uses outside of the town shall not be allowed to change to a different use or customer class, as defined in FHMC 13.05.010. In the event any such change occurs, the town shall provide the property owner with 30 days' written notice of the violation. If the proper use is not restored within 30 days, the town shall disconnect water service to that property.

C. No new water connections shall be allowed for properties outside of town except for those properties which have received prior commitments from the town as specifically identified in Resolution No. 1112 of the town. All connections allowed under this subsection shall be used only for Class II single-family residential as defined in FHMC 13.21.010 (B)(1)(g).

D. The right to connect those properties identified in subsection C of this section shall not be transferable to any other property and the town shall not recognize the right of any out-of-town property to connect to the town water system on the basis of a connection right having been transferred to that property from another property which is entitled to connect.

E. Use of Water for Out-of-Town Sprinkler Systems. Town water may be used to charge fire suppression sprinkler systems in structures located out of town if all of the following conditions are met:

1. The structure is used as an essential public facility, as defined in Appendix B (Joint Planning Policy) of the town's adopted comprehensive plan; and

2. The land on which the structure is located is:

a. Legally entitled to a connection to the town water system;

b. Located within an area where the town has an emergency fire response obligation;

c. Owned by a governmental agency.

This section shall not authorize the use of town water by an essential public facility located on government owned property which is legally connected to the town water system for any purpose other than charging a fire suppression sprinkler system, unless such other use qualifies as an existing use under the provisions of subsection B of this section. (Ord. 1141 § 1, 2000; Ord. 1139 § 1, 2000; Ord. 1114 § 2, 1999; Ord. 1082 § 1, 1998)

13.12.040 Limitation on use of water.

A. When current annual revolving demand, as defined in FHMC 17.72.020(H), exceeds 85 percent of adopted level of service, as set forth in the comprehensive plan as amended, a minor emergency condition, as set forth in FHMC 13.16.020(A), shall be deemed to exist.

B. Said minor emergency condition shall continue in effect until current annual revolving demand does not exceed 85 percent of water system capacity. (Ord. 1116 § 2, 1999)

Chapter 13.16

WATER USE RESTRICTIONS

Sections:

13.16.010 Purpose.
13.16.020 Restrictions.
13.16.030 Violation and enforcement.

13.16.010 Purpose.

The purpose of this chapter is to control the use of water from the town water supply system so as to improve conservation and prevent improper use and waste during declared water emergencies. (Ord. 1083 § 1, 1998)

13.16.020 Restrictions.

Whenever, by resolution, the town council declares that existing water supplies in the town's domestic water supply system are in a condition that requires implementation of an emergency conservation plan, such resolution shall declare whether such condition constitutes a minor emergency, moderate emergency, severe emergency, or critical emergency, whereupon the following user restrictions and penalties shall apply to use of water from the town water supply system:

A. Minor Emergency Condition.

1. There shall be no watering of lawns, which does not include the grass areas which comprise public use athletic and physical education fields.

2. There shall be no washing of any sidewalk, walkway, driveway, parking lot, or other impervious surfaced area, except that high pressure, low water volume washers may be used.

3. There shall be no washing of any building or structure, except that high pressure, low water volume washers may be used.

4. There shall be no washing of any motor vehicle, boat, travel trailer, or airplane other than for safety cleaning of windows, except that high pressure, low water volume washers may be used.

5. No tap water shall be served to customers at restaurants unless expressly requested by the customer to whom it is provided.

6. There shall be no use of water for fire department drills or burn house exercises.

7. Penalties.

a. First observed violation: Hand delivery of a written warning to resident or tenant explaining the town's present water shortage situation and a verbal warning of the installation of a flow restrictor if a second violation is observed. This is seen as an educational visit;

b. Second observed violation: Installation of a flow-restriction device for seven days that will only allow one gallon per minute of water to enter the premises of the resident; a verbal warning of discontinuance of service if a third violation is observed;

c. Third observed and successive violations: Water service shutoff and a $100.00 charge assessed to the utility account to turn the service back on;

d. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300.

B. Moderate Emergency Condition.

1. There shall be no watering of lawns including grass areas which comprise public use athletic and physical education fields.

2. There shall be no washing of any sidewalk, walkway, driveway, parking lot, or other impervious surfaced area.

3. There shall be no washing of any building or structure, including the washing of windows.

4. There shall be no washing of any motor vehicle, boat, travel trailer, or airplane other than for safety cleaning of windows except at a commercial washing facility that recycles its wash water.

5. No tap water shall be served to customers at restaurants unless expressly requested by the customer to whom it is provided.

6. There shall be no use of water to fill any indoor or outdoor swimming pool or spa.

7. There shall be no use of water for operating private or public fountains or ponds

for aesthetic or scenic uses except where necessary to support fish life.

8. There shall be no use of water for dust control.

9. There shall be no sale of water directly from the town's reservoir tanks.

10. Landscaping and screening requirements per FHMC Title 17 for development permits issued prior to declaration of a severe emergency condition shall be suspended until the severe emergency condition has abated. The issuance of a final certificate of occupancy for the development shall not be made until all landscaping and screening requirements of the development permit are completed.

11. The town council shall consider enactment by ordinance of a drought surcharge for all classes of water users.

12. The town council shall consider enactment by ordinance of a temporary moratorium on such things as the approval of water availability certificates, the issuance of development permits that will require a new connection to the town's water supply system, the approval of increases in the size of water meters then serving properties with town water, the extension of any water main that is part of the town's water system, except for extensions necessary or appropriate for installation of town fire hydrants, approved sprinkler systems, and such other fire suppression systems as may be beneficial to public safety, or such other matters as may be necessary or appropriate under the circumstances.

13. Penalties.

a. First observed violation: Hand delivery of a written warning to the occupant explaining the town's water shortage situation and subsequent penalties;

b. Second observed violation: A $100.00 charge to the occupant, assessed to the utility account, and a verbal warning of potential water service shutoff;

c. Third observed and successive violations: A $250.00 charge to the occupant, assessed to the utility account, and the water service shutoff;

d. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300.

C. Severe Emergency Condition. All nonessential use of water from the town's water supply system shall cease. The following uses are deemed nonessential and shall be prohibited:

1. There shall be no watering of any landscaped areas including trees, plants, vegetable gardens, flowers, or lawns including grass areas which comprise public use athletic and physical education fields.

2. There shall be no washing of any sidewalk, walkway, driveway, parking lot, or other impervious surfaced area.

3. There shall be no washing of any building or structure, including the washing of windows.

4. There shall be no washing of any motor vehicle, boat, travel trailer, or airplane other than for safety cleaning of windows.

5. No tap water shall be served to customers at restaurants unless expressly requested by the customer to whom it is provided.

6. There shall be no use of water to fill any indoor or outdoor swimming pool or spa.

7. There shall be no use of water for operating private or public fountains or ponds.

8. There shall be no use of water for dust control.

9. There shall be no sale of water directly from the town's reservoir tanks.

10. Landscaping and screening requirements per FHMC Title 17 for development permits issued prior to declaration of a severe emergency condition shall be suspended until the severe emergency condition has abated. The issuance of a final certificate of occupancy for the development shall not be made until all landscaping and screening requirements of the development permit are completed.

11. The town council shall consider enactment by ordinance of a drought charge for all classes of water user.

12. The town council shall consider enactment by ordinance of a temporary moratorium on such things as the approval of water

availability certificates, the issuance of development permits that will require a new connection to the town's water supply system, the approval of increases in the size of water meters then serving properties with town water, the extension of any water main that is part of the town's water system, except for extensions necessary or appropriate for installation of town fire hydrants, approved sprinkler systems, and such other fire suppression systems as may be beneficial to public safety, or such other matters as may be necessary or appropriate under the circumstances.

13. Water use shall be rationed to all residential classes of users and limited to 50 gallons per day per person residing within the dwelling unit.

14. Water use shall be rationed to all nonresidential users based on 50 percent of their historical usage as calculated by the town.

15. All nonresidential classes of users shall be required to post a notification adjacent to all water use areas that states the severe emergency drought conditions as enacted.

16. Penalties.

a. First observed violation: A $100.00 charge to the occupant, assessed to the utility account, and a verbal warning of potential water service shutoff, and additionally any account whose consumption exceeds the amounts stated in subsections (C)(13) and (C)(14) of this section in two successive billing cycles shall have a water-restricting device placed on their water meter that will limit water flow to one gallon/minute in the case of residential classes of users and five gallons/minute in all other classes of users. Removal of such restrictors shall be made only after the installation by the town of toilet dams, low-flow shower heads, faucet aerators, and other water conservation devices at a cost of time and materials to the account.

b. Second observed and successive violations: A $250.00 charge to the occupant, assessed to the utility account, and the water service shutoff.

c. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300.

D. Critical Emergency Condition. In order to provide for the essential health, safety, and welfare of the public the only allowed uses of the town's water supply are:

1. Residential classes of users whose consumption shall be limited to 25 gallons per day per person residing within each dwelling unit.

2. Group care facilities housing the infirm or elderly whose consumption shall be limited to 50 gallons per day per person residing within such group care facility.

3. Fire suppression as needed.

4. Municipal uses to process water, wastewater, or refuse as required by law.

5. Penalties.

a. First observed and successive violations: A $500.00 charge to the occupant, assessed to the utility account, and the water service shutoff;

b. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300. (Ord. 1083 § 2, 1998)

13.16.030 Violation and enforcement.

A. The town administrator is designated as the enforcement officer and shall have responsibility for enforcing the provisions of this chapter. In addition to penalties set forth above, a violation of this chapter shall be and hereby is declared both a public nuisance and a civil infraction, as defined in Chapter 1.18 FHMC. Each day that a violation of this chapter exists may be treated as a separate infraction.

B. Except in circumstances where there is a serious and imminent threat to public health or safety, prior to filing a public nuisance abatement action in San Juan County superior court, the town shall attempt to gain compliance by use of the civil infraction procedures set forth in Chapter 1.18 FHMC.

Appendix C: Water Rights

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

R1-22004C

COPY

CERTIFICATE OF WATER RIGHT

[X] Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[ ] Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
July 8, 1974	R1-22004	R1-22004P	R1-22004C

NAME
TOWN OF FRIDAY HARBOR

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
Box 219	Friday Harbor	Washington	98250

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
Unnamed Stream (Trout Lake)

TRIBUTARY OF (IF SURFACE WATERS)
False Bay

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
		497.0 161,947,947 gal

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal supply - continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1300 feet east and 1500 feet north of the southwest corner of Sec. 18

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, E. OR W.I W.M.	W.R.I.A.	COUNTY
NE¼SW¼	18	35	3 W.	2	San Juan

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Friday Harbor.

PROVISIONS

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Redmond *Washington, this* 30th *day of* June, *19* 78

Department of Ecology

ENGINEERING DATA

OK

by ROBERT K. McCORMICK, Regional Manager

FOR COUNTY USE ONLY

Aug I

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT S1-23127C

COPY

[X] Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[ ] Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
June 7, 1978	S1-23127	S1-23127P	S1-23127C

NAME
TOWN OF FRIDAY HARBOR

ADDRESS (STREET) (CITY) (STATE) (ZIP CODE)
c/o Mayor Edward Bourne, P.O. Box 278, Friday Harbor Washington 98250

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
Unnamed stream

TRIBUTARY OF (IF SURFACE WATERS)
False Bay

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
0.98		240.0 = 77,875,200 gals

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal and industrial supply - continuous from October 1 to April 15

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL
1600 feet south and 1500 feet east of NW¼ corner of Sec. 7

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼NW¼	7	35	3 W	2	San Juan

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Town of Friday Harbor and surrounding area served by municipal water system.

(SEE REVERSE SIDE)

CERTIFICAT

PROVISIONS

A. Withdrawal at the point of diversion shall occur only from October 1 to April 15.

B. All diversion shall cease when the overflow from the point of diversion catch basin drops to 0.50 cubic feet per second (225 gallons per minute).

C. Construct a staff gauge immediately downstream of point of diversion to monitor the 0.50 cubic feet per second.

D. Total withdrawal from R1-22004C (497 acre-feet per year) and S1-23127 (240 acre-feet per year) shall not exceed an annual withdrawal of 613 acre-feet per year for Municipal Supply.

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Redmond *Washington, this* 30th *day of* September, *19* 80

Department of Ecology

by Robert K. McCormick

ROBERT K. McCORMICK, Regional Manager

ENGINEERING DATA

OK

FOR COUNTY USE ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

95112704

Aug 11
Town of Friday Harbor

DEC -6 1995
RECEIVED

DEC -6 1995
RECEIVED

SUPERSEDING CERTIFICATE OF WATER RIGHT

[X] Surface Water (issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[ ] Ground Water (issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
July 16, 1979	S1-23457	S1-23457 P	S1-23457 C

NAME
Town of Friday Harbor

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
P.O. Box 219	Friday Harbor	Washington	98250

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Unnamed Stream

TRIBUTARY OF (IF SURFACE WATER)
False Bay, Haro Straight

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
3.0		736.5 = 239,988,262 gals

QUANTITY, TYPE OF USE, PERIOD OF USE

Municipal supply - November 1 thru April 15

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION–WITHDRAWAL

1500 feet north and 1400 feet east of the SW¼ corner of Section 17

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NW¼ SW¼	17	35	3W	2	San Juan

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Town of Friday Harbor and surrounding area served by municipal water system, Township 35N, Range 3W W.M., San Juan County, State of Washington.

INDEXED

95112704

Filed for Record at the Request
of TOWN OF FRIDAY HARBOR
On NOV 27 1995 AD
at 12:22 PM and recorded
In vol. 530 of Official
Records, page 139-140
SI STEPHENS, AUDITOR
San Juan County, WA
By _____ Deputy

PROVISIONS

This certificate supersedes the certificate dated April 30, 1992. Only the annual quantity changed from 153 af/ to 736.5 af/y, is updated to reflect permit conditions.

Withdrawal from this P.O.D. shall occur only from November 1 thru April 15.

All diversion shall cease when the overflow from the P.O.D. catch basin drops to 0.765 cfs. A measuring devic approved by the Department of Ecology shall be installed to monitor the 0.765 cfs outflow, the purpose of whic is to maintain a minimum flow within the streambed.

A staff gauge shall be installed upstream of the P.O.D.

If the downstream Zylstra ponds (prior water rights for a total of 372.2 acre-feet per year) are not satisfied b June 1 of each year, the Town of Friday Harbor shall supply the difference from the Trout Lake Reservoir.

Total withdrawal from R1-22004C (497 acre-feet per year), S1-23127 (240 acre-feet per year) and S1-2345 (736.5 acre-feet per year) shall not exceed 1473.5 acre-feet per year.

An approved measuring device shall be installed and maintained in accordance with RCW 90.03.360, WAC 508 64-020 through WAC 508-64-040.

95112704

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herei described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RC\ 90.14.180.

Given under my hand and the seal of this office at Bellevue, Washington,

this 15th day of November, 1995.

ENGINEERING DATA
OK AC

Department of Ecology

by _____
Raymond K. Hellwig, Regional Supervisor, Shorelands and Water Resource

FOR COUNTY USE ONLY

Appendix D: Water Conservation Plan

"Water is a precious Islands' resource, please use it wisely."

Water Conservation Plan

Volume 2 of the
Town of Friday Harbor
Comprehensive Water System Plan Update

Final
August 2001

Water Conservation Plan

Final

August 2001

Prepared for:
Town of Friday Harbor
60 Second Street
PO Box 219
Friday Harbor, WA 98250

Prepared by:
Susan Key, Water Conservation Program Coordinator
Town of Friday Harbor, Water Conservation Office

Analysis and Graphics by:
Steven Dubail, System Administrator
Town of Friday Harbor, System Administration Department

See C:\Program Files\Adobe\Acrobat 4.0\Acrobat\plug_ins\OpenAll\Transform\temp\AllWaterConPlan01.doc

ACKNOWLEDGMENTS

This water conservation plan was developed by the Town of Friday Harbor's Water Conservation Office. It was guided by recommendations from the Town Planning Commission proceeding from a 1999 Work Session on Water Demand Management. Meetings focusing on water supply and conservation were held by the local chapter of The League of Women Voters' Friday Harbor Water Subcommittee, results of which were incorporated, as well as individual member's suggestions. Contributions were incorporated from various American Water Works Association (AWWA) and Water Conservation Coalition of Puget Sound (WCCPS) members, and conservation staff from the cities of Olympia, Seattle and Victoria, BC, and from Arizona, California, Florida, and New Mexico.

The Town's System Administration Department is to be commended for excellent data collection, digital management, and analysis. Utility Summary Reports generated monthly provide staff and elected decision-makers with invaluable information. Using these databases, the System Administrator produced the analyses that constitute the bulk of the Town's 1998 *Draft Water Conservation Analysis*, portions of which provided a baseline for Chapter 3, Sections 3.4 to 3.6, of this plan.

Thanks to Steven DuBail, Jim Slocomb and Don Eaton for internal review.
Map of the Town's Water System by Warren Jones.

For more information contact:

Water Conservation Program Coordinator
Water Conservation Office
Town of Friday Harbor
PO Box 219
Friday Harbor, WA 98250
360-378-2390 Ext. 234
FAX 360-378-5339
WEB www.fridayharbor.org

Table of Contents

Executive Summary

Background

Summary of Recommended Water Conservation Program

Introduction **- Goals, Policies and Objectives**

PART I Water Resources and Use Analysis

Chapter 1 Town of Friday Harbor's Water System
- 1.1 Description of Sources
- 1.2 Capacity of Trout Lake Reservoir
- 1.3 Sustainable Yield of Combined Water Sources
- 1.4 Capacity of Treatment, Distribution and Storage Systems
- 1.5 Cost Comparison of Increased Capacity

Chapter 2 Hydrological Factors Influencing the Water Supply
- 2.1 Rainfall Patterns
- 2.2 Drought Occurrences
- 2.3 Water Supply Recharge Rates
- 2.4 Watershed Health

Chapter 3 Demographic Factors Influencing the Water Supply
- 3.1 Actual Population
- 3.2 Population Growth
  - a. Increases in Resident Population
  - b. Seasonal Population Increases
- 3.3 Town Water Accounts
- 3.4 Yearly Consumption of Water Resources
  - a. Average Annual Overall Consumption
  - b. Percentage of Total Water Use by Class
  - c. Residential Annual Use
  - d. Average Daily Use per Residential Occupant
  - e. Commercial Annual Use
  - f. Industrial, Public Authority and Special Accounts' Annual Use
- 3.5 High End Water Users
- 3.6 Peak Use
- 3.7 Projected Demand for Water Resources
- 3.8 Regulatory Requirements

Chapter 4 Legislation and Planning Guidelines
- 4.1 Legislation Requiring and/or Supporting Water Conservation
- 4.2 Planning Guidelines
  - a. American Water Works Association (AWWA)
  - b. WA State Departments of Health (DOH) and Ecology
  - c. Environmental Protection Association (EPA)

PART II Water Conservation/Demand Management Programs and Measures

Chapter 5 System Measures Implementing Water Efficiency
- 5.1 Approve a *Water Conservation Plan* and Fund its Implementation
- 5.2 Metering
- 5.3 Unaccounted Water/Leak Detection

5.4 Pressure Reduction
5.5 Analysis of Improved Technologies
a. Desalination
b. Water Reuse

Chapter 6 Rate Structure Encouraging Water Conservation
6.1 Existing Town Rate Structure
a. Fourth Tier Added to Single Family Residential
b. Seasonal Increase for All Other Classes
6.2 Incentive Program
6.3 Drought Conservation Surcharge

Chapter 7 Indoor Water Conservation Measures
7.1 Plumbing Codes – WA State Water Use Standards
7.2 Fixture Replacement Programs
a. Toilet Rebates
b. Clothes Washing Machine Rebates
c. Showerhead and Faucet Aerator Retrofit

Chapter 8 Outdoor Water Conservation Measures
8.1 Partnership with WSU Master Gardeners
a. Landscape and Irrigation Audits
b. Award Winning Gardens and Landscapes
8.2 Landscaping Ordinance, Management Policy, and BMPs

Chapter 9 Peak Season Programs
9.1 Outdoor Water Use Ordinance
9.2 Partnership with Chamber of Commerce
a. Workshops for Businesses
b. Visitor Education
c. Speakers Bureau
9.3 Audits for High End Peak Water Users

Chapter 10 Information and Education Programs
10.1 Audit Program
10.2 Leak Detection Program
10.3 New Accounts
a. Welcome and Information Packet
b. Change of Ownership Ordinance
10.4 School Programs
10.5 Community Events
10.6 Water Conservation Message
a. Inclusion in Local Publications
b. Websites
c. Printed Material Distribution

Chapter 11 Data Collection and Demand Forecasting
11.1 Data Collection and Reporting
a. Monthly Utilities Summary Reports
b. Conservation Program Data
c. Water Conservation Customer Account Database
11.2 Water Demand Forecasting
a. Weather Forecasting

Chapter 12 Water Resources Advisory Board

Chapter 13 Funding Sources
13.1 State Funding for Water Utilities
13.2 Federal Funding
13.3 Professional Organizations
13.4 Partnerships at the Local Level

PART III

Acronyms and Definitions

References

Bibliography

List of Appendices

A. Relationship of Water Conservation Plan to Other Planning Efforts

B. History of the Town of Friday Harbor's Water System

C. Trout Lake Reservoir Level

D. Town Population Estimate Worksheet for April 1, 2000

E. Estimated and Projected Water Area Served Population

F. Specific Accounts by Customer Class

G. Water Consumption and Production

H. Water Consumption by Customer Class

I. 2000 Average Daily Water Use per Occupant – In and Out of Town

J. Estimated Average Daily Use per Occupant for SFR MFR Accounts, 2000

K. 2000 Top 40 Annual and Peak Month Water Users

L. Water Consumption – Peak Month

M. Projected Water Source Requirements

N. WA State Legislative Actions and Statutes

O. History of Town Water Conservation Programs

P. Monthly Utility Rates - 2000

Q. Benchmarks for Estimating Residential End Uses of Water

Executive Summary

Background

In 1912, Town officials believed that economic development and growth would outpace available water supplies and declared “the future of Friday Harbor depends on good water and sewage systems.” This quote is as true today as it was then, yet during portions of the year, we have a limited supply of this precious resource due to two seasonal influences.

San Juan Island is situated in the rain shadow of the Olympics. Because it is an island, there are no rivers bringing in water from melting snow packs and other upstream sources. Therefore, Trout Lake Reservoir depends solely upon precipitation for recharge.

Because the island lies in a rain shadow, precipitation is historically limited during the dry season, which varies in length, and can occur anywhere from April through October. This corresponds to the period that Augmentation 1 and 2 watersheds *cannot* be tapped due to restrictions on water rights. An analysis of precipitation and reservoir level data illustrates that rain falling during April through October *does not* increase the reservoir level. Increased human consumption, evaporation, and watershed absorption effectively offset rainfall during this period.

A second seasonal factor is the economically important visitor population bulge that dramatically impacts the Town’s infrastructure and nearly doubles daily consumption of water. This seasonal population increase occurs during the same months that San Juan Island historically experiences little rainfall.

Thus, periods of high demand correspond to periods of low water supply.

- Water conservation methods outlined in this plan will effectively target this period of low supply and peak demand.

In calendar year 2000, the Town used 67.2% of its capacity to provide water. When 85% is reached, the Town’s *1999 Comprehensive Plan, Capitol Facilities Element* CFE-50 recommends decreasing demand and/or increasing supply. A dam raising the level of Trout Lake Reservoir has been considered, however the cost of this project was estimated at over 3 million dollars. (KCM, 1997.)

- Focused water conservation programs outlined in this plan will achieve a 10-20% savings in water use which translate into a significant deferral of capital investments, allowing more time to effectively plan and save for needed infrastructure improvements.

The 2000 population of the Town of Friday Harbor was estimated at 1,989 as per WA State’s Office of Financial Management . These individuals, plus out of Town

customers, must bear the burden of rate increases to cover the rising costs of system operation, maintenance and improvements. By capitalizing on water in effect 'purchased' by water conservation programs, ratepayers may be protected from immediate, extreme rate increases otherwise needed to fund infrastructure improvements.
Legally, the Town of Friday Harbor must plan for and provide adequate water to supply basic customer and fire suppression needs during periods of peak use. Therefore, enough water must be available to supply all hookups and to prevent potential fires during the busiest and driest season, regardless of how much water is running over the spillway during the wettest of winters.

According to RCW 35.92.010 *"Municipal Utilities-Authority to Acquire and Operate Waterworks,"* the Town is obligated to provide a safe and reliable supply of water as efficiently as possible. These responsibilities extend to current customers, as well as to undeveloped lots within Town boundaries.

- Effective water conservation programs outlined in this plan help keep rates affordable, while saving water for future development within the Town limits.

Part 1 of this Plan provides further background detail, including a description of the Town's water sources and system, the hydrological and demographic factors influencing the water supply, and pertinent legislation and planning guidelines.

Summary of Recommended Water Conservation Plan

Part 2 of this plan outlines specific water conservation and demand management programs and measures. **<Funding Potential>** indicates the possibility of obtaining funding through grant applications.

- Recommended Programs or Measures have been prioritized as important.

- Potential Programs or Measures provide ideas for future implementation.

- Current Programs or Measures are presently being implemented.

- Information Required identifies weak links in the necessary data chain.

- Recommended Town Council Action refers to upcoming State legislation.

This plan takes a long-term approach to water conservation and targets all classes of water users. Industry cost-benefit analyses of commonly used water conservation programs, combined with local data, will be used to prioritize each year's expenditures.

A minimum of five years of data is necessary to analyze the actual effectiveness of programs. The Town will be able to begin this type of analysis after 2001 (refer to Chapter 11, Data Collection and Demand Management). Meanwhile, an industry rule of thumb is:

- Up to 10% conservation is achieved by voluntary methods.
- Up to 20% conservation is achieved by regulatory or mandatory methods.
  Examples – Plumbing and Building Code Amendments
  Landscaping Ordinance
- Up to 30% conservation is achieved by severe mandatory restrictions.
  Example - Instituting the Town's current *Water Shortage Response Plan*

Certain programs, such as fixture replacement, when combined with Plumbing and Building Codes requiring the installation of low flow fixtures for all remodels and new construction, can reasonably be phased out as the majority of older toilets, for example, are replaced with ultra low flush models.

Other programs, such as leak detection, weather forecasting, and assessing improvements in water conservation technologies, can reasonably be seen as ongoing, with funds allocated per year as for weather forecasting and technology assessment, and averaging every three years, as for leak detection.

Shaping attitudes toward water and the use of this resource has proven to be one of the most effective methods of conservation. Target audiences, such as local 5th grade classes, high school biology classes, new homeowners, and seasonal 'visitors' are constantly changing. Therefore, education programs, including audits, can also be thought of as ongoing.

This plan follows the *Conservation Planning Requirements* published by WA State Department of Health (DOH). The following criteria from the Environmental Protection Agency's *Water Conservation Guidelines* were also used in the development of this plan:

- Cost effectiveness
- Program costs
- Ease of implementation
- Consistency with other programs
- Rate payer impacts
- Legal issues or constraints
- Regulatory approvals
- Public acceptance
- Staff resources and capability
- Environmental impacts

In 1999, DOH approved the Town's *Compreh* *te* with the condition that current levels of water conser xpand. The next scheduled update of the water syste d must contain a Water Conservation Plan, that must th ent will be revised and updated as necessary to satisfy .

In summary, water conservation is a viable method of purchasing additional water, a finite resource that is in seasonal short supply. The Town's investment in effective water conservation programming will pay off because the cost is magnitudes less than the $3,000,000 plus needed for a dam improvement project.

However, a future balloon payment for infrastructure improvements is likely inevitable, especially if the Town is to continue to expand its ratepayer base and its visitor shoulder seasons. Typically, the cost of construction increases at a rate similar to inflation, thus no true savings are incurred by building sooner rather than later.

Implementation of water conservation programs and resource demand management will delay costly capital improvement projects, allowing more time for funding sources to be negotiated, and in return shielding constituents from dramatic and immediate rate increases. Funding the programs outlined in this plan will benefit not only the Town of Friday Harbor, but more importantly, the citizens that the Town serves.

Introduction

As the Town's population grows and visitor shoulder seasons expand, our water resources are going to have to go further in order to meet increasing demands. The dollars lost in revenue to the Town due to conservation are but drops in the bucket when compared to the cost of raising the dam. Conservation represents the least costly source of water for current and future needs.

According to Maddaus, 1987, there is no universally accepted definition of water conservation. The US Water Resources Council defines water conservation as "activities designed to:

1) reduce the demand for water,
2) improve efficiency in use and reduce losses and waste of water,
3) and improve land management practices to conserve water."

The importance of water conservation and demand management have long been acknowledged by Town of Friday Harbor elected officials and the citizens they serve, as well as by Washington State legislators and state agencies. Water conservation has become an increasingly important part of overall Town planning, and dovetails with many County and State level efforts. Refer to Appendix A for a description of these relationships.

This plan is divided into three parts:

Part 1 gives pertinent background information by briefly describing the Town of Friday Harbor's water system, listing the hydrological and demographic factors that influence the Town's water supply, and summarizing state legislation requiring and/or supporting water conservation.

Part 2 describes ongoing and proposed water conservation and demand management programs and measures.

Part 3 provides a list of acronyms and definitions, a list of references, a bibliography, and appendices.

The following goals, policies and objectives are taken from Town of Friday Harbor planning documents and provide a basis for Part 2 of this plan, Water Conservation Programs and Measures.

Goals

The following goals and policies relating to water conservation are taken from pages 6-70, 71 and 73 of the Town's *1999 Comprehensive Plan, Capitol Facilities Element.*

CFE-34 To develop and maintain a safe, efficient, and cost-effective water supply treatment and distribution for Friday Harbor.

CFE-35 To promote water conservation as a means to ensure protection and availability of Friday Harbor's water supply.

CFE-37 To encourage the research and use of water conservation technology.

CFE-38 To exhaust potential cost effective conservation measures before seeking new resources.

Policies

CFE-39 Friday Harbor should establish water conservation measures that apply to both water supply development and water use.

CFE-40 Friday Harbor should consider and support the best available options for water sources and supply to ensure that its citizens have adequate and reliable supplies of drinking water.

CFE-42 Friday Harbor should review and implement all viable methods of conservation, including but not limited to –

- water efficient devices.

CFE-43 Friday Harbor should establish a Conservation Program Manager to –

- collect, maintain and distribute conservation information;
- educate the public on new conservation technology;
- evaluate conservation systems;
- encourage the public to adopt conservation measures.

CFE-44 Friday Harbor should explore utility rate structures that encourage conservation.

CFE-45 Friday Harbor should encourage the voluntary adoption of conservation measures and purchase of conservation devices through education and incentive programs.

CFE-47 Friday Harbor should revise its land use, development and building regulations to encourage water conservation. Measures should include, but not be limited to –

- point-of-use demand management and water meters,
- water-efficient landscaping.

CFE-52 Friday Harbor should favor conservation measures over the acquisition of new resources.

Water Conservation Program Objectives

The objectives listed below and following quotes are taken from the Town of Friday Harbor's current *Comprehensive Water System Plan Update.* The objectives appear as amended by the Planning Commission during the 1999 Water Demand Management Work Session.

- Attain maximum efficient utilization of current water supplies resulting in financial savings achieved through the deferral of capital investments.

- Develop a program to inform all water customers, including visitors, how to use water efficiently.

- Reduce peak monthly and total annual consumption.

- Establish a means of incentive to conserve water.

- Promote long term efficiency with accelerated conservation on a short term basis.

"The Town of Friday Harbor is committed to implementing stringent conservation measures over the next 20 years to minimize costs associated with developing additional sources of water supply and treatment capacity."

"In the immediate future it is unlikely that additional sources of supply will be incorporated into the water system to meet anticipated increased demand. Friday Harbor must therefore rely on existing sources."

"Expansion of the source capacity can be delayed if conservation measures show a long-term reduction in water use or if the Town can accept more frequent periods when water conservation measures must be enforced."

"The Town's conservation efforts will also focus on limiting peak-day demands. The Town's goals are to reduce peak flows by 10 percent over the 20 year planning period."

In conclusion, past elected officials and appointed members of the Town's Planning Commission have long considered water conservation to be imperative, thus the maxim:

"Water is a precious Islands' resource, please use it wisely."

Chapter 1 Town of Friday Harbor's Water System

1.1 Description of Sources

Surface water is the sole source for the water supply accessed by the Town of Friday Harbor. Trout Lake Reservoir, the initial and primary source, is about five miles west of Friday Harbor in an isolated, undeveloped pocket fed by a steep drainage basin. The Town owns 600 acres of the surrounding watershed that totals approximately 860 acres.

In 1979, Augmentation (AUG) 1 was constructed to supplement the reservoir with additional surface water runoff. A dam was built near the southeast end of Lake 310 to collect water from a 190-acre watershed. Water captured is then pumped over a hill and into Trout Lake Creek, which drains into the northwest end of Trout Lake. The Town does not own the watershed, but has primary water rights for a 440-gpm instantaneous withdrawal and an annual withdrawal of 78 MG (with certain limitations) from October 1 to April 15.

Augmentation (AUG) 2 was built in 1988 and consists of a stream diversion, pumping station and force main. Water from a 3,850-acre watershed is funneled through a weir and pumped to the reservoir just above the dam. The Town owns secondary water rights and may withdraw 1,350 gpm instantaneously from November 1 to April 15 for a total annual withdrawal of 240 MG (with certain limitations).

Refer to Figure 1.1, a map of Trout Lake, AUG 1 and AUG 2 watersheds, and to Appendix B for a more detailed history of the Town's water system.

1.2 Capacity of Trout Lake Reservoir

Four studies have been done over a nineteen-year period determining the capacity of Trout Lake Reservoir. The results are summarized in Table 1.1 below.

Table 1.1 Capacity Studies of Trout Lake Reservoir

Date	Organization	Total Volume	Usable Volume
1975	Ecology	469 MG	Not computed
1979	Island Surveying	Not computed	318 MG
1983	KCM	520 MG	385 MG
1994	KCM	468 MG	370 MG

The most recent study, the *Town of Friday Harbor Trout Lake Capacity Analysis,* done in 1994 by KCM, determines the total volume of the reservoir to be 468 MG based on bathometric studies. The usable volume is less because the outlet pipe elevation is 288.2 inches below the spillway. The volume below the pipe is termed 'dead storage'

because it is not readily available, and is estimated to be 98 MG, leaving a usable volume of 370 MG.

During 1995, the year following a severe winter-long drought, the "dead storage" volume was accessed by a siphoning system that remains in place. The high sediment and organic content of this water puts a strain on the water treatment facility's filters, thereby limiting its use. The amount reasonably accessible by siphoning that will not put too great a strain on the treatment plant filters is estimated at 30 MG.

Usable volume of 379 MG + 30 MG siphoning = 400 MG total capacity of Trout Lake Reservoir.

However, the elements listed below that contribute to sustainable yield must be factored into the equation, as the total capacity is a very simplistic and unrealistic representation of the amount of water actually available for use.

1.3 Sustainable Yield of Combined Water Sources

Sustainable yield is calculated using recharge projections and average annual conditions including fire suppression needs, historical consumption, precipitation, drought occurrences, reservoir levels, and watershed characteristics. The figures in Table 1.2 determine the amount of water that the reservoir and augmentation watersheds can safely and sustainably yield during a one-year period.

Table 1.2 Sustainable Yields of Water Sources Available to the Town
Calculated by KCM in the 1994 *Trout Lake Capacity Analysis*

Source	Sustainable Yield (MG, million gallons)
Trout Lake Reservoir	106 MG
Trout Lake + AUG 1	146 MG
Trout Lake + AUG 1 + AUG 2	168 MG
Trout Lake + AUG 1 + AUG 2 + Dead Storage	193 MG

Use of dead storage would only be condoned during drought conditions, therefore the effective total sustainable yield amount of 168 MG is the basis for the Town's monthly *Water and Sewer Utilities Summary Reports.*

1.4 Capacity of Treatment, Distribution and Storage Systems

The Town's *Comprehensive Water System Plan Update* provides an in depth description of the following elements which are briefly summarized below.

a. Treatment

Three gravity filters are located at the Town's Water Treatment Facility, two of which can be operated simultaneously, leaving one as a backup in case of failure. Usually operated at a conservative 4 gpm/sf, the filters have been pilot tested at higher rates within the hydraulic capacity of the systems pumps and piping. At a surface loading rate

of 5 gpm/sf, each of the three filters would have a capacity of 845 gpm. During peak season, two filters operating jointly increase potential production to 1,690 gpm.

b. Distribution System

Consisting of both transmission lines and pumps, the distribution system has the hydraulic capacity to operate at the above 1,690 gpm rates, but is not designed to carry a greater volume. During peak season and depending upon fire suppression needs, daily consumption may exceed this amount, in which case the 1.5 million-gallon storage capacity summarized below is critical.

c. Storage

Water is held in the Town's two tanks for three reasons – standby, equalization and fire storage. The standpipe, or storage tank, by the Town shop holds .5 MG, and the tank up on hill at the intersection of Harborview and Salmonberry holds 1 MG. Additional components of the transmission system store smaller amounts of water.

During peak season, the storage tanks are replenished during evenings and nights, corresponding to periods of lower demand.

1.5 Cost Comparison of Increased Capacity

The cost of acquiring 'new water' has increased by a factor of 10, from hundreds of thousands to millions of dollars. Refer to the Table 1.3 below.

Table 1.3 Cost Comparison of Additions to Town's Water System
KCM, *Comprehensive Water System Plan Update,* February 1997
KCM, *Town of Friday Harbor Trout Lake Dam Improvement Feasibility Study,* October 1997

Date	Description	Yield in MG	Total Cost	Cost per MG
1914	Addition to natural dam	?	$600	?
1914	Construction of wooden pipeline	NA	$7,251	NA
1979	AUG 1 system	78 MG	$256,000	$3,282
1988	AUG 2 system	240 MG	$556,000	$2,316
2000	New Dam raising total reservoir storage level by 7 feet	100 MG MG=million gallons	$3,000,000	$30,000

"The days of cheap water are over" is a quote heard at local, state and federal levels. Unfortunately, it is the Town's ratepayers that must bear this burden. According to WA State legislation RCW 35.92, it is the responsibility of Town elected officials and staff to minimize the financial impact to their customers, while continuing to provide a safe and reliable supply of potable water.

Chapter 2 Hydrological Factors Influencing the Water Supply

Rainfall patterns, drought occurrences, water supply recharge rates, and watershed health all influence the amount of water available in Trout Lake, AUG 1 and AUG 2 watersheds. Each of these elements is part of the larger 'hydrological cycle' and all are interdependent.

Factors determining the amount of water available to the Town of Friday Harbor fall into two general categories, hydrological and demographic. Hydrological factors, such as rainfall, often influence demographic factors, such as consumption rates. To a certain extent, we can control the human factors, but we must adapt to and plan for the effects of the natural factors.

All of these factors must be taken into account during local planning efforts and when tailoring water conservation programs to meet local needs.

2.1 Rainfall Patterns

The Olympic Mountain massif partially shields the San Juan Islands from moisture laden clouds blowing in from the Pacific. This is termed a rain shadow effect, whereby less precipitation falls here than in mainland Puget Sound. San Juan Island and Lopez are closest to the Olympics and are more strongly influenced by the rain shadow effect than Shaw, Orcas and the more northerly islands of the San Juan Archipelago.

Precipitation is the sole source of recharge to the watersheds comprising the San Juan Islands. There are no rivers bringing in snowmelt or accessing other stored water sources upstream. As well, the bedrock geology is too convoluted to provide pathways of groundwater movement from the mainland. (Brandon, 1988.) Therefore, both surface and groundwater systems are resupplied or recharged by precipitation.

The Town of Friday Harbor has kept rainfall data since the early 1900s at the Trout Lake station. This data is accessible in digital form for the years since 1979, and when mined, produces information that can be used both in planning and in tailoring water conservation programs.

The average yearly rainfall for the Trout Lake station was 27.64 for 1980-1999 and 29.18 for 1990-1999. Refer to Figure 2.1, Rainfall – Trout Lake Water Treatment Facility.

According to the US Geological Survey (USGS), precipitation in the Pacific Northwest has decreased since 1977. *"The water supply, though under greater demand, is not being renewed as fast as it was two to four decades ago because of the Pacific Northwest's currently drier and warmer climate. In the long term, managing the region's water resources will require better understanding of the role of climate."* (USGS, 1999.)

Figure 2.2, 100 Year Rainfall Averaged by Decade, illustrates that this general trend is also present at Trout Lake.

2.2 Drought Occurrences

Due to conditions summarized above, the Town's water supply is particularly vulnerable to cyclical droughts. During the last 20 years, the Town of Friday Harbor experienced three 50-year droughts. A 50- year drought is expected by the USGS to occur only once every 50 years. Local droughts of this magnitude occurred in 1979, 1988 and 1993/94 the last of which was declared a State level emergency.

As stated on page 3-8 of the Town's *Comprehensive Water System Plan Update*:

> "*On May 1, 1993, the water level [of Trout Lake Reservoir] was 89 inches below the spillway, triggering a moderate emergency. On May 1, 1994, the water level was 141 inches below the spillway, triggering a severe drought emergency."*

The Town of Friday was required to develop a *Water Shortage Response Plan*, which defines levels of emergencies and measures to be taken. To implement this plan, the Town passed Ordinance 1083, *Emergency Water Restrictions,* revised in 1998, and codified in Chapter 13.16 FHMC.

2.3 Water Supply Recharge Rates

The type of bedrock underlying a reservoir influences its hydrologic connection to the surrounding watershed. Trout Lake Reservoir is located in the Constitution Formation, "a clastic sequence containing massive volcaniclastic sandstone, with interbedded mudstone, ribbon chert, pillow lava, and green tuff." (Brandon, 1988.) The reservoir also lies along a fault valley. Both of these factors indicate that there is a degree of connectivity between the reservoir and the surrounding groundwater system. Further research is needed to determine the specifics of this connection.

The influence of rainfall on reservoir levels is shown in Figure 2.3, Rainfall and Max/Min Trout Lake Reservoir Levels. Note that a three-year, 20-inch decline in rainfall produces a sharp 195-inch decrease in reservoir level during the fourth year. At the beginning of a drought, surrounding groundwater is still adding to the reservoir level. Thus the reservoir level does not drop as quickly as one might think when precipitation is less than normal.

Depending on the duration and severity of the drought, the reservoir may actually loose water to the connected groundwater system through faults in the bedrock. And, as rainfall begins to increase following the drought, the surrounding watershed's hydrologic system is still recharging, and there is less flow into the reservoir itself, causing a "delayed recharge effect."

According to KCM's *Town of Friday Harbor Trout Lake Capacity Analysis,* there is no effective recharge from runoff to the reservoir until 18.5 inches of rain have fallen for any given year. For each inch of rain over 18.5 annual inches, there is a net recharge of approximately 35 million gallons to the reservoir. Refer to Appendix C, Trout Lake Reservoir Level, for data covering 1993 to 2000.

The same analysis determined that no water is available from AUG 1 until 17.5 inches of rainfall occurs in the watershed. Once this threshold is reached, each additional inch yields 42.4 million gallons.

For the purpose of the *Trout Lake Capacity Analysis*, KCM engineers estimated that AUG 2 requires 18 inches of rainfall to recharge the watershed, and that after this amount of rain has fallen, each additional inch yields 30 million gallons.

A comparison of rainfall data with reservoir levels shows that precipitation occurring after April *does not* increase the level of Trout Lake Reservoir. Not until October or later does the reservoir level begin increasing, no matter how much rain falls in May, June or September. In effect, consumption, evaporation, and watershed absorption negates rainfall during this period. Refer to Figure 2.4, Rainfall and Trout Lake Reservoir Levels.

For this reason, a customized local weather forecasting program would be extremely useful in determining the levels of demand management needed to ensure adequate water supply through dryer periods. Accurate weather forecasting would also determine the potential for precipitation and thus recharge during the coming winter months. If this potential were predicted to be low, increased levels of water conservation methods would be justifiable even after the end of the usual dry season.

2.4 Watershed Health

Though all vegetation uses a certain percentage of water during transpiration, most species of plants and trees trap precipitation and gradually release far more than they use into the watershed. Vegetation coverage also insures that the ground temperature is cooler than incoming precipitation. Rainwater can only infiltrate under this “positive temperature gradient,” or when it is warmer than the surface it falls upon.

Therefore, the amount of healthy vegetative surface area in a watershed is directly proportional to the amount of precipitation that is trapped and slowed for infiltration into that water system. In a healthy forested area, “the retention of runoff is in the order of 85%, about 15% being absorbed by the vegetation and humus and about 70% going towards groundwater recharge.” (Coats, 1998.)

A healthy watershed also prevents erosion and filters out many of the contaminants found in today’s precipitation. Sediments from erosion put an increased burden on the water treatment facility’s filters. Those that settle out in the reservoir bottom decrease the overall holding capacity of the reservoir, reducing the volume of water held for use.

In the long run, healthy watersheds provide a cleaner more abundant supply of relatively pristine water to the community of Friday Harbor.

Chapter 3 Demographic Factors Influencing the Water Supply

Actual population, estimates of population increases (both resident and seasonal), consumption, peak use, projected demand, and regulatory requirements are demographic or human factors that influence the Town's water supply.

3.1 Actual Population

According to the State Office of Financial Management (OFM) data, the population of the Town of Friday Harbor's incorporated area (inside town limits), was 1,957 as of April 1st 2000. Refer to Appendix D, Town Population Estimate Worksheet for April 1, 2000.

The total residential population (not including business or industrial accounts) of the area obtaining water from the Town system (both in-town and out-of-town connections) during 2000 can be estimated using OFM factors and Town water account data as follows:

472 SFR units (InTown accounts) x .9270 (OFM occupancy rate) x 2.3236 (OFM persons/unit) = 1,017
342 SFR units (OutofTown accts) x .6245 (OFM occupancy rate) x 2.2181 (OFM persons/unit) = 474
485 MFR units (InTown accounts) x .8194 (OFM occupancy rate) x 1.6984 (OFM persons/unit) = 675
Number of MFR InTown units obtained from Town CCR distribution list for 2000
57 MFR units (OutofTown accts) x .6245 (OFM occupancy rate) x 2.2181 (OFM persons/unit) = 79
Total number of residential individuals provided Town water in 2000 = 2,245

Figure 3.1, April 1 Population per OFM, tracks population for both Friday Harbor and unincorporated San Juan Island. The degree to which non-rate-paying individuals use "Town" water is difficult to determine, as is accurately tracking the total number of people who depend upon the Town's water system.

The above paragraphs illustrate that this most basic of factors, population, is difficult to pin down. Yet it plays an integral role in determining all of the following factors. The value of accurate population data cannot be overstated.

3.2 Population Growth

Increases in the population supplied by the Town of Friday Harbor fall into two categories – resident and seasonal. More accurate data is available on the resident population of both in-town and out-of-town water accounts, yet even this data is an estimate. Seasonal population increases are estimated by cobbling together data from a range of sources. As with baseline population, this is an area that warrants further refining. Refer to Appendix E, Estimated and Projected Water Area Served Population, for estimates up to the year 2015.

a. Increases in Resident Population

The projected growth rate for the Town of Friday Harbor was estimated to be 2.78% in 1995 by KCM in the Town's *Comprehensive Water System Update*. The growth rate for 1991 – 1994 shows an average 4.66% increase (refer to Figure 3.1, April 1 Population per OFM), yet in actuality, the growth rate for 1995 – 2000 shows an average 1.78% increase. During the Town of Friday Harbor's Comprehensive Plan update for 2001, an analysis was done that lead to a recommendation of a new growth rate of 1.4%. The

document's projections are based on this new number of 1.4%, pending final approval later this year.

Projected growth rates are invariably difficult to estimate as they are affected by unpredictable economic and geopolitical factors.

b. Seasonal Population Increases

People visit San Juan Island for a variety of reasons. Some come here only once, some come to visit family or friends, some stay part of the year in summer homes, and some come again and again because they enjoy it here. Most of these people access San Juan Island through Friday Harbor, using the municipality's infrastructure, and impacting the Town's water supply. The livelihood of many Friday Harbor businesses, and indeed Islanders in general, depends to an extent upon this seasonal population bulge.

Following are statistics drawn from various sources that illustrate dramatic seasonal increases in population:

- 58% increase in the day population of San Juan Island from April to September 1995, *Town of Friday Harbor Comprehensive Water System Plan Update*
- 87% increase in day population of San Juan Island during the peak month of August 1995, *Town of Friday Harbor Comprehensive Water System Plan Update*
- 450% increase in ferry traffic, both vehicular and walk-on, between January and August WA State Ferry data, TFH *Capitol Facilities Concurrency, Planning Commission Report,* 4-22-1999
- 5,274% increase from January to August in boat nights/month, two person occupancy Port of Friday Harbor data, TFH *Capitol Facilities Concurrency, Planning Commission Report,* 4-22-1999

This seasonal population bulge must be taken into account when estimating water use per capita, planning for future water supply, and tailoring effective water conservation programs. However, there is no one source of accurate data.

- Information Required – Establish a shared reporting framework including the Port of Friday Harbor, WA State Ferries, the lodging industry, and the San Juan Island Chamber of Commerce that will provide more accurate seasonal population information.

3.3 Town Water Accounts

The Town of Friday Harbor divides water customers into the following general classes. Further subdivision, for instance into type of commercial use, is complicated by many instances of communal metering.

a. Classes

SFR = Single Family Residential, also includes
SFR-RUR = low income elderly/disabled (must qualify through TFH)
MFR = Multi Family Residential

COM = Commercial
IND = Industrial
PA = Public Authority
Special (refer to Appendix F)

For a list of Industrial, PA and Special accounts, refer to Appendix F

b. Total Connections

As of December 2000, the Town of Friday Harbor water system has a total of 1201 connections, up from 992 accounts in 1990. The average rate of increase has been 21.5 per year since 1990. WA State DOH is requiring that connections be translated to equivalent residential units (ERUs), a unit of measure that is specific to the water system, and that reflects the amount of capacity needed to serve a typical full time single family residence.

3.4 Yearly Consumption of Water Resources

The Town of Friday Harbor meters customer service connections to measure water consumption. The Town's Water Department also meters the flow of water produced by the Water Treatment Facility. The difference between production and consumption equals unaccounted water, which must also be factored into yearly use figures and is present to some degree in all water systems. Refer to Chapter 5, System Measures Implementing Water Efficiency, Section 5.3 for a complete discussion of unaccounted water.

A *Draft Water Conservation Analysis,* modeled after Tacoma Public Utilities *Water Consumption Analysis,* was performed by the Town's System Administration Department and Water Conservation Program Coordinator in 1998, parts of which were used as baseline data for sections 3.4 to 3.6 of this chapter.

The Town's System Administrator receives data from the Water Department, performs analyses and produces monthly Utilities Summary Reports, as required by WA State DOH. This data can be framed in various helpful formats, some of which are listed below.

a. Average Annual Overall Consumption

Annual use of water has risen more slowly than anticipated during the six years since the last drought, reaching 112.8 MG in 2000. Refer to Figure 3.2, Water Consumption and Production. This is mainly due to the following reasons:

1) Following the drought of 1994, residents continued with many water conservation methods implemented by the Town's *Water Shortage Response Plan.* In addition, the Town's water conservation program was established in 1996, and has been operating since, reinforcing the importance of water conservation.

2) Some water customers have drilled wells for outdoor use.

3) Population growth has been less than expected, as discussed in Section 2.6a above.

4) The gravel pit, an industrial account that was the largest annual consumer of Town water significantly reduced consumption during the mid 90's and ceased operations shortly thereafter.

Refer to Appendix G, Water Consumption and Production, for more detailed information for the years 1994 to 2000.

b. Percentage of Total Water Use by Class

Table 3.1 below shows percentage by class of total annual water use for 2000. This comparison is instructive to a point. At first glance, the SFR class presents the greatest potential for water conservation savings. However, if most residents of the Town have already embraced the "water is a precious resource, please use it wisely" ethic, then there may be less potential for savings in this class than initially apparent.

Table 3.1 Percentage of Total Water Use of Class for 2000
Town of Friday Harbor Monthly Utilities Report, December 2000

Customer Class		% of Total Annual Water Use, 2000
SFR	Single Family Residential Includes SFR-RUR	37.7
COM	Commercial	25.7
MFR	Multifamily Residential	18.8
PA	Public Authority	14.4
IND	Industrial	1.5

The Town's System Administration Department has been tracking consumption by customer class since 1991. Refer to Appendix H, Water Consumption by Customer Class, for more detailed information for the years 1996 to 2000. A wealth of information is contained within this data. Refer to the figures below during the following sections on residential, commercial, public authority, and industrial annual use:

Figure 3.3, Water Connections by Customer Class, 1990 & 2000
Figure 3.4, Annual Water Use by Customer Class, 1990 & 2000
Figure 3.5, Separate graphs for COM, MFR, SFR, PA & IND Annual Water Consumption 1990-2000
Figure 3.6, Comparison by Customer Class, 1990 – 2000

c. Residential Annual Use

The number of Single Family Residential accounts has gone from 728 in 1990 to 806 in December of 2000, increasing by 10%. However, SFR annual usage in 2000 was 39.2 MG, actually below the maximum annual use of 46.5 MG that occurred in 1992. Multi-Family Residential (MFR) comparisons are problematic because a single account may represent a few to many living units. In 1990 there were 438 Multi-Family

Residential units (not accounts) and in 1997 there were 666, an increase of 34% over seven years. Annual MFR consumption was 15.6 MG in 1990 and 19.6 MG in 2000.

d. Average Daily Use per Residential Occupant

This calculation is problematic due to the difficulty in obtaining accurate occupancy rates, both number of people per household and fulltime versus seasonal occupancy. OFM occupancy rates were used for both In Town and Out of Town accounts. Refer to Appendix I, 2000 Average Daily Water Use per Occupant – In and Out of Town, and Appendix J, Estimated Average Daily Use per Occupant for SFR MFR Accounts - 2000, for complete information used in this calculation.

Table 3.2 Average Daily Use in 2000 Per Occupant for SFR and MFR

Customer Class	Location	Average Daily Use Per Occupant
Single Family Residential (SFR)	In Town	55.8 gallons
	Out of Town	99.9 gallons
Multifamily Residential (MFR)	In Town	63.6 gallons
	Out of Town	97.9 gallons

Note: MFR Out of Town includes 44 single family units on Friday Island, 39 of which are occupied seasonally. An attempt was made to adjust for this by using a four month occupancy for 39 units, and fulltime for 5 units.

In town water use by both single and multi family homes is below national averages, figured at 72.6 gcd (gallons per capita per day). Refer to Chapter 7, Figure 7.1, Typical Single Family Home Water Use Without Conservation.

e. Commercial Annual Use

The total number of commercial accounts has steadily increased from 146 in 1990 to 188 in 2000. Much of the downtown core has multiple uses on one meter, making it difficult to calculate consumption by business type.

f. Industrial and Public Authority Annual Use

Industrial accounts stabilized in 1992 at 15, remaining so through 1999, and increased to 18 as of end 2000. Primarily due to the closure of the gravel pit, industrial annual use has declined from a peak of 34.5 MG in 1993 to 1.7 MG in 2000.

Public Authority accounts increased from 38 in 1995 to 53 as of end 2000, while use increased from 10.8 to 15 MG.

3.5 High End Water Users

Certain factors make this comparison difficult. The UW Labs, for instance, has an entire complex on one meter, while the County, Town, school district, and some businesses and apartment complexes each have multiple meters. Most newer buildings are individually metered, whereas the downtown core has many instances of communal buildings where multiple businesses plus an occasional residential unit share a single meter.

Therefore a simple arrangement by individual account is often misleading. Appendix K, 1999 Top 40 Annual and Peak Month Water Users, was therefore compiled by combining multiple accounts into classes of users.

The Town was singled out because it is currently the top single annual water user on the system primarily due to the amount of water used by the Wastewater Treatment Facility. Refer to Chapter 5, System Measures Implementing Water Efficiency, for ways in which the Town could reduce use.

3.6 Peak Use

The Town must provide water supply (including fire suppression needs) and infrastructure capacity for periods of peak use. Monthly peak use historically falls in August and occasionally in July, and as of 2000 was 14,000,000 gallons per month, 3 MG below the highest pre-drought level of 17,026,910. Refer to Appendix L, Water Consumption – Peak Month. This decrease is due to a combination of leveling of population growth, added groundwater usage, and increased implementation of water conservation methods by Town customers. Refer to Figure 3.7, Water Consumption - February and August 2000, for a breakdown of peak monthly use by class.

The Town's peak use periods are historically synonymous with seasonal population increases and with decreased rainfall, necessitating irrigation. Therefore, peak use can be divided into two main categories, outdoor irrigation and visitor services.

a. Outdoor Irrigation

Most of this type of peak seasonal use occurs in areas outside the Town limits. As outdoor use is rarely separately metered, it is difficult to quantify. Chapter 8, Outdoor Water Conservation Methods, targets this type of peak use.

b. Visitor Services

Most of this type of peak seasonal use occurs within the Town limits, although 'visitors' more appropriately refers not only to tourists, but also to friends and families of residents, as well as to individuals living in the county who come to town. Because of their relatively large impact on water use, the visitor population can in essence be considered another class of resource user, and is targeted as such in Part 2 of this plan.

No method is currently in place to quantify the specific effects of this added class of user.

3.7 Projected Demand for Water Resources

Projected demand for water resources is based on population rates, historical per connection water production, and estimated per capita reductions due to conservation.

According to the Town's *Comprehensive Water System Plan Update,* the projected water use of those supplied by the Town's system was to exceed existing sources'

sustainable yield in the year 2000 with no water conservation, and in the year 2001 with 10% water conservation. Refer to Figure 3.8, Projected Source Requirements, (KCM, 1995).

In actuality, water use has leveled off. Population has not grown as rapidly as projected in 1995, thus the revision of the growth rate mentioned above. Conservation measures have taken effect, groundwater use has increased, and industrial use decreased, all of which have reduced the per capita use of water.

Based on current data, projected water source requirements were recalculated by the Town's System Administrator (refer to Appendix M, Projected Water Source Requirements, for the actual calculations and data used in Figure 3.9). Refer to Figure 3.9, Projected Source Requirements, Revised, and note that the maximization of the Town's water supply has shifted to:

- 2046 for sustainable yield, based on consumption, without tapping into dead storage (volume below outlet pipe), with ongoing water conservation. 85% of sustainable yield will be reached in 2030.

- 2038 for sustainable yield, based on production. 85% of sustainable yield will be reached in 2022.

- Information Required – Include projected land use designations and related densities, as well as refined projections of commercial, industrial and public authority annual and peak uses to determine projected water demand for inclusion in the Town's next Comprehensive Water System Plan Update.

3.8 Regulatory Requirements

The Town of Friday Harbor is classified as a medium system by WA State Department of Health (DOH), and is required to have an approved Water Conservation Plan meeting the specifications for systems with 1,000 to 10,000 hookups.

In order to remain in compliance, DOH requires the Town to maintain infrastructure for periods of peak use and to maintain an adequate water supply for fire suppression and potential periods of drought.

Therefore, one cannot realistically divide the total capacity by yearly consumption averages to obtain the total available water. Periods of peak use, which historically correspond to lower reservoir levels, and the amount of water needed for fire protection during typically dry months, must be factored in.

Chapter 4 State Legislation and Planning Guidelines

4.1 State Legislation Requiring and/or Supporting Water Conservation

A growing recognition that water conservation and demand management are important resource management tools has spurred Washington State legislators to pass statutes directing the State Departments of Ecology and Health to encourage and in some cases require water use efficiency. Refer to Appendix N, WA State Legislative Actions and Statutes, for a detailed list of legislation. Five are particularly worth mentioning in the body of this plan.

- Note that RCW 90.14.130 - 180 concerning water rights is currently being reevaluated with the intention of eliminating or reducing the "use it or lose it" disincentive to conservation and providing certainty relating to inchoate water rights, e.g. that portion of water right certificates not yet put to an end use. (WA State DOH, 1998.) Specifically, "there is a concern among some systems that if they use less water, water rights may be reduced by a similar volume. In practice, this is not Ecology's approach." (WA State DOH, June 2000.)

- Note that the Town Attorney interprets the RCWs relevant to the Town of Friday Harbor's powers and duties as indicating that the Town has the responsibility to provide water to both developed and *undeveloped* lots within the Town limits.

a. RCW 90.03.400 (Water Rights)

"Crimes against water code – Unauthorized use of water. The unauthorized use of water to which another person is entitled or the willful or negligent waste of water to the detriment of another, shall be a misdemeanor."

b. RCW 35.92.017 (Cities and Towns)

"**Intent – Water Conservation encouraged – 1989 c 421:** The conservation and efficient use of water is found and declared to be a public purpose of highest priority. The legislature further finds and declares that all municipal corporations, public utility districts, water districts, and other political subdivisions of the state that are engaged in the sale or distribution of water should be granted the authority to develop and carry out programs that will conserve resources, reduce waste, and encourage more efficient use of water by consumers."

c. RCW 90.54.180 (Water Use Efficiency and Conservation Programs and Practices)

"In determining cost-effectiveness of alternative water sources, consideration should be given to the benefits of conservation and wastewater recycling." "Entities receiving state financial assistance for construction of water source expansion or acquisition of new sources shall develop and implement a water use efficiency and conservation element of a water system plan."

d. RCW 43.20.230 (Water Resource Planning) and subsequent WAC 246-290-100 Water System Plans

WA State Department of Health (DOH) requires systems with over 1,000 service connections to submit a Comprehensive Water System Plan update every six years. In

order to be approved, these plans must contain a Water Conservation Plan in compliance with the department's *Conservation Planning Requirements*. Specifically stated,

- WAC 246-290-100(4) - "In order to demonstrate system capacity, the water system plan shall address the following elements, as a minimum, for a period of at least twenty years into the future:

    - (4)(i) "Development and implementation of a cost-effective conservation program, which includes evaluation of conservation-oriented water rate structures.

WAC 246-290-480 states "For systems with 1000 or more service connections, water use data will be collected and submitted for each individual customer class."

e. State Salmon Recovery Strategy

DOH has recently been mandated by the state legislature to lead progressive efforts to promote water conservation. "Specifically, the Legislature has appropriated special funding for the Department to help water systems develop water conservation programs that will maintain or reduce the impact of human development on water tables and stream levels." (WA State DOH, June 2000.)

In 1999, DOH's Division of Drinking Water created three water conservation specialist positions to provide technical and other assistance to water systems through the Division's regional offices. An interim Water Conservation Program is being developed based on budget proviso language per the WA State Legislature, the State Salmon Recovery Strategy, the Joint Natural Resources Cabinet and the Governor's Office. (WA State DOH, June 15, 2000.) The following documents have recently been made available:

- *Water Conservation: survey of small and medium water systems*
- *Water Conservation Communications Plan*

4.2 Planning Guidelines

Water conservation and demand management programs have been in place for well over a decade in many parts of the nation, and longer in areas that have historical water deficits. Water conservation is increasingly acknowledged as a relatively inexpensive source of water compared to construction projects. In turn, dramatic rate increases can be prevented, benefiting the customers that municipalities are in the business to serve.

The following organizations, both private and governmental, have distilled years worth of experience in the area of water conservation/demand management and have published guidelines that are helpful in tailoring programs that fit local needs. These guidelines were used in the design of this plan.

a. American Water Works Association (AWWA)

Providing peer education, research and support since 1881, AWWA is a professional organization which has an active water conservation/demand management branch that has published a helpful *Water Conservation Plan Outline*.

The *Water Conservation Guidebook for Small and Medium Sized Utilities,* published by AWWA's Pacific Northwest Section Water Conservation Committee and revised in 1999 is also considered a leading reference.

b. WA State Departments of Health (DOH) and Ecology
As stated above in section 4.1d, WA State DOH requires the inclusion of a Water Conservation Plan in a municipality's Comprehensive Water System Plan. A seven page checklist provided by the department, *Conservation Planning Requirements for Public Water Systems with 1,000 – 10,000 Service Connections* acts as the regulatory guideline.

In 1994, WA State DOH also published *Conservation Planning Requirements: guidelines and requirements for public water systems regarding water use reporting, demand forecasting methodology, and conservation programs*. These guidelines emphasize flexibility and recognize regional differences in water supply and demand conditions. Municipalities are encouraged to tailor programs to fit local needs.

More stringent conservation measures than those defined herein may be required by DOH

1) where regional water resource plans, pursuant to RCW 90.54.045 have been, or are being developed and include more rigorous conservation standards;

2) for areas designated as critical water resource situations, pursuant to WAC 173-500-080 (Critical Water Resource Situation Response Process);

3) if legislation is passed mandating additional conservation efforts.

c. US Environmental Protection Agency (EPA)
In 1998, the US Environmental Protection Agency published *Water Conservation Plan Guidelines.* A helpful summary appears in the Winter 1998 Special Water Conservation Issue of "On Tap," a quarterly publication of the National Drinking Water Clearinghouse, sponsored by the Rural Utilities Service.

Chapter 5 System Measures Implementing Water Efficiency

This chapter lists water conservation measures that a utility undertakes and that target the water system itself. All numbered subheadings below are required by WA State DOH.

5.1 Approve a *Water Conservation Plan* and Fund its Implementation

The Town's water system currently has 1,201 connections. WA State DOH requires public water systems with 1,000 or more hookups to have an approved *Water*

Conservation Plan as part of their *Comprehensive Water System Plan Update*, and to fund its implementation. The Town's next update is due October 2001.

According to DOH, water conservation plans must contain the following three elements, listed with reference chapter numbers from this plan:

- Data collection and reporting – Chapter 11
- Demand forecasting for future water needs – Chapter 11
- Conservation program development and implementation – Chapters 5 to 10

This Water Conservation Plan is designed to meet as many criteria as possible, and will be updated and revised as needed.

The Town has funded a Water Conservation Program and part time Program Coordinator since 1996. Refer to Appendix N, History of Town Water Conservation Programs, for details.

5.2 Metering

a. Source

Town Water Department staff take daily manual readings of reservoir levels. The amount of water entering the water treatment facility from Trout Lake is automatically metered.
The US Geological Survey (USGS) has installed a data station that includes flow monitoring where the creek enters the reservoir at the northern end of Trout Lake.

- Information Required – Any data relating to the capacity of Trout Lake Reservoir, and AUG 1 and AUG 2 watersheds will assist the Town in determining source availability.

- Potential Measure - Install an automatic reservoir level monitoring system at the spillway using telephone telemetry connecting to the Water Treatment Facility.
  <Funding Potential>

b. Production

In order to calculate consumption and forecast demand, the amount of water entering the distribution system must be known. In 1955, the Town installed meters monitoring the amount of water the Water Treatment Facility produces.

c. Service Meters and Sub-metering

Friday Harbor Municipal Code (FHMC) Title 13, Water Line Specifications, currently requires the water service meter to be installed at the edge of the public right-of-way, and a shut-off valve for each building on the parcel. Requirement of a separate meter for each building was considered, however the following concerns were raised:

- Cost of connection charges doubling or tripling depending upon the number of planned buildings per parcel.

- Who is responsible for reading the meters? Invasion of privacy issues may be raised if Town meter readers proceed beyond the public right-of-way in order to read sub-meters.

- Who is responsible for repair and maintenance of transmission lines running from the public right-of-way to the dwelling?

Many 'communal' buildings in the older downtown core contain multiple uses. To retrofit with sub-meters for each use would be a complicated process, raising all of the above mentioned concerns. To date, the Town has elected not to require sub-metering for either separate uses or structures, but has instead left that option open to individual property owners.

Outdoor use can also be sub-metered. To date, the Town has left this option up to the customer as well.

5.3 Unaccounted Water/Leak Detection

The Town tracks the amount of water produced by the Water Treatment Facility and the amount of water used by all metered water accounts.

Production – Consumption = Unaccounted for Water

The following are the three main categories of unaccounted for water.

a. Flushing of Transmission Lines

In order to clean out accumulated sediment and organic buildup, the Town Water Department must regularly flush the transmission mains.

- Recommended Measure – Flush mains on a regular basis but not during periods of high demand.

b. Fire Suppression and Training

When a Town water system fire hydrant is tapped to either put out a fire or for training exercises, the amount of water used is not recorded accurately.

- Potential Measure – Require all Fire Departments to accurately estimate and report water usage.

c. Leaks in Transmission Lines

Leaks are particularly wasteful as the lost water is not benefiting anyone, is depleting the water supply, costs money to produce, and is not bringing in revenue. The Town of Friday Harbor has taken proactive steps to detect and fix leaks. Town Water Department staff has been trained to spot evidence of leaks and is on 24-hour call to respond to leak reports, especially during dryer months.

Water System Utility Reports produced monthly by the Town's System Administration Department list the amount of unaccounted water. 10 to 15% of total production is acceptable by State standards. Since 1994, the Town's policy has been to contract a

leak detection firm to test the main distribution lines when unaccounted water exceeds 10%. Refer to Figure 5.1, Unaccounted for Water as Percent of Water Produced.

- Current Program – Continue monitoring the percentage of unaccounted water and contract a leak detection firm as necessary. **<Funding Potential>**

- Recommended Program – Include major subsidiary lines in leak detection schedules.

Occasionally leaks occur during phases of construction. The Town does not currently charge the individual or company responsible for the costs of lost water or repairs.

- Potential Program – Institute a miscellaneous billing process to charge the cost of lost water and a repair assessment to the individual or company responsible for line breaks.

d. Customer Leaks

During the course of recording monthly use, Town meter readers have been trained to assess individual meters for evidence of leaks that are the customer's responsibility. Customers are contacted immediately when their meter indicates such a leak.

- Potential Program – Newer meter models have a built in leak detection arrow and are much easier to read than older meters. Develop a program partnering with customers to replace older meters. This program will peak and then be phased out.

5.4 Pressure Reduction

When water pressure in transmission lines is too high, above 40 psi, water waste can occur. During the 1970s, the Town installed flow reducers in low lying areas of high pressure, primarily the Port of Friday Harbor and the waterfront area.

5.5 Analysis of Improved Technologies

As the cost of water continues to rise, utilities are searching for ways to increase efficiency, and technological advances continue to bring what were once cost prohibitive measures into the range of consideration.

For instance, former U.S. Senator Paul Simon, author of *Tapped Out: the coming world crisis in water and what we can do about it,* suggests channeling funding and research into desalination.

- Recommended Program – Monitor improvements in water conservation technology. When warranted, conduct specific cost benefit analyses for:

  a. **Desalination Plant** to provide water for the Town's Wastewater Treatment Facility. This facility is currently the largest annual consumer of Town water. Excess water could be used to irrigate the high school ball field, as this would require installation of a relatively short transmission line. **<Funding Potential, especially as a 'pilot' project>**

  b. **Water Reuse Methods** to be incorporated into the Wastewater Treatment Facility. WA State DOH's standards for water reuse are currently so stringent that reuse is cost prohibitive. (WA State DOH, 1993.) However, the department has been directed to reexamine these standards, potentially opening this avenue as a cost-effective option. **<Funding Potential>**

Chapter 6 Rate Structure Encouraging Water Conservation

6.1 Existing Town Rate Structure

Across the nation, water rates are increasing as municipalities attempt to replace aging infrastructure and comply with increasing regulatory demands. In an effort to cope with rising production, maintenance and infrastructure costs, the Town of Friday Harbor continues to adjust its water rates. The average annual increase in water rates in Washington has been 5.6%. (Association of Washington Cities, 1999.)

In 1993, the Town contracted Financial Consulting Solutions Group, Inc. to complete the *Town of Friday Harbor Utility Rate Study Final Report.* This report, finalized in 1996, recommended a 34.5% increase for water rates and a 16.9% increase for sewer rates.

Table 6.1 below compares monthly water rates per 1,000 cubic feet of water.

Table 6.1 Comparison of Monthly Water Rates in Washington State
Annual *AWC Tax and User Fee Surveys*, Part IV, published by the Association of Washington Cities
Rates are based on the use of 1,000 cf (cubic feet) of water.

Year	Number of Reporting Municipalities	Rank In WA State	Inside TFH Single Family Water Rate	Average Inside Single Family Water Rate	Highest Inside Single Family Water Rate
1996	306	3	$39.64	$18.38	$54.52
1997	255	1	$48.50	$19.17	$48.50
1998	149	68	$22.30	$19.74	$25.03
1999	265	95	$20.24	$20.29	$26.80
2000	260	2	$50.17	$22.17	$54.92

Refer to Appendix P, Monthly Utility Rates, for the 2000 rate schedule.

Increasing the amount customers pay for water is arguably the most effective water demand management tool. However, in this context, it is only fair to reward low end consumers, while encouraging high-end water users to conserve. The Town has implemented the following two rate structure changes.

a. Fourth Tier Added to Single Family Residential

In 1997, the Town shifted from a flat rate to a block rate structure for the Single Family Residential (SFR) class. Each block, or tier, charges a certain amount up to a designated number of thousands of gallons used. For example, SFR customers can use up to 3,500 gallons a month, or 117 gallons a day to qualify for the basic first tier rate of $3.80 per 1000 gallons.

The Town Council added a fourth tier to SFR water rates effective January 1999. As of 2000, any SFR account using 10,500 or more gallons a month, or an average of 350 gallons a day, falls into Block 4 and is charged $7.58 per 1,000 gallons. The revenues from this tier help fund the Town's water conservation program.

b. Seasonal Increase for All Other Classes

All other classes are subject to rate increases during 'summer,' defined as June through September. Recall that this period typically corresponds to lower reservoir levels, seasonal population increases, and proportionally higher use. This type of rate structure was instituted in 1996. In 2000, the cost per 1,000 gallons increases from $3.80 for October through May, to $4.75 for June through September.

6.2 Incentive Program

There are several examples of incentives offered by municipalities that reward customers for participating in water conservation programs. Many of these programs

can be accessed through AWWA's website, which links to member utility and municipality websites.

The Town's Water Conservation Office records the names and account numbers of customers that have, for example, acquired water saving devices, including ultra low flush toilets, efficient clothes washing machines, or rainbarrels.

- Recommended Program – Develop an ongoing system to reward those customers, of all classes, that participate in water efficiency programs offered by the Town Water Conservation Office. Consider establishing a Conservation Class for each type of water account, with membership determined by a predetermined reduction in use.

6.3 Drought Conservation Surcharge

Several municipalities institute increased charges for water during periods of official drought. The Town's *Water Shortage Response Plan* outlines the definitions of various drought stages, limitations on water use, and the steps the Town must take to notify the public. Currently, no additional rate increases go into effect during drought conditions.

- Potential Measure – Reexamine the official levels of drought defined in the *Water Shortage Response Plan* and attach a drought conservation surcharge to the highest two tiers of residential accounts, to increase as the official drought level increases. For all other classes, institute a surcharge if a specific percentage decrease in use, tied to the level of drought, is not achieved.

Chapter 7 Indoor Water Conservation Measures

It is estimated that residential indoor use of water exceeds outdoor use in most cases. Unless both uses are metered, however, an accurate accounting will not be achieved. Table 7.1 compares typical indoor and outdoor uses for both single and multi-family units in a southern California water district.

Table 7.1 Residential Indoor Versus Outdoor Use
WA State DOH, *Municipal Water Conservation Analysis and Recommendations,* December 1998
*Water use figures are based upon the average annual use for Metropolitan Water District, S. California.

Type of Water Use	**Water Use*** **(gallons per capita per day)**	
	Single Family	Multi-Family
Indoor		
Toilet Flushing	30	30
Showers and Baths	27	25
Clothes Washing	21	17

Cooking and Cleaning	13	13
Dishwashing	6	4
SUBTOTAL	**97**	**89**
Outdoor		
Landscape Irrigation and Gardening	46	18
Car Washing and Miscellaneous	7	3
SUBTOTAL	**53**	**21**
TOTAL	**150**	**110**

Refer to Figure 7.1, Typical Single Family Water Use, for an industry estimate of the same. Tables of this sort differ depending upon the year that is represented. Note that with the trend of increasing water conservation and the installation of improved efficiency fixtures, overall indoor use has been decreasing. Thus, more recent data shows lower use rates. Consumption rates also differ by region, with areas that have focused on the need for conservation showing lower use rates as well.

Estimates of residential indoor and outdoor end uses can be calculated using the average range of values found in Appendix Q, Benchmarks for Estimating Residential End Uses of Water, adapted from *Water Conservation Plan Guidelines,* US EPA, August 1998.

7.1 Plumbing Codes – WA State Water Use Standards

The Town of Friday Harbor follows the Washington State Uniform Plumbing Code, section 402 of that code deals with water conserving fixtures and fittings. Its purpose is "to implement water conservation performance standards in accordance with Chapter 19.27.170 RCW."

Beginning in July of 1993, upgraded water use efficiency standards, as illustrated in Table 7.2, went into effect in Washington. It is now prohibited to sell, distribute, import or install fixtures that do not meet the standards listed below. These standards apply to both new construction and remodeled buildings.

Table 7.2 Washington State Water Efficiency Standards
WA State DOH, *Municipal Water Conservation Analysis and Recommendations,* December 1998

Plumbing Fixture	Upgraded Standard	Pre-1993 Standard
Showerheads	2.5 gpm	3-8 gpm
Faucets	2.5 gpm	3-5 gpm
Toilets	1.6 gallons per flush	3.5, 5-7 gallons per flush

7.2 Fixture Replacement Programs

Replacing older models with more efficient fixtures gives proven investment returns and results in significant water use reduction. Due to the adoption of the above standards, the following fixture replacement programs would target only pre-July of 1993 homes.

- Information Required – Data is needed on the number of homes that still have pre-1993 standard fixtures to provide a realistic estimate of the cost of the following retrofit programs. Integration of the Town's building permit database with utility accounts would provide more information than is currently available.

After considering types of fixture replacement programs, the Town has chosen rebate programs to be the least expensive and time consuming for both the customer and Town staff. Offering a combined and ongoing rebate program will save money in printing and mailing costs, as well as in staff time.

- Recommended Program – Establish an ongoing Fixture Replacement Fund that would cover all rebate programs. This combined program will peak and then be phased out as most inefficient fixtures are replaced.

a. Toilet Rebates

In 2000 the Town initiated a Toilet Rebate Program offering $75 per toilet to water customers of all classes that replace their existing toilet/s with 1.6 gallon ultra low flush models. As suggested above, this program could be combined with clothes washers and other fixtures in a general fixture replacement fund. This rebate is currently ongoing, will peak, and then be phased out.

b. Clothes Washing Machine Rebates

$50 rebates were offered to customers upgrading to low flow models in 1998 and the program has not been funded since. Clothes washing machines typically rank second in indoor water use, falling after toilets and before showers. Were this rebate to be reinitiated as part of the Fixture Replacement Fund, it too would peak and then be phased out.

c. Showerhead and Faucet Aerator Retrofits

Showers, faucet use and baths rank in that order of indoor water use. During 1997 the Town began a partnership with Orcas Power and Light (OPALCO), the area electrical utility, to retrofit all multi-family residential (MFR) units with low flow showerheads, kitchen faucet heads, and other faucet aerators.

The Water Conservation Office has received requests for these devices, and currently has baskets of free aerators at all customer service desks for Town water accounts. However the supply is limited as the aerators are a popular item.

- Recommended Program – Reinstate above partnership with OPALCO.

Chapter 8 Outdoor Water Conservation Measures

A main factor contributing to increased water use during the low rainfall season is the need for irrigation. Gardens and landscaping often represent significant investments in both time and money that require water to survive through the dry season. There are, however, techniques that reduce the amount of water necessary without sacrificing variety, quality and aesthetics.

Additional ways in which water is often used outdoors will be addressed in the following chapter, Peak Season Programs.

8.1 Partnership with WSU Master Gardeners

Gardening and landscaping are hobbies for many, as well as sources of food and beauty. For those who don't want to do it themselves, landscaping professionals are available. There are tricks of the trade including plant selection, soil preparation, type of irrigation system, and watering schedules that reduce the amount of water needed and result in healthy, beautiful and productive gardens and landscapes.

Volunteers trained as WSU Master Gardeners are wellsprings of this sort of practical knowledge. A condition of receiving the extensive program training is to volunteer a certain number of community service hours. Therefore, an opportunity exists for a partnership between the Town of Friday Harbor and WSU Extension whereby Master Gardeners would volunteer to participate in projects as outlined in the subheadings below.

A valuable body of knowledge specific to local conditions also exists within Island landscaping and nursery professionals. Currently, there is no local professional landscaping organization, however preliminary conversations indicate a willingness to participate in a conservation partnership.

Many utilities, especially in California, hire and train in-house water conservation professionals to accomplish the following programs. The Town has the opportunity to act as facilitator, matching trained volunteers with its water customers for overall savings.

a. Landscape and Irrigation Audits

WSU Master Gardener volunteers would be available to assess Town water customers' gardens and/or landscaping, sharing their recommendations for improving water efficiency. Hours devoted to this program satisfy their community service commitments, as well as benefit participating Town water customers. The audit format could be that of a "walking tour," incorporating several customers at once and held on an annual basis.

b. Award Winning Gardens and Landscapes

Nominate and award Town water customers of all classes for outstanding examples of water efficient gardens and landscapes. Establish a committee consisting of WSU Master Gardeners and local landscaping professionals who judge entries and select winners in various categories. Winning gardens and landscapes would have the option of being open to the public during a tour, similar to the already existing "Garden Tours," organized by WSU Extension.

- Recommended Program – Partner with WSU Extension Master Gardeners and local landscaping professionals to design and implement a Landscape and Irrigation Audits Program and Award Winning Gardens and Landscapes. Target high end users *and* be open to all classes of water accounts that volunteered. Once up and running, this program would be ongoing as techniques and technologies continually improve.

  <Funding Potential>

8.2 Landscaping Ordinance, Management Policy, and BMPs

Many municipalities have enacted ordinances detailing procedures for landscaping and irrigation installation and management. Review of a new development's Landscaping Plan becomes part of the permit process. Fees are charged for professional review of the plan.

A landscaping ordinance for new or re-development helps to ensure proper soil preparation, use of water efficient species, efficient irrigation system installation, and watering schedules. Were the Town to choose this option, a review of existing landscaping ordinances and discussions with local professionals would be necessary in order to tailor an ordinance effective for local conditions.

A less regulatory approach would be to design a set of Landscaping Management Standards, or best management practices (BMPs) that would then be made available to those Town water customers who irrigate. There are examples of BMPs accessible through other utilities, or via the internet.

- Potential Measure – Tailor a Landscaping Ordinance and/or Management Policy including BMPs in conjunction with existing landscaping and screening requirements pursuant to Title 17 FHMC.

Chapter 9 Peak Season Programs

When monthly water use for December through April is compared to use during the peak month of August, consumption almost doubles. As discussed previously, this is due to two main factors – a seasonal population bulge, and the need for irrigation. Both are addressed in the sections below.

9.1 Outdoor Water Use Ordinance

Several municipalities, including Seattle, Vancouver BC, and Victoria BC, have passed ordinances that limit or prohibit outdoor water use during the 'summer' or peak season. A review of these ordinances reveals that most measures have already been incorporated into the Town's *Water Shortage Response Plan*. However, where these types of ordinances exist, they go into effect at a specific date regardless of supply levels, usually the first of June extending through the end of August. This is due to periods of seasonal low rainfall that particularly impact surface water dependent municipalities. These municipalities are simply not willing to take the risk that the much-needed rains and snows may be late, or may be far less than needed.

Water uses have been prioritized, and those viewed as wasteful are eliminated during the dry season. Permits are available for special circumstances. Uses that are prohibited and viewed as wasteful are typically:

- Using water to clean decks, sidewalks, driveways, parking lots, buildings or other outdoor structures.
- Vehicle, boat and airplane washing (unless using a recycled/enclosed system).
- Watering sidewalks or other non-vegetated surfaces.

Irrigation is usually limited to mornings or evenings, which decreases the rate of evaporation. When increased levels of conservation are in effect, the schedule may shift to one day on, one day off, and can become even more stringent as the need arises.

- Potential Measure – Using the Town's *Water Shortage Response Plan* and corresponding Chapter 13.16 FHMC, *Emergency Water Restrictions* as a basis, evaluate other such ordinances and design an Outdoor Water Use Ordinance tailored to fit local conditions.

9.2 Partnership with Chamber of Commerce

Visitor services contribute substantially to peak season water consumption. However, as with gardens and landscaping, there are 'tricks of the trade' that can be utilized without compromising customer service. In fact, incorporating the following two elements has the potential to actually increase the level of customer service:

- Combine the simple message "Water is a precious Islands' resource, please use it wisely" with a sincere "Welcome to the Islands."

- Satisfy natural curiosity by sharing 'local' information that the Islands are special, and have a limited supply of fresh water.

An ideal opportunity exists for the Town to partner with the Chamber of Commerce, benefiting both visitors and businesses that serve them by implementing the following

programs. This would also more evenly distribute the responsibility of conservation between residents and visitors.

a. Workshops for Businesses

Sharing results from audits conducted on a single business within a category such as restaurant or lodging among like-type businesses decreases the overall investment in both time and money. Managers, supervisors and/or owners trained in a workshop held in early Spring would then pass on conservation information to incoming seasonal staff.

- Recommended Program – Partner with the Chamber of Commerce to design and implement a peak season auditing, training and awards program. Include water efficiency recommendations in a simple handout to be distributed annually. Give participants a sticker or certificate denoting membership in the Wise Water Use Club, to be posted in public view. **<Funding Potential>**

b. Visitor Education

Incorporate the simple message "Water is a precious Islands' resource, please use it wisely" into all publications targeting visitors.

- Potential Program – Partner with the Port of Friday Harbor to design and distribute at the Port's fuel dock and main office a rack card with conservation methods specific to boaters plus information that the Port deems important. **<Funding Potential>**

- Potential Program – Partner with the Chamber of Commerce to design and distribute a rack card welcoming visitors to Friday Harbor, including conservation methods and information that the Chamber deems important such as the location of public restroom facilities, parks, and walking paths. **<Funding Potential>**

c. Speakers Bureau

This element is required by WA State Department of Health. Fortunately, the San Juan Stewardship Network has already organized a volunteer Speakers Bureau. Participants are trained in various areas of local natural history and must in turn perform community service. Volunteers trained in a summary of the Town's water sources, general Island hydrology, and water conservation methods would be a relatively inexpensive conduit for passing information on to visitors.

An ideal setting for this type of education would be aboard the ferries. The current WA State Ferries Outreach Coordinator has submitted a funding proposal for on board education which has not been implemented, however there is potential to revive this program.

- Recommended Program – Partner with the San Juan Stewardship Network and WA State Ferries to fund and implement an onboard visitor education program. **<Funding Potential>**

9.3 Audits for High End Peak Water Users

The State of California has directed public utilities to assign water quotas, or allocations, to individual accounts using a formula based on type of use, past history, amount of vegetation, numbers in household or business, and other factors. When an account uses more than their allotted amount of water, they are penalized and in some cases offered assistance to bring down consumption. Washington, and certainly the Town of Friday Harbor, has not reached this point. However, as of 1998, water allotments are being considered at the state level. (WA State DOH, 1998.)

In lieu of allotments, high-end peak users could be offered audits. Rarely, if ever, would a single-family residential account appear on the list of top consumers. More typically, one sees Public Authority, Commercial and Industrial accounts topping the list. Types of audits vary depending upon account class and whether the use is indoor or outdoor.

- Recommended Program – Prioritize and target high-end peak water users in both the Landscape and Irrigation Audit Program (Chapter 8.2) and the Indoor Audit Program (Chapter 10.1). **<Funding Potential>**

Chapter 10 Information and Education Programs

Informing customers of recommended water conservation measures, and educating community members of all ages is an integral part of any water conservation program. The most effective education programs target specific audiences, as do the programs listed below.

10.1 Audit Program

Water audits are a method whereby trained individuals identify inefficient water use practices. Water use varies between classes, and audits need to be tailored to be as cost effective as possible. Training to perform audits can range from simple, for both single and multi-family accounts, to detailed for commercial accounts, to complex for some industrial and public authority accounts.

a. Residential (SFR and MFR accounts)

Develop a training program for youth service groups such as 4-H and Scouts. Trained in simple audit procedures, adults or older leaders would in turn train group members. Participation in this type of program would fulfill their community service requirements. Youth groups would be responsible for setting up the logistics of auditing certain neighborhoods, and would use a standard reporting format to convey data to the Town.

b. Commercial (COM accounts)

Develop a program whereby the results of auditing one type of commercial use, a restaurant for example, could be used to tailor a workshop for like-type business staff. Include water efficiency recommendations in a simple handout to be distributed annually. This program would be most effective in spring, targeting managers and staff

supervisors who would then train incoming seasonal staff. Refer to Chapter 9, Peak Season Programs, Section 2a, Workshops for Businesses.

c. Industrial and Public Authority (IND and PA accounts)

Hiring a professional auditing firm for this type of account is usually most cost effective. Exploring the potential of partnering with the highest water users to cover the costs is a possible funding avenue.

- Recommended Program – As the fixture replacement program phases out, build up an ongoing audit program, portions of which will also peak and then be phased out. Award participants a "Wise Water Use" sticker or certificate. Publicize accounts that demonstrate the greatest reductions as a Water Use Winner 2001. **<Funding Potential>**

Leak Detection Program

Even low flow fixtures, such as toilets and faucets, may develop leaks after extended use. Water account customers are also responsible for transmission pipes on their property. Leaks can occur anywhere in this system, and typically make up 4-10% of each account's yearly water consumption. The following program would educate customers of all account classes in simple steps to spot and repair leaks at both home and work.

- Recommended Program – Designate the second week of May as Seek Out Leaks Week, which corresponds to National Drinking Water Week. Advertise in local papers, describing how to spot leaks, and approach local hardware stores about the possibility of offering discounts on specific plumbing supplies. Ongoing program on an annual basis. **<Funding Potential>**

10.2 New Accounts

When relocating to Friday Harbor, new home and business owners may not understand the need to conserve water, nor be familiar with recommended conservation techniques. The following two programs target this information gap.

a. Welcome and Information Packet

Most people are willing to conserve once they realize that water is a precious Islands' resource. New residents and business owners/operators would most likely appreciate a 'welcome basket.' The Chamber of Commerce, Realtor's Association, civic organizations and other organizations may have information that would be helpful to include.

- Recommended Program – Develop a "Welcome to Friday Harbor" packet in conjunction with the Chamber of Commerce for business accounts and the Realtor's Association for residential accounts. Include water conservation brochures already available from WA State Departments of Ecology and Health. If deemed cost-effective, design a portion of the packet in house that is specific to Friday Harbor. Ongoing program. **<Funding Potential>**

b. Change of Ownership Ordinance

Many municipalities require a checklist as part of the change of ownership process verifying that low flow plumbing fixtures have been installed.

- Potential Measure – Research such ordinances and develop a Change of Ownership Ordinance targeting all classes that is tailored to the Town of Friday Harbor.

10.3 School Programs

Town staff members have conducted Water and Wastewater System Tours for 5th grade classes each fall since 1989. Classroom presentations are combined with tours of Trout Lake Watershed, the Water Treatment Facility, and the Wastewater Treatment Facility. This has proven to be an extremely popular program and was requested last year by the high school environmental and biology classes.

- Current Program – Continue scheduling annual Water and Wastewater System Tours to correspond to Washington Water Weeks, a statewide series of more than 150 water-related education and action activities taking place September 1 – October 15. Open these tours to the public, and advertise in local papers. Ongoing program to be expanded as staff time and funding allows.

- Potential Program – Partner with San Juan Island School District, Spring Street School, UW Labs, and SJC Conservation District to develop a Mountain to Bay curriculum focusing on False Bay Watershed (which encompasses Trout Lake Watershed), including the hydrological cycle, water conservation measures, and the Town of Friday Harbor's Water and Wastewater Systems. **<Funding Potential>**

  The UW Friday Harbor Laboratories recently established an "Outreach Program" that includes a K-12 component designed to involve school children in programs that give them the opportunity to partner with scientists in both field and lab research settings.

  The SJC Conservation District recently received Centennial Clean Water Fund grant monies for a "Watershed Restoration" project targeting four watersheds including False Bay (contains Trout Lake, AUG 1 and AUG 2 watersheds).

10.4 Community Events

a. Annual Master Gardeners Workshop

A daylong event organized by WSU Master Gardeners and held each spring. The Town Water Conservation Office has designed a display and presentation focusing on gardening and landscaping since 1999. **<Funding Potential>**

b. San Juan Farmers Market

Held every Saturday from April through October, the Town Water Conservation Office supplies the Master Gardener's table with water conservation material pertaining to gardening, landscaping, and water cachement. **<Funding Potential>**

c. San Juan County Fair

Attendance has increased to nearly 20,000 in 1999, making this the largest community based event in San Juan County. The Town's Water Conservation Office has participated in the County Fair in the following two ways:

- Sharing space with the WSU Master Gardener exhibit at the west entrance to the main building. This display focuses on gardening, landscaping and water

cachement. Free rain gauges and literature are offered to the public. **<Funding Potential>**

- A booth devoted to water conservation provides a venue for showcasing current programs, for instance the Toilet Rebate offer during 1999 and 2000. When staffed, an opportunity exists for Town staff and elected officials to interact with their customers and constituency. Water conservation handouts on a range of topics are available to the public. **<Funding Potential>**

d. Children's Festival

Sponsored by San Juan Island Parks and Recreation District, and held every September at the Fairgrounds, this festival offers a variety of activities for children and their parents. The Town Water Conservation Office could borrow, rent or purchase a different activity each year that focuses on water conservation, watersheds, or the hydrological cycle. A wide range of fun and educational activities of this type are available through various professional educational organizations. **<Funding Potential>**

- Current Program – Continue participation in community events. Ongoing program expanded to a level warranted by staff time and funding.

10.5 Water Conservation Message

a. Inclusion in Local Publications

Rather than devote funding to in-house publications, an effective and often times free approach is to contact local publications and request the inclusion of the simple message "Water is a precious Islands' resource, please use it wisely," providing more information as space allows. Examples of such publications include:

- Newspapers – press releases, guest editorials, and occasional paid advertising
- Event Schedules – SJC Fair, Jazz Festival, San Juan Theatre
- Targeting Visitors – *Springtide, Reflections, Island's Almanac, At Home*
- Real Estate – *At Home*, Caldwell Banker's *Showcase,* Windermere's *Guide*
- Guidebooks – include locally produced (e.g. *Emily's Guides,* etc.) and mainstream
- Maps of the San Juans available for visitors.

Note that the Discover Washington State series contour maps of the San Juan Islands, published by International Travel Maps, contains the following message: *"Water Conservation in the Islands – Despite the obvious fact that there seems to be water nearly everywhere you look in the San Juans, fresh, potable water is in short supply in many locales. If you are traveling in a camper or private boat, it is advisable to fill your water tanks at home or at the last mainland stop. Once in the islands, be mindful of your water consumption and* ***think conservation****. Don't let*

faucets run unnecessarily at campgrounds, don't use fresh water to wash down your boat at marinas, and don't plan to wash your car or camper in the islands."

b. Websites

The Town's Water Conservation Office works with the System Administration Department to post current water conservation programs on the website, www.fridayharbor.org and to link to other web sites that feature Friday Harbor.

When possible, these websites are asked to include at least the simple message "Water is a precious Islands' resource, please use it wisely." Further information on water conservation is provided when appropriate.

- Current Program – Continue to post aspects of the Town's water conservation program on the web. This is in essence free coverage of the Town's programs, and is accessed by a worldwide audience. Funding organizations often give credits for a web presence. Ongoing program to be implemented and expanded as staff time allows.

c. Printed Material Distribution

Handouts pertaining to water conservation are available from a number of sources, including other utilities, state and federal agencies, and professional peer organizations. Though it takes time to read newsletters and other publications listing such resources, it is well worth it in the printing costs saved. The Water Conservation Office has a supply of several such handouts and keeps records of quantity distributed and contact information for obtaining additional copies.

The Water Conservation Office maintains a distribution schedule to the following:

- Town Offices – main reception areas, and Water Conservation Office
- County Courthouse
- SJC Health and Community Services
- SJC Planning Department
- San Juan Public Library

- Current Program – Continue to accumulate and distribute water conservation handouts. Ongoing program.

For general information, the above approach works well, however there may be specific instances when locally tailored information is beneficial. The key to minimizing cost is to specify a target audience and to accurately estimate the print run needed.

- Potential Program – Redesign in-house a tent card (or other type of format) when the current supply runs low. Include information specific to the Town and a welcome to visitors. **<Funding Potential>**

The Town's Water Conservation Office has produced two pieces of tailored information, and though outdated, both are still useful:

1) *Water Conservation: good sense on an island* – describes Friday Harbor's water conservation program and gives tips for summer savings. Three brochures are recommended, all of which are out of print and no longer available.

   - Potential Program – Reprint the Town's water conservation brochure including updated information. Do so after a thorough analysis of past distribution to determine the maximum quantity necessary. **<Funding Potential>**

2) *Town of Friday Harbor Tip Sheet* – describes customers' meters and how to locate leaks, as well as the Town's leak detection program. This was intended to be the first in a series of publications and is dated Spring 1998, however, the information contained is never the less still pertinent.

   - Potential Program – Publish the Tip Sheet series on an annual basis, mailing only to owners and renters who live on the island, and designing the publication in-house.
     <Funding Potential>

Chapter 11 Data Collection and Demand Forecasting

WA State Department of Health's (DOH) *Conservation Planning Requirements* established 1991 as the initial year for a specific set of data to be collected, and for demand forecasting to be completed by municipalities and reported to DOH.

11.1 Data Collection and Reporting

According to DOH requirements, *"If the data has not been collected for any of the categories, you will be required to make a commitment in your conservation plan to begin collecting the data as required. This commitment must include a schedule for when the data will begin to be collected, and what improvements if any will be made to ensure the data is collectable. Systems which make this commitment to collect data, but do not follow through and collect the information may be unable to receive subsequent water system plan approval or approval for additional water rights, until the required data is collected."*

This data will be used by state agencies to forecast demand for future water needs, develop regional water use patterns, evaluate the success of water conservation plans, and other efforts.

a. Monthly Utilities Summary Reports

The Town's System Administration Department has been publishing most of the required daily, monthly and annual water use data in the Town of Friday Harbor Water and Sewer Utilities Summary Reports, updated monthly.

The 'mining' of this data provides information that is used by Town staff in daily operations, and in both short and long-term planning efforts. In order to maximize this resource to benefit the Town's elected decision-makers, and in order to more fully comply with State requirements the following recommendations are made.

- Recommended Program - Install a device to automatically measure reservoir levels, and transmit data to the Water Treatment Facility. **<Funding Potential>**

b. Conservation Program Data

As previously mentioned, at least five years worth of data must be accumulated to assess program success. Data is collected by the Water Conservation Office in the following formats:

- Event Summary – tracks printed material handed out, supplies needed, and general event information for each event.

- Material Distribution Log – tracks each water conservation publication, location of distribution points, number distributed, date of distribution, back-stocked quantities, and contact information for obtaining more copies. This information helps determine the print run quantity for publications designed by the Town's Water Conservation Office, as well as when a publication may need to be updated.

- Customer Service Log – records calls and walk-ins for both Town water customers and those not on Town water.

c. Water Conservation Customer Account Database

Records of those customers who participate in conservation measures offered by the Town of Friday Harbor are correlated with account numbers. This database is still in the design phase, and will include water efficient clothes washers, low flush toilets, and rain barrels. As proposed conservation programs are implemented, it will be expanded to include other elements, such as audits.

Two things are accomplished by this system

1) Customers that are documented as conserving can be awarded incentives.
2) Actual conservation may be more closely measured by correlation with use data.

- Recommended Program – Finalize and maintain a database that will track customer participation in Town water conservation programs, and link this database to utility accounts.

11.2 Water Demand Forecasting

WA State DOH requires that water utilities develop a complete forecast of water demand, including water use reduction resulting from implementation of water conservation measures. Demand projections for six and twenty years into the future,

for both average daily demand and peak daily demand must also be included. This information is currently included in the Town's *Comprehensive Water System Plan Update.*

a. Weather Forecasting

On a practical local level, accurate weather forecasting data is very helpful in assessing both immediate future supply and immediate demand. Weather forecasts for the 'summer' indicate levels of potential outdoor use, and predicted sunny days may be linked to potential visitor population increases, thus demand.

Weather forecasts for upcoming fall and winter predict precipitation levels, and thus the resulting recharge of the reservoir. Given the vulnerability of the Town's water sources to over-winter droughts, this type of forecasting would be very valuable.

- Recommended Program - Install an automatic weather station at the Water Treatment Facility including rain and wind gauges, thermometer and barometric pressure with telemetry capability.
- Recommended Program – Develop a series of weighted coefficients based on the most accurate sources of weather forecasting, including sources in British Columbia. Evaluate this data on a monthly basis, and on a weekly basis during periods when increased levels of water conservation may need to be implemented - for example if the proposed Outdoor Use Ordinance goes into effect or if stages of the Town's *Water Shortage Response Plan* are implemented.

- Potential Program – Assess the cost/benefit of contracting for customized, local weather forecasts on a quarterly or seasonal basis, more often when in drought conditions.

Chapter 12 Water Resources Advisory Board

"The history of humankind is the story of water – a tale of communities blooming along the banks of rivers, lakes, and edges of oceans. No civilization flourishes without water and human survival depends on good drinking water. All the water that ever has been or will ever be on Earth is here now, and with only 1 percent of all that water available for drinking, water conservation makes sense." (Emerson, Harriet 1998.)

Water conservation and demand management factor into the larger scope of "water resources." Issues such as water quality and watershed management are increasing in importance as county, state and federal agencies turn their attention in these directions.

Once the Town of Friday Harbor added the 1,001 account, WA State Department of Health classified the municipality along with all other utilities serving 1,000 to 10,000 connections. Accompanying this distinction of moving into the medium league came increased regulation and responsibilities, many of which are unfunded mandates.

In the water quality arena, testing requirements have increased, and recently a Water Quality Report, also known as a CCR (Consumer Confidence Report) has been required annually. False Bay Watershed, which contains the Town's Trout Lake Watershed, was prioritized ninth in San Juan County's Watershed Ranking process and in the recently adopted *San Juan County Watershed Management Action Plan*.

On another front, San Juan County is now in Phase II of the Water Resource Inventory Area (WRIA) planning process and is attempting to determine the quantity of water available in the San Juans, including the amount available to the Town's system. Washington State water law is undergoing an intense period of scrutiny and change. The old definitions of 'water rights' may well undergo transformation in the near future.

In summary, water resource issues are increasing in number and scope. The Town, as the largest incorporated area and largest water provider in San Juan County, is a major player. An advisory body of qualified individuals who are also water customers would benefit Town staff, elected officials, and ultimately their constituency and customers.

An immediate focus on areas of high potential in water conservation and demand management, within the larger, overall context of emerging water issues would bring much needed information to the Town's decision making table.

- Recommended Measure – Assign the duties of a Water Resources Advisory Board to the Town Planning Commission. Assess the potential of the following:

- Desalination unit and/or reuse potential for the Wastewater Treatment Facility.
  <Funding Potential>

- Partnering with SJC Health and Community Services in Phase III of WRIA planning which, according to Ecology and DOH, will focus on water conservation and reuse.
  <Funding Potential, SJC is a current funding recipient>

Chapter 13 Funding Sources

To date, the Town's Water Conservation Program has been funded through internal sources only. In effect for 1999 and thereafter, the fourth tier of SFR rates was established to fund the program and in actuality covered 91% of program costs in 1999.

The Town of Friday Harbor struggles along with other municipalities around the nation to meet unfunded state and federal mandates, and to adequately maintain and improve infrastructure. Awareness at the federal and state levels of this plight, combined with the recognition of the importance of water conservation, is slowly translating into funding opportunities.

Augmentation of the Town's investment in water conservation is possible by directing staff to explore all levels of funding opportunities. Note that credit is given for the

inclusion of water conservation elements in State funding applications for infrastructure improvements.

- Recommended Program – Research funding criteria and establish a chronology of funding deadlines. Create a prioritized list of fundable Town projects and programs. Devote the necessary staff time to communicate with funding agencies and organizations, attending workshops when necessary. Complete targeted funding applications and, when necessary, administer funded projects. Ongoing program.

13.1 State Funding for Water Utilities

Water conservation plans and the implementation of specific conservation measures may soon be required of applicants for any type of state funding. (WA State DOH, December 1998.)

a. Combined Ecology Funding Application

Applications have been modified to include Section V, which asks, *"Are there any State of Washington or Federal mandates that this proposed project addresses?"* Worth 100 points out of an application total of 1,000, the applicant must also answer the question, *"How does the project involve water conservation and/or the development of facilities to provide reclaimed water to replace potable water in non-potable applications?"*

b. State Revolving Fund

Authorizes use of funds for leak repair and main replacement, meter installation and pressure reduction valves.

c. Water Utility Tax Credits

House Bill 1821 was executive request legislation in 1996 and forwarded for consideration through 2001. If passed, it would provide a tax credit, $.50 or $1 for every $1 invested, for public water systems investing in water conservation measures. As of April 2001, water utility tax credits for municipalities with an approved water conservation plan are proposed in House bill 1832.

- Recommended Town Council Action – Support legislation that provides incentives for water conservation during upcoming legislative sessions. Your Water Conservation Office has specific details.

13.2 Federal Funding

Most of the following programs require specific project detail that is linked to an approved economic development plan and/or proof of financial hardship.

a. Bureau of Reclamation, U.S. Department of the Interior

Grants are available for a range of water conservation projects, such as planning, education, demonstrating innovative technologies, and conservation-implementation activities.

b. Economic Development Administration, U.S. Department of Commerce
Grants are provided to fund public works infrastructure and development facilities including improvements to drinking water systems. Conservation measures are eligible under the grants.

c. Rural Utilities Service (RUS), U.S. Department of Agriculture
Grants and loans are offered for drinking water and wastewater infrastructure construction for communities serving fewer than 10,000. Conservation measures are eligible.

13.3 Professional Organizations

Though much smaller in award amount, opportunities exist to fund specific projects through various professional organizations devoted to water conservation.

13.4 Partnerships at the Local Level

Today's funding climate rewards partnerships. Various public and private sources, including Puget Sound Water Quality Action Team and People for Puget Sound, maintain substantial funding programs. Single applicants are rarely, if ever, considered. Instead, partnerships between 'stakeholders' are rewarded.

The Town of Friday Harbor is a major stakeholder in several potentially fundable areas, including water conservation. An added advantage to partnering is that another organization may be designated to provide administration. Depending upon the effort required and the percentage of the overall dollar figure devoted to administration, this may be of significant benefit. Following are partnerships recommended in this plan that are potentially fundable, and are indicated by the notation **<Funding Potential >**

- Partnership with WSU Extension Master Gardeners.
- Partnership with Chamber of Commerce, San Juan Stewardship Network, and WA State Ferries.
- Partnership with San Juan Island School District, Spring Street School, UW Labs, and SJC Conservation District.

Acronyms and Definitions

AUG = Augmentation

AWWA = American Water Works Association

BMPs = Best Management Practices

CFE = Capitol Facilities Element, TFH Comprehensive Plan

DOH = Washington State Department of Health

EPA = US Federal Environmental Protection Agency

ESHB =

FHMC = Friday Harbor Municipal Code

NDWC = National Drinking Water Clearinghouse

NPDES = National Pollutant Discharge Elimination System

OFM = Washington State Office of Financial Management

OPALCO = Orcas Power and Light Company

RCW = Revised Code of Washington

SJC = San Juan County

TFH = Town of Friday Harbor

USGS = US Geological Survey

UW = University of Washington

WA = Washington State

WAC = Washington Administrative Code

WCCPS = Water Conservation Coalition of Puget Sound

WCO = Water Conservation Office, Town of Friday Harbor

WSU = Washington State University

Customer Classes

SFR = Single Family Residential, also includes
SFR-RUR = low income elderly/disabled (must qualify through TFH)
MFR = Multi Family Residential
COM = Commercial
IND = Industrial
PA = Public Authority
Special

For a list of PA, Special and Industrial accounts, refer to Appendix F

Measurements

MG = million gallons
cf = cubic feet
sf = square feet
psi = pounds per square inch
gcd = gallons per capita per day
gpd = gallons per day
gpm = gallons per minute
ERUs = equivalent residential units

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Relationship of Water Conservation Plan to Other Planning Efforts

Appendix A

Coordination and consistency with related Town and County documents are important elements of any planning effort, as are meeting state level planning requirements. This plan dovetails with the following Town, County and State efforts.

Town of Friday Harbor

Comprehensive Water System Plan Updates
The umbrella document outlining the Town's long-term strategies for water supply management. Required by WA State Department of Health (DOH) to be updated every six years. Next update required October 2001.

The *Water Conservation Plan* is Volume 2 of this overall plan.

Capitol Facilities Element of Adopted GMA Comprehensive Plans
The planning element outlining the Town's long-term strategy for infrastructure improvements, such as water system transmission lines and the Trout Lake Reservoir dam.

The *Water Conservation Plan* outlines strategies to reduce annual and peak consumption of water by 10-20%, thereby allowing more time to financially plan for needed infrastructure improvements.

Comprehensive Sewer System Plan
A planning document outlining the Town's long-term strategy for wastewater management.

The *Water Conservation Plan* outlines strategies to reduce use of water by 10 - 20% and thus decrease the effluent load on the wastewater treatment facility.

Water Shortage Response Plan
Adopted in 1988, this plan defines the official level of water shortages, the steps the Town must take to inform the public, and outlines limited and/or prohibited public water uses as well as fines and enforcement procedures.

Chapter 13.16 FHMC, *Emergency Water Restrictions,* accompanies the above plan and was revised in 1998.

The *Water Conservation Plan* outlines strategies to prevent the occurrence of water shortages, weather permitting.

San Juan County

San Juan Island Critical Water Supply Service Area (CWSSA) Coordinated Water System Plan
Proposed by the San Juan Island Water Utilities Coordinating Committee and adopted October 7, 1977 by the SJC Board of Commissioners via Resolution 81-1997. Following the procedures and criteria of WAC 248-56, this plan outlines "a policy framework in which utilities, agencies, and the public can begin to focus and prioritize efforts to ensure the reliability of the island's existing water resources and prepare for future needs in an orderly and efficient manner." Update required every five years.

Appendix A, continued

Water Assessment for San Juan County
Prepared by a local volunteer Citizens' Water Advisory Committee in December, 1985, as required by WAC 248-56-300. Provides a basis for planning and management of San Juan County's water resources. Includes a preliminary analysis of San Juan Island's geography and geology, precipitation, surface and groundwater resources, and planning data, and future water supply needs.

Washington State

***Public Water System Coordination Act,* Chapter 70.116 RCW**
Established a procedure for water utilities to coordinate their planning and construction programs with those of adjacent water utilities and other local governmental activities. This Act specifies that WA State DOH or the county legislative authority may declare an area within a county as a Critical Water Supply Service Area (CWSSA).

***Water Resource Act,* Chapter 90.54 RCW**
Set forth fundamentals of water resource policy to ensure the waters of the state will be protected and fully utilized for the greatest benefit of the people of the state. This act requires that "Procedures Relating to the Preservation of Water for Future Public Water Supply," Chapter 173-590 WAC be established. The "Preservation of Water" constitutes a shared water right, which establishes priority for public water supplies for future allocation of water resources by the Department of Ecology.

History of the Town of Friday Harbor's Water System Appendix B

Surface water is the sole source for the water supply accessed by the Town of Friday Harbor. Trout Lake, the initial and primary source, is about five miles west of town in an isolated, undeveloped pocket fed by a steep drainage basin. The Town owns 600 acres of the surrounding watershed that totals approximately 840 acres.

1912 Town officials declared that the "the future of Friday Harbor depends upon good water and sewage systems." Following the recommendations of an engineer, the Town, with approval from the voters, began construction of a dam at Trout Lake and a wooden pipeline to transport water by a gravity flow system into the Town through Beaverton Valley.

1929 Trout Lake's wooden dam replaced with a 26 foot high cement dam.

1955 Original water treatment plant constructed and put on line.

1961 Cement dam raised 11 feet, substantially increasing storage capacity. Ten inch transite transmission pipeline located through San Juan Valley to replace original wood system.

1979 AUG 1 constructed to supplement Trout Lake with additional surface water runoff. Dam built near the southeast end of Lake 310 to collect water from a 190-acre watershed. Water captured in a small storage impoundment is then pumped over a hill and into Trout Lake Creek, which drains into Trout Lake. Lake 310 is also in the remote mountainous interior of the island and is somewhat protected from significant development. The Town does not own the watershed but has water rights for withdrawal from October 1 to April 15.

1988 AUG 2, consisting of a stream diversion, pumping station and force main, built to provide additional surface water runoff. The Town owns *secondary* water rights and may withdraw water from November 1 to April 15. Water from a 3850-acre watershed is funneled through a weir and was initially pumped directly to the treatment facility. The high tannin content presented difficulties to the treatment plant's filters. The situation was remedied in 1994.

1994 AUG 2's pump station improved and a main added to pump water directly to Trout Lake prior to treatment to mitigate the above mentioned treatment difficulties.

1995 Facilities constructed to allow withdrawal from Trout Lake's "dead storage". Emergency siphoning has the potential to increase the Town's supply by up to 50 million gallons (MG).

1998 A third filter was added to the treatment system. Two filters must operate simultaneously during peak demand, the third acts as a backup in case of failure.

♦ Note: replacement of aging distribution lines is funded on an ongoing basis.

1999 Top Annual Water Users

Customer Type	# of Accounts	Use (gallons)	Avg./Acct
Town	2	5,421,720	2,710,860
Public Authority	6	11,229,080	1,871,513
Multi-family	8	12,894,120	1,611,765
Commercial	23	18,159,080	789,525
Single Family	1	302,190	302,190

1999 Top Peak Month Water Users

Customer Type	# of Accounts	Use (gallons)	Avg./Acct
Public Authority	6	2,124,660	424,932
Multi-family	4	1,307,240	326,810
Town	2	479,200	239,600
Commercial	24	2,459,260	102,469
Single Family	4	184,160	46,040

WA State Legislative Actions and Statutes Appendix N

Legislative Actions

Water Rate Study Committee – DOH, Ecology and the Washington Water Utility Council prepared a report to the legislature in December 1995 identifying economic and institutional constraints to implementing conservation oriented water rates.

Water Resources Forum – A stakeholder group representing local, state and tribal governments, and business, agriculture, fisheries, recreation and environmental interests forwarded consensus based water conservation recommendations to the Governor and legislature in October 1994.

Water Resources Data Management Task Force – The Legislature enacted Chapter 295, Laws of 1990, which provided for the development of the Water Resources Data Management Program and Task Force. Members included state agency representatives, tribal and local governments, business and recreational interest, agricultural and environmental organizations, and other interested parties.

Final Report of the WA State Water Use Efficiency Study Committee – SHB 1594 was passes by the state legislature in 1988. As part of this bill, a committee was directed to investigate and evaluate opportunities for improving water use efficiency and to report to the legislature. The committee included members of the State House and Senate, outside water interests, state agencies, and the governor. Water use efficiency was considered from a technical, legal, institutional, socio-economic and environmental perspective.

Water Efficiency: Opportunities for Action – Report to the Western Governors' Association
The Western Governors' Association (WGA) is composed of sixteen states, one commonwealth and two territories. Members of the WGA Water Efficiency Working Group, the Western States Water Council and the US Department of the Interior compiled this report in 1987 with funds from the Ford and Hewlett Foundations.

Statutes Supporting and/or Requiring Water Conservation

RCW 19.27.170 – *Water Conservation Performance Standards* – Establishes state low flow plumbing fixture requirements.

RCW 35.67.020 **– *Sewerage Systems* – Authorizes cities/towns to consider the achievement of water conservation goals and the discouragement of wasteful water use practices when setting sewer rates.**

RCW 35.92.010 – *Municipal Utilities – Authority to Acquire and Operate Waterworks* – Requires municipalities to provide a safe and reliable supply of water as efficiently as possible: *Classification of Services for Rates* – Authorizes cities/towns to consider the achievement of water conservation goals and the discouragement of wasteful water use practices when setting water rates.

RCW 43.20.230 – *Water Resources Planning – Procedures, Criteria, Technical Assistance* – Directs DOH, consistent with the water resources planning process of Ecology, to develop procedures and guidelines related to water use efficiency to be included in the development and approval of cost effective water system plans.

RCW 43.20.235 – *Water Conservation – Water Delivery Rate Structures* – Requires water purveyors who develop water system plans to evaluate the feasibility of adopting and implementing water delivery rate structures that encourage water conservation.

RCW 43.27A.090 – *Powers and Duties of Department* – Directs Ecology to adopt policies to insure water is "used, conserved and preserved" for the best interests of the state.

RCW 43.70.310 – *Cooperation with Department of Ecology* – Directs DOH, where feasible, to integrate our efforts and endorse policies in common with Ecology.

RCW 90.03.005 – *State Water Policy – Reduction of Wasteful Practices* – Instructs Ecology to reduce wasteful practices in the exercise of water rights "to the maximum extent practicable."

RCW 90.03.400 – *Crimes Against the Water Code* – The willful or negligent waste of water to the detriment of another shall be a misdemeanor.

RCW 90.44.110 – *Waste of Water Prohibited* – No public ground waters that have been withdrawn shall be wasted without economical beneficial use. Ecology shall require both flowing and non-flowing wells to be constructed and maintained as to prevent the waste of public groundwater through leaky pipes.

RCW 90.48.495 – *Water Conservation Measures to be Considered in Sewer Plans* – Ecology is to require sewer plans to include a discussion of water conservation measures considered or underway and their impact on public sewer service.

RCW 90.54.020 – *General Declaration of Fundamentals for Utilization and Management of Water of the State* – Directs Ecology to encourage federal, state, and local governments to carry out practices of conservation. Also indicates that improved water use efficiency and conservation shall be emphasized in the management of the state's water resources and in some cases will be a potential new source of water to meet future needs.

RCW 90.54.180 – *Water Use Efficiency and Conservation Programs and Practices* –

- Provides that increased water use efficiency should receive consideration as a potential source of water in state and local water resource planning processes and stipulates that water use efficiency programs should mix incentives and regulation.
- In determining cost-effectiveness of alternative water sources, consideration should be given to the benefits of conservation, wastewater recycling and impoundments.
- Entities receiving state financial assistance for construction of water source expansion or acquisition of new sources shall develop and implement a water use efficiency and conservation element of a water system plan.
- State programs to improve water use efficiency should focus on areas where water is over appropriated.
- State agencies should educate the public concerning the wise and efficient use of water.

Senate Joint Resolution 8210 – *Amendment to State Constitution to Encourage Water Use Efficiency* (passed by voters November 1989) – Permits county, city, town, quasi-municipal corporations, municipals corporations or political subdivisions of the state engaged in the sale or distribution of water to use public money to finance increased water use efficiency.

ESHB 2514 – *Regional Watershed Planning Bill (1998) Session* – Local planning units developing watershed plans are required to develop an estimate of water actually being used (water use), an estimate of water needed in the future (water demand forecast), and strategy for increasing water supplies through conservation, reuse, etc. (water conservation).

WAC 246-290 – *Group A Public Water Systems – Water System Plans* – Requires public water systems to address several elements including a "conservation program" in their water system plan. Public water systems are also required to specifically address water demand forecasting, water use data collection, and enhanced water conservation planning where water rights will be needed within 20 years.

History of Town Water Conservation Programs
Appendix O

Note that the Town Council reduced water conservation funding to one day per week for 2001. This covered the updating and adoption of the Town's *Water*

***Conservation Plan*, however no programming or other projects except for the continuation of the toilet rebate program were funded.**

MEASURES UNDERTAKEN BY UTILITY

Utility = Town of Friday Harbor Water System

Implementation Dates	Program Description
1997, 1998, 1999, 2000	Fund a Water Conservation Program Coordinator Position
1998	Draft a Water Conservation Analysis
1999, 2000, 2001	Produce an adopted and approved Water Conservation Plan

PUBLIC INFORMATION

Implementation Dates	Program Description
	Events
1997, 1998, 1999, 2000	• Master Gardener Annual Workshop
1997, 1998	• San Juan County Fair
1999, 2000	• Share booth space with OPALCO
	• Separate booth focusing on water conservation
1997,1998, 1999, 2000	• Incorporate conservation message into Master Gardener displays
1989 -1998,1999, 2000	• 5th Grade Annual Watershed Tours in September & October
1997, 1998	• Display at Library (for a 1 month period)
	Distribution of Information
1997, 1998, 1999, 2000	• Master Gardeners' table at Farmers' Market every Saturday April – Sept.
1997, 1998, 1999, 2000	• Library, Courthouse, Public Health Department, WSU Extension Office, Port of Friday Harbor
1997, 1998, 1999, 2000	• Hotels, Bed & Breakfasts, other businesses
1997	• Water Conservation Brochure produced by TFH, WCO
1998	• Tip Sheet produced by TFH, Water Conservation Office
	Articles
1997, 1998, 1999, 2000	• Newspapers
1997, 1998, 1999, 2000	• Other Publications and Programs, examples: San Juanderer, SJC Fair Premium Book, and Springtide

TFH = Town of Friday Harbor **WCO** = Water Conservation Office

MEASURES TARGETING USERS

Customer Classes: **SFR**=Single Family Residential; **MFR**=Multifamily Residential; **COM**=Commercial; **IND** = Industrial **P.A** = Public Authority

Implementation Dates	Program Description
1970's	**Monthly Billing Statement** - consumption history
1997, 1998, Ongoing	**Rate Structuring**, tiers to block rates added
Ongoing	**Plumbing Code** updates mandated by WA State
1997, 1998 2000, 2001 1997, 1998	**Fixture Retrofits & Rebates** SFR, MFR classes • Showerheads & Aerators coop with OPALCO • Low Flush Toilet Rebate • Washers (Washwise) coop with OPALCO, Conservation District, and local retailers
1998, 1999 1997, 1998, 1999, 2000	**Efficient Irrigation** SFR, MFR, COM, IND, PA classes • Rain Barrels • Rain Gauges **Landscaping Audits** SFR, MFR, COM, IND, PA classes
	Customer Surveys SFR and MFR classes • Number of visitors by month • Type of plumbing devices in use • Use patterns • Interior • Exterior
	Audits SFR, MFR, COM, IND, PA classes • Inside • Outside

MEASURES TARGETING UTILITY

Implementation **Dates**	Program Description
1955 1996 Upon user request	**Source Metering** • Production at Treatment Plant • Source into Trout Lake **User Metering** • Sub-metering Specific Users
Ongoing since 1970's	**Reduced PSI** primarily at Port and Waterfront
Occurs if line loss is >10% 1993, 1996, 2000 Have not been tested	**Leak Detection** • Mains • Subsidiaries

	Reclaimed Treatment Facility Water • Wastewater Treatment Plant internal use • Watering football field

Appendix E: Water Extension Requirements

Town of Friday Harbor
Water System
Sewer System
Extension Requirements

Town Hall

Friday Harbor,

San Juan County, Washington

Telephone: 378-2390

NOTE - Deposit funds in
Trust Account

Kramer, Chin & Mayo, Inc.
1917 First Avenue
Seattle, Washington 98101

TABLE OF CONTENTS

Section		Pages
A	Checklist - Water System, Extension Checklist - Sewer System Extension Checklist - Storm Sewer System Extension	1-3
B	Application for Permission to Construct Extension	1-5
C	Design Requirements and Drafting Standards	1-3
D	General Conditions	1-8
E	Technical Specifications	1-10
F	Attachments:	
	Easement Form	
	Bill of Sale - Water System	
	Bill of Sale - Sewer System	
	Performance Bond	
	Water and/or Sewer Facility Contract	

SECTION A

CHECKLIST
WATER SYSTEM EXTENSION

Developer

_____ _____
Name of Extension Name

_____
Address

_____

Telephone _____

A. Preliminary
_____ 1. Application form completed (Developer)
_____ 2. Extension fee paid (Developer)
_____ 3. Application approved (Town)

B. Required before plans are started (where design if furnished by Town)
_____ 1. Final plat (scale 1: - 100') (Developer)
_____ 2. Contour map with 5' or less contour interval and scale of 1" = 100' (Developer)
_____ 3. Road profiles (Developer)

C. Required before extension is constructed
_____ 1. Plans, specifications, cost estimate, bill of sale forms approved by Engineer
_____ 2. Approval of Contractor (Town)
_____ 3. Cash bond (Contractor)
_____ 4. Certificate of Insurance (Developer)
_____ 5. Easements (Developer)
_____ 6. Property boundary stakes in place (Developer)
_____ 7. Material and equipment list approved by Engineer (Contractor)
_____ 8. 48 hours' notice of starting date given to Town (Contractor)
_____ 9. Construction stakes in place (Developer)

D. Required before any service is connected
_____ 1. Applicable additional fees paid (Developer)
_____ 2. Approval of construction (Engineer)
_____ 3. Executed bill of sale delivered to Town (Developer)
_____ 4. Acceptance of title (Town)

E. To be done one year after acceptance
_____ 1. Final inspection (just prior to end of year (Town)
_____ 2. Release of Performance Bond (Town)

CHECKLIST
SEWER SYSTEM EXTENSION

Developer

_____ _____
Name of Extension Name

_____
Address

_____

Telephone _____

A. Preliminary
_____ 1. Application form completed (Developer)
_____ 2. Extension fee paid (Developer)
_____ 3. Application approved (Town)

B. Required before plans are started (where design if furnished by Town)
_____ 1. Final plat (scale 1: - 100') (Developer)
_____ 2. Contour map with 5' or less contour interval and scale of 1" = 100' (Developer)
_____ 3. Road profiles (Developer)

C. Required before extension is constructed
_____ 1. Plans, specifications, cost estimate, bill of sale forms approved by Engineer
_____ 2. Approval of Contractor (Town)
_____ 3. Cash bond (Contractor)
_____ 4. Certificate of Insurance (Developer)
_____ 5. Easements (Developer)
_____ 6. Property boundary stakes in place (Developer)
_____ 7. Material and equipment list approved by Engineer (Contractor)
_____ 8. 48 hours' notice of starting date given to Town (Contractor)
_____ 9. Construction stakes in place (Developer)

D. Required before any service is connected
_____ 1. Applicable additional fees paid (Developer)
_____ 2. Approval of construction (Engineer)
_____ 3. Executed bill of sale delivered to Town (Developer)
_____ 4. Acceptance of title (Town)

E. To be done one year after acceptance
_____ 1. Final inspection (just prior to end of year (Town)
_____ 2. Release of Performance Bond (Town)

CHECKLIST
STORM SEWER SYSTEM EXTENSION

Developer

_____ Name of Extension

_____ Name

_____ Address

_____

Telephone _____

A. Preliminary
_____ 1. Application form completed (Developer)
_____ 2. Extension fee paid (Developer)
_____ 3. Application approved (Town)

B. Required before plans are started (where design if furnished by Town)
_____ 1. Final plat (scale 1: - 100') (Developer)
_____ 2. Contour map with 5' or less contour interval and scale of 1" = 100' (Developer)
_____ 3. Road profiles (Developer)

C. Required before extension is constructed
_____ 1. Plans, specifications, cost estimate, bill of sale forms approved by Engineer
_____ 2. Approval of Contractor (Town)
_____ 3. Cash bond (Contractor)
_____ 4. Certificate of Insurance (Developer)
_____ 5. Easements (Developer)
_____ 6. Property boundary stakes in place (Developer)
_____ 7. Material and equipment list approved by Engineer (Contractor)
_____ 8. 48 hours' notice of starting date given to Town (Contractor)
_____ 9. Construction stakes in place (Developer)

D. Required before any service is connected
_____ 1. Applicable additional fees paid (Developer)
_____ 2. Approval of construction (Engineer)
_____ 3. Executed bill of sale delivered to Town (Developer)
_____ 4. Acceptance of title (Town)

E. To be done one year after acceptance
_____ 1. Final inspection (just prior to end of year (Town)
_____ 2. Release of Performance Bond (Town)

SECTION B

APPLICATION FOR PERMISSION TO CONSTRUCT EXTENSION TO THE FRIDAY HARBOR WATER SYSTEM AND/OR SEWER SYSTEM

The undersigned, hereafter referred to as "Developer," hereby makes application to the Town of Friday Harbor, San Juan County, Washington, for permission to construct and install an extension in the public right-of-way under the Town's franchise therefore, and/or on easements which are subject to approval of the Town, and to connect the the Town's water system and/or sewer system, and makes the following representations and agreements, to-wit:

1. LOCATION OF EXTENSION

The proposed extension will be installed in roads and/or easements and/or on the other approved rights-of-way and shall be for the use and benefit of the property hereafter described, which property is owned by the Developer and/or other persons who are contributing to the costs of said extension; that said other owners join in this application and are referred to as "additional owners;" that said property is described as follows:

2. DESCRIPTION OF EXTENSION

The proposed extension will consist of approximately _____ linear feet of water pipe and approximately _____ linear feet of sewer pipe and shall be installed in accordance with plans and specifications approved by the Town and in accordance with the Rules and Regulations of Construction Extensions adopted by the Town of Friday Harbor, which are on file in the Town Hall. The storm drainage system consists of approximately _____ linear feet of storm pipe.

3. EXTENSION FEE

An extension fee shall be paid by the Developer in consideration for the following basic work:

a. Extension design (where requested or reviewed).

b. Approving of contract plans, specifications, cost estimate, and bill of sale forms (where design is prepared by Developer).

c. Submittal of contract plans and specifications to regulatory agencies for approval (if applicable).

d. Application for State and/or County permits, where applicable.

e. Inspection of the work as described in the General Conditions.

f. Advice regarding the Town's requirements.

4. ADDITIONAL FEES

An additional fee shall be paid to the Town by the Developer for the following additional work:

a. Additional inspections.

b. Re-inspection of deficient work.

c. Excessive water use.

5. PAYMENT OF FEES - DEPOSIT

The application fee shall be paid as follows:

a. An amount equal to $6,000 plus $6.00 per linear foot for the estimated length of the water, storm and of the sewer extension shall be deposited with the Town at the time of filing of this application, said amount being $_____.

b. This fee may cover Town administration, engineering and inspection.

c. The actual time and expense cost shall be deducted from this amount and the balance returned to the Developer prior to acceptance of the extension by the Town. If costs exceed the initial fee, the additional cost must be paid by the developer before the lines will be accepted by the Town.

6. PRELIMINARY ENGINEERING

Where design is not provided by the Town, the Developer shall furnish three copies of plans for review and approval.

The Developer shall also provide the description, location and elevation of all bench mark data available on the project site and this information shall be indicated on the plans.

7. EVIDENCE OF INSURANCE

Developer shall provide Town with written evidence of insurance covering public liability and property damage to third parties, in which the Town shall be named insureds, to the extent as provided in the General Conditions. Developer agrees to indemnify and bold Town harmless from any and all claims, demands, actions and/or liabilities of every kind and nature as may be made and/or entered against the Town by reason of or arising out of the acts of Developer, its agents, and/or contract, in making installation after obtaining the permission of the Town to proceed, including costs and attorney's fees incurred by the Town in investigating and defending against any such claim in the event of failure of Developer to so defend as herein required.

8. CASH BOND

Developer agrees to have any contractor installing an extension in accordance with this application and agreement to provide the cash specified in Section 5 on page B-2 prior to beginning construction of said extension and no construction shall be commenced until said bond is furnished. This cash bond shall be conditioned upon the contractor's strict compliance with the Town's conditions and standards contained herein and shall ensure the Town against any damage to the existing system as a result of the contractor's failure to comply.

The cash bond will be refunded to the contractor upon satisfactory completion of the extension and connection of the extension to the existing system. In the event of the contractor's failure to comply, the Town may exercise the right to irrevocably forfeit the total amount of the cash bond as liquidated damages. The amount refunded will be less the actual costs incurred by the Town.

A copy of the performance bond is attached to this set.

9. WARRANTY BOND OR CASH DEPOSIT

The Developer shall furnish to the Town upon completion of the project a certified cashier's check or warranty bond between Developer and the Town upon the form approved by Town and in an amount equal to 10 percent of the construction cost for a period of one year to ensure against faulty workmanship or materials. During the one-year warranty the Developer shall be liable for any expense caused by faulty workmanship or material. In case the Developer refuses to accept the responsibility, the Town shall use the cash or bond to cover all expenses and at the end of one year, the unused balance will be returned to the Developer.

10. EASEMENTS

Any required easement shall be obtained by Developer at his sole cost and expense, and a true copy of such easement shall be delivered to the Town prior to the time Developer commences construction hereunder. Upon completion of construction and prior to acceptance of said extension by Town in accordance with the provisions hereof, the original easement shall be delivered to the Town. The Developer shall provide all necessary easements at his sole cost regardless of changes in the Contract Plans.

11. PERMITS

All the necessary permits from any governmental agency shall be obtained by Developer directly or, if required, Town will obtain the same but at Developer's expense; and Town shall be provided with a copy of all such permits before construction commences.

12. GRADING OF ROADS

Developer shall grade all roads to the design subgrade elevation prior to the start of construction and shall advise the Town in writing of any changes which may be contemplated during construction. If the Developer changes the subgrade elevation of the road after completion of the extension, or any part thereof, the Developer shall be responsible for all costs incurred for the extension as a result of said change in subgrade elevation. This obligation shall remain in full force until San Juan County releases the right-of-way or road construction bond or bond of other description in connection with the Developer's obligation to the County for completion of roads within the area.

13. CONNECTION TO THE FRIDAY HARBOR SYSTEM

No less than 48 hours prior to the time that said extension is partially or fully completed and connection to the Town's system is desired, written application for permission to make the actual connection to the Town's system at a specified time shall be made by Developer or his contractor. All connections to the existing system shall require the authorization of the Town Administrator and shall be conducted in the presence of the Town.

During construction, the Developer's Contractor shall remove such water and debris accumulated in the extension under construction by pumping to suitable disposal areas and shall not be permitted to discharge such waste into the Town's existing facilities.

14. FINAL ACCEPTANCE

Developer's Engineer shall furnish the State Department of Health for water systems with a certified statement that installation was in accordance with approved plans and specifications.

Town agrees to accept title to the extension when all work which may in any way affect the lines constituting the extension has been completed and when any and all damage to said lines which may have been caused thereby has been repaired, and when the Town has made final inspection and given approval of the system as having been completed in accordance with the plans and specifications. Acceptance of said extension shall be by resolution of the Town Council.

Such acceptance by the Town shall not relieve Developer of the obligations to correct defects in labor and/or materials as heretofore provided and/or the obligations set forth in the applicable paragraphs hereof. Acceptance by the Town shall cause said extension to be the subject to the control, use and operation of the Town, which may apply thereto to all regulations and conditions of service and make such changes therefore as the Town deems reasonable and proper.

15. LIMITATION OF PERIOD FOR ACCEPTANCE

The extension shall be complete and accepted within one year of date of acceptance of this Application by Town. If the extension is not completed and accepted within one year from the date below, then the Developer's rights under this agreement shall cease and no additional service shall be connected to such extension unless and until Developer shall make a new Application or Town consents to the renewal of the existing Application and the Developer shall pay the additional administrative, legal, engineering and inspection costs involved, all as determined by the Town.

DATED at _____, Washington, this _____ day of _____, 2___.

_____
Developer

_____

_____

_____
Additional owners

Upon compliance with the terms and conditions of the contract documents furnished by the Town to the above named Developer, the Town of Friday Harbor will accept said extension and furnish water service thereto.

TOWN OF FRIDAY HARBOR
San Juan County, Washington

By _____
Mayor

Attest:

_____
Town Clerk

SECTION C

DESIGN REQUIREMENTS AND DRAFTING STANDARDS

1. Design Requirements

The following design requirements are general in nature and are intended to assist the developer's engineer in preparing the extension plans. The Town may require modifications or additions to conform to the Comprehensive Plans, Department of Ecology or Department of Health requirements, or to meet specific site problems.

Water Mains

Mains -

Size: 8-inch minimum except 6-inch for cul-de-sacs in single-family residential zones supporting one fire hydrant and no possibility of extending main.

Material - Ductile-iron per AWWA C151, "CL.50 PVC per AWWA C900 DR 18, CL.150"

Location: 5-feet north or east of street centerline. Lines serving more than 20 lots or three fire hydrants must be looped.

Valves - Location: Valve at each connection to existing system. Typically intersections will have one less valve than pipe legs. At Town's option valves on all legs may be required. Commercial and multi-residential zones may have mid-block valves to separate fire hydrants.

Fire Hydrants-

Spacing: 400 feet maximum in single-family residential zones. In cul-de-sacs provide hydrant coverage equivalent to a block grid system. Typically a hydrant is set 150 feet from the center of the end lot in the cul-de-sac and a second hydrant is set 400 feet from the first.

300 feet maximum in commercial and multi-family residential zones. Hydrants may be spaced closer if necessary to provide building coverage or to increase number of hydrants.

Service Lines -	Size:	3/4-inch for single-family residence. One-inch for dual-residence line. Commercial and multi-family residence service will be sized by specific flow requirements.
	Material:	Copper Type K
	Location:	Preferably dual service at lot line. Alternate lot lines with side sewer locations.

Sanitary Sewers

Mains -	Size:	8-inch
	Slope:	0.005 minimum, uppermost run 0.008
	Material:	PVC per ASTM D 3034
	Location:	5-feet south or west of street centerline
Manholes -	Size:	48-inch
	Spacing:	300 feet maximum
	Material:	Precast concrete
Side Sewers-	Size:	6-inch
	Slope:	0.020 minimum
	Material:	PVC per ASTM D 3034 SDR 35
	Location:	Preferably double service at lot lines. Use alternate lot line from water service location. If water and sewer service are at the same lot line, keep a 10-foot separation.

2. DRAFTING STANDARDS FOR SEWER AND WATER PLANS

a. Plan sheets shall be Mylar 22-inch by 34-inch or 24-inch by 36-inch. Profile grid shall fit scales used. Scale shall be 1" = 50' horizontal and 1"=10' vertical.

b. Base plan shall show street centerline, right-of-way lines, future curbs or edge of pavement and sidewalks. Other utilities to be constructed in the street shall be shown as necessary for plan checking. Use legend to identify various lines.

c. Plans for sewer and water construction in existing streets shall show surface and underground improvements from topographic surveys and available records.

d. Sewer plans shall show the sewer main, manholes, and side sewers. Line weight shall be sufficient to distinguish them from other facilities. Horizontal locations shall be indicated by stationing and offset from street centerline. Side sewers shall be stationed from lower manhole. Pipe size shall be indicated in inches, i.e., 8-inch S.

e. Sewer profile shall show finished grade, manholes with inverts and top elevations and sewer line with pipe size, material, length between manhole centers and slope in feet per feet, i.e., 8-inch PVC - 296.8 feet S = 0.0064.

f. Water plans shall show water main fittings, valves, fire hydrants, and services. Line weights shall be sufficient to distinguish them from other facilities. Horizontal location from street centerline shall be shown.

Water main size, material and length between angle points shall be shown, i.e., 8-inch PVC - 545 feet.

Describe hydrants, fittings, valves, etc. by number and joint type. Detail connection requirements. Typical plan callouts should be:

1 - 5" MVO	Fire Hydrant Assembly
1 - 8" x 6"	Tee M.J.
1 - 8"	Tee H. x Fl.
1 - 8"	Gate Valve M.J. x Fl

SECTION D

GENERAL CONDITIONS
FOR JOBS CONSTRUCTED BY DEVELOPERS

1. SCOPE

These are general conditions to all contracts for extension of the Town's sewer and water system by Developers. Reference to, or requirements for, non-applicable conditions for any particular contract will be construed to have no meaning relative to the performance of such work.

2. DEFINITIONS

The following terms as used in this contract shall be defined and interpreted as follows:

a. "Contract" or "This Contract:" The application for permission to construct an extension to the water distribution or sewer collection system executed by the Developer and the Town of which these general conditions are an integral part.

b. "Town:" Town of Friday Harbor, San Juan County, Washington, acting through the Town Administrator, or his designee.

c. "Developer:" The person, partnership, firm or corporation having an agreement with the Town to cause the installation of water system improvements to become a part of the Town water system upon completion and acceptance. The term shall also include the Developer's agents, employees and subcontractors. The legal address is shown in the application.

d. "Town Engineer:" The Engineer for the Town of Friday Harbor. The Town Engineer may be the Town Administrator, or his duly authorized personnel, acting as agents for the Town in the administration of this contract, for the benefit of the Town in accordance with the Contract Documents.

e. "Extension:" The system of water and/or sewer mains and appurtenances or other system improvements to be constructed in whole or in part through the performance of this Contract.

f. "Plans:" The plans shall mean all official drawings or reproductions of drawings made or to be made pertaining to the work provided for in the Contract or to any structure connected therewith.

g. "Specifications:" The specifications shall mean the technical specifications of this document.

h. "Work:" The work necessary for the construction called for in the plans.

i. "Words and Phrases:" Wherever the words "as directed," "as required," "as permitted," or words of like effect are used, it shall be understood that the direction, requirement or permission of the Town is intended. The words "approved," "acceptable," "satisfactory," and words of like import shall mean approval of or acceptable to the Town.

j. "Surety:" Any firm or corporation executing a surety bond or bonds payable to the Town securing the performance of the contract either in whole or in part.

3. PLANS AND SPECIFICATIONS

The Developer shall retain an engineer to prepare plans and specifications for submittal to the Town for approval. The design must be prepared by a registered professional engineer licensed to practice in the State of Washington. The Developer may request that the Town prepare the plans. All costs incurred by the Town shall be borne by the Developer.

The design plans must be in accordance with construction standards of the Town and comply with all Town regulations, ordinances and State standards. Three sets of plans and specifications are to be submitted. When approved the Town will send one set of the Water Plan to the State Department of Health for approval.

Should the proposed improvement involve a pumping station, storage reservoir or other general facility, the Town reserves the right to do the engineering work, and prepare plans and specifications with all costs to be paid by the Developer.

4. PERMITS, LAWS AND REGULATIONS

a. Permits, permission under franchises, licenses and bonds of a temporary nature necessary for and during the prosecution of the work, and inspection fees in connection therewith shall be secured and paid for by the Developer. Where the Town is required to secure such permits, permission under franchises, licenses and bonds and pay the fees, the costs incurred by the Town, thereby shall be reimbursed to the Town by the Developer.

b. Developer shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work required by the Contract Documents. If the Developer performs any work contrary to such laws, ordinances, rules and regulations, or prior to obtaining permits, permission under franchises, licenses and/or bonds as required to be furnished by or obtained by the Town, he does so at his own risk.

5. INSPECTION AND TESTS

a. Inspection of the work by the Town and its authorized agents shall be strictly for the benefit of the Town and nothing contained herein shall be construed to relieve the Developer of his obligations under this application.

b. The Town shall at all times have access to the work for the purpose of inspecting and testing. The Developer shall provide proper facilities for such access and for such inspection and testing.

c. If any work should be covered up without approval or consent of the Town, it must be uncovered for inspection at the Developer's expense.

d. The Developer shall make reasonable tests of the work at the Developer's expense upon the Engineer's request and shall maintain a record of such tests.

e. For a performance test to be observed by the Town, the Developer shall make whatever preliminary tests are necessary to assure that the material and/or equipment are in accordance with the specifications.

f. The Developer shall pay all costs of inspection and administration. The Town will determine the amount of inspection time necessary to ensure compliance with the plans and specifications.

6. RECORD DRAWINGS

Upon completion of the project the Developer's Engineer shall prepare an "as-built" reproducible together with two sets of drawings for the Town's use at no cost to the Town.

7. INSURANCE

The Developer shall carry liability and property damage insurance covering all work under this contract, including that done by subcontractors. This insurance shall name the Town and their Engineer as co-insured and shall be primary coverage with any insurance carried by the Town classified as additional coverage. Unless otherwise specified, this insurance shall be carried as follows: Bodily injury of not less than $1,000,000 for bodily injury, including accidental death, to any person, and subject to that limit for each person, of not less than $1,000,000 for each occurrence; and property damage of not less than $500,000 for each occurrence.

8. MATERIAL AND EQUIPMENT

a. Material and equipment shall be new. All materials and equipment furnished are warranted by the Developer as new and in accordance with the plans and specifications, if specified therein, and as suitable for

the intended purpose. The Developer shall furnish the Town with copies of the supplier's warranty and adopt the same as the warranty of the Developer and shall also be liable thereon to the Town.

b. The Developer shall file three (3) copies of materials and equipment list with the Engineer prior to proceeding with construction. This list shall include the quantity, manufacturer, and model number of materials and equipment to be installed under the contract. This list will be checked by the Engineer as to conformity with the plans and specifications.

The Developer shall make any required corrections and file two (2) corrected copies with the Engineer. The Engineer's review and acceptance of the lists shall not relieve the Developer from responsibility for suitability for the intended purpose nor for deviations from the drawings and specifications unless the Developer has, in writing, called the Engineer's attention to such deviations at the time of submittal, and secured the Engineer's written approval for such deviation.

9. WORKMEN

a. The Developer shall enforce strict discipline and good order among his employees and shall not employ on the work any person unfit or not skilled in the work assigned to him. Employees or agents of the Developer who, in the opinion of the Town, may impair the quality of the construction, shall be removed from the work.

b. Necessary sanitation conveniences for the use of workmen on the job, properly secluded from public observation, shall be provided and maintained by the Developer.

10. DETERMINATION OF "OR EQUAL"

The Town shall be the sole judge of the question of "or equal" of any supplies or materials proposed by the Developer.

11. ROYALTIES AND PATENTS

The Developer shall be liable for all suits brought against the Town by reason of infringement of patent rights or license on any material, machine, appliance or process that he may use on the work or incorporate into the finished job except where specifically exempted by special provisions. The Developer shall defend and hold the Town harmless from any such suit, costs of defense and any judgment which may be made or entered against the Town thereon.

12. PROTECTION OF WORK AND PROPERTY AND SAFETY

a. Developer shall continuously maintain adequate protection of the work from damage and shall protect Town's property from injury or loss arising in connection with or during the existence of this contract. He

shall make good any such damage, injury or loss, except as may be directly due to errors in the Contract Documents or caused by agents or employees of the Town. He shall adequately protect adjacent property from damage or loss occasioned by performance of the work. He shall provide and maintain all passageways, guard fences, lights and other facilities for protection required by public authority or local conditions.

b. Developer shall bear the risk of loss or damage for all finished or partially finished work until the entire extension is accepted by the Town.

c. Developer shall take all necessary precautions for the safety of employees on the work and shall comply with all applicable provisions of Federal, State and municipal safety laws.

13. EXISTING UTILITIES AND FACILITIES

a. Underground utilities of record shall be shown on the construction plans insofar as it is possible to do so. These, however, are shown for convenience only and the Town assumes no responsibility for improper locations or failure to show utility locations on the construction plans.

b. Developer shall take adequate precautions to protect existing lawns, trees and shrubs outside rights-of-way, sidewalks, curbs, pavements, utilities, adjoining property, and structures, and to avoid damage thereto. He shall, at his own expense, completely repair any damage thereto caused by his operations to the satisfaction of the Town, except as otherwise provided in other sections of these specifications.

14. REPLACING IMPROVEMENTS

Whenever it is necessary in the course of construction to remove or disturb culverts, driveways, roadways, pipelines, monuments, property stakes or other existing improvements, they shall be replaced to a condition equal to that existing before they were so removed and disturbed.

15. SUPERINTENDENCE AND SUPERVISION

Developer shall keep on the construction site during the progress of the work a competent superintendent and any necessary assistants, all satisfactory to the Town. The superintendent shall not be changed except with the consent of the Town. The superintendent shall represent Developer in his absence and all directions given to the superintendent shall be as binding as though given to Developer.

16. CONVEYANCE OF UTILITY TO THE TOWN

a. A warranty bond minimum of $5,000.00 or 10 percent of the construction cost, whichever is greater, shall be posted with the Town Clerk to ensure against any defect in any workmanship or material in

the project for a period of one (1) year. If desirable, this bond can be part of the performance bond.

b. The Developer shall prepare a bill of sale to convey title to the Town for the utility improvement stating the same is free and clear of all encumbrances and that Developer has good and right authority to transfer title.

c. The Developer, after acceptance of the completed water and sewer systems of the Town, shall have his Engineer prepare a certified statement that the extension was installed in accordance with the approved plans and specifications. The Town Engineer will submit this statement to the State Department of Health for water systems and the State Department of Ecology for sewer systems.

17. CORRECTION OF DEFECTS OCCURRING WITHIN WARRANTY PERIOD

When defects occurring within the warranty period are discovered, Developer shall start work to remedy any such defects within seven (7) days of mailing notice of discovery thereof by the Town and shall complete such work within a reasonable time. In emergencies, where damage may result from delay and where loss of service may result, corrections may be made by the Town immediately upon discovery, in which case the cost thereof shall be borne by the Developer. In the event the Developer does not commence and/or accomplish corrections within the time specified, the work shall be otherwise accomplished and the cost of same shall be paid by the Developer.

Developer shall be responsible for any expenses incurred by the Town resulting from defects in the Developer's work, including actual damages, cost of materials and labor expended by the Town in making emergency repairs and cost of engineering, inspection and supervision by the Town or Engineer, as well as reasonable attorney's fees to be fixed by the court in any action which the Town may commence against Developer to enforce the provisions hereof.

18. INDEMNITY

Developer shall indemnify, defend and save harmless the Town from and against all losses and claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought and recovered against the Town by reason of any act or omission of Developer, Developer's subcontractors, agents, and/or employees arising directly or indirectly from the performance of the contract or in guarding of the work. Developer will, after reasonable notice of any such suit or action, defend and pay the expense of defending any suit which may be commenced against the Town arising therefrom.

19. SUBLETTING AND SUBCONTRACTING

Developer agrees that he is fully responsible to the Town for the acts and omissions of subcontractors. Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the Town.

20. SEPARATE CONTRACT; INTERFERENCE WITH OTHER DEVELOPERS

The Town reserves the right to perform work with its own forces or to let other contracts for work in connection with this project or other projects. Developer shall afford the Town and other contractors reasonable opportunity for the execution of their respective work and shall property connect and coordinate his work with theirs.

21. LOSS OF SIDE SEWER MARKERS

The Town shall not be responsible for costs to locate sidesewers in the event of removal and destruction of side sewer markers by parties other than the Town itself.

22. QUALIFICATION OF CONSTRUCTION CONTRACTOR

All work shall be carried by Contractors experienced in the type of construction involved. The Town reserves the right to take necessary action to ascertain the competence and ability of proposed contractors. Contractors must be licensed by the State of Washington, and must havecurrent Friday Harbor business license.

23. SURVEYS

All surveys including boundaries, topography for plans and profiles, and construction staking are the sole responsibility of the Developer. Surveys must be based on Town vertical datum. Where construction in Town rights of way outside of the development site occurs, the Town reserves the right to require additional surveys to establish right-of-way limits and to locate existing improvements as necessary to protect the Town's interests.

All surveys shall be carried out by a licensed Professional Land Surveyor.

24. TEMPORARY WATER POLLUTION CONTROL

Provide acceptable means to control erosion and turbid runoff from construction areas. Methods may include, but are not limited to, diversion of ditches or water courses, settling basins and filtration systems on drainage courses, or systems leaving the construction site.

25. TRAFFIC CONTROL AND PROTECTION OF PUBLIC

All work on public rights of way must conform to traffic control requirements of the Town including detours, signs, and flagmen. Maintain one-way traffic

as a minimum except when constructing street crossings. Restore two-way traffic at end of day.

At end of day all trenches must be backfilled or protected with lighted barricades to the satisfaction of the Town.

26. COMPLETION TIME FOR WORK ON PUBLIC RIGHTS OF WAY

Prior to construction on public rights of way, the Town will establish a reasonable completion time for the work including cleanup and restoration of improvements.

For overruns in completion time the Town will assess the Developer liquidated damages in the amount of $50.00 per day.

SECTION E

TECHNICAL SPECIFICATIONS

1. MATERIALS

a. Water System

Mains

Pipe: Ductile iron (DI) conforming to AWWA C151, thickness Class 50, with push-on joints conforming to AWWA C111-90 and cement mortar lining conforming to AWWA C104 standard thickness.

Polyvinyl chloride (PVC) conforming to AWWA C900 DR18 (Class 150) cast-iron pipe equivalent O.D. with elastomeric gasket joints.

Fittings

Fitting joints for DI pipe and when specified on the plan for PVC pipe shall be mechanical joint (M.J.) conforming to AWWA Standard C111.

Fittings for PVC pipe when not specified M.J. on the plan may have push-on gasketed joints suitable for the pipe.

Flanges shall conform to Section 10.17 of AWWA C110.

Couplings

Flexible and flange by flexible couplings shall be Smith Blair or equal with gray iron sleeves and ductile-iron followers nuts and bolts.

Gate Valves

2 inches and smaller: Bronze, NRS wedge disc, standard square operating nut. Crane No. 438 or equal.

3 inch through 12 inch: Resilient seat per AWWA C509 non-rising stem, open CCW "O" ring stem seal, standard operating nut. Valve ends as indicated on the plans and conforming to fitting joints above.

Valve Box: Two-piece slide extension as shown on Water Standard Details herein.

Fire Hydrants

Conform to AWWA Standard C502 and the following requirements:

1. 3-foot 6-inch Bury unless otherwise specified on plan.
2. Two 2-1/2-inch hose nozzles NST.
3. One 5 ¼-inch pumper nozzle NST.
4. 5 ¼-inch main valve opening.
5. 6-inch flanged inlet connection.
6. Open counter clockwise.
7. Breakaway traffic flange.
8. "O" ring stem seal.
9. 1 ¼ " OPERATING NUT

Manufacturers: WATEROUS PACER, OR APPROVED EQUAL

Guard Posts

Reinforced concrete 9-inch diameter, 6-foot long.

Services

Saddles: Double-strap ductile-iron with corporation stop thread.

Corporation Stop: Bronze with AWWA C800 thread on inlet and flared copper outlet Ford Type F600 or equal.

Service Line Pipe: Copper tubing per ASTM B 88, Type K with flare-type joint fittings.

Curb Stop: Ford B22 or equal.

Line Setter: Ford 70 series Coppersetter or approved equal.

b. Gravity Sanitary Sewers

Pipe: Polyvinyl Chloride (PVC) conforming to ASTM D 3034 SDR 35 with joints conforming to ASTM D 3212 using restrained gaskets conforming to ASTM F 477.

Fittings: All fittings shall be PVC with gasketed joints compatible with PVC pipe.

Manholes: Precast concrete conforming to ASTM C 478 and the Sewer General Standard Details herein. Seal joints between precast elements with rubber gaskets. Provide PVC gasketed sewer manhole adaptor (sand collar) to connect PVC pipe to manhole.

Castings: Manhole frame and cover shall be gray iron conforming to ASTM A 48, Class 30. Machine frame and cover to provide non-rocking seat. Cover pattern to match Town standard. Paint all surfaces with bituminous coating.

Adjustment Brick: Concrete conforming to ASTM C 55, Grade S.

Drop Manholes: Construct with ductile-iron pipe as specified herein for water systems.

c. Pressure Sewers/Force Mains

Pipe shall be ductile iron or PVC conforming to the requirements for water mains of this specification.

d. Aggregates for Bedding and Backfill

Aggregates shall conform to the following sizes. Percentages passing are by weight.

Bank run gravel for trench backfill and foundation material:

Sieve Size		Percent Passing
2-1/2 square		100
1-4" square		25 min.
U.S. No. 200		10.0 max
Dust Ratio:	% Passing U.S. No. 200	
	% Passing U.S. No. 40	2/3 max.
Sand Equivalent		30 min.

Pipe Bedding for PVC Pipe

Sand

Sieve Size	Percent Passing
3/4"	100
3/8"	70-100
No. 4	55-100
No. 10	35 - 95
No. 20	20 - 80
No. 40	10-55
No. 100	0 - 10
No. 200	0 - 3

Pea Gravel

Sieve Size	Percent Passing
3/4"	100
3/8"	95 - 100
No. 8	0 - 10
No. 200	0 - 3

Pipe Bedding for ductile-iron pipe: Use bank run gravel.

e. **Restoration Materials**

Crushed surfacing for shoulders and pavement base:

Sieve Size	Base Course Percent Passing	Top Course and Keystone Percent Passing
1-1/4" square	100	
5/8" square	50 - 80	100
1/4" square	30 - 50	55-75
U.S. No. 40	3 - 18	8 - 24
U.S. No. 200	7.5 max.	10.0 max.
% Fracture	75 min.	75 min.
Sand equivalent	40 min.	40 min.

Asphalt Concrete:

Class B per Section 5-04 of the Standard Specifications for Road, Bridge and Municipal Construction.

2. INSTALLATION

a. **Trenching for Sewers and Water Mains**

Trench width at top of pipe shall be minimum 30 inches and maximum 40 inches. At manhole excavations, provide 12-inch clearance around structure.

For trenches over 4 feet deep, provide shoring consistent with Washington State and Federal Safety codes.

Dewater trench and keep dry until backfill is placed and compacted.

Remove ledgerock, boulders and stones to provide 6-inch minimum clearance around pipe.

When directed by the Town, overexcavate unsuitable material and remove from the site. Backfill with compacted bank run gravel to base of bedding line.

In easements or public rights of way outside of the developer's site, maximum open trench length is 200 feet.

Maintain excavated material so that there is minimum interference with public travel. Interrupt access to private driveway, fire hydrants, etc., only as necessary. Restore access as soon as possible. Provide one-day notice to residents of construction activity and blockage of property access.

b. Backfilling

Backfill with native material unless directed by the Town to use bank run gravel. Keep backfill free from debris and stones over 6 inches in length.

Place backfill in 8-inch lifts and mechanically compact with approved equipment. Compact to 95 percent maximum density in pavement areas and 90 percent in other areas. Densities will be determined by ASTM D 1557. In-place densities will be measured by ASTM D 1556 or ASTM D 2922.

In steep areas the Town may require clay trench dams to control groundwater flow along trench. Trench dams shall extend from the base of the bedding to 6 inches below grade.

c. Bedding

Bedding material for PVC sewer or water pipe shall conform to the specifications under Aggregates of this specification. Lay pipe on 4-inch layer of compacted bedding material. Continue backfilling with bedding material to 6 inches over the top of the pipe. Carefully place material around the pipe to provide full support and lateral restraint.

Ductile-iron pipe may be laid on the trench bottom unless bedding is required by the Town. Bedding shall be 4 inches under the pipe. Backfill with bedding material to the springline.

d. Water Main Installation

Pipe: Lay pipe with minimum 30-inch cover from finished grade unless plans require greater depth. Bed pipe as specified above.

Conform to AWWA Standard C600, the manufacturer's recommendations, and these specifications. Carry pipe. Do not roll or drag. Avoid damage to coatings, linings, and ends. Examine pipe for damage or defects before lowering into the trench. Cut pipe with

approved pipe saws only. Clean pipe of all foreign material before lowering into trench. Flushing capacity is limited and large particles must be kept out of the pipe.

All PVC pipe shall be laid with magnetic detector tape in the trench placed 18 inches below finished grade.

Provide water-tight plug for each size pipe installed. Plug pipe at end of each day's work. The Town will stop work whenever an approved pipe plug is not available at the job site.

Valve: Clean valve of all foreign material before installation. Provide blocking as required. Furnish valve box with all buried valves. Set box plumb, centered on valve, with top at grade. Install valve markers when directed. Paint marker and stencil valve distance on side facing valve.

Hydrants: Conform to AWWA Standard C600 and by the Standard Detail Fire Hydrant Assembly. Set hydrants to the grade indicated. Where necessary install barrel extensions to adjust the hydrant to the correct elevation. Paint shackle rods with one coat of red lead paint on a clean surface after installation. Holding spools or restrained mechanical joints may be used in lieu of shackle rods.

Concrete Blocking: Provide poured-in-place concrete blocking on fittings and angle points in the line. Keep concrete clear of bolts to permit dismantling the joint. Conform to size of block shown on the Water System Detail.

Connections to Existing Lines: Inform the Town two days prior to shutting off the line and proceed only after receiving permission. Assemble all necessary equipment and materials before breaking the lines and proceed continuously until connection is completed. Notify all affected users at least 24 hours in advance by a circular approved by the Town.

Service Lines: Conform to the Water System Details. Include curb stop immediately ahead of U-branch for double services or the meter box for single services. The meter will be installed later.

Concrete Guard Posts: Install where directed by the Town. Generally posts will not be used on hydrants where other protection such as curbs or ditches existig. Set posts 3-feet 0-inch to 3-feet 6-inches deep. Paint with two coats of approved concrete paint.

e. Hydrostatic Pressure Test

Apply hydrostatic pressure test to each valved section of the line as it is completed, unless otherwise allowed by the Town. The Contractor shall furnish all equipment including pressure gages and a flow meter to

record water loss. Test pressure shall be 150 psi over the system static pressure but not less than 200 psi. Include fire hydrants in the test. Pump the main back to the required pressure and measure the quantity of water used. For acceptance, the quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{NP(P)^{0.5}}{7,400}$$

in which:

L = Allowable leakage, gallons/hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, psi.

f. Sterilization and Flushing

Conform to AWWA C651 using calcium hypochlorite granules. Chlorine residual shall be not less than 50 parts per million. Contact period minimum eight hours. Operate all valves while in contact with the chlorinating agent. Chlorine shall be introduced by the continuous feed method or by granular placement in each length of pipe.

Flush line after chlorination. Limit flushing rate until chlorine residual is normal to avoid contamination of water courses. Dechlorinate water prior to discharge if directed by the Town. Continue flushing at flow indicated. Inspect drainage system receiving water to avoid flooding or property damage.

The Town will take water samples for bacteriological test by the State Health Department. All portions of the system must have satisfactory test result before being accepted and placed in service.

g. Sewer Main Installation

Pipe: Lay pipe to the line and grade indicated on the plan profile. Grade control shall be by trench laser or by other method satisfactory to the Town. If laser control is not used, then control hubs at 25-foot intervals will be required.

Maximum deviation from profile grade is 0.03 feet, provided that no adverse pipe grade results.

Pipe jointing shall conform to manufacturer's specifications. Lubricants must be those supplied with the pipe for use with the gasket material.

Gaskets must be clean as joint is made. Plug open end of pipe when pipe laying is not in progress.

Manholes: Install in conformance with the Standard Detail. Place precast base on 6 inches of compacted pipe bedding material. Construct shelf and channel to the crown elevation of the pipes. Use 3,000 PS2 concrete. Make channel smooth with well rounded junctions with branch lines. Shelf must slope to drain to channel.

Adjust cover to grade with concrete bricks. Fill all joints with grout and seat casting in grout. Line and coat adjusting brick with 3/4-inch thick mortar for water rightness. Patch all lift holes in the wall for water tightness.

Side Sewers: Install side sewer in conformance with the Standard Detail. Bedding, backfilling and pipe laying shall conform to this specification.

h. Connections to Existing Sewer System

Connection to Existing Sewer Line: Where connection to the existing system is made between manholes, install a new standard manhole on the existing main. Service must be maintained for users above the connection. The channeling of the new manhole may be accomplished by cutting off the top half of the pipe through the manhole and constructing the channel around it. This method is subject to Town approval after examination of the existing pipe.

Connection to Existing Manholes. Where an existing manhole does not have an usable pipe stub for extension, make the connection by coring into the manhole wall not higher than 0.2 feet over the invert elevation. Breakout shelf as necessary to construct a smooth, well-rounded channel for the new connection. Keep the manhole in service and take precautions necessary to prevent debris from entering the existing sewer. Patch the manhole wall as directed by the Town.

i. Cleaning Sewer Lines

Clean all sewer lines in a manner acceptable to the Town. Methods may include flushing, rodding, or forcing an inflatable ball through the pipe. Remove all debris so that none is flushed into the existing sewer system.

j. Sewer Leakage Testing

Leakage testing shall be by air testing, infiltration testing or exfiltration testing. The Developer is responsible for determining the groundwater level to the Town's satisfaction. The selected test shall be conducted as follows:

(1) Air Testing: Test pressure shall be 3.5 psi over the groundwater head at the mid point of the test section. The time for the pressure to deop 0.5 psi to 3.0 psi shall be greater than the following:

Pipe Size	Seconds per Linear Foot of Pipe
6-inch	0.25
8-inch	0.46
10-inch	0.72

(2) Infiltration: This method is acceptable only when groundwater level is above the top of all pipe in the test section. Provide acceptable method of measuring infiltration flow. Test for one hour minimum. Maximum infiltration shall not exceed the following rates:

Allowable Leakage per 100 Feet of Pipe in Gallons/Hour

Pipe Size	Groundwater Head Over Pipe at Upper End				
	2-ft	4-ft	6-ft	8-ft	11-ft
6-inch	1.0	1.4	1.7	2.0	2.2
8-inch	1.3	1.8	2.2	2.6	2.9
10-inch	1.6	2.3	2.7	3.2	3.6

(3) Exfiltration: Fill pipe to 6 feet over the crown of the pipe at the high end of the test section or to 6 feet over the groundwater level. Do not exceed 16 feet of head at the low end of the test section. Test for one hour minimum. Maximum exfiltration shall not exceed the following rates:

Pipe Size	Exfiltration Rate Per 100 Feet of Pipe in Gallons/Hour
6-inch	1.7
8-inch	2.2
10-inch	2.7

k. Restoration and Cleanup in Existing Public Rights of Way

Bituminous Pavement Replacement: Cut pavement with approved tools to even line. Minimum width of cut is 3 feet. Minimum pavement patch section is three inches of 3/4-inch minus crushed rock base and two inches of hot asphaltic concrete. Match existing section if depths are greater. Compact subgrade with tampers. Place and compact crushed rock base. Tack coat cut edge before patching. Roll asphaltic concrete in both directions with 5-ton roller and seal edges with hot asphalt cement.

Unpaved Roadway and Shoulders: Restore to original grades and ensure proper drainage. Place two-inch compacted layer of crushed surfacing top course where indicated. Town will check adequacy of shoulder grading prior to placement of crushed rock.

Lawn Restoration: Limit operations in lawn areas to avoid excessive damage. Place no pipeline materials or spoil pile on lawns. After pipe installation is complete bring the disturbed area to the proper grade and restore lawn by placing turf obtained from an approved source.

Street Cleaning: Wash and clean all streets of sand and debris caused by construction. Wash streets at end of each day's work when required by the Town to prevent dust nuisance. Provide water truck with pressure spray system designed for street cleaning when directed by Town.

Ditches and Culverts: Clean ditches of all foreign materials caused by construction. Keep culvert end free of debris at all times. Rake and smooth back slopes disturbed by construction. Remove all debris including large rocks.

Town of Friday Harbor

JAN 27 2003

RECEIVED

HART PACIFIC ENGINEERING
PO Box 3287, Friday Harbor, WA 98250 Ph. 360-378-7048
PO Box 124, Eastsound, WA 98245 Ph. 360-376-3996

RECOMMENDED METHOD FOR WATER MAIN TESTING & DISINFECTION*

1. Use blind plate and FL x MF fitting to connect new work to new or existing valve.

2. Use tablets with gasket glue to supply chlorine to pipe during construction (conform to AWWA C651 - Tablet Method).

3. Fill pipe slowly via approved double back flow prevention device. Bleed air out at services and other appropriate points.

4. Pressure test against blind flange. Include all services laterals in the test.

5. Take chlorine residual reading after a minimum of 24 hours has passed. Residual must be at least 25 ppm anywhere in the new piping. If residual is too low or leaks and repairs cause loss of test water then the continuous feed method should be used. Refer to AWWA C651, Continuous - Feed Method. Initial chlorine concentration shall be at least 25 ppm.

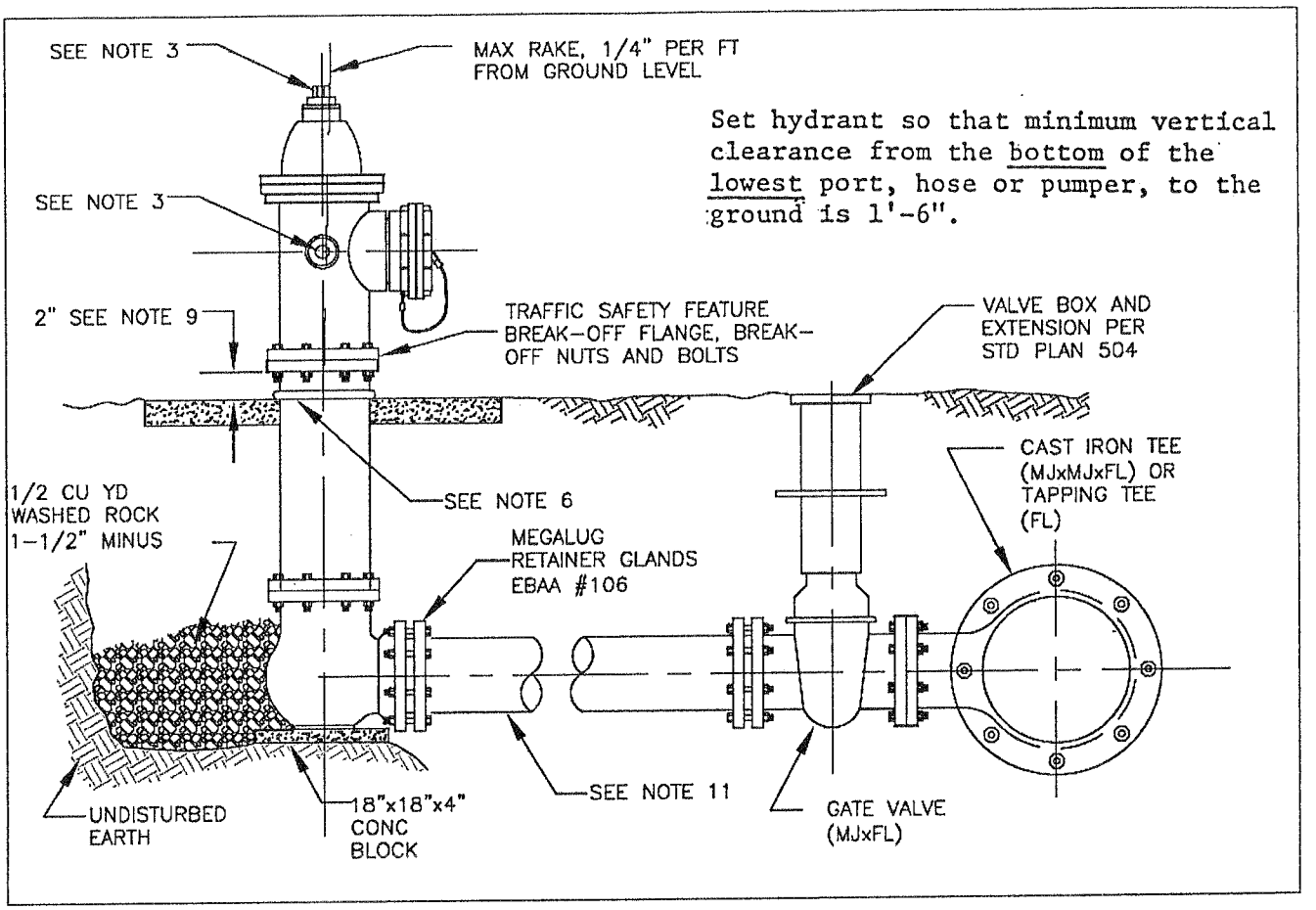
6. Flush using approved backflow prevention device. Direct heavily chlorinated water into tank (haul to approved disposal site) or use approved de-chlorinator.

7. Remove blind plate and request Town to open main valve for high velocity flush.

8. Take bacteriological sample and send to lab for analysis. Close valve after sample is taken.

9. Submit test results to engineer. Town will certify new main after satisfactory bacteriological test.

* Testing must conform to AWWA minimum requirements. Reference C-605 and C-651.



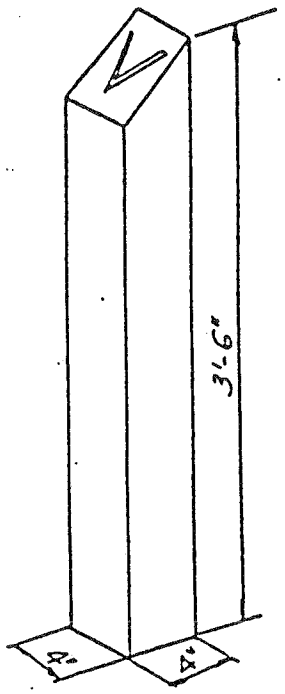
FIRE HYDRANT ASSEMBLY

notes

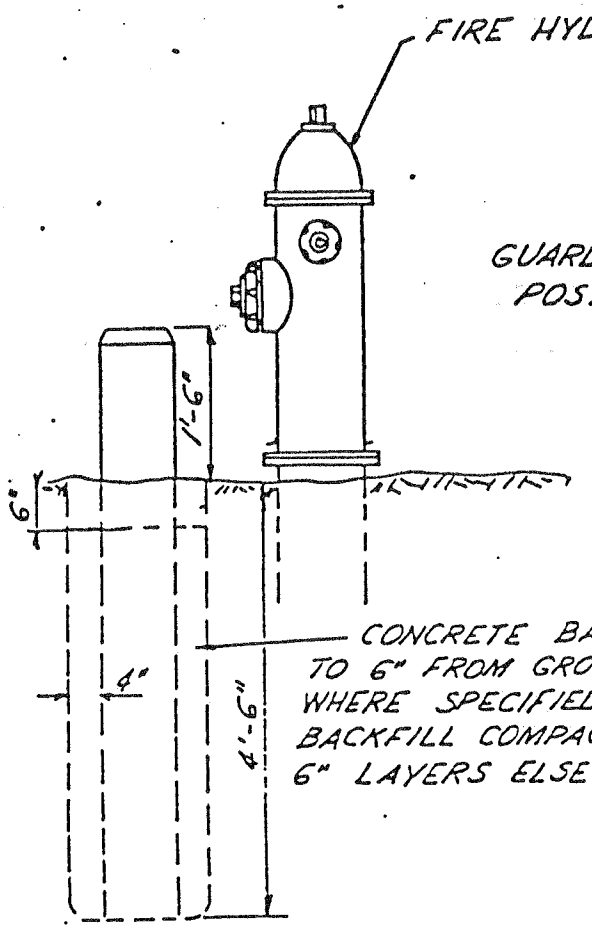
1. HYDRANTS AND ALL MATERIALS SHALL CONFORM TO AWWA STANDARDS AND SHALL BE OF STANDARDMANUFACTURE (WATEROUS PACER, OR APPROVED EQUAL)
2. 5 ¼ " VALVE MINIMUM
3. 1 ¼ " OPERATING NUT AND CAP NUT FOR 2 ½ " PORTS
4. NATIONAL STANDARD THREAD ON THE 5 ¼" PORT
5. PROVIDE VEHICULAR TRAFFIC PROTECTION WHEN NECESSARY PER STD.
6. IF HYDRANT RISES THROUGH CONCRETE, USE EXPANSION STRIP AROUND HYDRANT BARREL.IN ADDITION, INSTALLATION OF THE HYDRANT ON PRIVATE PROPERTY SHALL EQUAL OR EXCEED THE STANDARDS FOR INSTALLATION OF PUBLIC FIRE HYDRANTS IN THE TOWN OF FRIDAY HARBOR.
7. STEAMER PORT TO BE FACING STREET OR ROADWAY FOR FIRE ENGINE ACCESS.
8. HYDRANT SHALL BE CLEAR OF ALL DEBRIS SUCH AS ROCKS, MUD ETC.
9. BREAK OFF FLANGE TO BE 2" ABOVE GROUND LEVEL.
10. FIRE HYDRANTS SHALL BE PAINTED WITH TWO COATS OF HIGH GLOSS SAFETY YELLOW "RUST -OLEM TYPE PAINT
11. HYDRANT CONNECTION PIPE TO BE DUCTILE IRON CLASS 52, ANY INTERMEDIATE JOINTS TO BE MJ WITH RETAINER GLANDS, OR FIELD LOCK GASKET

TOWN OF FRIDAY HARBOR WATER DEPARTMENT

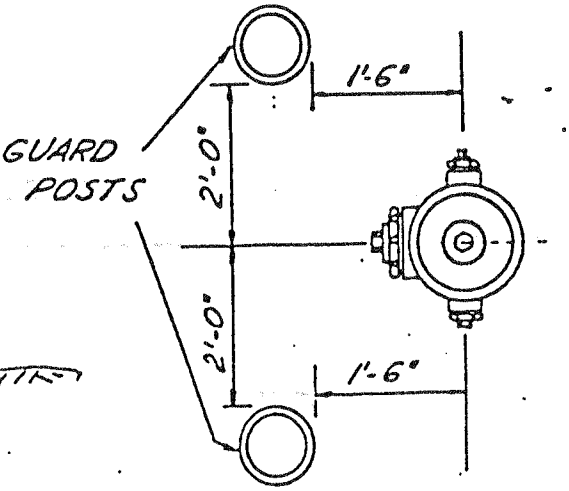
Rev. 11/04



VALVE MARKER POST



ELEVATION



PLAN

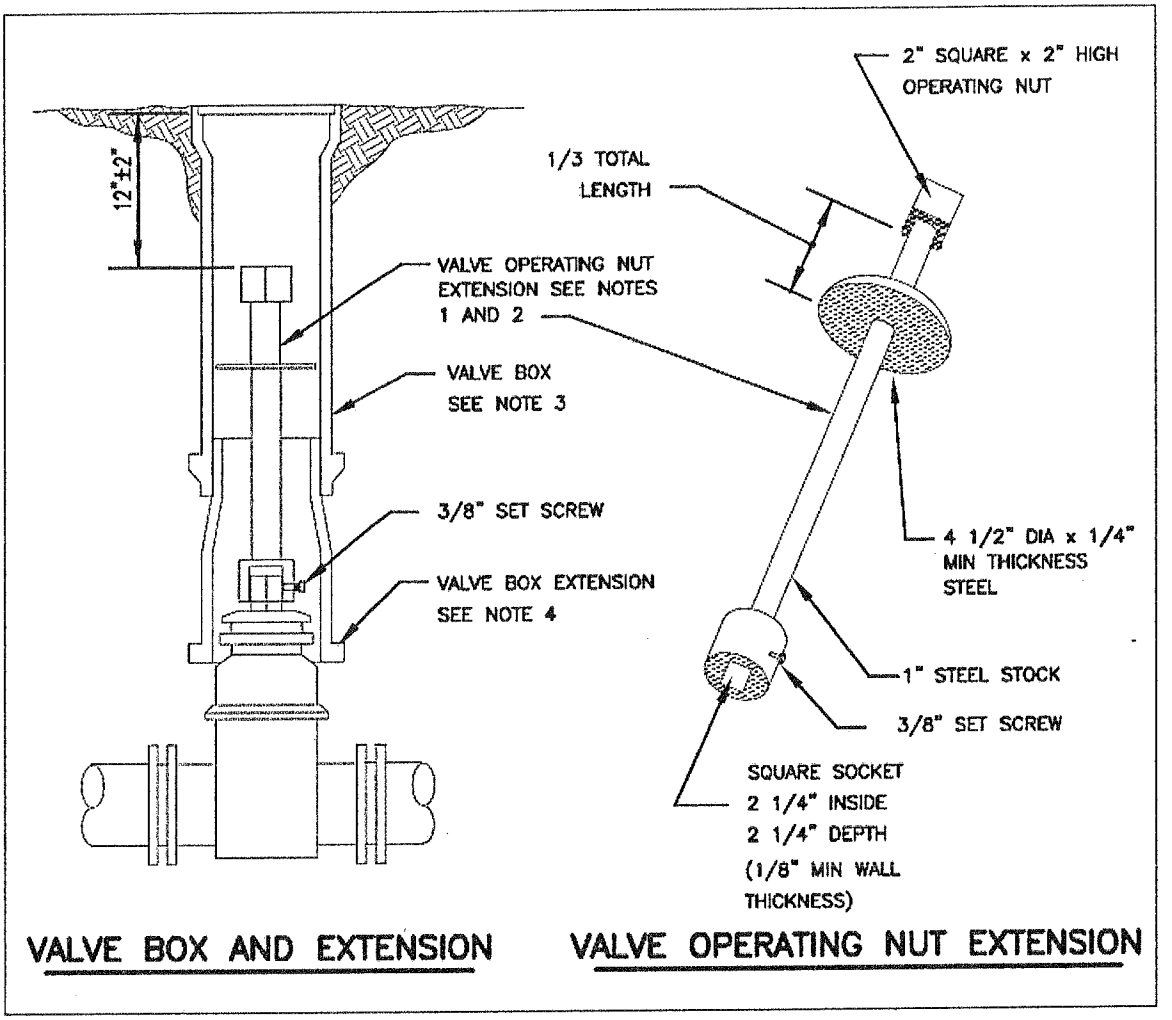
FIRE HYDRANT GUARD POST

DO NOT USE WITH CURB SECTION

Notes:

1. Guard Posts shall be 9" diam. x 6' long precast concrete posts per Department of Highways "STANDARD SPECIFICATIONS", 1963, Section 72.02 B. Paint with two (2) coats of Inertol Ramuc masonry paint,
2. Valve marker post shall be equal to Greystone PC 3.05. Paint as specified for hydrant guard post. Paint distance from the valve marker to the valve on the post with black enamel paint.

STANDARD DETAIL
FIRE HYDRANT GUARD POST
AND VALVE MARKER POST
BY CA CHK M.T. DATE June 1976
SCALE None SHEET 1 OF 1



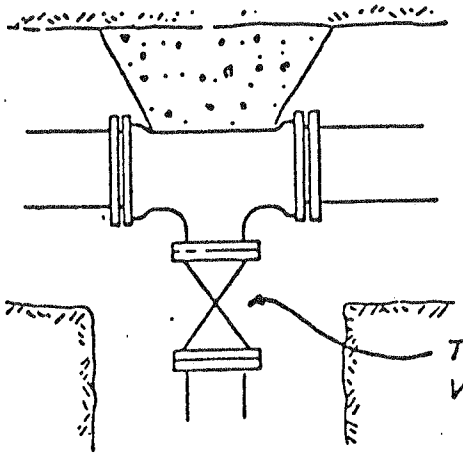
WATER BOX AND EXTENSION

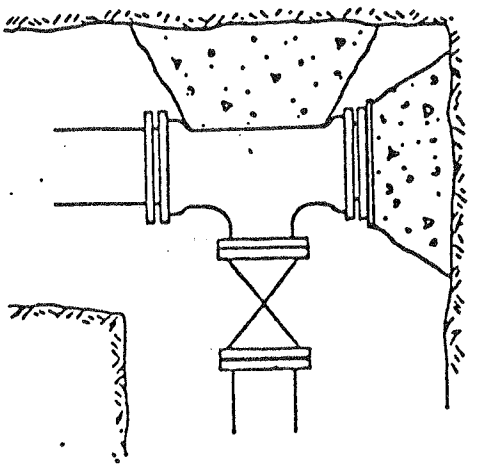
NOTES

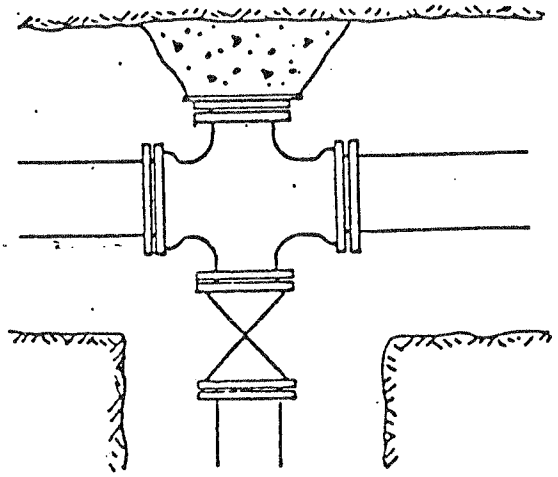
1. VALVE OPERATING NUT EXTENSIONS ARE REQUIRED WHEN THE NUT IS MORE THAN TWO FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE FOOT LONG. ONLY ONE EXTENSION WILL BE ALLOWED PER VALVE.
2. ALL OPERATING NUT EXTENSIONS ARE TO MADE OF STEEL, SIZED AS NOTED, AND PAINTED WITH TWO COATS OF METAL PAINT.
3. VALVE BOXES IN PAVED AREAS SHALL BE CAST IRON. TWO PIECE UNITS WITH (LUGS) ON COVER.EQUAL TO "RICH NUMBER 940" AS MANUFACTURED BY RICH OR SATHER. IN GRASS NON-PAVED OR NON-TRAFFIC AREAS USE OF PLASTIC VALVE BOXES, WITH CAST IRON LIDS AS MANUFACTURED BY HANDLEY INDUSTRIES ARE ACCEPTABLE.
4. USE OF PLASTIC VALVE BOX EXTENSIONS, AS MANUFACTURED BY HANDLEY INDUSTRIES ARE ACCEPTABLE.

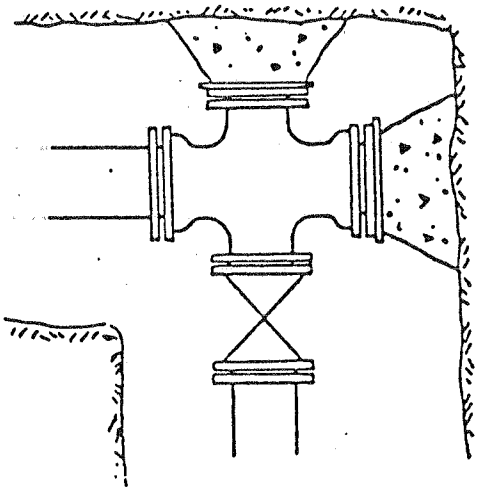
TOWN OF FRIDAY HARBOR WATER DEPARTMENT

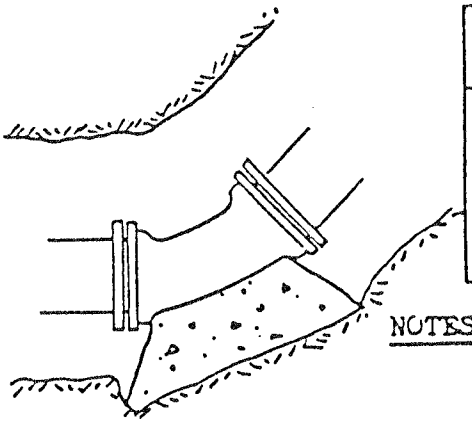
Rev. 11/04











FITTING SIZES	BEARING AREA OF BLOCK IN SQ. FT.			
	TEES & ENDS	90 BEND	45 BEND	22½ BEND
4	1½	2	1½	1½
6	3	4	2	1½
8	4½	7	3½	2
10	7½	10½	5	3
12	10½	15	8	4

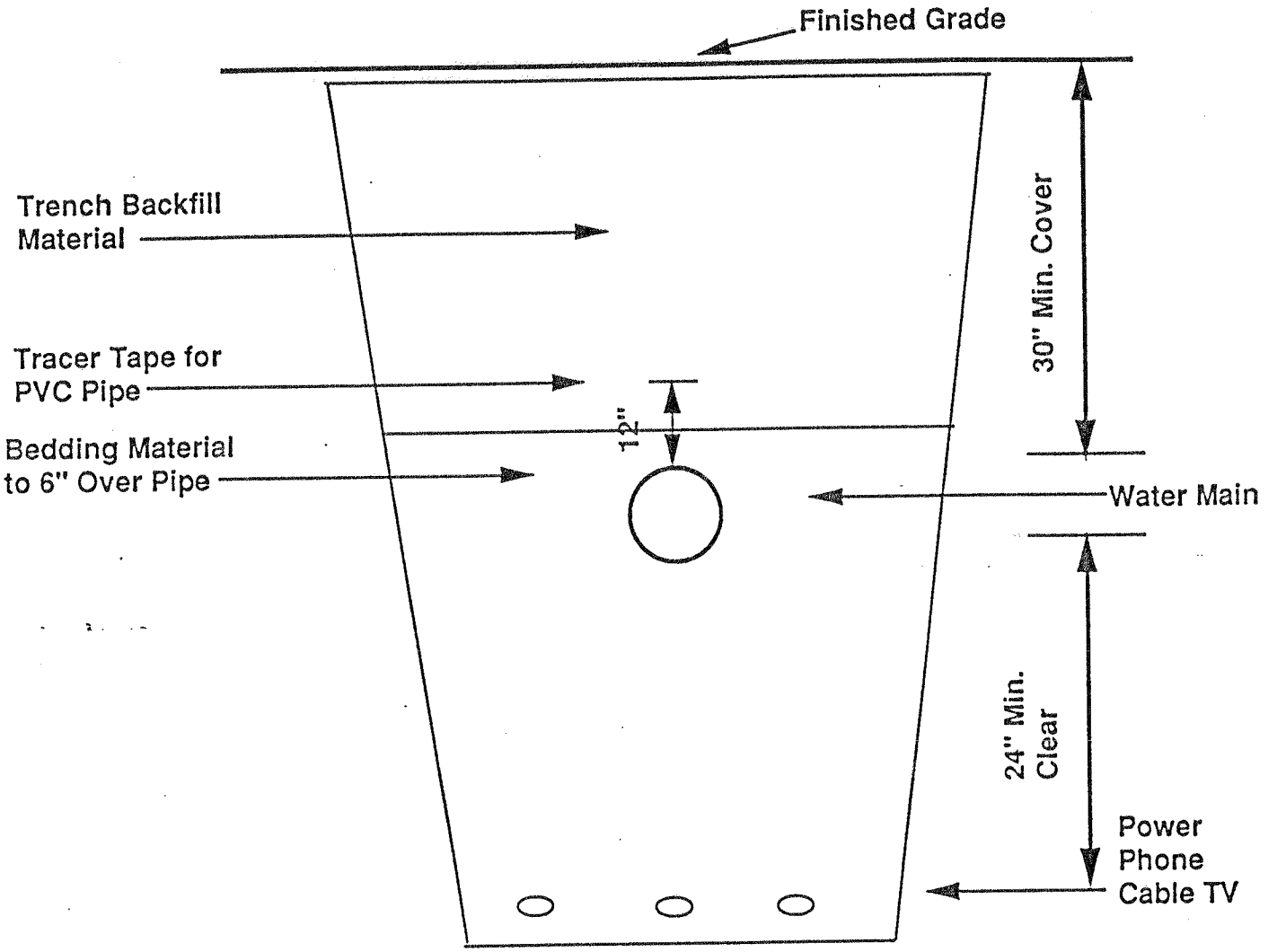
NOTES

1. All blocking shall be poured against firm undisturbed soil.
2. Bearing area at fittings not given in bearing table shall be as directed by the Engineer.
3. When pouring against plugs and blind flanges set steel meter box lid against fitting to keep concrete off bolts.
4. Layout to be approved by Engineer prior to concrete pour.

STANDARD DETAIL
CONCRETE BLOCKING & VALVE LOCATION

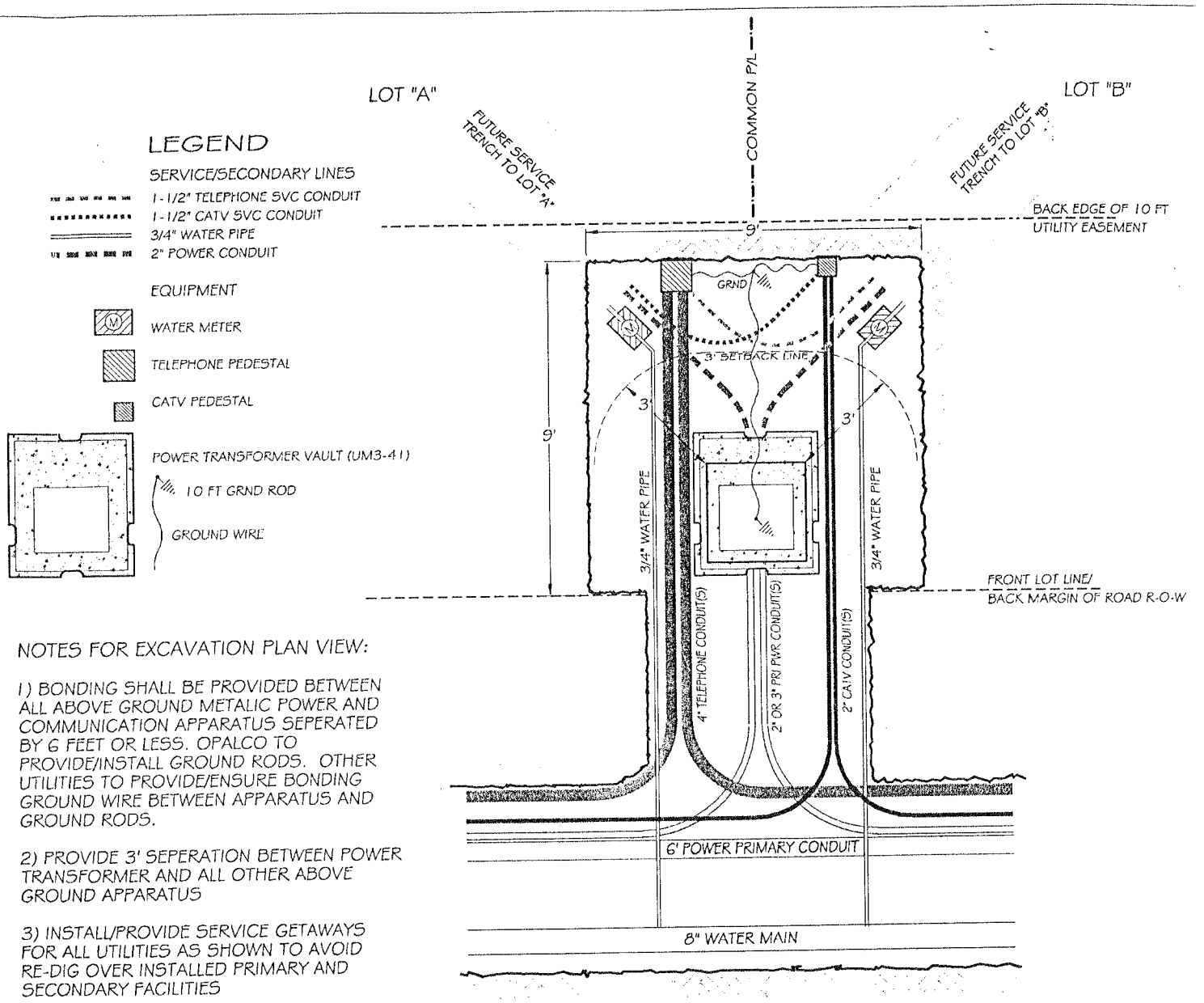
BY CA CHK M.T. DATE June 1976

SCALE None SHEET 1 OF 1



TRENCH SECTION FOR COMMON USE OF WATER MAIN AND OTHER UTILITIES

TOWN OF FRIDAY HARBOR
WATER STANDARD DETAIL



LEGEND

SERVICE/SECONDARY LINES

- 1-1/2" TELEPHONE SVC CONDUIT
- 1-1/2" CATV SVC CONDUIT
- 3/4" WATER PIPE
- 2" POWER CONDUIT

EQUIPMENT

- WATER METER
- TELEPHONE PEDESTAL
- CATV PEDESTAL
- POWER TRANSFORMER VAULT (UM3-41)
- 10 FT GRND ROD
- GROUND WIRE

NOTES FOR EXCAVATION PLAN VIEW:

1) BONDING SHALL BE PROVIDED BETWEEN ALL ABOVE GROUND METALIC POWER AND COMMUNICATION APPARATUS SEPERATED BY 6 FEET OR LESS. OPALCO TO PROVIDE/INSTALL GROUND RODS. OTHER UTILITIES TO PROVIDE/ENSURE BONDING GROUND WIRE BETWEEN APPARATUS AND GROUND RODS.

2) PROVIDE 3' SEPERATION BETWEEN POWER TRANSFORMER AND ALL OTHER ABOVE GROUND APPARATUS

3) INSTALL/PROVIDE SERVICE GETAWAYS FOR ALL UTILITIES AS SHOWN TO AVOID RE-DIG OVER INSTALLED PRIMARY AND SECONDARY FACILITIES

UTILITY LAYOUT PLAN VIEW

SMALL LOT SUBDIVISION SPEC

NOTES FOR MAIN TRENCH:

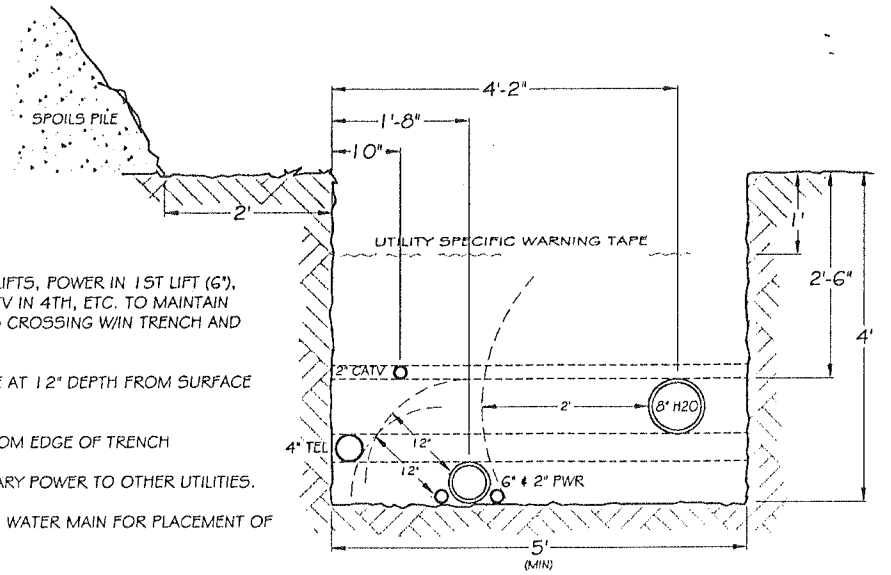
1) CONSTRUCT TRENCH IN COMPACTED LIFTS, POWER IN 1ST LIFT (6"), PHONE IN 2ND (4"), WATER IN 3RD (8"), TV IN 4TH, ETC. TO MAINTAIN VERTICAL SPERATION FOR UTITLITY LINES CROSSING W/IN TRENCH AND EXIT TO LATERAL TRENCHES

2) PLACE UTLITY SPECIFIC WARNING TAPE AT 12" DEPTH FROM SURFACE DIRECTLY ABOVE EACH UTILITY

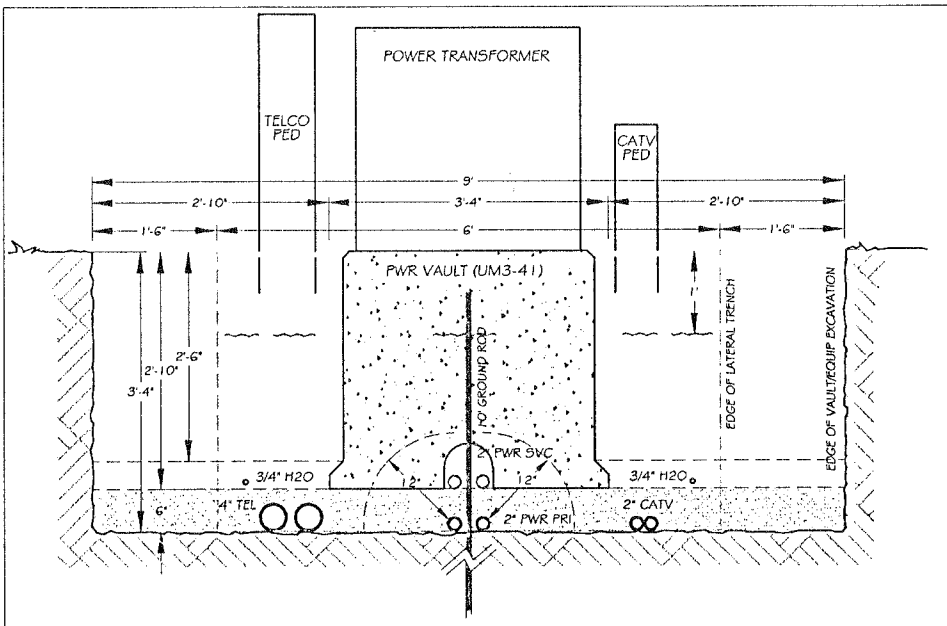
3) PLACE SPOILS PILE AT 24" OFFSET FROM EDGE OF TRENCH

4) MAINTAIN 12" MIN SEPARATION PRIMARY POWER TO OTHER UTILITIES.

5) MAINTAIN 24" MIN SEPARATION FROM WATER MAIN FOR PLACEMENT OF SADDLE



TYPICAL MAIN TRENCH PROFILE
SMALL LOT SUBDIVISION SPEC



NOTES FOR LATERAL TRENCH/VAULT EXCAVATION:

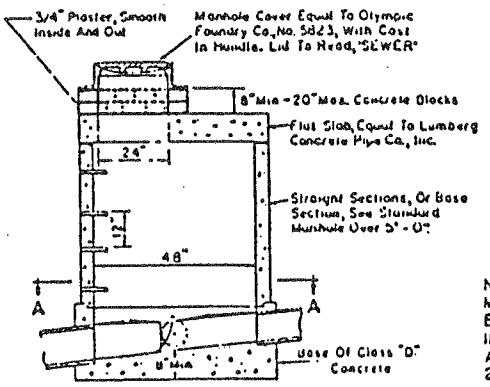
1) PLACE PRIMARY DUCT AT BOTTOM OF TRENCH/EXCAVATION

2) PLACE FIRST LIFT AROUND PRIMARY DUCTS AND LEVEL TO FORM PAD FOR TRANSFORMER VAULT

3) PLACE SECONDARY/SERVICE LINES ABOVE FIRST LIFT BUT KEEP BELOW 30" FROM SURFACE

4) DRIVE 10 FT GROUND ROD TO 6" BELOW GRADE

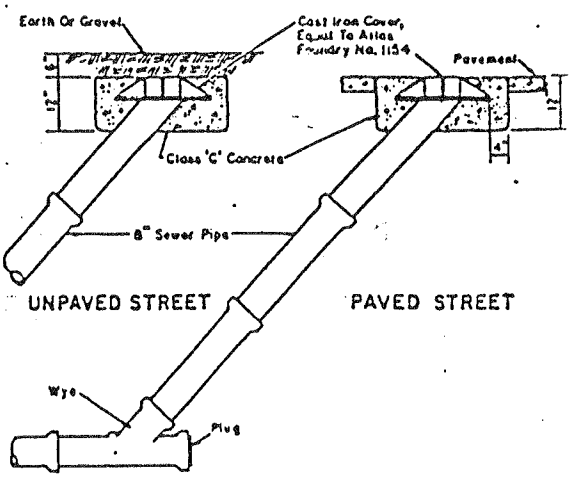
UTLITY LAYOUT PROFILE
SMALL LOT SUBDIVISION SPEC



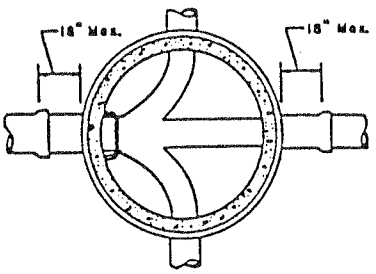
SECTION THRU CENTER

STANDARD MANHOLE UNDER 5'-0" HEIGHT

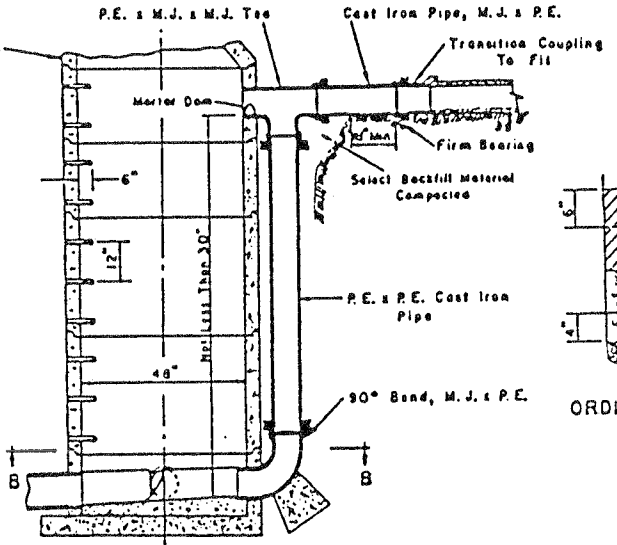
NOTE:
MANHOLES LOCATED WITHIN EASEMENTS SHALL HAVE LOCKING TYPE MANHOLE COVERS. ATLAS FOUNDRY "KAM-LOCK" NO. 2191 KL OR EQUAL.



LAMP HOLE

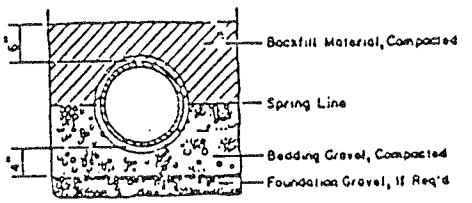


SECTION A-A

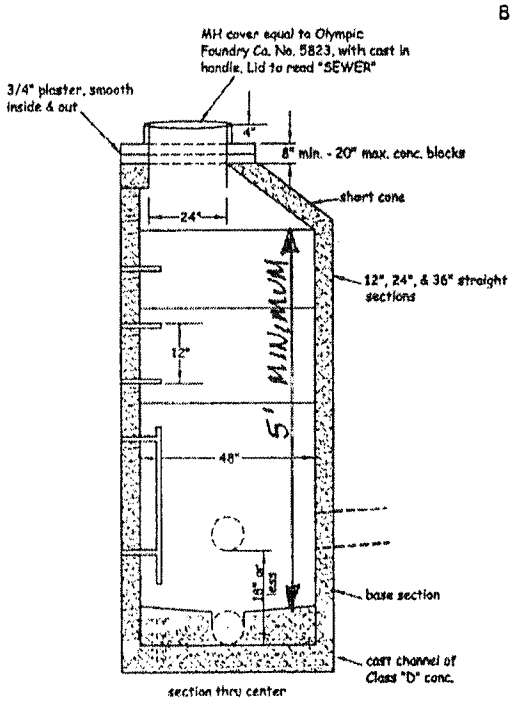


SECTION THRU CENTER

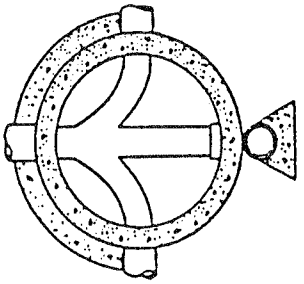
DROP MANHOLE



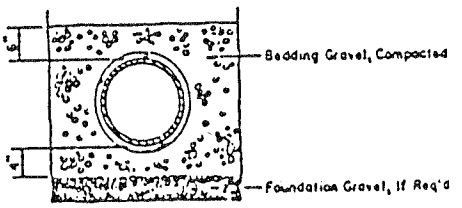
ORDINARY PIPE BEDDING



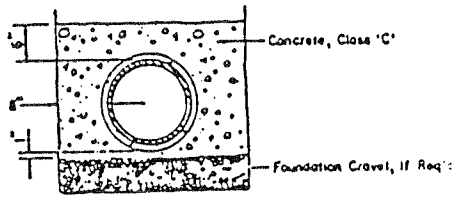
STANDARD MANHOLE OVER 5" - 0" HEIGHT



SECTION B-B



SPECIAL PIPE BEDDING



CONCRETE ENCASEMENT

PRECAST SECTIONS SHALL BE REINFORCED PER A.S.T.M. SPECS. FOR CORRESPONDING SIZE SEWER PIPE.

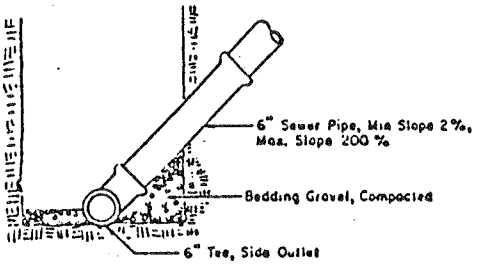
GALVANIZED DEFORMED BAR STEPS, 3/4" MINIMUM.

STEPS IN PRECAST BASE SECTION MAY BE CAST IN PLACE, OR MOVABLE SAFETY LADDER GROUTED IN PLACE.

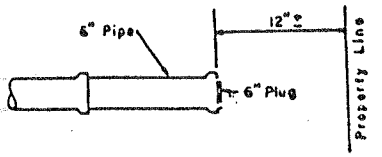
ALL HOLES FOR PIPE SHALL BE BLOCKED OUT AT THE TIME OF CASTING THE SECTION.

PIPE BEDDING CLASSES

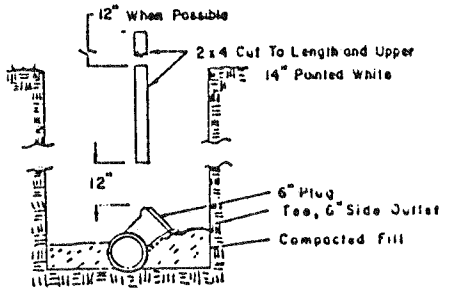
SEWER GENERAL STANDARD DETAILS



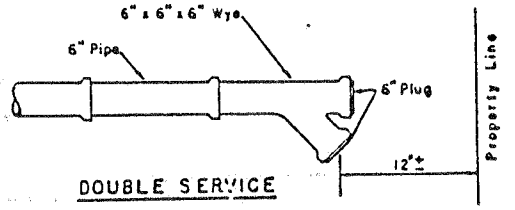
CONNECTION AT SEWER MAIN



SINGLE SERVICE



PLUGGED TEE ON SEWER MAIN

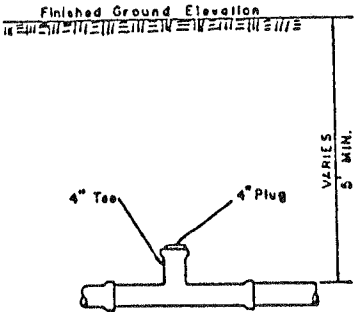


DOUBLE SERVICE

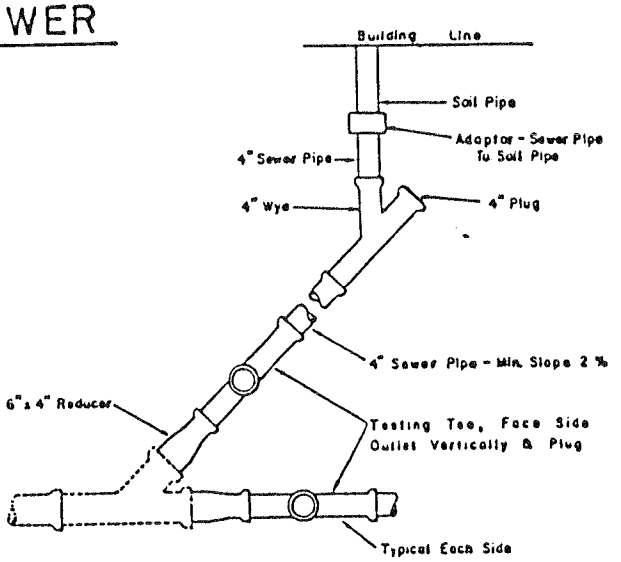
NOTES

1. WHERE SIDE SEWER CONNECTS TO MANHOLE INVERT OF SIDE SEWER SHALL BE EQUAL TO OR ABOVE MAIN SEWER CROWN, BUT NOT TO EXCEED 18" ABOVE INVERT OF MAIN SEWER.
2. UNLESS OTHERWISE INDICATED ON PLAN, SIDE SEWER SHALL BE MINIMUM OF FIVE (5) FEET DEEP AT PROPERTY LINE, OR 4.5 FEET LOWER THAN THE LOWEST HOUSE ELEVATION, WHICH EVER IS LOWER.

SIDE SEWER



TESTING TEE



BUILDING CONNECTION

HOUSE SEWER

SEWER GENERAL STANDARD DETAILS

SECTION F

ATTACHMENTS

Easement Form

Bill of Sale - Water System

Bill of Sale - Sewer System

Performance Bond

Water and/or Sewer Facility Contract

EASEMENT

THIS INSTRUMENT made this _____ day of _____, _____,

by and between _____

and _____

hereinafter called "Grantors", and TOWN OF FRIDAY HARBOR, a municipal corporation of San Juan County, State of Washington, hereinafter called "Grantee":

WITNESSETH:

That said Grantors for and in consideration of the mutual benefit of the parties, do by these presents grant, bargain, sell, convey, and confirm unto the said Grantee a right of way or easement for _____

_____

with necessary appurtenances over, through, across and upon the following described property situated in San Juan County, Washington, more particularly described as follows:

The said Grantee shall have the right without prior institution of suit or proceeding of law, at times as may be necessary, to enter upon said property for the purpose of constructing, repairing, altering, or reconstructing said _____

_____,

or making any connections therewith, without incurring any legal obligation or liability therefore; provided that such constructing, repairing, altering, or reconstructing of said

_____

shall be accomplished in such a manner that the private improvements existing in this right of way shall not be disturbed or destroyed, or in the event that they are disturbed or destroyed,

they will be replaced in as good a condition as they were immediately before the property was entered upon by the Grantee.

The Grantor shall retain the right to use the surfaces of said easement so long as said use does not interfere with the installation and maintenance of the _____ _____ and so long as no permanent buildings or structures are erected on said easement.

This easement shall be a covenant running with the land and shall be binding on the Grantor's successors, heirs, and assigns.

IN WITNESS WHEREOF, the undersigned has caused this instrument to be executed by its proper officers, who are duly authorized, on this _____ day of _____ 2_____.

_____

Title_____

_____

Title_____

STATE OF WASHINGTON)
) SS
COUNTY OF SAN JUAN)

On _____ day of _____, 2_____, personally appeared before me _____ and _____, who is/are personally known to me or whose identity I proved to be the signer(s) of the above instrument, and he/she acknowledged that he/she signed it.

_____

Notary Public

My commission expires _____

BILL OF SALE

WATER SYSTEM
TOWN OF FRIDAY HARBOR

San Juan County, Washington

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the mutual benefit of the parties; _____ ,Grantor, does hereby grant, bargain, and sell to the TOWN OF FRIDAY HARBOR, San Juan County, Washington, Grantee, the following described improvements situated in San Juan County, Washington:

A domestic water system consisting of:

WATER MAINS

LOCATION	FROM	TO	SIZE

Including approximately _____ lineal feet of _____ pipe, _____ hydrants, _____ valves, and all appurtenances, to have and to hold the same to the said Grantee, its successors, and assigns forever.

The undersigned hereby covenants that it is the lawful owner of said property; that the same is free from all encumbrances; that all bills for labor and material have been paid; that it has the right to sell the same as aforesaid, that it will warrant and defend the same against the lawful claims and demands of all persons holding Grantee harmless from all claims.

This Bill of Sale is given in consideration of the agreement of the Grantee, for itself, its successors and assigns to incorporate said domestic water system into its utility system and to maintain them as provided in the applicable Town ordinances.

IN WITNESS WHEREOF, the undersigned has caused this instrument to be executed by its proper officers, who are duly authorized, on this _____ day of _____ 2_____.

_____

Title_____

_____

Title_____

STATE OF WASHINGTON)
)
COUNTY OF SAN JUAN

On _____ day of _____, 2_____, personally appeared before me _____ and _____, who is/are personally known to me or whose identity I proved to be the signer(s) of the above instrument, and he/she acknowledged that he/she signed it.

_____

Notary Public

My commission expires _____

This Bill of Sale is given and accepted pursuant to Resolution No. _____ of the Town of Friday Harbor, San Juan County, Washington.

BILL OF SALE

SEWER SYSTEM
TOWN OF FRIDAY HARBOR

San Juan County, Washington

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the mutual benefit of the parties; _____, Grantor, does hereby grant, bargain, and sell to the TOWN OF FRIDAY HARBOR, San Juan County Washington, Grantee, the following described improvements situated in San Juan County, Washington:

A sanitary sewer system consisting of:

SEWER MAINS

LOCATION	FROM	TO	SIZE

Including approximately _____ lineal feet of _____ pipe, _____ manholes, and all appurtenances, to have and to hold the same to the said Grantee, its successors, and assigns forever.

The undersigned hereby covenants that it is the lawful owner of said property; that the same is free from all encumbrances; that all bills for labor and material have been paid; that it has the right to sell the same as aforesaid, that it will warrant and defend the same against the lawful claims and demands of all persons holding Grantee harmless from all claims.

This Bill of Sale is given in consideration of the agreement of the Grantee, for itself, its successors and assigns to incorporate said sanitary sewer system into its utility system and to maintain them as provided in the applicable Town ordinances.

IN WITNESS WHEREOF, the undersigned has caused this instrument to be executed by its proper officers, who are duly authorized, on this _____ day of _____ 2_____.

_____

Title_____

_____

Title_____

STATE OF WASHINGTON)
)
COUNTY OF SAN JUAN

On _____ day of _____, 2_____, personally appeared before me _____ and _____, who is/are personally known to me or whose identity I proved to be the signer(s) of the above instrument, and he/she acknowledged that he/she signed it.

_____

Notary Public

My commission expires _____

This Bill of Sale is given and accepted pursuant to Resolution No. _____ of the Town of Friday Harbor, San Juan County, Washington.

BILL OF SALE

STORM SEWER SYSTEM
TOWN OF FRIDAY HARBOR

San Juan County, Washington

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the mutual benefit of the parties; _____, Grantor, does hereby grant, bargain, and sell to the TOWN OF FRIDAY HARBOR, San Juan County Washington, Grantee, the following described improvements situated in San Juan County, Washington:

A storm sewer system consisting of:

STORM SEWER MAINS

LOCATION	FROM	TO	SIZE

Including approximately _____ lineal feet of _____ pipe, _____ catch basins, _____ manholes, and all appurtenances, to have and to hold the same to the said Grantee, its successors, and assigns forever.

The undersigned hereby covenants that it is the lawful owner of said property; that the same is free from all encumbrances; that all bills for labor and material have been paid; that it has the right to sell the same as aforesaid, that it will warrant and defend the same against the lawful claims and demands of all persons holding Grantee harmless from all claims.

This Bill of Sale is given in consideration of the agreement of the Grantee, for itself, its successors and assigns to incorporate said storm sewer system into its utility system and to maintain them as provided in the applicable Town ordinances.

IN WITNESS WHEREOF, the undersigned has caused this instrument to be executed by its proper officers, who are duly authorized, on this _____ day of _____ 2_____.

_____

Title_____

_____

Title_____

STATE OF WASHINGTON)
)
COUNTY OF SAN JUAN

On _____ day of _____, 2_____, personally appeared before me _____ and _____, who is/are personally known to me or whose identity I proved to be the signer(s) of the above instrument, and he/she acknowledged that he/she signed it.

_____

Notary Public

My commission expires _____

This Bill of Sale is given and accepted pursuant to Resolution No. _____ of the Town of Friday Harbor, San Juan County, Washington.

TOWN OF FRIDAY HARBOR

San Juan County, Washington

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we _____

_____

the Contractor (named in the contract) hereinafter referred to as PRINCIPAL, and

_____

as SURETY, are held and firmly bound unto:

(a) _____ hereinafter called and also being the owner named in said Contract, in the panal sum of: _____

DOLLARS ($_____)

lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, our heirs, executors, assigns, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas, the Principal entered into a certain Contract with the owner, dated _____ _____, for _____ WORK in connection with the Owner's _____ Project in _____, County of _____, State of _____.

AND THAT WHEREAS, the Owner has a Permit to construct upon certain roads and rights-of-way of the Town of Friday Harbor, all of which construction is covered by the Owner's Contract with the Principal.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all of the provisions and fulfill all of the undertakings, covenants, terms, conditions and agreements of said contract and permit during the period of the original contract and any extensions thereof that may be granted by the Owner, with or without notice to the Surety: and during the life of any guaranty required under the contract; and shall also well and truly perform and fulfill all of the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived; and furthermore shall pay all laborers, mechanics, and sub-contractors and material men, and all persons who shall supply such person or persons and such principal, or sub-contractors with provisions and supplies for the carrying on of such work, on his or their part, and shall indemnify and save harmless the Owner from any defect or defects, in any of the workmanship or materials entering into any part of the work or designated equipment covered by said contract,

which shall develop or be discovered within one (1) year after the final acceptance of such work, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect; provided, that the liability hereunder for defects in materials and workmanship for a period of one year (1) after the acceptance of the work shall not exceed the sum of _____ ($_____).

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals this _____ day of _____, 19_____, the name and corporate seal of each corporate party hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____
PRINCIPAL

BY: _____

TITLE: _____

TWO WITNESSES:

_____

_____

ATTEST: (If Corporation)

BY: _____

TITLE: _____

Corporate Seal:

_____
SURETY

BY: _____

TITLE: _____

_____
ADDRESS

Corporate Seal:

CERTIFICATE AS TO CORPORATE SEAL

I hereby certify that I am the (Assistant) Secretary of the Corporation named as Principal in the within Bond: that _____ who signed the said Bond on behalf of the Principal was _____ of said Corporation; that I know his signature hereto is genuine, and that said Bond is duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

By: _____
Secretary or Assistant Secretary

Water and/or Sewer Facility Contract

THIS AGREEMENT entered into this date by and between the Town of Friday Harbor, hereinafter called "Town", and _____, hereinafter called "Owner",

WITNESSETH:

WHEREAS, the Town has by resolution adopted by the Town Council of the Town of Friday Harbor on the _____ day of _____, 20___, approved the construction of water and/or sewer facilities by the owner to a certain tract of land hereinafter described;

NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

1. Owner shall construct at his own expense the water and/or sewer facility extension as per plan attached hereto, marked Exhibit A and incorporated herein by reference as though fully set forth. Said facility shall be constructed in accordance with the ordinances of said Town in effect governing the construction and specifications for facilities of such type, and subject to the approval of the Town Engineer or his agent.

2. For a period of _____ years from date hereof, any person, firm, or corporation owning real estate and not contributing to the original cost of such facility, who subsequently connects into or uses the same, shall pay a fair pro rata share of the cost of construction of said facility in accordance with the schedule set forth in Exhibit B which is attached hereto and incorporated herein by reference as though fully set forth.

3. Upon completion of construction of the extension and its acceptance by the Engineer of the Town, the facility shall become a part of the municipal system of the Town of Friday Harbor. Maintenance and operation costs of said lines and facilities after acceptance shall be borne by the said municipality.

4. No person, firm, or corporation shall be granted a permit or be authorized by the Town to connect into or use any such facility, or extensions thereof, during the period of time prescribed in paragraph (2) of this contract without first paying to the Town, in addition to any and all other costs and charges made and assessed for such connection or use, the amount required by the provisions of the contract under which the facility so connected onto or used or constructed, as set forth in Exhibit B. All amounts so received by the municipality shall be remitted to the owner or assignee within sixty (60) days after the receipt thereof.

5. Whenever any connection is made onto the facility described in Exhibit A under this contract without such payment having first been made in accordance with Exhibit B, the Town may remove or cause to be removed, such unauthorized connection and all connecting lines or pipe located in the facility right of way, and dispose of such material removed without any liability whatsoever.

6. Owner hereunder is an independent contractor and not an agent or employee of the Town.

7. Owner agrees to pay to the Town an administrative fee of ten percent (10%) of all reimbursements collected by the Town on behalf of the owner.

DATED at Friday Harbor, Washington, this _____ day of _____ 20___.

_____
Owner

_____
Mayor

Attest:

_____
Town Clerk

Exhibit A, contemplated under paragraph I of the contract, is a detailed plan of the facility, together with a description of the property to which the extension will run in order that when recorded in the Auditor's office it might be proper notice to intervening property owners.

Exhibit B, under paragraph II is an itemized cost of construction schedule set up against the tract of land served as well as each parcel of land intervening in order that the owners of the intervening land tapping on the line will know with certainty the amount of their necessary contribution without question or argument.

Both Exhibits A and B would be prepared by the contractor and approved by the Town Engineer before execution of the contract.

Appendix F: Water Shortage Response Plan

TOWN OF FRIDAY HARBOR
WATER SHORTAGE RESPONSE PLAN

September 1988

Town of Friday Harbor
Water Shortage Response Plan
September, 1988

Approved by Council Motion
October 6, 1988

H. James Cahail, Mayor

Town of Friday Harbor
SEP 19 1988
RECEIVED

. SUGARMAN
ecretary

STATE OF WASHINGTON

DEPARTMENT OF SOCIAL AND HEALTH SERVICES

217 Pine Street, Suite 220, B17-12 • Seattle, Washington 98101-1549

September 16, 1988

The Honorable Mayor and
Members of the Town Council
Town of Friday Harbor
P.O. Box 219
Friday Harbor, Washington 98250

Subject: San Juan County
Friday Harbor Water System
Water Shortage Response Plan

Gentlemen:

The water shortage response plan received in this office on September 9, 1988 has been reviewed and, in accordance with the provisions of WAC 248-54 is hereby **APPROVED.**

Nothing in this approval shall be construed as satisfying other applicable federal, state or local statutes, ordinances and regulations.

Sincerely,

Robert E. James

Robert E. James, P.E.
Regional Engineer
NW Drinking Water Operations

REJ:cb

cc: San Juan County Health Department
Peggy Johnson - DSHS, Olympia
Kramer, Chin & Mayo, Inc.

Problem Assessment

- Present & Future Demand Assessment
- Supply Analysis
- Supply & Demand Comparison

WORKSHEET 2 - WATER DEMAND FACTORS

Provide a brief discussion of the following factors:

1. User Characteristics. (What percentage of residential, commercial, industrial, and agricultural users make up your customer population?)

   a) All users are metered.

   b) 768 residential = 80.0%
      189 commercial = 19.7%
      2 industrial = .3%
      (1) gravel pit
      (2) cannery

   See appendix A for 1983 Comprenehsive Water Plan for description of user characteristics.

2. Population and Growth Forecasts

   1988 In-Town population = 1,540
   1988 out of town population = 814

   Total service area population = 2,354

   See Appendix B for 1983 Comprehensive Water Plan for narrative plus projected service area population.

3. Drought Impact on Consumption

   While normal communities would experience increased consumption during droughts, the San Juan Islands are different. Island residents are extremely conscious of water useage and conservation. Response has been extraordinary with consumption for the first 7 months of 1988 only 77% of what it had been for the first 7 months of 1987.

4. Other Factors

WORKSHEET 4 - AVAILABLE SUPPLY

Summarize available information on each water supply factor relevant to your utility:

A. Surface Supplies

1. River and Stream Flows

   None

2. Reservoir Levels

   See attached charts.

3. Lake Levels

   None

4. Snow Pack

   None

5. Other

   None

B. Ground Water Supplies

1. Static Well Levels

   None

2. Pumping Water Levels

   None

3. Soil Moisture

   None

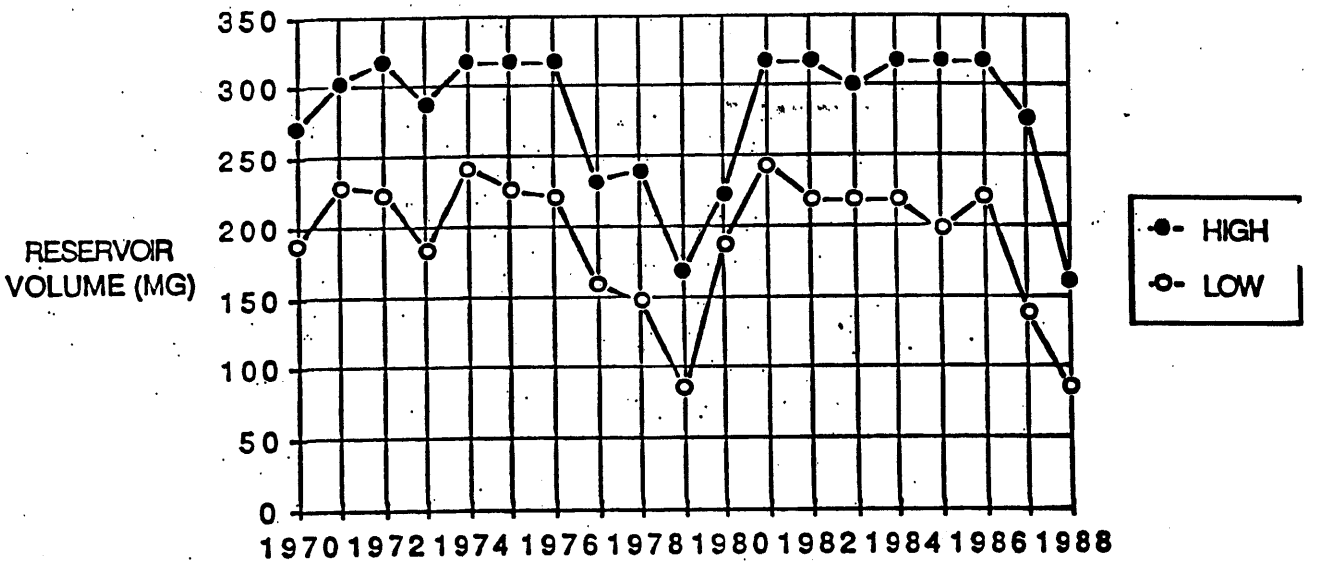
4. Ground Water Table Elevations

   None

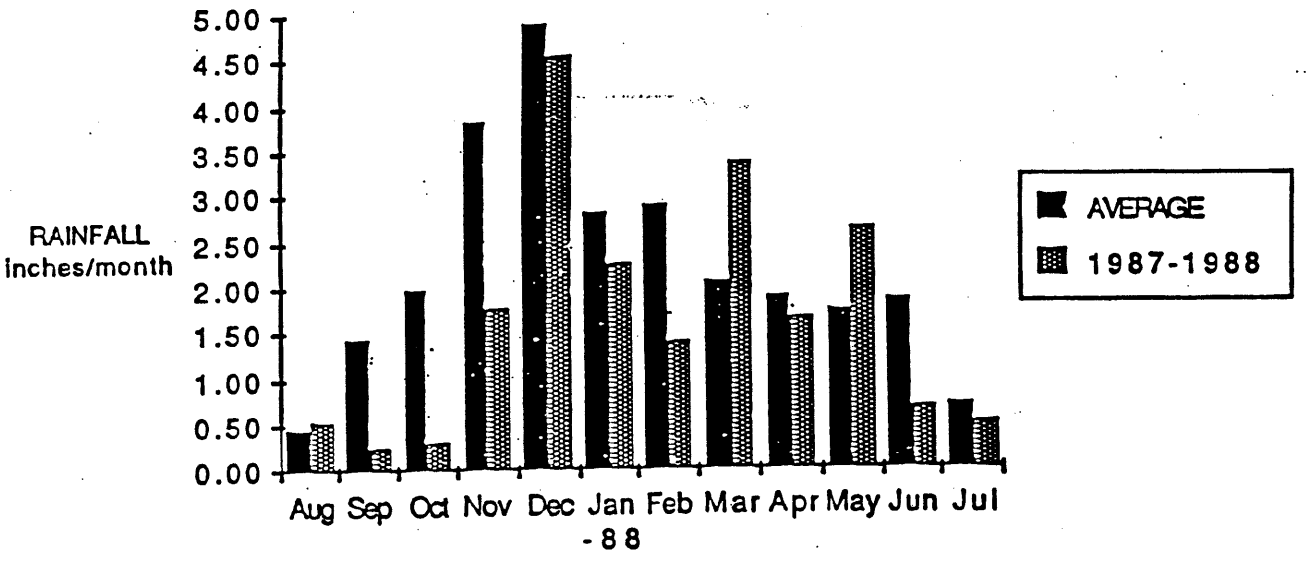
5. Other

   None

TROUT LAKE RESERVOIR HIGH & LOW LEVEL VOLUMES



MONTHLY RAINFALL AT THE TROUT LAKE WATERSHED



Option for Dealing with a Water Shortage

- o Utility Policies
- o Review & Evaluation of Options
- o Selection of a Course of Action

WORKSHEET 7 - CONSERVATION OPTIONS

List and provide a brief description of as many conservation options as possible that could be used by your utility (Column A). Estimate how much water each option is expected to save (Column B). Then place a (1), (2), or (3) next to each option, corresponding to the water shortage stage in which it should be implemented.

Minor shortage = 1
Moderate shortage = 2
Severe shortage = 3

A. Conservation Option	B. Water Saved (Est. Percentage or Quantity)	C. Water Shortage Stage
	ATTACHED	

o Impose the provisions of Ordinance 733.

Stage	Water Shortage Condition	Consumption Reduction Goal (Percent)	USER RESTRICTIONS
1	Minor: Voluntary Measures	5-10	o Implement voluntary water use reductions (see A.1 above).
2	Moderate: Mandatory Program	10-20	o Implement ordinance banning water waste (see B.1 above). o See Ordinance 733 - Appendix F.

A.

Stage	Water Shortage Condition	Consumption Reduction Goal (Percent)	PENALTIES
1	Minor: Voluntary Measures	5-10	o None
2	Moderate: Mandatory Program	10-20	o See Appendix F suggested penalties.

WORKSHEET 9 - SUPPLY AUGMENTATION OPTIONS

List supply augmentation options that could be constructed or accomplished by your utility (Column A). Indicate how much additional water supply will be provided by each option (Column B).

A. Supply Augmentation Option	B. Additional Water System Capacity
1) Add Augmentation Project #2	50 year drought year - 44 mg/yr
2) Purchase of Zylstra lake water right	50 year drought year - 15 mg/yr
3) Raise Trout Lake dam and increase reservoir capacity	50 year drought year - 64 mg/yr
4) Pump reservoir dead storage	135 mg

WORKSHEET 10 - FINAL COURSE OF ACTION

Based on the preliminary conservation and supply augmentation options identified worksheets 7 and 9, a final course of action should be determined. A thorough evaluation of each potential option should be conducted prior to making the final selection

A. CONSERVATION OPTIONS

Stage	Drought Emergency Condition	Conservation Goal (Percent)	Public Information Actions	Government Actions	User Restrictions	Penalties	Pricing
1	Minor	5 - 10	Done See Appendix E	Done	Done	None	None
2	Moderate	10 - 20	Done See Appendix E	Done	Done	None	
3	Severe	20 - 30					

WORKSHEET 11 - SCHEDULE

Program Elements \ Month	Jan. 88	Feb.	Mar.	April	May	June	July	August	Sept.	Oct.	Nov.	Dec. 88
A. Conservation Options												
1) Public Information Action	Stage 1 →					Stage 2	.....	.....	.....	..... →		
2) Government Action	Stage 1 →					Stage 2	.....	.....	.....	..... →		
3) User Restriction							Stage 2	→	→	→		
4) Penalties							Stage 2	→	→	→		
B. Supply Augmentation Options												
1) Advertise for Augmentation #2 Bids							X					
2) Award Contract								X				
3) Begin Const. Augmentation #2									X	→	→	
4) Begin Pumping Water @ Aug. #2												X

C. Summarize how rate adjustments will affect consumers and utility revenues.

No rate adjustments.

Appendix A

User Characteristics Narrative
1983 Comprehensive Water Plan

Appendix B

Population Estimates & Projections
1983 Comprehensive Water Plan

TOWN OF FRIDAY HARBOR
COMPREHENSIVE WATER PLAN UPDATE
HISTORIC AND PROJECTED SERVICE POPULATION

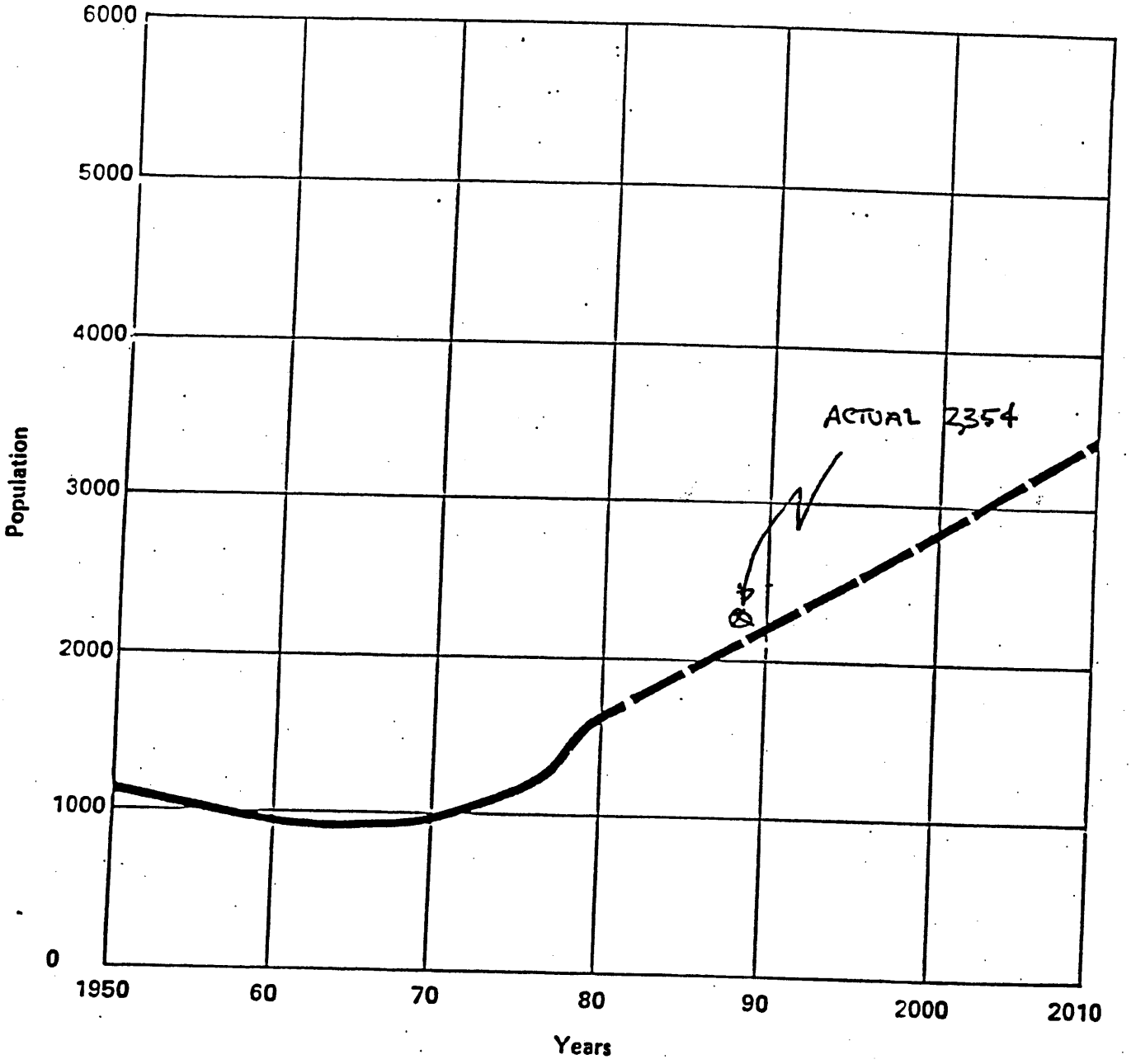


FIGURE 4

network was established using a combination of monthly billing records, flow recordings and existing population estimates.

Various computer simulations were made for each of the water system pressure zones. These simulations are included in Appendix A.

4.3 Projected Water Demands

Knowing that the system's average annual usage has been about 0.36 mgd over the past five years, a per capita consumption figure was computed and used to develop the water use projections. The projections are based on an average annual water use per capita of 160 gallons per day including a loss rate to account for system leakage and unbilled usage estimated to be 15 to 20 percent. These figures correspond very well to the town's recent usage records as well as the normal water usage as recorded in other similar communities.

Since the projected water demand is based on the number of persons served, the population projections presented on Figure 4 were used in conjunction with the per capita demand rate to establish the projections shown on Figure 7.

As shown, the average annual water demand of the service area is projected to increase from about 0.4 mgd in 1982 to nearly 0.7 mgd in the year 2010, an increase of nearly 3 percent annually.

4.4 Fire Demand

An essential consideration in the planning of any water system is providing adequate fire protection. Although the total amount of water used for

extinguishing fires usually is a negligible portion of annual consumption, the rate at which it must be supplied is so great that, in all but the largest communities, fire flows are the largest demands imposed on water systems. The National Board of Fire Underwriters (NBFU) evaluates each city and fire district and classifies it by a grading schedule consisting of 10 classes. Class 1 would classify a city with a very high degree of public fire protection and Class 10 is one that is virtually unprotected. There are many items that determine an insurance rate and of these the water system accounts for approximately 35 percent of the total evaluation. The fire flow to be provided is determined by such factors as the size, type, and concentration of buildings, which in turn are a function of community size. The required fire flows for average cities have been established by the NBFU as one of the general standards used in the classification of communities for insurance purposes. The Town of Friday Harbor is presently rated Class 7 by the NBFU. These required flows, presented below, were obtained from the Grading Schedule published by the NBFU.

Fire Flow Requirements
National Board of Fire Underwriters

Population	Fire Flow Requirement, gpm	Duration hours
1,000	1,000	4
1,500	1,250	5
2,000	1,500	6
3,000	1,750	7
4,000	2,000	8
5,000	2,250	9

The Friday Harbor water system is not capable of meeting the above fireflow requirements in all commercial areas. Nor is the system capable of meeting or exceeding state requirements for fire flow and reliability under WAC

determined. The critical supply for source availability is the "50-year drought" condtion. As shown on Figure 7, the average annual demand is projected to increase from about 0.4 mgd in 1983 to about 0.7 mgd in the year 2010. In about 1993, the Trout Lake storage capacity will have to be increased by raising the existing dam. The additional storage capacity is needed to increase the annual supply during drought conditions.

The existing 500,000-gallon storage tank does not meet current storage requirements for the system. The existing system storage should be sized to supply one peak day's demand plus fire flow. With this criteria, the peak day demand of 1.0 mgd plus 0.5 mgd for fire flow equals a total required storage of 1.5 mgd. The current storage requirement of 1.5 mgd will increase to about 2.5 mgd by the year 2010, assuming service area demand follows the projection shown on Figure 7.

The existing capacity of the water treatment plant is 900 gpm. The plant is able to meet peak day demands to about the year 1997, as shown on Figure 7. The peak day demand will increase to about 1,150 gpm by the year 2010. Therefore, the treatment plant capacity must be expanded by 25 percent before the year 2000 to satisfy the projected growth.

The existing pipeline network must be enhanced to satisfy peak usage and, in particular, fire flow. There are several undersized and dead-end pipelines which should be upgraded and looped into the network to enhance the distribution capacity. The specific problem areas are listed in the following section.

Appendix F

Emergency Water Conservation Ordinance

Chapter 13.16

WATER USE RESTRICTIONS

13.16.045 Water emergency conservation plan.

Whenever, by resolution, the council of the town declares that existing water supplies in the town's domestic water supply system are in a condition that requires implementation of an emergency conservation plan, such resolution shall declare whether such condition constitutes a minor emergency, moderate emergency, severe emergency, or critical emergency, whereupon the following user restrictions and penalties shall apply:

A. Minor Emergency Condition.

1. There shall be no watering of lawns, which does not include the grass areas which comprise public use athletic and physical education fields.

2. There shall be no washing of any sidewalk, walkway, driveway, parking lot, or other impervious surfaced area except that high pressure, low water volume washers may be used.

3. There shall be no washing of any building or structure except that high pressure, low water volume washers may be used.

4. There shall be no washing of any motor vehicle, boat, travel trailer, or airplane other than for safety cleaning of windows except that high pressure, low water volume washers may be used.

5. No tap water shall be served to customers at restaurants unless expressly requested by the customer to whom it is provided.

6. There shall be no use of water for fire department drills or burn house exercises.

7. Penalties.

a. First observed violation: hand delivery of a written warning to resident or tenant explaining the town's present water shortage situation and a verbal warning of the installation of a flow restrictor if a second violation is observed. This is seen as an educational visit;

b. Second observed violation: installation of a flow-restriction device for seven days that will only allow one gallon per minute of water to enter the premises of the resident; a verbal warning of discontinuance of service if a third violation is observed;

c. Third observed and successive violations: water service shut off and a $100.00 charge assessed to the utility account to turn the service back on;

d. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300.

B. Moderate Emergency Condition.

1. There shall be no watering of lawns including grass areas which comprise public use athletic and physical education fields.

2. There shall be no washing of any sidewalk, walkway, driveway, parking lot, or other impervious surfaced area.

3. There shall be no washing of any building or structure, including the washing of windows.

4. There shall be no washing of any motor vehicle, boat, travel trailer, or airplane other than for safety cleaning of windows except at a commercial washing facility that recycles its wash water.

5. No tap water shall be served to customers at restaurants unless expressly requested by the customer to whom it is provided.

6. There shall be no use of water to fill any indoor or outdoor swimming pool or spa.

7. There shall be no use of water for operating private or public fountains or ponds for aesthetic or scenic uses except where necessary to support fish life.

8. There shall be no use of water for dust control.

9. There shall be no sale of water directly from the town's reservoir tanks.

10. Landscaping and screening requirements per FHMC Title 17 for development permits issued prior to declaration of a severe emergency condition shall be suspended until the severe emergency condition has abated. The issuance of a final certificate of occupancy for the development shall not be made until all landscaping and screening requirements of the development permit are completed.

16. Penalties.

a. First observed violation: a $100.00 fine to the occupant, assessed to the utility account, and a verbal warning of potential water service shutoff, and additionally; any account whose consumption exceeds the amounts stated in FHMC 13.04.145 (C)(13) and (14) in two successive billing cycles shall have a water-restricting device placed on their water meter that will limit water flow to one gallon/minute in the case of residential classes of users and five gallons/minute in all other classes of users. Removal of such restrictors shall be made only after the installation by the town of toilet dams, low-flow shower heads, faucet aerators, and other water conservation devices at a cost of time and materials to the account.

b. Second observed and successive violations: a $250.00 fine to the occupant, assessed to the utility account, and the water service shut off.

c. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300.

D. Critical Emergency Condition. In order to provide for the essential health, safety, and welfare of the public the only allowed uses of the town's water supply are:

1. Residential classes of users whose consumption shall be limited to 25 gallons per day per person residing within each dwelling unit.

2. Group care facilities housing the infirm or elderly whose consumption shall be limited to 50 gallons per day per person residing within such group care facility.

3. Fire suppression as needed.

4. Municipal uses to process water, wastewater, or refuse as required by law.

5. Penalties.

a. First observed and successive violations: a $500.00 fine to the occupant, assessed to the utility account, and the water service shut off;

b. Charges assessed for violations shall constitute a lien against the premises to which the water was furnished, in accordance with RCW 35.21.290, which lien may be enforced by terminating water service in accordance with the provisions of RCW 35.21.300. (Ord. 973 § 2, 1995; Ord. 949 §§ 1, 2, 1994; Ord. 946 § 4, 1994)

13.16.050 Violation – Enforcement – Penalty.

A. Violation. Except as otherwise specifically provided in FHMC 13.16.045(B)(7) and (C)(13), failure to comply with the provisions of this chapter shall constitute a Class 4 civil infraction. Each day that a person, firm, corporation, or organization remains in violation of this chapter may be treated as a separate infraction.

B. Enforcement.

1. The town administrator is designated as the enforcement officer and shall have responsibility for enforcing the provisions of this chapter in accordance with the procedures set forth in Chapter 7.80 RCW, as amended from time to time.

2. In the event of repeated violations of the same provisions of this chapter by the same person(s), or in the event a violation constitutes a substantial threat to the health or safety of other persons, the violation shall constitute a public nuisance, and the town administrator may institute a civil proceeding to abate such nuisance.

C. Penalty. Except as otherwise specifically provided in FHMC 13.16.045(B)(7) and (C)(13), any person found to have committed a violation of this chapter shall be assessed a monetary penalty in the amount set forth in Chapter 7.80 RCW, as amended from time to time. (Ord. 946 § 5, 1994)

Appendix G: Trout Lake Emergency Action Plan (EAP)

EMERGENCY ACTION PLAN

Project Name: Trout Lake Storage Dam

DSO File Number: SJ02-0202

Location: Town of Friday Harbor, San Juan County,
Unnamed Stream

OWNER: Town of Friday Harbor, PO Box 219,
Friday Harbor, WA 98250

ISSUE DATE: MAY 2007

REVISION DATES:

TABLE OF CONTENTS

SECTION I INTRODUCTION

Responsibilities I-3

SECTION II NOTIFICATION FLOW CHARTS

Failure has Occurred II-1

Failure Imminent II-3

Slowly Developing Failure or Unusual Conditions II-5

SECTION III INUNDATION MAPS

Scenario A—Wet Weather Dam Failure

Scenario B—Sunny Day Dam Failure

SECTION IV POSSIBLE EMERGENCY CONDITIONS

Earthquake IV-1

Flooding IV-2

Erosion or Bank Slumping IV-3

New Cracks or increase in flow from existing cracks

IV-3

Landslides into the Reservoir IV-3

Spillway and Outlet Works Failures IV-4

Abnormal Weir or Other Readings IV-4

Other Problems IV-4

End of Emergency Situations and Follow-up Actions IV-4

SECTION V PREVENTATIVE ACTIONS

Reduction in Freeboard V-1

Overtopping by Flood Waters V-1

Increased Leakage of Existing Cracks, New Cracks, Additional Leakage from Abutments V-1

Undercutting of Soil off the End of the Spillway V-1

Bank Sloughing V-2

Failure of Outlet Pipe V-2

SECTION VI SUPPLIES & RESOURCES

Appendices

A Updating the EAP

B Locations of EAP, EAP Flow Charts and Inundation Maps

C Responsibilities of Individuals

D Approval of Plans

E Communication Systems

F References and Correspondence

SECTION I – INTRODUCTION

This Emergency Action Plan (EAP) defines responsibilities and provides procedures designed to:

- Identify unusual and unlikely conditions which may endanger the dam.
- Initiate remedial actions to prevent or minimize the downstream impacts of a dam failure.
- Initiate emergency actions to warn downstream residents of impending or actual failure of the dam.

Official Dam Name: Trout Lake Dam

Located on: An unnamed Creek, San Juan County

Section 35 Township 35 North Range 3 West W. M.

Dam Owner and Operator: Town of Friday Harbor, Washington

Type of Dam: Concrete Arch Dam

Dimensions of Dam:

Dam Height: 37 ft Structural/35.5 ft Hydraulic

Dam Crest Length: 121.5 ft

Dam Crest Width: 2 ft

Downstream Flood Path:

- Trout Lake Dam via unnamed creek across Julie Road, with run up toward Woods Reservoir,
- Across Prohaska Road with run up toward Nettle Creek Dr.,
- Across Wold Road and a small portion of Ellison Lane,
- Into Upper and Lower Zylstara Lake,
- Across Valley Farms Road,
- Across Bailer Hill Road and a portion of False Bay Drive, and
- Out False Bay and into the Strait.

Downstream Hazard Classification: Class 1C, High

Number of Homes in the Floodplain: 4 in the flood plain (3 are occupied as of Jan 2007). Several more are very close.

Downstream Property with Structures Description:

Street Address	Owner	Mailing Address	Description
346 Julie Road	DANIEL B SHELLEY & ELIZABETH BUCK	PO BOX 1161 FRIDAY HARBOR, WA 98250-1161	Sheet 1: one house above Julie Road at approximately 0.61 miles is not inundated but the water comes uncomfortably close ~5 minutes to arrival, 9 minutes to peak
375 Julie Road	BOYD & SAIFON CRUMPACKER	PO BOX 3034 FRIDAY HARBOR, WA 98250	Sheet 1: one house and outbuildings below Julie Road also at approximately 0.61 miles ~6 minutes to arrival, 10 minutes to peak
390 Prohaska Rd	MICHAEL J LAZZARI & ROBERTA L BLAIR-JT/RS	474 PROHASKA FRIDAY HARBOR, WA 98250	Sheet 1: one trailer at approximately 1.33 miles ~14 minutes to arrival, 36 minutes to peak
530 Wold Rd	TOWN OF FRIDAY HARBOR	PO BOX 219 FRIDAY HARBOR, WA 98250	Sheet 2: the Town of Friday Harbor's Water Treatment Plant at approximately 1.46 miles is not inundated but the water comes uncomfortably close ~18 minutes to arrival, 38 minutes to peak
378 Wold Rd	JOHN L DWYER	PO BOX 2031 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.65 miles is not inundated but the water comes uncomfortably close ~20 minutes to arrival, 41 minutes to peak
74 Wold Rd	GARRETT C & LEISHA M HOLMES	PO BOX 3214 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
72 Wold Rd	GARRETT C & LEISHA M HOLMES, or	PO BOX 3214 FRIDAY HARBOR, WA 98250, or	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
112 Wold Rd	BRADFORD T SMITH	PO BOX 596 OCCIDENTAL, CA 95465	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
1069 Bailer Hill Rd	SIDNEY E & SUSAN E CLARK	305 BLUE RIDGE PARKWAY MADISON, WI 53705	Sheet 6: no structures, minor water on northeast corner of property at approximately 4.98 miles ~1 hr 31 min to arrival, 2 hr 20 min to peak
3213 False Bay Dr	AMANDA A DUFF	1600 HUNTINGTON DR SO PASADENA, CA 91030	Sheet 6: one house at approximately 5.20 miles ~1 hr 38 min to arrival, 2 hr 23 min to peak
2416 False Bay Dr	LADDIA A WHITTIER,CUST FOR AMANDA DUFF & PAUL DUFF	PO BOX 9 FRIDAY HARBOR, WA 98250	Sheet 7: one barn at approximately 5.41 miles This address corresponds to a house that is NOT in the inundated area, but the nearby barn is in the inundated area. ~1 hr 45 min to arrival, 2 hr 27 min to peak

RESPONSIBILITIES

Day to day operation and maintenance of the dam: Utilities Superintendent, Town of Friday Harbor (Mike Wilks) at (360) 378-2154. In the absence of the Utilities Superintendent, the Lead Water Supervisor, Town of Friday Harbor (Mike Deegan) at (360) 378-8353 is responsible for fulfilling the Utilities Superintendent's duties.

Implementation of the Emergency Action Plan: Utilities Superintendent, Town of Friday Harbor (Mike Wilks) or the Town Administrator, Town of Friday Harbor (King Fitch). In the absence of the Utilities Superintendent (Mike Wilks), the Lead Water Supervisor (Mike Deegan) is responsible for fulfilling the duties of the Utilities Superintendent.

Determining and identifying conditions or events that require emergency action: Mike Wilks, Utilities Superintendent, Town of Friday Harbor. In the absence of Mike Wilks-Utilities Superintendent, Mike Deegan-Lead Water Supervisor (360) 378-8353 is responsible for fulfilling the duties of the Utilities Superintendent.

Mike Wilks-Utilities Superintendent (360) 378-2154 as representative of the dam owner is also responsible for the implementation of the EAP which includes:

a) Notifying Residents in downstream homes of the Emergency
b) Contacting San Juan County/Town of Friday Harbor Emergency Management
c) Contacting the San Juan County Sheriff
d) Contacting the DOE Dam Safety Section
e) Obtaining Emergency Supplies and Equipment

(In the absence the Utilities Superintendent (Mike Wilks), the Lead Water Supervisor (Mike Deegan) is responsible for fulfilling the duties of the Utilities Superintendent.

The Town Administrator (King Fitch) at (360) 378-2390 is responsible for notifying the Press and News Media.

The Utilities Superintendent (Mike Wilks) is also responsible for:

a) Coordinating activities at the dam and staying in contact with the Town Administrator (King Fitch)

b) Taking emergency measures at the dam to prevent failure, as directed by the Town Administrator (King Fitch)

(In the absence of the Utilities Superintendent (Mike Wilks), the Lead Water Supervisor (Mike Deegan) is responsible for fulfilling the duties of the Utilities Superintendent.

The 911 Dispatcher is responsible for activating the NOAA alert system.

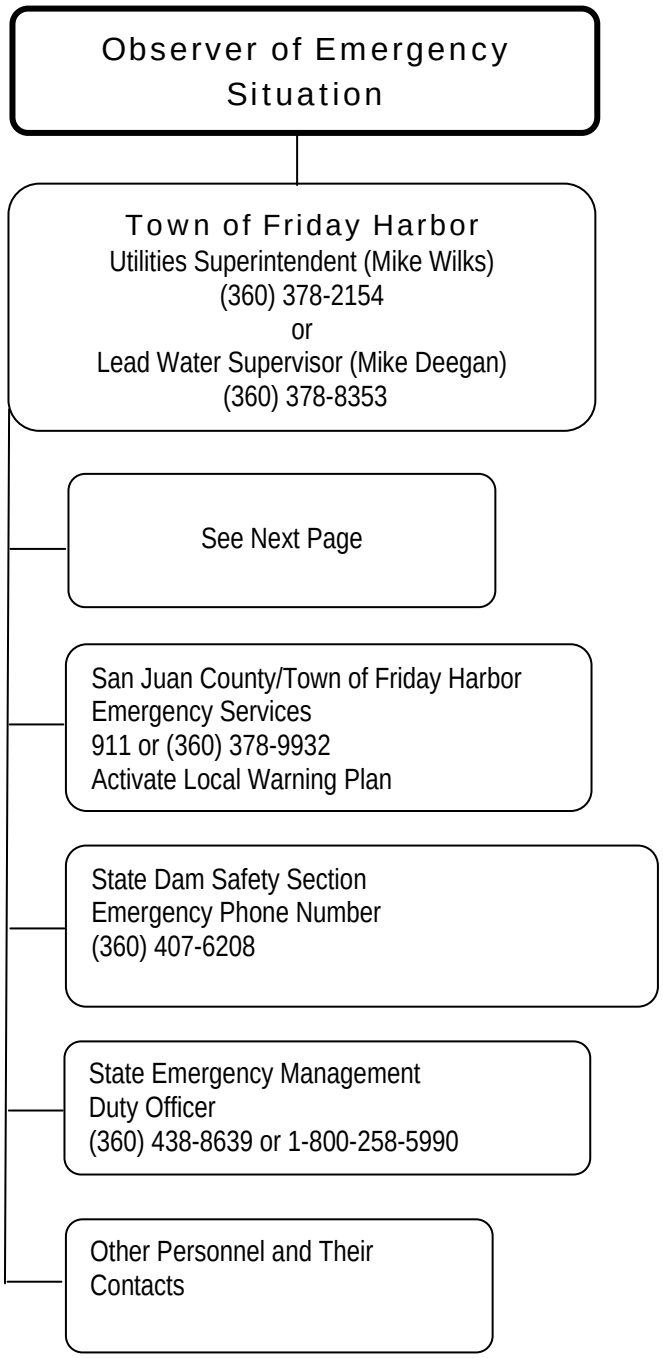
The responsibilities are also shown in Appendix C

FAILURE HAS OCCURRED

If a **failure has occurred**, downstream evacuation of the floodplain must be started immediately in accordance with the following:

- Notify persons downstream from the dam of the failure;
- Coordinate efforts with other dam owners downstream to try and reduce flooding, if applicable.

Notification Flowchart



SECTION II - NOTIFICATION FLOWCHART

FAILURE HAS OCCURRED

If a **failure has occurred** downstream evacuation of the floodplain must be started immediately in accordance with the following:

1. The Utilities Superintendent (Mike Wilks) or in his absence the Lead Water Supervisor (Mike Deegan) will notify persons in the following properties immediately downstream from the dam of the failure;

   We have received information or other indications that Trout Lake Dam has failed. Evacuate now using the information contained in your Individual Emergency Action Plan.

   Order of calls to be made. Should a phone not answer after six rings, go to the next number one the list one except for the 911 call where you must wait for an answer. An alternative number for 911 is (360) 378-4151. If there is no answer at 375 and 346 Julie Road, make several more attempts to contact them at after you have contacted the 911 Dispatcher. After several unsuccessful attempts to contact 375 and 346 Julie Road proceed down the list.

Street Address	Owner/Residents	Phone	Description
346 Julie Road	DANIEL B SHELLEY & ELIZABETH BUCK	(360) 378-7908 Jan 07	Sheet 1: one house and outbuildings below Julie Road at approximately 0.61 miles ~6 minutes to arrival, 10 minutes to peak
375 Julie Road	BOYD & SAIFON CRUMPACKER	(360) 378-1931 Cell (360) 472-0201 Cell (360) 298-0943 Feb 07	Sheet 1: one house above Julie Road at approximately 0.61 miles is not inundated but the water comes uncomfortably close ~5 minutes to arrival, 9 minutes to peak
Not Applicable		911 or (360) 378-4151 Jan 07	The 911 Dispatcher is responsible for putting in place the NOAA SAME alerts. Suggested language: *This is the 911 Dispatcher. I have received information that Trout Lake Dam has failed. Evacuate now!*
530 Wold Rd	TOWN OF FRIDAY HARBOR	(360) 378-2160 Jan 07	Sheet 2: the Town of Friday Harbor's Water Treatment Plant at approximately 1.46 miles is not inundated but the water comes uncomfortably close ~18 minutes to arrival, 38 minutes to peak

Street Address	Owner/Residents	Phone	Description
390 Prohaska Rd	MICHAEL J LAZZARI & ROBERTA L BLAIR-JT/RS	(360) 378-2514	Sheet 1: one trailer at approximately 1.33 miles ~14 minutes to arrival, 36 minutes to peak
378 Wold Rd	JOHN L DWYER	(360) 378-5831 Jan 07	Sheet 2: one house at approximately 1.65 miles is not inundated but the water comes uncomfortably close ~20 minutes to arrival, 41 minutes to peak
74 Wold Rd	GREG HERTEL LIENNETTE HIGDON-HERTEL DANIELLE FISHER	(360) 378-2818 (360) 317-4321 (360) 378-2818 Jan 07	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
72 Wold Rd	GARRETT C & LEISHA M HOLMES, or	(360) 378-8836 W(360) 378-5255 W(360) 378-2287 Feb 07	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
112 Wold Rd	BRADFORD T SMITH		Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
1069 Bailer Hill Rd	SIDNEY E & SUSAN E CLARK	(608) 239-0125c (608) 239-0234 March O7 Call is **informational call. It should be made after the other notifications**.	Sheet 6: one shed at approximately 4.98 miles ~1 hr 31 min to arrival, 2 hr 20 min to peak Jan 07, owners indicated that residence was unoccupied. March 07, owner provided survey data indicated that only a small area on the northwest corner of the property may be subject to water.
3213 False Bay Dr	AMANDA A DUFF		Sheet 6: one house at approximately 5.20 miles ~1 hr 36 min to arrival, 2 hr 23 min to peak
2416 False Bay Dr	LADDIA A WHITTIER,CUST FOR AMANDA DUFF & PAUL DUFF	(360) 378-5048	Sheet 7: one barn at approximately 5.41 miles This address corresponds to a house that is NOT in the inundated area, but the nearby barn is in the inundated area. ~1 hr 45 min to arrival, 2 hr 27 min to peak

2. Contact San Juan County/Town of Friday Harbor Emergency Services at 911 or (360) 378-9932.
3. Contact Town of Friday Harbor Public Works Department at (360) 378-2154

4. Contact the Washington State Department of Ecology, Dam Safety Office and begin any recommended procedures. Call out numbers are shown below:
    - Dam Safety Office Emergency Phone Number (360) 407-6208
    - Doug Johnson, Dam Safety Supervisor (360) 407-6623 direct line
    - Doug Johnson, Dam Safety Supervisor (360) 971-6347 pager
    - Doug Johnson, Dam Safety Supervisor (360) 588-2797 home
    - Jerald LaVassar, DSO, Geotechnical Engineer (360) 407-6625 direct line
    - Jerald LaVassar, DSO, Geotechnical Engineer (360) 456-1370 home
5. Contact the Washington State Emergency Management Duty Officer at (360) 438-8639 or 1 (800) 258-5990
6. Take preventive actions described in Section V of this plan.

List of Properties Downstream First Affected by Flood Waters

Street Address	Owner	Mailing Address	Description
346 Julie Road	DANIEL B SHELLEY & ELIZABETH BUCK	PO BOX 1161 FRIDAY HARBOR, WA 98250-1161	Sheet 1: one house above Julie Road at approximately 0.61 miles is not inundated but the water comes uncomfortably close ~4 minutes to arrival, 9 minutes to peak
375 Julie Road	BOYD & SAIFON CRUMPACKER	PO BOX 3034 FRIDAY HARBOR, WA 98250	Sheet 1: one house and outbuildings below Julie Road also at approximately 0.61 miles ~6 minutes to arrival, 10 minutes to peak
390 Prohaska Rd	MICHAEL J LAZZARI & ROBERTA L BLAIR-JT/RS	474 PROHASKA FRIDAY HARBOR, WA 98250	Sheet 1: one trailer at approximately 1.33 miles ~15 minutes to arrival, 37 minutes to peak
530 Wold Rd	TOWN OF FRIDAY HARBOR	PO BOX 219 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
378 Wold Rd	JOHN L DWYER	PO BOX 2031 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.65 miles is not inundated but the water comes uncomfortably close ~20 minutes to arrival, 41 minutes to peak
72 Wold Rd	GARRETT C & LEISHA M HOLMES	PO BOX 3214 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutesto peak
74 Wold Rd	GARRETT C & LEISHA M HOLMES	PO BOX 3214 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
112 Wold Rd	BRADFORD T SMITH	PO BOX 596 OCCIDENTAL, CA 95465	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
1069 Bailer Hill Rd	SIDNEY E & SUSAN E CLARK	305 BLUE RIDGE PARKWAY MADISON, WI 53705	Sheet 6: no structures, minor water on northeast corner of property at approximately 4.98 miles ~1 hr 31 min to arrival, 2 hr 20 min to peak
3213 False Bay Dr	AMANDA A DUFF	1600 HUNTINGTON DR SO PASADENA, CA 91030	Sheet 6: one house at approximately 5.20 miles ~1 hr 36 min to arrival, 2 hr 23 min to peak
2416 False Bay Dr	LADDIA A WHITTIER,CUST FOR AMANDA DUFF & PAUL DUFF	PO BOX 9 FRIDAY HARBOR, WA 98250	Sheet 7: one barn at approximately 5.41 miles This address corresponds to a house that is NOT in the inundated area, but the nearby barn is in the inundated area. ~1 hr 45 min to arrival, 2 hr 27 min to peak

Provide courtesy notification of the following person who are not in the inundation path but have expressed interest in receiving notification.

Address	Owner/Residents	Phone	Description
230 Julie Road	Ed Bailey	(360) 378-6686 (360) 378-9554 (360) 317-8650 cell	Appears above Inundated Area
455 Boyce Road	Kate Wisnicwski	(206) 297-1042 (206) 999-1432	Appears above inundated area; Used as a vacation rental
531 Boyce Road	Jim and Lisa Lawrence	(360) 378-5575 (360) 298-1812 cell	Appears above Inundated Area
236 Ellison Lane	Roger Ellison	(360) 370-5795; (360) 298-1033 cell	Appears above Inundated Area
236 Ellison Lane	Anita Barreca	(360) 370-5795 (206) 604-4385c	Appears above Inundated Area
146 Nettle Creek	Mike or Tamara Gregon	(360) 378-7955 (360) 378-5884 work	Appears above Inundated Area
1314 Douglas Road	Peter J. Wangoe II	(360) 378-7278 (360) 378-8051	Appears above Inundated Area
1314 Douglas Road	Leasa Birch	(360) 378-7278 (360) 298-0422	Appears above Inundated Area
862 Valley Farms Road	Chuck Tomas	(360) 378-3652 (818) 378-0495 cell	Appears above Inundated Area
862 Valley Farms Road	Evelyn Lee/Trahan	(360) 378-8719 (360) 317-4807 cell	Appears above Inundated Area
862 Valley Farms Road	Laura Tomas	(360) 378-8904 (360) 317-6931 cell	Appears above Inundated Area
1069 Bailer Hill Road	Sidney Clark	(608) 239-0125	No one living at this address
1069 Bailer Hill Road	Susan Clark	(608) 239-0234	No one living at this address
2143 False Bay Road	A Richard Weisbrod	(360) 378-5460	Unused Residence

DEACTIVATION

The Utilities Superintendent after consultation with the Town Administrator, the San Juan County and Town of Friday Harbor Emergency Manager, the Town of Friday Harbor's Fire Chief, the San Juan County Fire District #3's Chief and the DOE's representative on site will notify the impacted parties that the dam has released its contents and that the flooding has peaked.

The Utilities Superintendent will make the deactivation notification in the same order as on the notification flow chart.

It is possible that deactivation will occur at different times in the inundated area depending on the distance from the dam, the slope of the ground and other factors.

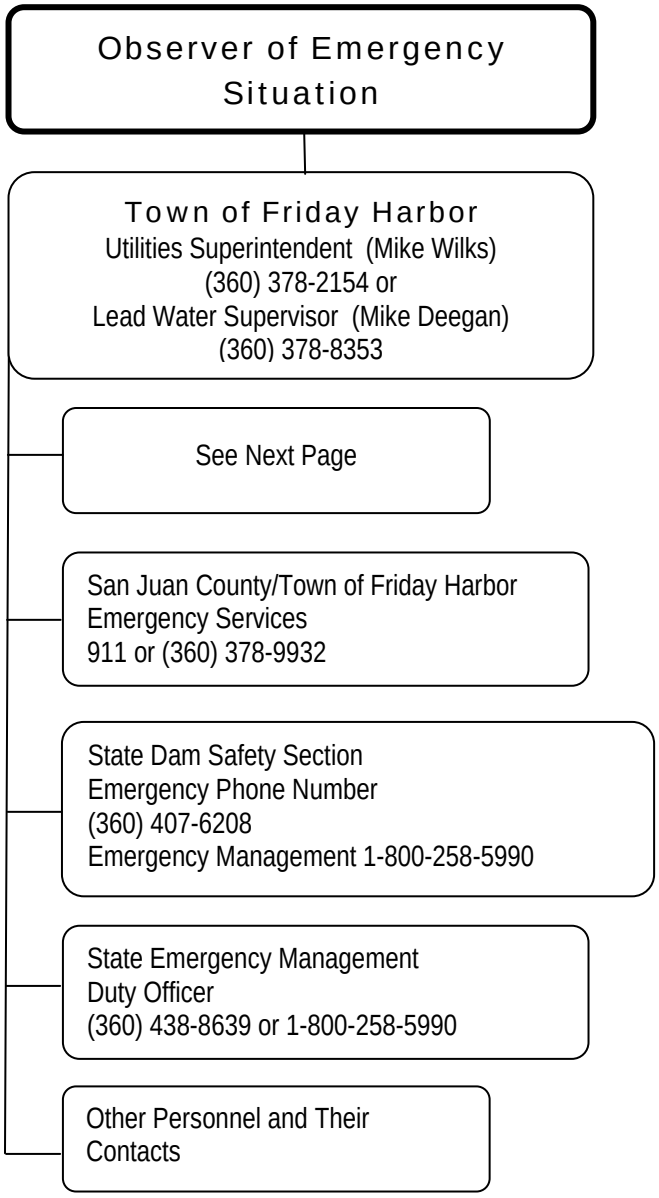
(In the absence of the Utilities Superintendent, the Lead Water Supervisor is responsible for fulfilling the duties of the Utilities Superintendent.

FAILURE IMMINENT

If **failure of the dam is imminent**, but has not yet begun, the following steps should be initiated immediately:

- Advise persons residing immediately downstream from the dam to evacuate due to the potential failure of the dam;
- Implement the notification flow chart;
- Contact State Dam Safety Office and begin any recommended procedures;
- Take preventive actions described in Section V of this plan;

Notification Flowchart



FAILURE IS IMMINENT

If a **failure is imminent,** but has not yet begun, the following steps should be taken immediately:

1. The Utilities Superintendent (Mike Wilks) on in his absence the Lead Water Supervisor (Mike Deegan) will notify persons in the following properties immediately downstream from the dam to evacuate due to the potential of the failure of the dam;

   We have received information or other indications that Trout Lake Dam is about to fail. Get ready to evacuate!

   Order of calls to be made. Should a phone not answer after six rings, go to the next number on the list except for the 911 call where you must wait for an answer. An alternative number for 911 is (360) 378-4151. If there is no answer at 375 and 346 Julie Road, make several more attempts to contact the residents at after you have contacted the 911 Dispatcher. After several unsuccessful attempts to contact 375 and 346 Julie Road proceed down the list.

   List of properties that receive direct notification:

Street Address	Owner	Phone	Description
346 Julie Road	DANIEL B SHELLEY & ELIZABETH BUCK	(360) 378-7908 Jan 07	Sheet 1: one house and outbuildings below Julie Road at approximately 0.61 miles ~6 minutes to arrival, 10 minutes to peak
375 Julie Road	BOYD & SAIFON CRUMPACKER	(360) 378-1931 Cell (360) 472-0201 Cell (360) 298-0943 Feb 07	Sheet 1: one house above Julie Road at approximately 0.61 miles is not inundated but the water comes uncomfortably close ~5 minutes to arrival, 9 minutes to peak
Town Water Treatment Plant		911 or (360) 378-4151 Jan 07	The 911 Dispatcher is responsible for putting in place the NOAA SAME alerts. Suggested Language: *This is the 911 dispatcher, I have received information that Trout Lake Dam is about to fail. Get ready to evacuate.*
530 Wold RD	TOWN OF FRIDAY HARBOR	(360) 378-2160 Jan 07	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak

Street Address	Owner	Phone	Description
390 Prohaska Rd	MICHAEL J LAZZARI & ROBERTA L BLAIR-JT/RS	(360) 378-2514	Sheet 1: one trailer at approximately 1.33 miles ~14 minutes to arrival, 36 minutes to peak
378 Wold Road	JOHN DWYER	(360) 378-5831 Jan 07	Sheet 2: one house at approximately 1.65 miles is not inundated but the water comes uncomfortably close ~20 minutes to arrival, 41 minutes to peak
74 Wold Rd	GREG HERTEL LIENNETTE HIGDON-HERTEL DANIELLE FISHER	(360) 378-2818 (360) 317-4321 (360) 378-2818 Jan 07	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
72 Wold Rd	GARRETT C & LEISHA M HOLMES	(360) 378-8836 W(360) 378-5255 W(360) 378-2287 Feb 07	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
112 Wold Rd	BRADFORD T SMITH		Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutesto peak
1069 Bailer Hill Rd	SIDNEY E & SUSAN E CLARK	(608) 239-0125c (608) 239-0234 Jan O7 Call is informational and can be made after other notifications.	Sheet 6: one shed at approximately 4.98 miles ~1 hr 31 min to arrival, 2 hr 20 min to peak Jan 07, owners indicated that residence was unoccupied. March 07, owner provided survey data indicated that only a small area on the northwest corner of the property may be subject to water.
3213 False Bay Dr	AMANDA A DUFF		Sheet 6: one house at approximately 5.20 miles ~1 hr 36 min to arrival, 2 hr 23 min to peak
2416 False Bay Dr	LADDIA A WHITTIER,CUST FOR AMANDA DUFF & PAUL DUFF	(360) 378-5048	Sheet 7: one barn at approximately 5.41 miles This address corresponds to a house that is NOT in the inundated area, but the nearby barn is in the inundated area. ~1 hr 45 min to arrival, 2 hr 27 min to peak

2. Contact San Juan County/Town of Friday Harbor Emergency Services at 911 or (360) 378-9932.
3. Contact Town of Friday Harbor Public Works Department (360) 378-2154

4. Contact the Washington State Department of Ecology, Dam Safety Office and begin any recommended procedures. Call out numbers are shown below:
    - Dam Safety Office Emergency Phone Number (360) 407-6208
    - Doug Johnson, Dam Safety Supervisor (360) 407-6623 direct line
    - Doug Johnson, Dam Safety Supervisor (360) 971-6347 pager
    - Doug Johnson, Dam Safety Supervisor (360) 588-2797 home
    - Jerald LaVassar, DSO, Geotechnical Engineer (360) 407-6625 direct line
    - Jerald LaVassar, DSO, Geotechnical Engineer (360) 456-1370 home
5. Contact the Washington State Emergency Management Duty Officer at (360) 438-8639 or 1 (800) 258-5990
6. Take preventive actions described on Section V of this plan.

List of Properties Downstream First Affected by Flood Waters

Street Address	Owner	Mailing Address	Description
346 Julie Road	DANIEL B SHELLEY & ELIZABETH BUCK	PO BOX 1161 FRIDAY HARBOR, WA 98250-1161	Sheet 1: one house above Julie Road at approximately 0.61 miles is not inundated but the water comes uncomfortably close ~4 minutes to arrival, 9 minutes to peak
375 Julie Road	BOYD & SAIFON CRUMPACKER	PO BOX 3034 FRIDAY HARBOR, WA 98250	Sheet 1: one house and outbuildings below Julie Road also at approximately 0.61 miles ~6 minutes to arrival, 10 minutes to peak
390 Prohaska Rd	MICHAEL J LAZZARI & ROBERTA L BLAIR-JT/RS	474 PROHASKA FRIDAY HARBOR, WA 98250	Sheet 1: one trailer at approximately 1.33 miles ~15 minutes to arrival, 37 minutes to peak
530 Wold Rd	TOWN OF FRIDAY HARBOR	PO BOX 219 FRIDAY HARBOR, WA 98250	Sheet 2: the Town of Friday Harbor's Water Treatment Plant at approximately 1.46 miles is not inundated but the water comes uncomfortably close ~18 minutes to arrival, 38 minutes to peak
378 Wold Rd	JOHN L DWYER	PO BOX 2031 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.65 miles is not inundated but the water comes uncomfortably close ~20 minutes to arrival, 41 minutes to peak
74 Wold Rd	GARRETT C & LEISHA M HOLMES	PO BOX 3214 FRIDAY HARBOR, WA 98250	Sheet 2: one house at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
72 Wold Rd	GARRETT C & LEISHA M HOLMES	PO BOX 3214 FRIDAY HARBOR, WA 98250	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
112 Wold Rd	BRADFORD T SMITH	PO BOX 596 OCCIDENTAL, CA 95465	Sheet 2: one barn also at approximately 1.80 miles ~22 minutes to arrival, 52 minutes to peak
1069 Bailer Hill Rd	SIDNEY E & SUSAN E CLARK	305 BLUE RIDGE PARKWAY MADISON, WI 53705	Sheet 6: no structures, minor water on northeast corner of property at approximately 4.98 miles ~1 hr 31 min to arrival, 2 hr 20 min to peak
3213 False Bay Dr	AMANDA A DUFF	1600 HUNTINGTON DR SO PASADENA, CA 91030	Sheet 6: one house at approximately 5.20 miles ~1 hr 36 min to arrival, 2 hr 23 min to peak
2416 False Bay Dr	LADDIA A WHITTIER,CUST FOR AMANDA DUFF & PAUL DUFF	PO BOX 9 FRIDAY HARBOR, WA 98250	Sheet 7: one barn at approximately 5.41 miles This address corresponds to a house that is NOT in the inundated area, but the nearby barn is in the inundated area. ~1 hr 45 min to arrival, 2 hr 27 min to peak

Provide courtesy notification of the following person who are not in the inundation path but have expressed interest in receiving notification.

Address	Owner/Residents	Phone	Description
230 Julie Road	Ed Bailey	(360) 378-6686 (360) 378-9554 (360) 317-8650 cell	Appears above Inundated Area
455 Boyce Road	Kate Wisnicwski	(206) 297-1042 (206) 999-1432	Appears above inundated area; Used as a vacation rental
531 Boyce Road	Jim and Lisa Lawrence	(360) 378-5575 (360) 298-1812 cell	Appears above Inundated Area
236 Ellison Lane	Roger Ellison	(360) 370-5795; (360) 298-1033 cell	Appears above Inundated Area
236 Ellison Lane	Anita Barreca	(360) 370-5795 (206) 604-4385 cell	Appears above Inundated Area
146 Nettle Creek	Mike or Tamara Gregon	(360) 378-7955 (360) 378-5884 work	Appears above Inundated Area
1314 Douglas Road	Peter J. Wangoe II	(360) 378-7278 (360) 378-8051	Appears above Inundated Area
1314 Douglas Road	Leasa Birch	(360) 378-7278 (360) 298-0422	Appears above Inundated Area
739 Telegraph Lane	Mary and Cal Ryan	(360) 378-2524	Appears above Inundated Area
862 Valley Farms Road	Chuck Tomas	(360) 378-3652 (818) 378-0495 cell	Appears above Inundated Area
862 Valley Farms Road	Evelyn Lee/Trahan	(360) 378-8719 (360) 317-4807 cell	Appears above Inundated Area
862 Valley Farms Road	Laura Tomas	(360) 378-8904 (360) 317-6931 cell	Appears above Inundated Area
1069 Bailer Hill Road	Sidney Clark	(608) 239-0125	No one living at this address
1069 Bailer Hill Road	Susan Clark	(608) 239-0234	No one living at this address
2143 False Bay Road	A Richard Weisbrod	(360) 378-5460	Unused Residence

DEACTIVATION

The Utilities Superintendent after consultation with the Town Administrator, the San Juan County and Town of Friday Harbor Emergency Manager, the Town of Friday Harbor's Fire Chief, the San Juan County Fire District #3's Chief and the DOE's representative on site will notify the impacted parties that the situation has stabilized.

The Utilities Superintendent will make the deactivation notification in the same order as on the notification flow chart.

It is possible that deactivation will occur at different times in the inundated area depending on the distance from the dam, the slope of the ground and other factors.

(In the absence of the Utilities Superintendent, the Lead Water Supervisor is responsible for fulfilling the duties of the Utilities Superintendent.

SLOWLY DEVELOPING FAILURE OR UNUSUAL SITUATION

If there is a slowly developing failure or unusual situation where failure is not imminent, but could occur if no action is taken, dam tending personnel should:

Notify the Utilities Superintendent, Town of Friday Harbor (Mike Wilks) at (360) 378-2154. In the absence of the Utilities Superintendent, the Lead Water Supervisor (Mike Deegan) at (360) 378-8353 is responsible for fulfilling the duties of the Utilities Superintendent.

Notify San Juan County/Town of Friday Harbor Emergency Services (360) 378-9932 of the potential problem and keep them advised of the situation.

Suggested Language: *We have received information or other indications that Trout Lake Dam maybe experiencing problems or that a hazardous situation is developing. We need your assistance to initiate evaluation and possible notification procedures.*

Contact the Washington State Department of Ecology, Dam Safety Office and begin any recommended procedures. Call out numbers are shown below:

- Dam Safety Office Emergency Phone Number (360) 407-6208
- Doug Johnson, Dam Safety Supervisor (360) 407-6623 direct line
- Doug Johnson, Dam Safety Supervisor (360) 971-6347 pager
- Doug Johnson, Dam Safety Supervisor (360) 588-2797 home
- Jerald LaVassar, DSO, Geotechnical Engineer (360) 407-6625 direct line
- Jerald LaVassar, DSO, Geotechnical Engineer (360) 456-1370 home

During these contacts, find out if there are any immediate actions that can be taken to reduce the risk of failure.

If necessary, implement preventative actions described in Section V, pages 1 and 2 of this plan.

If situation deteriorates, be prepared to implement NOTIFICATION FLOWCHART EAP-1 OR EAP-2 AS APPROPRIATE.

DEACTIVATION

The Utilities Superintendent (Mike Wilks), after consultation, will notify the impacted parties that the conditions have stabilized and that they can return to their normal activities.

The Utilities Superintendent will make the deactivation notification in the same order as the notification.

(In the absence of the Utilities Superintendent, the Lead Water Supervisor (Mike Deegan) at (360) 378-8353 is responsible for fulfilling the duties of the Utilities Superintendent.)

SECTION IV — POSSIBLE EMERGENCY CONDITIONS

Listed below are some, not necessarily all, of the events which can lead directly to the failure of the dam. Included after each condition is a brief outline of the steps to take in trying to stabilize the situation.

EARTHQUAKE

Very little warning time is available. Although the Finite Element Analysis of the dam conducted in 1993 showed the dam to be stable in an earthquake, should the dam fail in an earthquake, the failure is likely to occur quickly. If the Dam is breeched, the time it takes the water to get adjacent to the first residence is on the order of 5 minutes. The time for water to get to False Bay is 1 hour and 45 minutes.

If an earthquake of Richter Magnitude 5.0 or greater has been reported in the vicinity, or the responsible individual(s) has felt ground motions and experienced damage a large earthquake characterized by the following:

> *"Felt by all. Persons walk unsteadily. Windows, dishes, glassware are broken. Knickknacks, books etc. are knocked off shelves. Furniture moves or is overturned. Weak plaster and masonry crack. Trees bushes shaken visibly, or heard to rustle."*

1) Immediately, the Utility Superintendent (Mike Wilks) will conduct a general overall visual inspection of the dam. In the absence of the Utility Superintendent, the Lead Water Supervisor (Mike Deegan) will fulfill his duties.

2) If the dam is failing, or is damaged to the extent that there is increased flow passing downstream, immediately implement NOTIFICATION FLOWCHART procedures based on the nature of the observations.

3) If the dam is stable, check the dam crest for cracks or damage and the dam for additional cracking or increased flow from the cracks. If any of these have occurred, start to lower the reservoir pool level as a precautionary measure while an engineering evaluation of the structure is undertaken. Contact the DOE's Dam Safety Office (360) 407-6208 or their personnel (see activation flow charts for numbers) for further instructions. Also contact the San Juan County/Town of Friday Harbor's Emergency Management Office at (360) 378-9932. If the outlet works are damaged, it may be necessary to install siphon pipes or pumps to lower the pool level. The pool should remain drawn down until the dam can be examined by the Department of Ecology, Dam Safety Office or other qualified professional engineers.

4) Otherwise, if damage has occurred, but is not judged serious enough to cause failure of the dam, quickly observe the nature, location, and extent of the damage, and evaluate the potential for failure. Then contact the Department of Ecology, Dam Safety Office at (360) 407-6208. Also contact the San Juan County/Town of Friday Harbor's Emergency Management Office at (360) 378-9932. Provide a description of slides, sloughs, new or increased seepage, and

sudden subsidence, including the location, extent, rate of subsidence, effects on adjoining structures, springs or seeps, reservoir elevation, prevailing weather conditions, and other pertinent facts to DOE and San Juan County/Town of Friday Harbor's Emergency Management Office.

5) If there appears to be no imminent danger of dam failure the dam owner should thoroughly inspect the following:

   a) Both faces of the dam for additional cracks or increased leakage from existing cracks;

   b) Abutments for possible displacement;

   c) Spillway to confirm that continued safe operation is possible;

   d) Outlet works and valves for structural integrity;

   e) Seeps and cracks for increased flow, turbidity, or muddy water;

   f) Reservoir and downstream areas for landslides;

Report all findings to the Department of Ecology, Dam Safety Office and all other agencies that had been contacted earlier during the emergency. Also make sure to keep close watch on the dam for the next two to four weeks as some damage may not show up immediately after the quake.

FLOODING

Overtopping of the dam can usually be predicted. Warning is likely to be on the order of several hours. If the Dam is breeched, the time it takes the water to get adjacent to the first residence is on the order of 5 minutes. The time for water to get to False Bay is 1 hour and 45 minutes.

Routing of the Inflow Design Flood indicates that the spillway may not be able to handle the expected runoff without the dam overtopping. The action levels are summarized on the table immediately following this page.

Trout Lake Dam
RESERVOIR ACTION LEVELS

Elevation, feet	Inches down from crest		Dry Day	Rainy Day				
				Severe Rain	Intense Rain	Heavy Rain	Moderate Rain	Some Rain
281.00		Dam Crest						
280.92	1		NOTICE	NOTICE	NOTICE	NOTICE	NOTICE	NOTICE
280.83	2		NOTICE	NOTICE	NOTICE	NOTICE	NOTICE	NOTICE
280.75	3		NOTICE	NOTICE	NOTICE	NOTICE	NOTICE	NOTICE
280.67	4		Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
280.58	5		Every 2 hours	Continuous	Continuous	Continuous	Continuous	Continuous
280.50	6		Every 2 hours	Continuous	Continuous	Continuous	Every 2 hours	Every 2 hours
280.42	7		Every 8 hours	Continuous	Continuous	Every 2 hours	Every 2 hours	Every 8 hours
280.33	8		Every Day	Every 2 hours	Every 2 hours	Every 2 hours	Every 8 hours	Every Day
280.25	9		Mon-Wed-Fri	Every 2 hours	Every 2 hours	Every 8 hours	Every Day	Every Day
280.17	10		Mon-Wed-Fri	Every 8 hours	Every 8 hours	Every Day	Every Day	Mon-Wed-Fri
280.08	11	Top of Stop Log	Mon-Wed-Fri	Every 8 hours	Every Day	Every Day	Mon-Wed-Fri	Mon-Wed-Fri
280.00	12		Mon-Wed-Fri	Every Day	Every Day	Every Day	Mon-Wed-Fri	Mon-Wed-Fri
279.92	13		Mon-Wed-Fri	Every Day	Every Day	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri
279.83	14		Mon-Wed-Fri	Every Day	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri
			Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri
279.42	19	Spillway Crest	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri
Below 279.42			Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri	Mon-Wed-Fri

NOTICE MEANS---USE EAP TO NOTIFY DOWNSTREAM RESIDENTS OF AN UNUSUAL CONDITION
CONTINUOUS MEANS---THE DAM MUST BE CONTINUOUSLY OBSERVED
EVERY 2 HOURS MEANS---THE DAM MUST BE OBSERVED EVERY TWO HOURS ROUND THE CLOCK
EVERY 8 HOURS MEANS---THE DAM MUST BE OBSERVED EVERY EIGHT HOURS ROUND THE CLOCK
M – Means MODERATE RAIN---A PREDICTION OF 1 INCH IN 24 HOURS OR 0.5 INCH IN 12 HOURS
H – Means HEAVY RAIN---A PREDICTION OF 2 INCHES IN 24 HOURS OR 1 INCH IN 12 HOURS
I – Means INTENSE RAIN---A PREDICTION OF 3 INCHES IN 24 HOURS OR 1.5 INCHES IN 12 HOURS
S – Means SEVERE RAIN---A PREDICATION OF 4 INCHES IN 24 HOURS OR 2 INCHES IN 12 HOURS
IF THE RESERVOIR LEVELS ARE BELOW THESE ACTIONS LEVELS, THE DAM MUST BE OBSERVED AS A MINIMUM
EVERY MONDAY, WEDNESDAY AND FRIDAY

ANYTIME THE LEVEL OF WATER IN THE RESERVOIR IS WITHIN 4-INCHES OF THE CREST OR ELEVATION (280.67) OR WITHIN THE LEVELS SHOWN ON THE CHART ON THE PREVIOUS PAGE

CONTINUOUS OBSERVATION OF THE DAM IS REQUIRED

If the reservoir level is within or less than 3 inches from the crest of the dam (elevation 280.75), immediately implement the following procedures:

a) Contact San Juan County/Town of Friday Harbor Emergency Management/Services (360) 378-9932 and the Department of Ecology, Dam Safety Office (360) 407-6623 or (360) 407-6208 and inform them of the situation.

b) Gradually increase discharge through outlet works, if possible. The Utilities Superintendent (Mike Wilks) is responsible for operating the outlet to increase the downstream flow. In the absence of the Utilities Superintendent, the Lead Water Supervisor (Mike Deegan) will assume his duties.

c) Notify downstream residents of the increases in discharge, and increase the discharge.

d) Check the dam and downstream toe and abutments for any increase in flow, increase in new seepage or abnormal toe drain leakage. If there is any indication of muddy or silty flow, and/or the flow is substantially increasing implement the SLOWLY DEVELOPING FAILURE OR UNUSUAL SITUATION PROCEDURES.

e) Check for increased/decreased seepage due to a change in water level.

f) Check for cracks, slumping, sloughing, sliding, or other signs of distress near the dam abutment or crest.

EROSION, SLUMPING/SLOUGHING, OR CRACKING OF THE DAM OR ABUTMENT

Erosion, slumping/sloughing or cracking of the dam or abutment usually takes place over a long period...several months or more. Routine observation will spot a problem early while it can be mitigated. However, in unusual circumstances, cracking of the dam or settlement of the foundation can take place fairly rapidly. If the Dam is breeched, the time it takes the water to get adjacent to the first residence is on the order of 5 minutes. The time for water to get to False Bay is 1 hour and 45 minutes.

Determine the location and size of the affected area(s) (height, width, and depth) severity, estimated seepage discharge, clear or cloudy seepage, and the reservoir and tailwater elevations. If failure appears likely, immediately implement FAILURE IMMINENT PROCEDURES; if failure does not appear likely, contact Department of Ecology, Dam Safety Office for instructions.

NEW CRACKS OR INCREASE IN FLOW FROM EXISTING CRACKS

New cracks or increase in flow from existing cracks is generally a long term change...several months or more. Routine observation and measurement of flow will usually result in the detection of a problem while it can be mitigated. However, in unusual circumstances, these changes can place fairly rapidly. If the Dam is breeched, the time it takes the water to get adjacent to the first residence is on the order of 5 minutes. The time for water to get to False Bay is 1 hour and 45 minutes.

If there are new cracks or an appreciable increase in flow from the old cracks, an increase in seepage under or around the abutments of the dam, then location, size of the affected area, estimated discharge, nature of the discharge (clear or cloudy), and reservoir elevation (a map of the area may be helpful to illustrate where the problem is located) must be determined. If failure appears likely, implement FAILURE IMMINENT PROCEDURES; if failure does not appear imminent, report all findings to the DOE's Dam Safety Office and wait for further instructions.

LANDSLIDES IN TO THE RESERVOIR OR ADJACENT TO THE DAM

If the Dam is breeched, the time it takes the water to get adjacent to the first residence is on the order of 5 minutes. The time for water to get to False Bay is 1 hour and 45 minutes.

Very large rapid landslides into a reservoir have been known to put additional stress on the dam from the result surge of water displaced by the landslide. Visual inspection of the nature of the material up slope and up stream of Trout Lake Dam, makes this seem unlikely. However, a localized landslide or instability in the immediate vicinity of the dam is possible. If that happens, an assessment of the impact of the earth movement on the stability of the dam or the outlet piping should be made.

SPILLWAY AND OUTLET WORKS FAILURES

Once the O and M plan is implemented, the condition of the outlet works will be monitored thus decreasing the possibility of an unexpected sudden release of water. Small leaks can be corrected easily. Larger leaks require more effort. A sudden pipe break must be addressed immediately in order to reduce any undermining of the foundation. If the Dam is breeched, the time it takes the water to get adjacent to the first residence is on the order of 5 minutes. The time for water to get to False Bay is 1 hour and 45 minutes.

In case of sudden, planned or unplanned, large water releases from the outlet works or spillway (e.g. opening valves, pipe or stoplogs breaking), notify downstream residents and the appropriate agencies of the increased flow.

ABNORMAL WEIR OR OTHER INSTRUMENT READINGS

Once the O and M plan is implemented, the periodic readings of the weirs will allow the Town of Friday Harbor to track changes and thus to get early notification of any changes in the condition of the dam. Changes in weir reading will normally take place over a long period of time. Any sudden changes in weir readings must be quickly investigated.

After taking weir or other readings, compare the current readings to previous readings at the same reservoir level. If the reading appears abnormal, **Mike Wilks-Utilities Superintendent** is responsible for:

1) Determining:
    a) Changes from the normal readings;
    b) Other pertinent facts such as leakage through the cracks, additional flow from the abutments.
2) Contacting an engineer and the Department of Ecology, Dam Safety Office for their assistance in determining if the change is significant or not.

OTHER PROBLEMS

In case of other problems occurring that might pose a threat to the dam safety, contact the Department of Ecology, Dam Safety Office and explain the situation.

END OF EMERGENCY SITUATION AND FOLLOW-UP ACTIONS

Once conditions indicate that there is no longer an emergency at the dam site and the proper authorities (e.g. Department of Ecology - Dam Safety Office, or a professional engineer) have declared the dam safe, the Utilities Superintendent (Mike Wilks) at (360) 378-2154, will notify the impacted parties that the conditions are normal and that they can return to their normal activities.

Utilities Superintendent will make the deactivation notification in the same order as the notification.

(In the absence of the Utilities Superintendent, the Lead Water Supervisor (Mike Deegan) at (360) 378-8353 is responsible for fulfilling Mike Wilks duties.)

SECTION V — PREVENTATIVE ACTIONS

The following actions describe some of the steps that could be taken at the dam to prevent or delay failure after an adverse condition or emergency is first discovered.

ACTIONS TO BE TAKEN IN THE EVENT OF:

Reduction in Freeboard:

- Make sure that the AUG1 and AUG2 pumps are turned off.
- Increase flow in the pipeline to the water treatment to its maximum...including wasting water.
- Open the drain valve (if this can be done safely).
- Remove the stoplog if it is in place and removal can be done safely. It may be necessary to cut the stoplog or use a hoist to remove it. Personnel safety is paramount.

Overtopping by Flood Waters

- Utilize the steps above if they can be done safely.
- Immediately protect any areas at the end of the spillway or abutments that may be eroding.
- Report overtopping and any mitigation actions to the DOE's Dam Safety Office.
- If necessary, active the appropriate portion of this plan.

Increased leakage of existing cracks, new cracks, additional leakage from the Abutments

- Determine if the water from the abutments is cloudy or turbid...indicating that erosion is taking place.
- Determine if the flow is increasing.
- Immediately report the situation to DOE's Dam Safety Office
- If necessary, active the appropriate portion of this plan.

Undercutting of Soil off the End of the Spillway

- If it can be done safely, place sandbags or additional material at the toe of the spillway to prevent additional undercutting.

Bank Sloughing

- If it can be done safely, remove material if it poses a threat such as obstructing or partially obstructing the spillway.
- Determine if additional material is likely to slough and attempt to stabilize if it can be done safely.

Failure of Outlet Pipe

- Determine if the failure is downstream of the two sets of valves located at the toe of the dam and the second set about 75 feet further downstream.
- If the failure is upstream of the values, determine if the pipe can be plugged on the downstream side of the dam using normal water main repair techniques.
- If the failure is upstream of the valves, it may be necessary to obtain the services of a diver to block the outlet on the upstream side of the dam. This should be done rapidly as erosion of soil from the toe of the dam should be stopped quickly to prevent weakening the foundation of the dam. Such work is considered hazardous and must be only be attempted by professional divers.

SECTION VI — SUPPLIES & RESOURCES

An up to date listing of available that can be used is available on San Juan County Emergency Management's website at www.sanjuandem.net/resources .

A section of 36-inch corrugated metal pipe to help rebuild Prohaska Road is available in the Town of Friday Harbor's shops.

APPENDIX A

UPDATING THE EAP

UPDATING THE EAP

Updating information for the EAP is required annually and/or when major changes have occurred or when new houses have been built in the inundated areas. As a minimum, the following information needs to be checked and revisions made on an annual basis.

- Phone Numbers
- New Homes
- Supplies and the locations
- Personnel Change or Changes in Responsibilities
- Locations of copies of the EAPs
- Changes made to the dam or operational changes in the water supply system that could impact the dam.

Update Dates

APPENDIX B

LOCATIONS OF THE EAPs, EAP FLOW CHARTS, and INUNDATION MAPS

LOCATIONS OF THE EAPS, EAP FLOW CHARTS, and INUNDATION MAPS

The copies of complete EAPs, EAP Flow Charts and Inundation Maps are located at:

- Town of Friday Harbor Town Hall
- Town of Friday Harbor Water Treatment Plant
- Town of Friday Harbor Maintenance Shops
- Town of Friday Harbor Fire Department
- San Juan County/Town of Friday Harbor Emergency Management Office
- San Juan Fire District #3
- San Juan County 911 Dispatcher
- San Juan County Maintenance Shops
- Department of Ecology, Dam Safety Office

Copies of the Inundation Maps are located at the locations shown above.

Copies of individual EAP are located in the homes and other structures in the inundated area.

Individual EAPs have be prepared for:

- 346 Julie Road
- 375 Julie Road
- 530 Wold Road
- 390 Prohaska Road
- 378 Wold Road
- 74 Wold Road
- 72 Wold Road
- 112 Wold Road
- 2416 False Bay Road

APPENDIX C

RESPONSIBILITIES OF INDIVIDUALS

RESPONSIBILITIES OF INDIVIDUALS

Day to day operation and maintenance of the dam: Utilities Superintendent, Town of Friday Harbor (Mike Wilks) at (360) 378-2154. In the absence of the Utilities Superintendent, the Lead Water Supervisor, Town of Friday Harbor (Mike Deegan) at (360) 378-8353 is responsible for fulfilling the Utilities Superintendent's duties.

Implementation of the Emergency Action Plan: Utilities Superintendent, Town of Friday Harbor (Mike Wilks) or the Town Administrator, Town of Friday Harbor (King Fitch). In the absence of the Utilities Superintendent (Mike Wilks), the Lead Water Supervisor (Mike Deegan) is responsible for fulfilling the duties of the Utilities Superintendent.

Determining and identifying conditions or events that require emergency action: Mike Wilks, Utilities Superintendent, Town of Friday Harbor. In the absence of Mike Wilks-Utilities Superintendent, Mike Deegan-Lead Water Supervisor (360) 378-8353 is responsible for fulfilling the Wilks' duties of the Utilities Superintendent.

Mike Wilks-Utilities Superintendent (360) 378-2154 as representative of the dam owner is also responsible for immediately activating the EAP by:

f) Notifying Residents in downstream homes of the Emergency

g) Contacting San Juan County/Town of Friday Harbor Emergency Management

h) Contacting the San Juan County Sheriff

i) Contacting the DOE Dam Safety Section

j) Obtaining Emergency Supplies and Equipment

(In the absence the Utilities Superintendent (Mike Wilks), the Lead Water Supervisor (Mike Deegan) is responsible for fulfilling the duties of the Utilities Superintendent.

C. The Town Administrator (King Fitch) at (360) 378-2390 is responsible for Notifying the Press and News Media.

The Utilities Superintendent (Mike Wilks) is also responsible for:

c) Coordinating activities at the dam and staying in contact with the Town Administrator (King Fitch)

d) Taking emergency measures at the dam to prevent failure, as directed by the Town Administrator (King Fitch)

(In the absence of the Utilities Superintendent (Mike Wilks), the Lead Water Supervisor (Mike Deegan) is responsible for fulfilling the duties of the Utilities Superintendent.

The 911 Dispatcher is responsible for activating the NOAA alert system.

APPENDIX D

ACCEPTANCE OF THE EAP

ACCEPTANCE OF THE EAP

The following agencies have accepted the EAP and concur with the proposed notification procedures:

- Town of Friday Harbor, Dam Owner
- Town of Friday Harbor, Dam Operator
- San Juan County/Town of Friday Harbor, Emergency Services
- Washington State, Department of Ecology, Dam Safety Section
- San Juan County Fire District #3

APPENDIX E

COMMUNICATION SYSTEMS

COMMUNICATION SYSTEMS

Cell phones are not reliable at the dam site.

Town of Friday Harbor Truck Radios (but not necessarily the handhelds) can communicate with the San Juan County Sheriff's Office and the Town of Friday Harbor Fire Department from the vicinity of the dam.

Pagers

Location of Radios

- Trucks
- Water Treatment Plant
- Town Shops
- Town Hall

APPENDIX F

REFERENCES AND CORRESPONDENCE

REFERENCES and CORRESPONDENCE

References:

Guidance for performing a Failure Mode Analysis for FERC Part 12 Dam Safety Inspections, Feb, 2003, FERC

Dam Safety Evaluations of Existing Dams, 1992, US Bureau of Reclamation

Managing the Risks of Dam Project Development, Safety and Operation, Aug 1998, 18th Annual USCOLD Lecture Series, USCOLD

Quantifying the Cost of Upgrading Non-Federally Owned Dams, Oct 1994, Association of State Dam Safety Officials and FEMA

FERC Dam Safety, Independent Consultant Inspection Workshop, March 2001, Portland, OR FERC

Guidelines for Achieving Public Protection in Dam Safety Decision Making, April 1997, US Bureau of Reclamation

Guidelines for the Preparation of Standing Operating Procedures for Dams and Reservoirs, 1993, US Bureau of Reclamation

Guidelines for Reporting the Performance of Dams, October 1993, Association of State Dam Safety Officials and Stanford University

Guidelines for Developing Dam Emergency Action Plans, Feb 1995, Washington State Department of Ecology

Dams Risks to Third Parties, 1982*,* International Commission on Large Dams

Trout Lake Dam Correspondence

Topic: Trout Lake Dam
From: DOE Sep 20, 1985
Subject: Results of inspection of dam on 8/1/85

This report is the first inspection of the dam in the Town's files. There are two outlets, one outlet provides water to town; the other is an outlet or drain for the reservoir. The spillway had an earthen embankment across it. There were two CMP's though the spillway embankment. It appeared that the embankment on the spillway had been overtopped. The downstream toe was obscured by trees and brush. Suggestions...

- Earth on spillway should be removed
- Hydrology should be investigated
- Vegetation should be removed from base of the dam so that the downstream toe can be observed.
- The Town should institute a regular maintenance program.

Topic: Trout Lake Inspection Report
From: DOE Feb 3, 1988
Subject: Results of the inspection of dam on 1/20/88

The report noted the repairs that were made in 1986. This inspection was at the request of Mr. Fitch. The earthen berm on spillway had been removed. A new concrete channel was added at the end of the spillway. There is minor seepage at toe of east abutment. There is an indication that seepage increases with increasing water level. There is some indication that seepage also happens on the west abutment when the reservoir is at a high level. Seepage is indicated by the amount of brush growing. Two vertical joints in the rock on west abutment were noted. Suggestions:

- **Monitor the Seepage**---Install three weirs; two at the toe from east and west sides and one to monitor the total. Record observation is a log book.
- **Periodically observe the cracks...**monthly and record
- **Periodically measure the displacement of the dam**
- **Observe abutment and foundation conditions**. (Note any increase in width of joint to west abutment, signs of movement in rock forming the abutments, new seepage locations in abutments, sudden increase in the quantity of seepage.)
- **Annual activities**....a person should be made responsible for clearing trees and brush, cleaning of trashracks, lubrication of gate mechanisms

and records of all monitoring activity, maintenance actions, and any other activity at the dam.

- **Develop** EAP....an EAP needs to be developed for earthquakes and floods.

Topic: Trout Lake Dam
From: DOE Feb 3, 1988
Subject: Summary of results of inspection of dam on 1/20/88

Cover letter for report above but adds several long term issues...the need for an EAP and O&M manual. DOE requests that they be provided copies of monitoring data on a yearly basis for review...reservoir levels, seepage quantities, measured displacements of the dam, air temperatures at the time of measurements. They requested “as builts” of the spillway extension and drawings of the proposed bridge across the spillway.

Topic: Reconnaissance Inspection of Trout Lake Dam
From: DOE Aug 16, 1991
Subject: Results of inspection of dam on 8/2/1991

The reconnaissance was performed as a result of an increase in the seepage of the dam. Leakage was from the lower portion of the dam....lower most lift line leaks at about 4 gpm. Two more leaks were found 10 and 25 feet to the left of the above seep. These two leaks were probably 20 to 30 gpm.

Topic: Invoice for Commercial Diving
From: Emerald Seas International Dec 8, 1992
Subject: Inspection invoice for divers to obtain access to the valve and pipe in the dam. (No report was found.)

Topic: Trout Lake Dam
From: DOE Jan 13, 1993
Subject: Preliminary findings about stability of the dam

Results of inspection of the dam in April 1992.

- Dam is stable under normal loads.
- Vertical cracks are the result of shrinkage and not a sign of structural instability.
- Deterioration is taking place along the cold joints in the dam. Repairs are needed.
- Spillway does not have capacity to handle the inflow design flood. But the foundation is erosion resistant and the overtopping (by 1 foot) is not considered a problem.

Topic: Periodic Dam Safety Inspection Report
From: DOE March 1993
Subject: Inspection Report on 4/9/92 Inspection of the dam

Formal 18 page report. Results of inspection of 4/9/1992. "Fairly well maintained and operated facility" Static and Seismic stability is adequate. Issues:

- Seepage and repair of concrete. Vertical joints need to be repaired.
- Spillway is inadequate
- Outlet sluice ways and valves are inoperative.
- Need formal procedure for Operations and Maintenance
- EAP is needed
- DOE would like any available information about the design of the dam.
- At the design flood, the spillway is over topped by about a foot
- Needs written O&M plan
    - Visual inspection of the dam weekly
    - Weirs are to be recorded
- Required actions
    - Repair concrete, seal lift lines, place a 3 to 4 inch concrete cover to protect the damaged areas
    - Seal vertical cracks
    - Repair outlet works
    - O&M manual
        - Define who does the work
        - Project Data Sheet
        - Rule Curve
        - Description of each device that regulates flow in to and out of the dam
        - List items that need periodic monitoring...which items, how often, procedures for monitoring, measuring and record keeping.
        - List of items requiring period maintenance and procedures for doing the maintenance
        - List of items that need periodic inspections or testing...how often and how
    - EAP
        - Notification Procedures
        - Situations that require notifications...excessive cloudy seepage, embankment sumps or depressions on the slopes.

Topic: Draft Structural Analysis Trout Lake Dam
From: DOE April 1993
Subject: Draft Report on structural analysis of the dam

Finite Element Method analysis of the dam was undertaken. Conclusion, "Therefore, during a major seismic event, it is likely that the dam will continue to transfer the water load across the crack and into abutment rock."

Topic: Structural Analysis Trout Lake Dam
From: DOE April 1993
Subject: Report on structural analysis of the dam

Final of above report.

Topic: Repairs to Cold Joint
From: Steffen Roberson and Kirsten, Nov 30, 1993
Subject: Proposal to repair "cold joint"

Letter proposal for repairs to the cold joint.

Topic: Trout Lake Capacity Analysis
From: KCM, June 1994
Subject: Report on the volume of water stored

The latest of the capacity studies (469 MG, 318 MG, and 385 MG were suggested values under various conditions). Report states that the volume of water stored is 468 MG at capacity. (Brown and Caldwell could not determine if that counted the flashboards being in place or not.)

Topic: Trout Lake Dam
From: DOE, Jan 27, 1995
Subject: Results of the inspection of the dam on 1/20/1995

Inspection was in response to a contractor's call. When DOE's DSO looked at the dam, it really hadn't changed that much. Repairs appear to have been properly made. Some blistering but otherwise the repairs appear ok. Town should watch for blistering of the repairs after the next round of freeze thaw cycles. Future safe operation requires:

- Sealing of the remaining vertical cracks with flexible mastic...otherwise freeze-thaw of the face of the dam
- Sluice gates and downstream valves need to be inspected and made operational
- Develop formal O&M manual
- Develop EAP

Topic: Draft Trout Lake Dam Improvement Feasibility Study
From: KCM, Oct 1997
Subject: Report on various methods of raising the dam

Topic: Trout Lake Dam
From: DOE, Feb 18, 1998
Subject: Comments of DOE on the Feasibility Study of raising the lake.

> Rockfill is probably the best alternative because there isn't competition for concrete on the islands. Visual inspection gives the impression of a faulty structure...but it isn't. There are vertical cracks but they have intact aggregate interlocks. Also attached was a report from Jerald LaVassar on the seismic assessment of Trout Lake Dam.

Topic: Trout Lake Dam, Margo's Lake Dam
From: DOE, Feb 19, 1999
Subject: Letter informing Town of upcoming inspection

Topic: Trout Lake Dam, Margo's Lake Dam
From: DOE, March 24, 1999
Subject: Letter informing Town of date of inspection of dam

Topic: Trout Lake Storage Dam, Margo's Lake Dam
From: DOE, July 18, 2000
Subject: Results of brief inspection of the dam on 7/8/2000

Observations:

- There was so much brush that the downstream contact plane could not be observed
- An area 15 to 20 feet downstream of the dam should be cleared of brush
- If the splashboards are in place too soon or too late, they add to risk

Topic: Trout Lake
From: DOE, Jan 31, 2005
Subject: Requests Inundation Maps, EAP, and O&M Manuals

Observations

- The dam meets DOE's requirements on a "conditional basis"
- The dam poses a significant downstream hazard
- The Town should recalculate the dam's stability with existing conditions and knowledge because of the degree of uncertainty in the earlier analysis

- Need to know the inundated area
- O&M manual is needed
- EAP is needed

Topic: Periodic Dam Safety Inspection Report
From: DOE, Jan 2005
Subject: Results of most recent dam inspection 4/16/2002

The 1992 repairs by Quantum Construction of Anacortes on the dam itself are discussed. The repairs were accomplished by a diver hand-packing mastic into the upstream side of the cracks. Downstream was cleared of algae. There is an old dam downstream of the structure that one can use as an indication of the amount of water running around the dam. The single flashboard is installed during the month of April. Outlet works remain inoperable in the open position for the outlet valve and in the closed position for the drain valve. Replacement or repair by a diver is required if they are replaced or repaired...no requirement in the report.

Required actions:

- If dam is raised, then there is a need to restore the operation of the outlet works
- The suspected area of inundation needs to be inspected on the ground
- The Town needs to get O&M procedures in place
- The Town needs to produce an EAP

Topic: Comments to Draft EAP
From: DOE, April 23, 2007
Subject: Emergency Plan Draft

Acceptance of Emergency Plan.

SECTION III

INUNDATION MAPS

A. Flooding Dam Failure

B. Sunny Day Failure

C. Individual Residences

INUNDATION MAPS

Design Flood

INUNDATION MAPS

Sunny Day

TELEPHONE CONTACT NUMBERS

TOWN OF FRIDAY HARBOR

- Town Administrator, Mr. King Fitch (360) 378-2390
- Utilities Superintendent, Mr. Mike Wilks (360) 378-2154
- Lead Water Supervisor, Mr. Mike Deegan (360) 378-8353
- Public Works Department (360) 378-2154
- Fire Department 911 or (360) 378-4183

SAN JUAN COUNTY/TOWN OF FRIDAY HARBOR EMERGENCY SERVICES

- Director Department of Emergency Management, Mr. Brendan Cowan (360) 378-9932

SAN JUAN COUNTY FIRE

Fire Chief 911

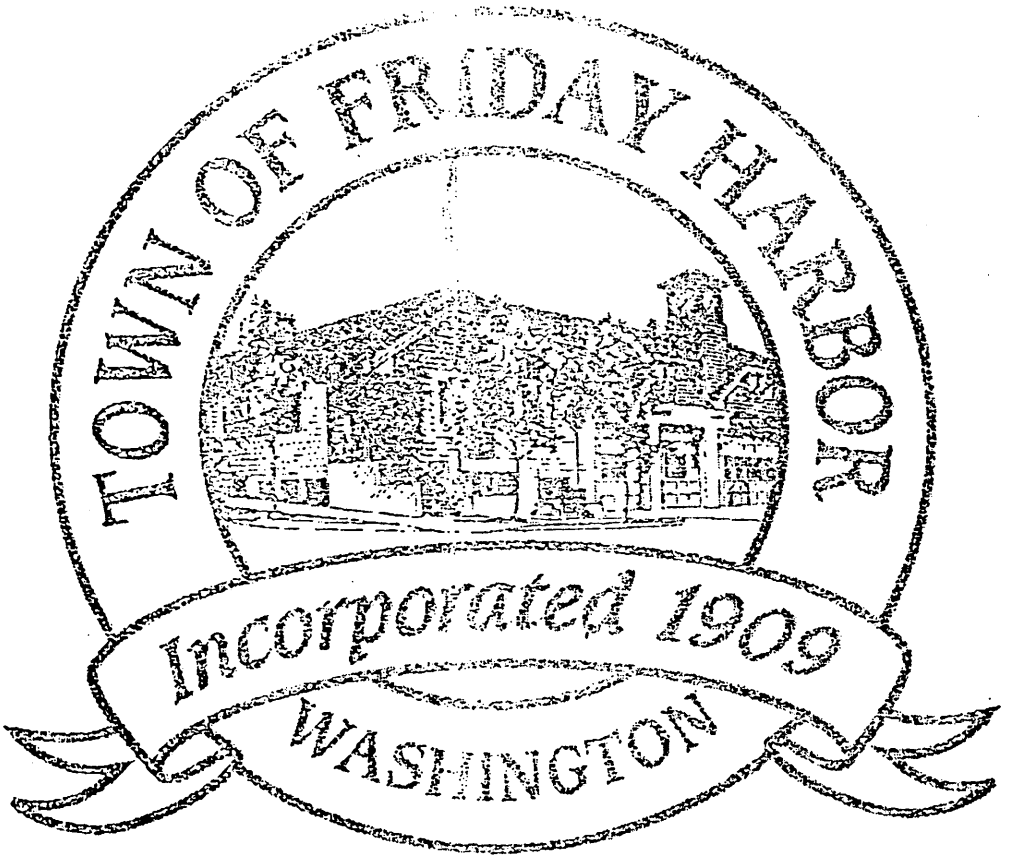
DOE DAM SAFETY OFFICE

- Dam Safety Office Emergency Phone Number (360) 407-6208
- Dam Safety Supervisor, Mr. Doug Johnson, (360) 407-6623 direct line, (360) 971-6347 pager, (360) 588-2797 home
- Geotechnical Engineer, Mr. Jerald LaVassar, (360) 407-6625 direct line, (360) 456-1370 home

WASHINGTON STATE EMERGENCY MANAGEMENT DUTY OFFICER (360) 438-8639 or 1-(800) 258-5990

Appendix H: Cross-Connection Control Plan

Cross Connection Control Manual



January 1996

COPY

ORDINANCE NO. 950

AN ORDINANCE by the Town of Friday Harbor concerning the protection of the municipal water supply from contamination or pollution from cross connections, and amending Ordinance #616 and Friday Harbor Municipal Code Chapter 13.04, and repealing Ordinance #675 in its entirety.

BE IT ORDAINED by the Council of the Town of Friday Harbor;

SECTION 1. PURPOSE. That the purpose of this ordinance is to protect the public health of the water consumer of the Town of Friday Harbor municipal water system by the control of actual or potential cross connections. It shall be the responsibility of the Town of Friday Harbor to protect the public drinking water system from contamination due to cross connection. The owner of the property in which a cross connection occurs is fully responsible for all damages incurred.

SECTION 2. Section 2 of Ordinance #616 and FHMC 13.04.020 are hereby deleted and changed to read as follows:

"13.04.020 Definitions. As used in this division:

A. "Base charge" means the monthly cost to provide services allocated to a particular class.

B. "Backflow" - The flow other than the intended direction of flow, of any foreign liquids, gases, or substances into the distribution system of the public drinking water system.

C. "Contamination" - The entry into, or the presence in, the public drinking water system of any substance or matter when present in drinking water above an acceptable level may adversely affect the health of the consumer and/or the aesthetic qualities of the water consumed.

D. "Cross Connection" - Any physical arrangement whereby a public water supply is connected, directly or indirectly, with a source of water not approved for the system, or any non-potable supply, which may be capable of contaminating the public drinking system as a result of backflow.

E. "Customer" - Any person(s), firm, or corporation that is furnished drinking water through a legal service connection to the public drinking water system.

F. "Customer classes" means the various classes of customers that the domestic water system serves. These classes are distinguished both by their use classification and their location within or outside the town limits. They are as follows:

COPY

1. Class I - Commercial (COM). A building located within the town limits whose principal use is for the providing of goods or services for compensation and connected to the town domestic water system.

2. Class I - Industrial (IND). A building located within the town limits whose principal use is for manufacturing and/or processing for compensation and connected to the town domestic water system.

3. Class I - Multifamily Residential (MFR). A building located within the town limits whose principal use is residential, designed for two or more families and connected to the town domestic water system.

4. Class I - Public Authority (P. A.). A building located within the town limits owned or operated by a public entity and connected to the town domestic water system.

5. Class I - Single-family Residential (SFR). A building within the town limits whose principal use is residential, designed for one family and connected to the town domestic water system.

6. Class II - Commercial (COM). A building located outside the town limits whose principal use is for the providing of goods or services for compensation and connected to the town domestic water system.

7. Class II - Industrial (IND). A building located outside the town limits whose principal use is for manufacturing and/or processing for compensation and connected to the town domestic water system.

8. Class II - Multifamily Residential (MFR). A building located outside the town limits whose principal use is residential, designed for two or more families and connected to the town domestic water system.

9. Class II - Public Authority (P. A.). A building located outside the town limits owned or operated by a public entity and connected to the town domestic water system.

10. Class II - Single-family Residential (SFR). A building outside the town limits whose principal use is residential, designed for one family and connected to the town domestic water system.

These classes of customers are further distinguished by the size of their individual water meters. Currently these meter sizes range from five-eighths inch to four inch meters.

G. "Department" - The Washington State Department of Health.

H. "Multi-user" means a water system user or applicant for water use with buildings that include more than one unit whether the building is intended for multifamily residential (including duplexes, apartments, and condominiums) or shops, businesses, hotels, motels, trailer courts, ports, and the like.

COPY

I. "Person" means and includes persons of either sex, associations, partnerships, and corporations whether acting by themselves or through authorized representatives; the singular number shall include the plural and the masculine shall include the feminine.

J. "Public Drinking Water System" - Any water system or supply intended or used for human consumption or other domestic uses; including source, treatment, storage, transmission, and distribution facilities where water is furnished to any community, collection, or number of individuals; however excluding a system serving one (1) single family residence.

K. "Purveyor" - The Town of Friday Harbor, or its authorized agent.

L. "Service" - A physical connection between the public drinking water system and the customer's system.

M. "Town Clerk" means the individual employed by the town under this position title, or his or her authorized representative.

N. "Town water supply system" means the water resources, storage tanks, distribution lines, fire hydrants, meters, pumps and all other appurtenances necessary for the supply of domestic water.

O. "Water supervisor" means the individual employed by the town under this position title, or his or her authorized representative."

SECTION 3. Section 3(f) of Ordinance #616 and FHMC 13.04.080 are hereby deleted and changed to read as follows:

"13.04.080 System requirements.

A. Water service into a building shall have a shutoff valve. Piping must be kept in repair and protected from freezing by the owner, and the owner or occupant shall be responsible for all damages resulting from leaks and breaks from the shutoff valve to the building.

B. No person with a property or building connected to the town water system shall alter or extend the piping of his property or building in such a manner as to meet the test of multi-use, if intended water use was for only one unit, or change the class of use other than the class applied for. Any such alteration or extension shall justify immediate disconnection from the town water system.

C. No person supplied with water from the town water system shall use it for any purpose other than that stated in the application, and/or for which the person pays water rates.

D. No person shall install or maintain any actual or potential cross connection to the public drinking water system. Any such cross connection now existing is hereby declared unlawful and shall be removed immediately

COPY

E. The control or elimination of cross connection shall be in accordance with the State of Washington Administrative Code (WAC 248-54-285), or any superseding WAC.

F. Water service to any premise shall be contingent upon the customer providing cross connection control in a manner approved by the purveyor.

G. The policies, procedures, and criteria for determining appropriate levels of protection shall be in accordance with the "Accepted Procedure and Practice in Cross Connection Control Manual - Pacific Northwest Section - American Waterworks Association, Fourth Edition", or any superseding editions, however, the Town Council may establish requirements for cross connection control more stringent than the state regulation if it is determined that conditions so dictate.

H. Backflow prevention assemblies, if required, shall:

1. be a model approved by the Department,

2. be installed under the direction of the Water Supervisor and/or under the supervision of a cross connection specialist,

3. be tested at least annually at the owners expense. Completed Test Reports shall be returned to the Town of Friday Harbor within 30 days after receipt of the yearly test notification. Tests and inspections may be required on a more frequent basis at the discretion of the Water Supervisor. Authorized employees of the Town of Friday Harbor with proper identification shall have free access at reasonable hours of the day to all parts of a premises or within buildings to which water is supplied. Water service shall be refused or terminated to any premise for failure to allow necessary inspections."

SECTION 4. Section 3(g) of Ordinance #616 and FHMC 13.04.090 are hereby deleted and changed to read as follows:

"13.04.090 Prohibited acts. The following acts are prohibited:

A. To allow water to run when not in use for the purpose intended;

B. To allow the existence of defective or leaking faucets, toilets or other fixtures. Water shall be shut off to such a building until the proper repairs have been made.

C. To install or maintain any actual or potential cross connection.

D. To open, close, turn or interfere with, to attach to, or connect with, any fire hydrant, stop valve, or stopcock, belonging to the town water department, unless authorized by the water supervisor or town clerk, and provided that this rule shall not apply to the town departments.

E. To disturb or damage any pipe, machinery, tools or other property of the town water department.

F. To introduce any substance or deleterious matter into Trout Lake or its watershed.

G. To reconnect pipes that have been disconnected, to turn water on or off without written permission from the water supervisor or town clerk when the water has been turned off for failure to pay water, sewer or refuse bills."

SECTION 5. Section 12 of Ordinance #616 and FHMC 13.04.150 are hereby deleted and changed to read as follows:

"13.04.150 Violation - Penalty.

A. Water service to any premise receiving its water from the purveyor's public drinking water system shall be contingent upon compliance with all rules and regulations of the Department and the purveyor. Service shall be discontinued to any premise for failure to comply with the rules and regulations of the Department and the purveyor.

B. A violation of any section of this chapter shall be deemed a misdemeanor and punishable by a fine of not more than five hundred dollars. Each day a violation continues shall be considered a separate violation."

SECTION 6. REPEALER. Ordinance #657 is hereby repealed in its entirety.

SECTION 7. This ordinance shall become effective following publication in accordance with State law.

ADOPTED this 15th day of September, 1994.

Wm. J. LaPorte, Mayor

SEAL of the
Town of Friday Harbor

ATTEST:

Steven Dubail, Town Clerk

AN INTRODUCTION TO CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION

OVERVIEW

The water purveyor has a responsibility to provide its customers with water that is safe under all foreseeable circumstances. Thus, in the exercise of this responsibility, the water purveyor must take reasonable precaution to protect the community distribution system from the hazards originating on the premises of its customers that may degrade the water in the community distribution system.

Technology has made it possible to deliver safe (potable) drinking water of high quality to the distribution systems of public water supplies. However, to assure safe water at the consumer's tap, it is essential that physical cross connections and backflow possibilities are eliminated from the distribution system and the plumbing systems in buildings. The backflow menace in buildings is especially significant. When this condition occurs, the potable water may become a transmitter of disease, toxic materials, or other hazardous substances. Health and water supply officials recognize that measures of protecting the source of supply, and providing treatment, are not sufficient in themselves to guarantee safe water at the consumer's tap.

Plumbing fixtures such as the consumer's tap and basin are actually the end of the water supply system, and the beginning of the sewerage system. The line of separation is sometimes finely drawn, but it determines whether the water supply system is safe for human use. Backflow from secondary or unsafe water supplies into the public supply is recognized as a potential hazard wherever such supplies are interconnected. Such an interconnection is known as a cross-connection.

There are numerous and well-documented cases where cross connections have been responsible for contaminating the drinking water and helped to spread disease. The problem of cross-connection control is a continual one because piping systems are constantly being installed, altered, or extended. All potable water purveyors are required by the Federal Clean Water Act to have cross-connection control surveillance programs to maximize the protection of potable water systems. In Washington State, cross-connection control surveillance programs are required by

WAC 246-290-490. Furthermore, in various court decisions, it has been held that the water purveyor is responsible for the delivery of safe water to the consumer.

The water purveyor is required by Washington State regulations to take necessary measures to ensure that the community potable water distribution system is protected from contamination. Such action includes mandating the installation of a backflow prevention assembly, consistent with the degree of hazard, at the service connection of specific facilities such as chemical plants, food processing plants, hospitals, medical centers, clinics, laboratories, mortuaries, nursing homes, and other premises with potential health hazard water piping connections. Additionally, customer use of water from the community distribution system for cooling or other purposes within the customer's system and later return to the community distribution system is not acceptable.

WHAT IS A CROSS-CONNECTION?

A "cross-connection" is defined as "any actual or potential physical connection between a potable water line and any pipe, vessel, or machine containing a non-potable fluid, such that it is possible for the non-potable fluid to enter the potable water system by backflow."

To clarify and expand this definition, it is important to understand these key terms:

ACTUAL CROSS-CONNECTION: A cross-connection that currently exists.

POTENTIAL CROSS-CONNECTION: A cross-connection that does not exist at the time of inspection, but may be made at any time. Examples of potential cross-connections include bypass arrangements, jumper connections, unattached hose connections, intricate piping, etc.

POTABLE WATER: Water suitable for human ingestion, free from harmful or objectionable materials.

NON-POTABLE FLUID: All liquids and gases that are not potable water. The list of non-potable fluids is virtually infinite, but includes used water, fuel, liquid chemicals, gases, etc. Used water is any potable water which is no longer in the purveyor's distribution system. In most cases, this includes any water downstream of (past) the water meter and/or property line.

BACKFLOW: The reverse from normal flow direction in a plumbing system or public water distribution system. It is caused by BACKPRESSURE or BACKSIPHONAGE. Backflow within a potable water piping system can cause contaminants to enter the drinking water through unprotected cross-connections.

BACKPRESSURE BACKFLOW: Backpressure backflow is the reverse from normal flow direction within a piping system that is the result of the "downstream pressure" being higher than the "supply pressure". Basically, the "downstream pressure" can be higher than the "supply pressure" when the water system delivers water to a point higher than its source; when the water system is connected to a pumped or pressurized system; or when the "downstream" water is heated (thermal expansion) and not given room to expand.

BACKSIPHONAGE BACKFLOW: Backsiphonage backflow is the reverse from normal flow direction in a piping system that is the result of a partial vacuum (negative pressure) within the piping system. Since backsiphonage is always associated with negative pressure in the piping system, it is important to understand how a vacuum can be produced within a system designed to be under continuous positive pressure.

BOOSTER PUMP: Backsiphonage can result when potable water is connected to the suction side of a pump. Booster pumps are used in a water system when there is a significant change in elevation or a desire for higher pressure. The hydraulic condition that occurs on the suction side of the pump can cause backsiphonage. Under higher than normal demand on the suction or discharge piping, a partial vacuum can be produced on the suction side of the pump. This condition may induce backsiphonage within the piping system.

ELEVATED PIPING: The supply line to an elevated outlet, such as an overhead tank, can result in backsiphonage. (Elevated piping can also produce backpressure).

VENTURI EFFECT: Backsiphonage can occur in a water system due to high withdrawals of water. If water flows through a pipeline at a high velocity, the pressure in the pipeline is reduced. Velocities can be increased to a point that a partial vacuum is created along the inside walls of the pipeline. Due to this differential of pressure, water and other fluids can backflow into the pipeline. This condition is known as a venturi effect. When there is a venturi effect, backsiphonage will occur wherever a tee, tap, or conduit connects to a line containing water or other fluids which are open to the atmosphere, including leaks in the water line.

HAZARDS ASSOCIATED WITH BACKFLOW CONTAMINATION: In the past, cross-connection incidents have resulted in many serious problems. It is helpful to separate the hazards created by cross- connections into three categories: biological hazards, chemical hazards and physical hazards.

Biological Hazards

Backflow incidents have been documented by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research as early as 1903. These incidents show that drinking water contaminated from cross-connections caused the deaths of numerous people. These deaths were primarily caused by serious waterborne infectious diseases such as typhoid fever and dysentery.

Although waterborne illness is rarely associated with death in the United States today, the incidence of waterborne outbreaks continues to be of concern to our public health officials. Recent publications by the Oregon State Health Division show a continuous increase in the number of infectious disease cases normally associated with water and food transmission. Currently, these waterborne diseases are of the greatest concern:

Hepatitla: Serious illness, fever, nausea, vomiting and jaundice.

Giardiasis: "Explosive", possibly long term diarrhea, excess gas and bloating, and weight loss.

Campylobacteria: Bloody diarrhea, nausea and vomiting.

Gastroenteritis: May include diarrhea, nausea, cramps, vomiting and fever.

Cross connections involving sewage or sewage contaminated water create a continued risk for transmission of these and other infectious diseases.

Chemical Hazards:

Thousands of chemicals currently used in the United States have been registered by the U.S. Environmental Protection Agency for their toxicity to humans. These chemicals range

from the raw materials used in manufacturing to the active ingredients of over-the-counter products, readily available to every American consumer.

Chemicals that are intended for use in conjunction with water are the greatest threat to drinking water. A survey of backflow incidents quickly establishes the most notorious of problem chemicals, including boiler and heat exchanger compounds (chromates, nitrates, etc.), cleaning agents (detergents, soaps, etc.), herbicides (2,4-D, silvex, etc.), insecticides (chlordane, dioxin, etc.), water conditioning chemicals (phosphates, chlorine, etc.), antifreeze (ethylene glycol, glycerine), fertilizers/fungicides/etc. (ammonium nitrate, "penta", etc.), and photo/xray/film processing chemicals.

Physical Hazards:

When certain kinds of materials are introduced into water systems, the results can be quite dramatic. Fire, explosion, destruction of property, and physical injury have occurred when cross-connections have resulted in backflow. For example, fuels such as propane may cause fires or explosions. Live steam causes burns.

Although physical injuries from cross-connections are not very common, they are of great significance due to their tremendous potential for harming people and property.

Congress passed the "Safe Drinking Water Act" with the intent of protecting the public health and welfare of all public water supply users in the United States. The Environmental Protection Agency (EPA) interpreted this mandate to mean that certain contaminants should not be found in water "delivered to the free flowing outlet of the ultimate user." Thus, these contaminants became the responsibility of the water purveyor. The EPA specifically exempted contaminants added to the water under circumstances controlled by the user (except for plumbing corrosion by-products). This was not, however, intended to absolve the purveyor of his responsibility to conduct an aggressive cross connection control program.

Normally, the risk to the water system caused by actual or potential cross connections can be cataloged into one of two categories:

High Hazard: a physical or toxic hazard which could be detrimental to health. (High hazard is also referred to as "contamination").

Low Hazard: a hazard which could cause aesthetic problems or have a detrimental effect on the quality of water in the system. (Low hazard is also referred to as "pollution").

In plumbing systems where high hazards or unknown hazards exist, a properly maintained air gap separation, or a reduced pressure backflow assembly, shall be used to protect against backpressure and/or backsiphonage of delivered water, since they offer the highest known degree of protection. Double check valve assemblies or vacuum breakers are used where low hazard (aesthetic problems or undesirable situations) may occur.

To protect in-plant (within premise) personnel, it is generally preferred to isolate the area of the premises affected rather than to install backflow protection at the meter. However, the history of cross-connection control has provided regulatory authorities with sufficient information to establish a list of those premises where hazardous cross-connections exist, or where the potential hazard is so great that these premises must be isolated from the utility's water system by a positive and reliable means. Washington State has established mandatory protection for these premises.

PREMISE ISOLATION:

There are premises which will require mandatory premise isolation. The practice of premise isolation is used to protect against cross-connections on premises where actual or potential hazards exist. Under this philosophy, the entire premise is separated from the utility's water system by means of a backflow prevention assembly installed at or near the service connection. In many industrial complexes or where access is restricted, premise isolation is the only method of system protection available to the water purveyor. However, premise isolation does not offer any protection to personnel or customers within the premise.

IN-PLANT ISOLATION:

In-plant isolation is the practice of installing backflow prevention assemblies to protect one or more cross connections within a customer's facility. This type of protection is necessary to protect in-plant personnel and customers. The backflow prevention assemblies may be sized smaller because of smaller piping, and less expensive backflow preventers may be used to isolate each specific hazard. However, extreme health hazards or water purveyor policies may also require premise isolation.

In addition to the mandatory premise isolation previously discussed, there are a number of fixtures, equipment, or areas common to many customer's premises which are actual or potential cross-connections. These fixtures, equipment, or areas must be regularly inspected and analyzed to determine their potential risk to the system. They must be provided with proper backflow protection either at the fixture, equipment, or area. Some examples of the fixtures, equipment, and areas requiring backflow protection include:

Air conditioning systems, aspirators (medical or weedicide, herbicide and pesticide aspirators), autoclaves, autopsy tables, bedpan washers, bidets, boiler feed lines, bottle washing equipment, chemical feeder tanks, chilled water systems, computer cooling lines, condensate tanks, cooling towers, decorative ponds, degreasing equipment, demineralized water systems, dental cuspidors, dialysis equipment, fertilizer injection equipment, film processors, fire sprinkler systems, landscape irrigation systems, heat exchangers, laboratory equipment, commercial laundry machines, mobile carpet cleaners, livestock drinking tanks, outboard motor test tanks, perchlorethylene reclaim machines, photo developing tanks and sinks, photostat equipment, pipette washers, radiator flushing equipment, sewer connected equipment, steam cleaners, sterilizers, stills, trap primers, used water systems, wet vacuum systems, X-ray processors.

INTRODUCTION

In order to protect the Town of Friday Harbor public potable water system from contamination Federal Public Law, Washington State Regulations, the Uniform Plumbing Code, and local Town of Friday Harbor ordinance require approved backflow prevention assemblies to be installed on all landscape irrigation systems. These guidelines have been furnished to help insure that required backflow assemblies are correctly installed to meet the various regulations.

INSTALLATION

General:

1. All backflow prevention assemblies to be installed, except atmospheric vacuum breakers, must be models approved for installation by the State of Washington, Department of Social and Health Services.

2. All backflow prevention assemblies must be installed in accordance with the requirements of the Town of Friday Harbor standard specifications.

3. A plumbing permit is required to install a backflow prevention assembly. Permits can be obtained at 60 Second St., Friday Harbor, WA 98250.

4. No stop and waste valves, or other type drains may be installed below ground level upstream of the backflow prevention assembly.

5. An inspection of the final installation by the Town of Friday Harbor water systems inspector is required. (call 378-2154).

6. The property owner must select a Washington State approved backflow assembly tester to test the backflow assembly when it is installed, and the property owner will be notified annually to have the backflow assembly re-tested. (No testing is required for properly installed air vacuum breaker backflow assemblies).

7. A reduced pressure principle backflow assembly (RPBA) is required when fertilizer is directly injected into the landscape irrigation system. The RPBA can not be installed below ground level or in areas subject to flooding.

8. Compressed air fittings, when used for blowing water from the irrigation system, must be installed downstream of the double check valve assembly. No compressed air fittings are allowed on a system using air vacuum breakers as backflow protection.

9. Air vacuum breakers (AVB) shall be installed a minimum of 6' above the highest sprinkler head.

10. No control valves may be installed downstream of an air vacuum breaker.

TOWN OF FRIDAY HARBOR
CROSS-CONNECTION CONTROL PROGRAM

PURPOSE:

To protect and maintain the bacteriological and chemical quality of the municipal potable water supply by the elimination and prevention of cross connections between the Town of Friday Harbor potable water distribution system and other sources of water or liquids used for any purposes whatsoever.

GENERAL:

Except where specifically designated herein, all words used in this procedure shall carry their customary meanings. Words used in the present tense include the future, and plural includes the singular: The word "shall" is always mandatory; the word "may" denotes a use of discretion in making a decision.

DEFINITIONS:

Utilities Maintenance Supervisor: Shall mean the Utilities Maintenance Supervisor of the Town of Friday Harbor, Washington. Any act in this procedure required or authorized by the "Utilities Maintenance Supervisor" may be done on his behalf by an authorized representative of the water department.

Public Health Officer: Shall be the duly appointed Public Health Officer of the San Juan County Health Department. Any act in this procedure required or authorized to be done by the "Public Health Officer" may be done on his behalf by an authorized representative of the San Juan County Health Department.

Building Inspector: Shall be the Building Inspector of the Town of Friday Harbor.

Water Quality Inspector: Shall be that person or persons employed by the water department that have been trained and are qualified to perform the designated inspection work.

Cross-Connection: The term "cross-connection" shall mean any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system,

well, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains, or may contain, contaminated water, sewage, or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as a result of backflow.

Public Water Supply: The system of water supply intended or used for human consumption or other domestic use, including source, treatment, storage, transmission, and distribution facilities where water is furnished by the water department, Town of Friday Harbor to the residences of the Town of Friday Harbor and the immediate surrounding area.

Auxiliary Supply: Shall mean any water supply on or available to the premises other than the public water supply.

Customer: Any person, persons, firm, or corporation that is furnished potable water from the public water supply through a legal service connection to the public water supply distribution system.

Service Connection: A connection between the public water supply distribution system and the customer's system. Except, when the customer's system distributes to more than one family dwelling, each dwelling shall be considered as a service connection.

Industrial Fluids: Shall mean any fluid or solution which may be chemically, biologically, or otherwise contaminated or polluted in a form or concentration such as would constitute a health, system, or plumbing hazard if introduced into a potable water supply. This may include, but is not limited to, all types of processed waters originating from the public water supply or auxiliary supply which may deteriorate in sanitary quality, chemicals in fluid form, plating acids and alkalis, circulated cooling waters that are chemically or biologically treated or stabilized with toxic substance, contaminated natural waters such as from wells, springs, streams, or ponds.

Liquids: The term liquid shall mean any substance that flows readily but does not expand indefinitely, such as water and industrial fluids.

Air Gap Separation: (AG): Shall mean the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture or other device and the flood rim level of the

receptacle, and shall be twice the diameter of the supply pipe measured vertically above the flood rim level of the receiving vessel. In no case shall this air gap be less than one (1) inch.

Backflow: Shall mean any flow other than in the intended direction of flow, of any foreign liquids, gasses, or other substances into the distribution system of the public water supply.

Back Pressure: Shall mean any back flow caused by a pump, elevated tank, boiler, or other means that could create pressure within the system greater than the supply pressure.

Back Siphonage: Shall mean a form of backflow due to a negative or subatmospheric pressure within the water system.

Approved Backflow Prevention Assembly: Shall mean any assembly to counteract back pressure or back siphonage, that has been approved for use by the Director, Washington State Division of Health, Department of Social and Health Services. Approved backflow prevention assemblies shall be those that have successfully passed performance tests of the University of Southern California Engineering Center or other testing laboratories so approved.

Atmospheric Vacuum Breaker: (AVB): Shall mean a backflow prevention assembly which is operated by atmospheric pressure in combination with the force of gravity. The unit is so designed to work on a vertical plane only. The moving part consists of a poppet valve which must be carefully sized to slide in a guided chamber and effectively shut off the reverse flow of water when a negative pressure exists in the supply system. No shutoff valves downstream of the AVB are allowed.

Pressure Vacuum Breaker: (PVB): Shall mean a vacuum breaker similar to an atmospheric vacuum breaker except that the checking unit "poppet valve" is activated by a spring. This type of vacuum breaker does not require a negative pressure to react and can be used on the pressure side of a valve.

Double Check Valve Assembly: (DCVA): Shall mean a backflow prevention assembly composed of two (2) single, independently acting "approved check valves," including tightly closing resilient seated ball shutoff valves located at each end of the assembly, and suitable connections (test cocks) for testing the water tightness of each check valve.

Reduced Pressure Backflow Assembly: (RPBA): Shall mean a backflow prevention assembly containing a minimum of two (2) independently acting, "approved check valves," including tightly closing resilient seated ball shutoff valves located at each end of the assembly, and suitable connections (test cocks) for testing the water tightness of each check valve, together with an automatically operated pressure differential relief valve located between the two approved check valves. During normal flow, the pressure between these two check valves shall be less than the upstream (supply) pressure. In case of leakage of either check valve, the differential relief valve, by discharging to the atmosphere, shall operate to maintain the pressure between the two check valves at less than the supply pressure.

Degree of Hazard: Shall express the results of an evaluation of a health, system, or plumbing hazard.

Health Hazard: Shall mean any condition, device, or practice in a water supply system and/or its operation that creates, or may create, a danger to the health and well-being of a customer.

Plumbing Hazard: Shall mean a cross-connection in a customer's potable water system that may permit back siphonage in the event of a negative pressure in the supply line.

System Hazard: Shall mean a threat to the physical properties of the public or the customer's potable water system by a material not dangerous to health but aesthetically objectionable that would have a degrading effect on the quality of the potable water in the system.

Code Authority and Enforcement: The enforcement of this cross-connection program in the area served by the Water Department, Town of Friday Harbor will be in accordance with the Uniform Plumbing Code, 1991 Edition, the May 1990 Fifth Edition AWWA Cross Connection Control Manual Pacific NW Section, and WAC 248.54, Rules and Regulations of the State Board of Health relating to public water supplies.

General Policy: It is the intention of this policy to provide for the permanent abatement or control of all cross-connections. Where it is physically and economically unfeasible to find or to permanently eliminate all cross-connections of the customer's water system, and when it is deemed necessary by the appropriate inspector, there shall be installed at the service connection a suitable backflow prevention assembly commensurate with the degree of hazard to the public water supply.

*** The following methods of cross-connection control are considered minimum protection at the service connection:

1. The public water supply to any medical, dental, or veterinary premises shall require an approved reduced pressure backflow prevention assembly at the service connection.

2. The public water supply to a premises on which material dangerous to health or toxic substances are handled shall require an approved reduced pressure backflow prevention assembly at the service connection.

3. The public water supply to a premises where entry is restricted so that inspection for cross-connections cannot be made with sufficient frequency or at sufficient short notice to assure that cross-connections do not exist shall require an approved reduced pressure backflow prevention assembly at the service connection.

4. The public water supply to a premises having a repeated history of cross connections being established, or re-established, shall require an approved reduced pressure backflow prevention assembly at the service connection.

5. The public water supply to a premises on which there is an auxiliary water supply and which has internal cross-connections that are not correctable or which has intricate plumbing arrangements that make it impractical to ascertain whether or not cross-connections exist, shall require an approved reduced pressure backflow prevention assembly at the service connection.

6. The public water supply to a premises having an unapproved auxiliary water supply with no known cross-connections shall require an approved reduced pressure backflow prevention assembly at the service connection.

7. The public water supply to a fire system (with anti-freeze or chemical additives) shall require an approved reduced pressure detector-check backflow prevention assembly at the service connection. The Reduced Pressure Detector Check Valve Assembly (RPDCVA) shall be complete with a 3/4" bypass RPBA, and 5/8" Rockwell SR-II water meter reading in cubic feet.

8. The public water supply to a commercial premises with no known hazards and no known cross-connections shall require an approved double check valve backflow prevention assembly at the service connection.

9. The public water supply to a premises on which is handled a substance that is objectionable, (not a health hazard), in a manner constituting a potential cross-connection shall require an approved double check valve backflow prevention assembly at the service connection.

10. The public water supply to a premises on which any non-health hazard substance is handled under pressure so as to permit entry into the public water supply, or where a cross-connection could reasonable be expected to occur, shall require an approved double check valve backflow prevention assembly at the service connection.

11. The public water supply to a fire system (with no anti-freeze or chemical additives) shall require an approved Detector Double Check Valve backflow prevention assembly at the service connection. The Detector Double Check Valve Assembly (DDCVA) shall be complete with a 3/4" bypass DCVA, and 5/8" Rockwell SR-il water meter reading in cubic feet.

SURVEILLANCE PROGRAM:

The control of cross-connections requires cooperation between the customer, water purveyor, the health officer, and the plumbing inspector. The water purveyor has primary responsibility to prevent contamination of the public water supply. The customer served, public health officer, and the building inspector are jointly responsible inspecting for contamination of the water system within the customer's premises. (See WAC 248-54). The owner must realize that he may be held responsible for acts of negligence.

A surveillance program for cross-connections and sanitary hazards requires the inspection of all new and existing buildings, structures, and grounds. As proposed, this procedure will require the full time work of one water department inspector who must be knowledgeable in the field of plumbing, piping arrangements, and cross-connection control.

The systematic program of inspection shall be established with priority given on the basis of risk to public health and shall be conducted as outlined below:

1. Upon application for a building permit, the building inspector shall require a detailed plan and specification for the plumbing installation, and shall make such detailed plan and specification data available to the water quality inspector of the water department.

2. The building inspector and the water quality inspector shall review these plans and specifications to determine the probability of cross-connections, the availability of auxiliary water supply, the handling of substances which, if introduced into the water system, would constitute a health, plumbing, or system hazard. If, upon review, it is determined that any of these conditions will exist, the water quality inspector shall coordinate with the property owner to insure such cross-connections are controlled properly.

3. During the construction phase of any new building, structure, or ground installation, the water quality inspector will perform the required cross-connection control inspection. Upon completion of the inspection, but prior to the establishment of a water service connection, the water quality inspector shall advise the customer, in writing, that subject cross-connection control inspection has been made and that further backflow prevention is or is not required. Further, the customer will be notified that a Washington State certified backflow assembly tester shall test the backflow assembly(ies) prior to use of the new water service.

BUILDINGS, STRUCTURES, AND GROUNDS:

An initial inspection (prioritized by degree of hazard) of all premises will be conducted by the water quality inspector of the water department. (A two member inspection team is highly desirable).

The initial inspection shall proceed according to the following steps:

(a) A form letter will be sent to each commercially metered customer explaining the need for a water system inspection, and requesting a convenient date and time for the inspection. Request that someone familiar with the plumbing system be on hand to answer questions, if possible.

(b) On the appointed date, the water quality inspector (and if possible, an assistant) will meet with the owner/manager (and/or an individual from the facility that is knowledgeable with the plumbing system). The water quality inspector will inspect any blue-prints or drawings of the "in plant" system that are available, discuss any questions or other problems that arise, and conduct the inspection. The water quality inspector will make a complete physical survey of all exposed piping, the underground system is to be checked as accurately as possible. All lines will be sketched on a field drawing except where intricate plumbing arrangements make it impractical. In this case, an "as-built" drawing will be requested. Each line shall be followed to its end and a survey made to determine whether there are any actual or potential cross-connections or any conditions that might tend to pollute the potable water system.

(c) Immediately upon completion of the survey, the inspection team will orally brief the owner/manager (or representative) of the findings, if desired.

(d) The water quality inspector will prepare a written report that will include, but is not limited to, the following:

1. A list of all cross-connections found, their location, and any optional methods of control.
2. Any applicable drawings, sketches, blue-prints, etc.
3. A summary of the findings, and the recommendations or requirements for corrective actions, and a time (normally 90 days) in which the corrective action must be completed.

(e) The water quality inspector shall mail one copy of the completed report to the facility owner/manager. The completed report shall include the recommendations and requirements for corrective actions and a corrective action completion date. One copy of the completed report shall reside in the water quality inspector's permanent cross-connection control file for the facility.

(f) On the corrective action completion date, the water quality inspector shall contact the facility owner/manager and ask if the corrective actions have been completed. If the corrective actions have been completed, the water quality inspector shall make a

reinspection of the facility. If the corrective actions have not been completed, a new completion date will be set.

(g) When all required actions have been completed, the file copy of the completed actions shall be placed in the cross-connection control file for the facility, together with any completed backflow assembly test report forms.

(h) Reinspection of each premises found to be subject to this procedure shall be accomplished annually or more often if the degree of hazard so indicates.

RECORDS AND REPORTS:

Cross-Connection Control Inspections File:

1. A separate jacket file shall be established by the Water Quality Division, for each individual customer that requires the installation of a backflow prevention assembly. Jacket files shall be filed in alphabetical sequence by customer name (last name first).

2. The following information shall be maintained in each individual jacket file:

   (a) Copies of all correspondence with customer relative to cross-connection control.
   (b) Copy of inspection reports complete with field drawings.
   (c) Copy of application and completed installation order.
   (d) Copies of maintenance inspection reports on all assemblies.

3. All backflow assembly test report forms shall be entered into a computer program that tracks backflow testing and dates of tests.

TOWN OF FRIDAY HARBOR
CROSS-CONNECTION CODE

Service connections and customers facilities

Cross-connection Protective Devices.

(1) In conjunction with the Uniform Plumbing Code, Chapter 10, State of Washington cross-connection regulations and the current edition of the Cross Connection Control Manual - Accepted Procedure and Practice, published by the Pacific Northwest Section, American Water Works Association, the town is committed to protect the health of the water consumer and the potability of the water in the distribution system. Inspection and regulation of all actual or potential cross-connections between potable and nonpotable systems is required in order to minimize the danger of contamination or pollution of the public potable water supply. Controlling and preventing cross-connections is accomplished by either removing the cross-connection or installing an approved backflow prevention assembly to protect the public potable water supply.

(2) The Town of Friday Harbor is required to eliminate or control all cross-connections throughout its service area. Therefore, anyone wanting or using water from the Town of Friday Harbor is required to comply with these regulations. The owner of the property in which a cross-connection occurs is fully responsible for all damages incurred.

(3) The utilities maintenance supervisor will enforce the provisions of this title. The utilities maintenance supervisor may delegate responsibilities to a certified cross-connection control specialist/inspector. The provisions of this title may supersede state regulations but in no case shall they be less stringent. All approved standards shall be approved by the Town of Friday Harbor and the utilities maintenance supervisor required by this ordinance shall be a model approved by the Washington State Department of Health Drinking Water Program.

(4) Approved backflow prevention assemblies required by this title shall be installed under the direction of the water department supervisor or his designee.

(5) All RPBAs, RPDAs, DCVAs, and PVBAs are required to be tested at least annually and all air gaps installed in lieu of an approved backflow prevention assembly shall be inspected at

least annually. Completed test reports shall be returned to the Town of Friday Harbor within 30 days after receipt of the yearly test notification. Tests and inspections may be required on a more frequent basis at the discretion of the utilities maintenance supervisor.

(6) Authorized employees of the Town of Friday Harbor with proper identification shall have free access at reasonable hours of the day to all parts of a premises or within buildings to which water is supplied. Water service shall be refused or terminated to any premises for failure to allow necessary inspections.

(7) Failure of the customer to cooperate in the installation, maintenance, repair, inspection or testing of backflow prevention assemblies required by this title shall be grounds for termination of water service to the premises or the requirement for an air gap separation.

(a) The service connections, meters, and other facilities furnished by the Town and located wholly or partially upon customer's premises are the property of the Town, which has the right to repair, replace and remove them upon discontinuance of service.

(b) The Town will not be responsible for the installation and maintenance of the water liens beyond the end of the Town's service connection or meter.

(c) The Town shall have at all reasonable times the right of ingress to and egress from the customer's premises for any purpose properly connected with the service of water to the customer.

(c) The Town will not be responsible for any loss or damage caused by any negligence or wrongful act of a customer or his authorized representative in installing, maintaining, operating, or using any or all appliances, facilities, or equipment for which water service is supplied. The customer will be held responsible for damage to the Town's facilities and other property resulting from the use and operation of appliances and facilities on customer's premises, including damage caused by steam, hot water, chemicals, etc.

WATER QUALITY REQUIREMENTS

PROJECT:
LOCATION:
CASE NO.: RELATED CASE:
DATE:

1. (NON-MEDICAL/DENTAL COMMERCIAL BUILDINGS): A double check valve assembly (DCVA) is required on the domestic water supply service, installed immediately downstream of the water meter, prior to any branch connections, and installed per Town of Friday Harbor standard specifications for vault installations of backflow assemblies. Upon approval of installation by the water quality inspector, the DCVA shall be tested by a Washington State certified backflow assembly tester, and the test report results shall be received by the water quality inspector prior to use of the water system.

2. (MEDICAL/DENTAL COMMERCIAL BUILDINGS): A reduced pressure principle backflow assembly is required on the domestic water supply service to any medical or dental building or office space which will contain water connected equipment such as film processors, autoclaves, aspirators, computer cooling lines, dental cuspidors, dialysis equipment, or other potential health hazard water connections. The placement of the reduced pressure backflow assembly (or assemblies) shall be determined by the Town of Friday Harbor water quality inspector and shall be installed per Town of Friday standard specifications.

3. If the building is equipped with a fire sprinkler system, then a detector double check valve assembly (DDCVA), complete with 3/4" bypass DCVA, and 5/8" Sensus SR-II water meter reading in cubic gallons, is required on the fire service piping, and shall be located at or near the property line, and shall be installed per Town of Friday Harbor standard specifications for vault installations of backflow assemblies for fire systems. Upon approval of the installation by the water quality inspector, the DDCVA, (and the by-pass DCVA), shall be tested by a Washington State certified backflow assembly tester, and the test report results shall be received by the water quality inspector prior to occupancy of the building.

4. Brass or dielectric unions shall be installed immediately upstream and immediately downstream of all backflow assemblies 2" and smaller. A Rockwell #912 (or approved equal) flanged coupling adapter shall be installed on the immediate upstream side of the 3" and larger backflow assemblies.

5. Integral air-vacuum breakers are required on all threaded water outlets, including sink faucets, lab faucets, janitor sink faucets, and hose bib faucets.

6. Any equipment or machinery connected to the buildings internal water system shall be protected with backflow protection commensurate with the degree of hazard imposed on the water system. Contact the water quality inspector at 378-2154 for information regarding proper backflow protection to utilize for specific equipment.

7. All landscape irrigation systems require backflow protection. Contact the water quality inspector at 378-2154 for information regarding proper backflow assembly to utilize.

WATER QUALITY REQUIREMENTS

PROJECT:
LOCATION:
CASE NUMBER: RELATED CASE NUMBER:
DATE:

1. A (double check valve assembly) (DCVA) I A (reduced pressure principle backflow assembly) (RPBA) is required on the domestic water supply service, installed immediately downstream of the water meter, prior to any branch connections, and installed per Town of Friday Harbor standard specifications for installations of specified backflow assemblies. Upon approval of the installation by the water quality inspector, the DCVA shall be tested by a Washington State certified backflow assembly tester, and the test report results shall be received by the water quality inspector prior to use of the water system.

2. If the building is (or will be) equipped with a fire sprinkler system, then a detector double check valve assembly (DDCVA), complete with 3/4" bypass DCVA, and 5/8" Sensus SR-II water meter (reading in cubic gallons), is required on the fire service piping, and shall be located at or near the property line, and shall be installed per Town of Friday Harbor standard specifications for vault installations of backflow assemblies for fire systems. Upon approval of the installation by the water quality inspector, the DDCVA (and by-pass DCVA) shall be tested

by a Washington State certified backflow assembly tester, and the test report results shall be received by the water quality inspector prior to occupancy of the building.

3. Brass or dielectric unions shall be installed upstream and downstream of all backflow assemblies 2" and smaller. A Rockwell #912 (or approved equal) flanged coupling adapter shall be installed on the immediate upstream side of the 3" and larger backflow assemblies.

4. Integral air-vacuum breakers are required on all threaded water outlets, sink faucets, and hose bibs.

5. Any equipment or machinery connected to the water system shall be protected with backflow protection commensurate with the degree of hazard imposed on the water system. If you need to know what backflow protection is required for specific equipment or machinery, contact Stan Reitan @ 378-2154.

6. All landscape sprinkler irrigation systems require backflow protection. With the exception of air-vacuum breaker installations, all other approved backflow assemblies require testing, upon installation (and at least once each year thereafter), by a Washington State certified backflow assembly tester. Test report results shall be received by the water quality inspector prior to use of the system.

WATER QUALITY REQUIREMENTS

PROJECT:
LOCATION:
CASE NO.:
DATE:

1. A double check valve assembly (DCVA) is required on the domestic water supply service, installed immediately downstream of the water meter, prior to any branch connections, and installed per Town of Friday Harbor standard specifications for vault installations of backflow assemblies. Upon approval of installation by the water quality inspector, the DCVA shall be tested by a Washington State certified backflow assembly tester, and the test report results shall be received by the water quality inspector prior to use of the water system.

2. If the building is equipped with a fire sprinkler system, then a detector double check valve assembly (DDCVA), complete with 3/4" bypass DCVA, and 5/8" Sensus SR-II water meter reading in cubic gallons, is required on the fire service piping, and shall be located at or near the property line, and shall be installed per Town of Friday Harbor standard specifications for vault installations of backflow assemblies for fire systems. Upon approval of the installation by the water quality inspector, the DDCVA, (and the by-pass DCVA), shall be tested by a Washington State certified backflow assembly tester, and the test report results shall be received by the water quality inspector prior to occupancy of the building.

3. Brass or dielectric unions shall be installed immediately upstream and immediately downstream of all backflow assemblies 2" and smaller. A Rockwell #912 (or approved equal) flanged coupling adapter shall be installed on the immediate upstream side of the 3" and larger backflow assemblies.

4. integral air-vacuum breakers are required on all threaded water outlets, including sink faucets, lab faucets, janitor sink faucets, and hose bib faucets.

5. Any equipment or machinery connected to the buildings' internal water system shall be protected with backflow protection commensurate with the degree of hazard imposed on the water system. Contact the water quality inspector at 378-2154 for information regarding proper backflow assembly to utilize for specific equipment.

6. All landscape irrigation systems require backflow protection. Contact the water quality inspector at 378-2154 for information regarding proper backflow assembly to utilize.

WATER QUALITY SECTION REQUIREMENTS

Project:
Date:

1. A reduced pressure principle backflow assembly is required on the domestic water supply service, installed immediately downstream of the water meter, prior to any branch connections, and installed per Town of Friday Harbor standard specifications. Upon approval of installation by the water quality inspector, the RPBA shall be tested by a Washington State certified

backflow assembly tester, and the test report results shall be received by the water quality inspector prior to use of the water system. CONTACT:

2. Brass or dielectric (or PVC, if approved) unions shall be installed upstream and downstream of all backflow assemblies 2" and smaller. A Rockwell #912 (or approved equal) flange coupling adapter shall be installed on the immediate upstream side of 3" and larger backflow assemblies.

3. Integral air-vacuum breakers are required on all threaded water outlets, sink faucets, lab faucets, and hose bibs.

4. Any equipment or machinery connected to the water system shall be protected with backflow protection commensurate with the degree of hazard imposed on the water system. This includes photo-processors, x-ray equipment, sterilizers, and bed pan washers.

5. All landscape irrigation systems require backflow protection installed per Town of Friday Harbor standard specifications.

I wish to advise the (2" Febco double check valve assembly located at the north corner of your facility) was last tested on (date of test) by (name of backflow tester).

Washington State regulations require backflow assemblies to be tested at least once each year to insure they are properly functioning. I am enclosing the necessary backflow assembly test report form and a list of Washington State certified backflow assembly testers you can contact to perform your required testing.

Please have this backflow assembly tested, and return the white copy of the completed test report form to this office prior to (target date). If you have any questions, please contact me at 378-2154.

Thank you for your cooperation in this matter.

Sincerely,

Stan Reitan, Utilities Maintenance Supervisor

or

Dear (Property Owner),
TOWN OF FRIDAY HARBOR
Stan Reitan, Utilities Maintenance Supervisor
Water Department
P.O. Box 219
501 Marguerite St.
Friday Harbor, WA 98250

Phone: 360/378-2154 Fax: 360/378-5065

It has come to my attention that you have an artesian water well located in the front yard of your property. You are also connected to the Town of Friday Harbor public water system. The unapproved auxiliary well water supply system on your property represents a potential hazard to the Town of Friday Harbor public water supply system.

You have the following two options available to you.

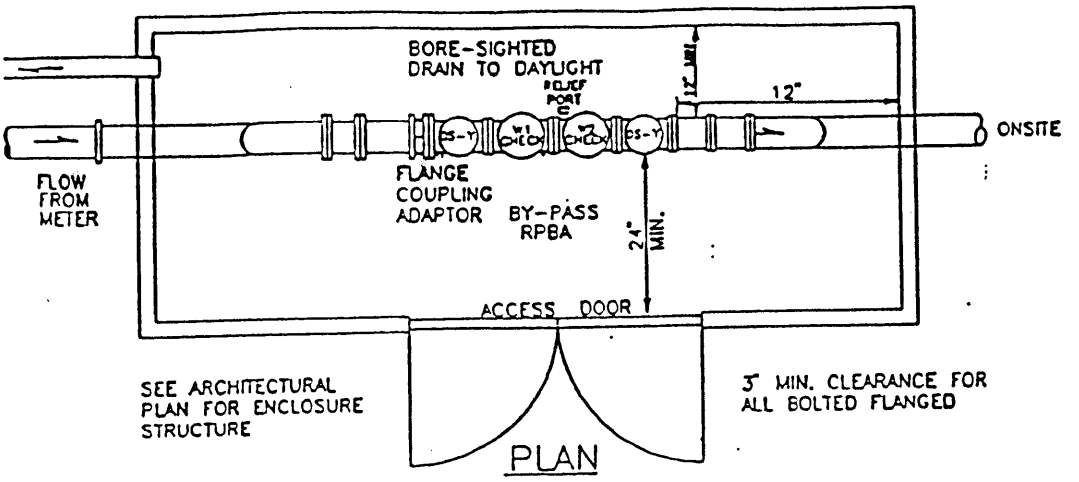
Option #1: You can discontinue the use of the well system by removing all of the threaded connections and welding a watertight seal on the well pipe casing, so that water cannot be withdrawn from the well. If you choose this option, nothing else will be required by the Town of Friday Harbor.

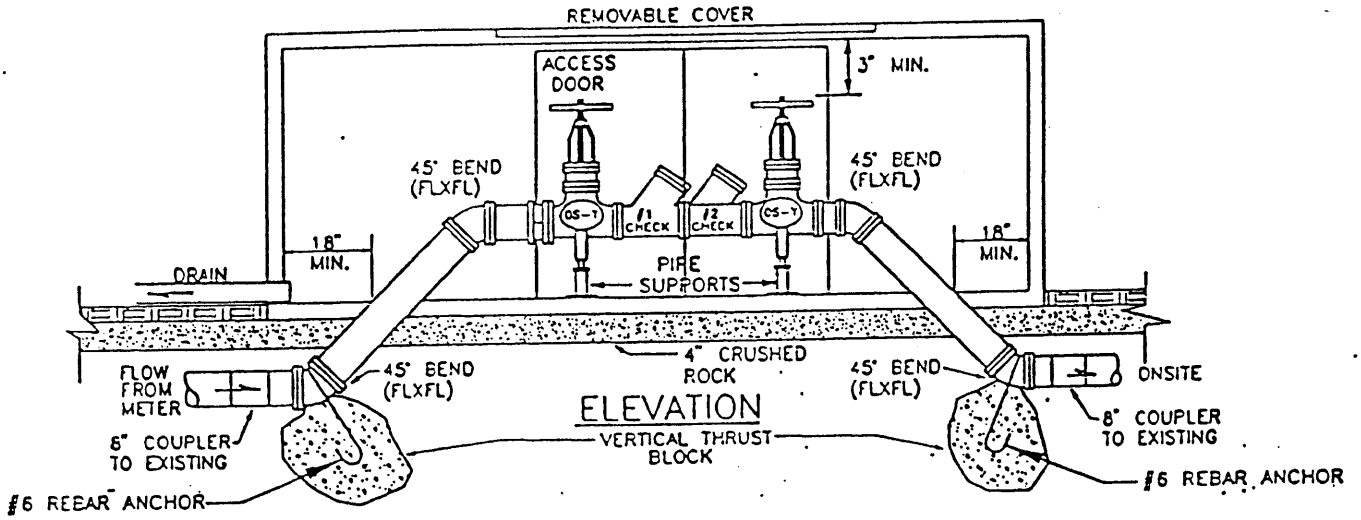
Option #2: You can keep the well system active, as it is. If you choose this option, you must protect the Town of Friday Harbor public water system from possible contamination from your well by installing a Reduced Pressure Principle Backflow Assembly on your city water supply piping, immediately downstream of the existing water meter, prior to any branch connections. This option has some associated costs. The installation costs for the required backflow preventer would be approximately $350.00 or more. Additionally, the backflow preventer must be tested by a Washington State certified backflow assembly tester when it is installed, and at least once each year thereafter. This testing costs approximately $30.00 annually. This type of backflow preventer is installed "above ground" and may present an unappealing sight to visitors.

Please let me know, without delay, which option you intend to choose.

Thank you for your cooperation in this matter.

Stan Reitan
Utilities Maintenance Supervisor





N.T.S.

NOTES:

1. INSTALLATION OF THESE APPROVED BACKFLOW ASSEMBLIES SHALL BE IN ACCORDANCE WITH THE "ACCEPTED PROCEDURE AND PRACTICE IN CROSS-CONNECTION CONTROL" MANUAL OF THE CROSS-CONNECTION CONTROL COMMITTE, PACIFIC N.W. SECTION OF THE A.W.W.A. MAY, 1990, FIFTH EDITION MANUAL.

2. BACKFLOW ASSEMBLIES MUST BE SELECTED FROM WASHINGTON STATE DEPARTMENT OF SOCIAL AND HEALTH SERVICES' LIST OF BACKFLOW ASSEMBLIES APPROVED FOR INSTALLATION IN WASHINGTON STATE, MARCH 15, 1991.

3. IMMEDIATELY UPON INSTALLATION OF AN APPROVED BACKFLOW ASSEMBLY, (AND YEARLY THEREAFTER), THE ASSEMBLY SHALL BE TESTED BY A WASHINGTON STATE CERTIFIED BACKFLOW ASSEMBLY TESTER, WHO SHALL PROMPTLY FORWARD THE TEST REPORT RESULTS TO: CITY OF PUYALLUP, WATER QUALITY OPERATIONS, 218 WEST PIONEER, PUYALLUP, WA 98371.

4. OS & Y GATE VALVES SHALL HAVE SUPERVISED TAMPER SWITCHES, LOCATED AS DIRECTED BY OWNER.

5. ALL ELECTRICAL SHALL BE INSPECTED BY A WASHINGTON STATE ELECTICAL INSPECTOR.

6. RPDCA MUST BE PURCHASED AND INSTALLED AS A UNIT. NO MODIFICATIONS TO ANY PART OF THE ASSEMBLY ARE ALLOWED.

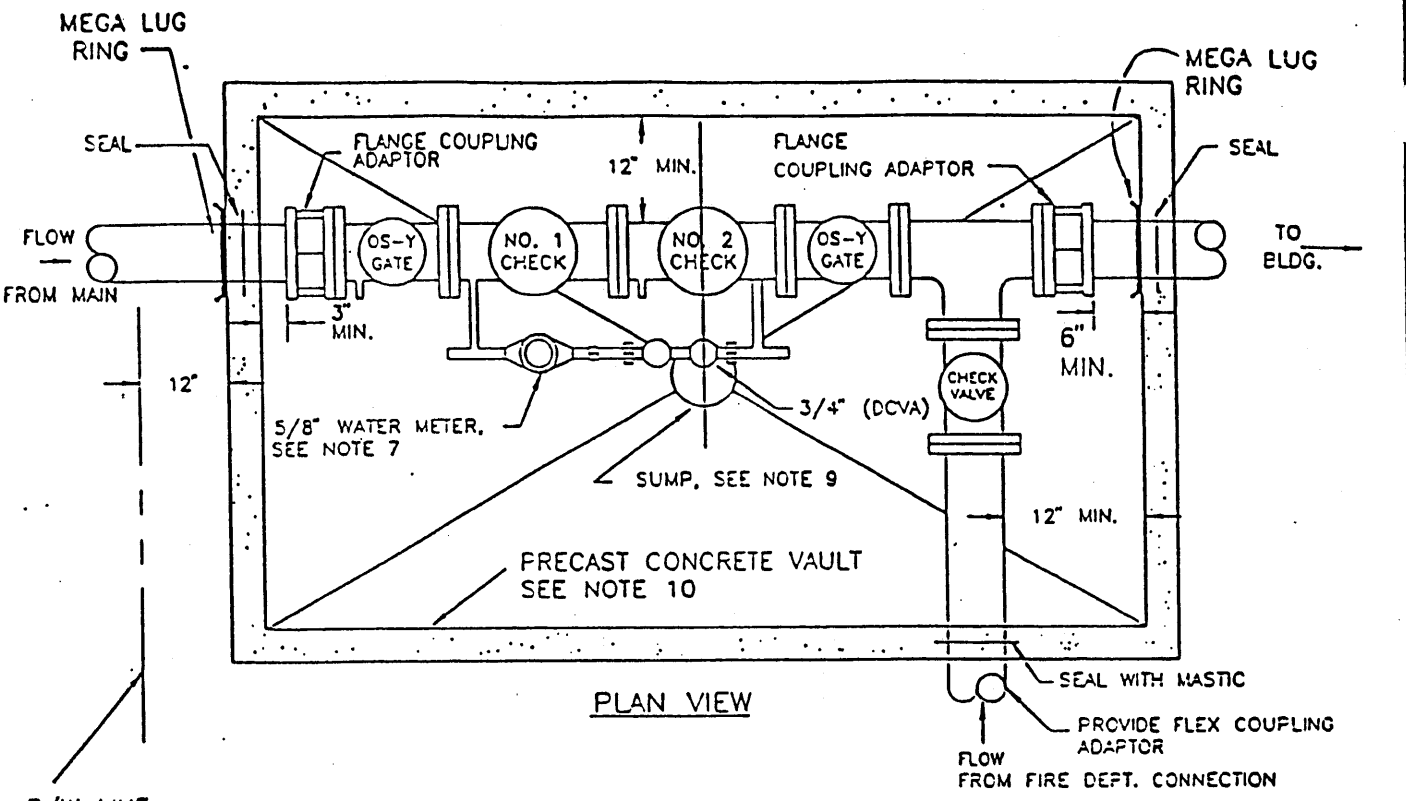
7. PIPE SUPPORTS SHALL BE RUST-PROTECTED WITH ALUMINUM PAINT.

8. PROVIDE FREEZE PROTECTION AS DIRECTED BY OWNER.

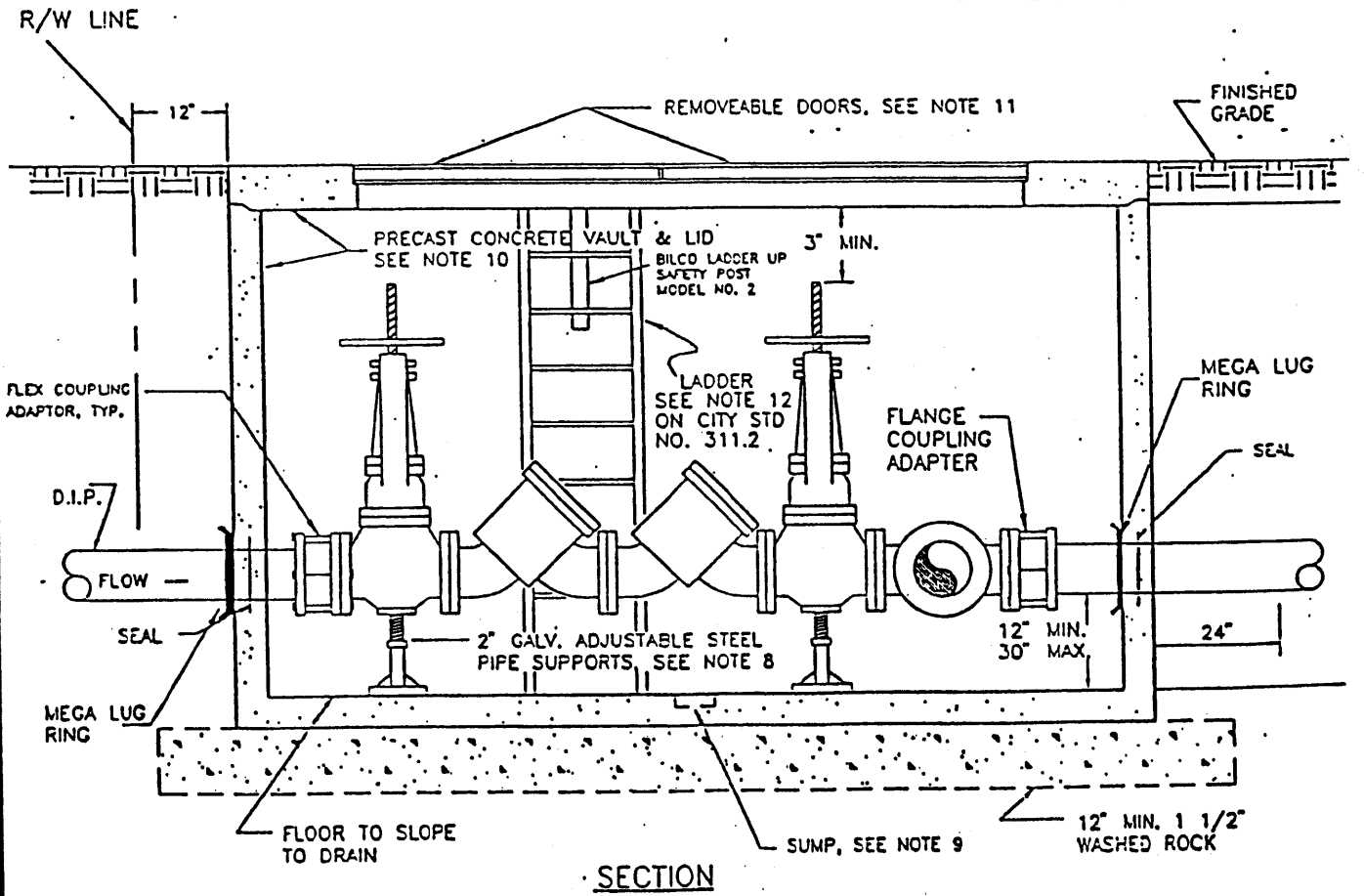
TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

8" REDUCED PRESSURE BACKFLOW ASSEMBLY

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	7-13-93	NO. 315
FILE NAME \WATER\315RPBA8.DWG		CHECKED BY G. STIDHAM		



PLAN VIEW



SECTION

TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

DOUBLE DETECTOR-CHECK VALVE ASSEMBLY INSTALLATION

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	6-15-93	NO. 311.1
FILE NAME \WATER\311DDCVA.DWG		CHECKED BY G. STIDHAM		

NOTES FOR: DOUBLE DETECTOR CHECK VALVE ASSEMELY (DDCVA) INSTALLATION

1. INSTALLATION OF THE APPROVED BACKFLOW ASSEMELY SHALL BE IN ACCORDANCE WITH THE "ACCEPTED PROCEDURE AND PRACTICE IN CROSS-CONNECTION CONTROL" MANUAL, OF THE CROSS-CONNECTION CONTROL COMMITTEE, PACIFIC N.W. SECTION OF THE A.W.W.A., MAY 1990, 5TH EDITION MANUAL.

2. BACKFLOW ASSEMBLY MUST BE SELECTED FROM WASHINGTON STATE DEPARTMENT OF SOCIAL AND HEALTH SERVICES' LIST OF BACKFLOW PREVENTION ASSEMBLIES APPROVED FOR INSTALLATION IN WASHINGTON STATE, LATEST EDITION.

3. UPON INSTALLATION OF THE APPROVED BACKFLOW ASSEMBLY, (AND YEARLY THEREAFTER), THE ASSEMBLY SHALL BE TESTED BY A WASHINGTON STATE CERTIFIED BACKFLOW ASSEMBLY TESTER, WHO SHALL PROMPTLY FORWARD THE TEST RESULTS TO: THE CITY OF PUYALLUP, WATER QUALITY OPERATIONS, 218 WEST PIONEER, PUYALLUP, WA. 98371.

4. DOUBLE DETECTOR CHECK VALVE ASSEMBLY OS & Y GATE VALVES SHALL HAVE SUPERVISED TAMPER SWITCHES.

5. ALL ELECTRICAL SHALL BE INSPECTED BY BY A WASHINGTON STATE ELECTRICAL INSPECTOR.

6. DDCVA MUST BE PURCHASED AS A UNIT. NO MODIFICATIONS TO ASSEMBLY ARE ALLOWED.

7. WATER METER SHALL BE A ROCKWELL SR-2/CF OR AN APPROVED EQUAL. READING IN CUBIC FEET.

8. PIPE SUPPORTS SHALL BE RUST-PROTECTED WITH ALUMINUM PAINT.

9. A 1/4 HP SUMP PUMP SHALL BE INSTALLED IN THE SUMP PIT OF THE VAULT. IT SHALL BE WIRED PER WASHINGTON STATE ELECTRICAL CODE AND INSPECTED BY AT STATE ELECTRICAL INSPECTOR. THE DISCHARGE PIPE SHALL BE CONNECTED TO THE NEAREST ON SITE STORM DRAINAGE STRUCTURE OR DRAIN TO DAYLIGHT.

10. THE VAULT SHALL BE A PRECAST CONCRETE VAULT SIZED TO MEET THE CLEARANCE REQUIREMENTS SHOWN ON THE DETAIL.

11. REMOVABLE DOORS SHALL BE A MINIMUM OF 6'-0" X 3'-0" DIAMOND PLATE DIAMOND PLATE HINGED LOCKING DOORS, WITH HINGES LOCATED AT EACH END OF OPENING. DOORS SHALL HAVE AN H-20 LOAD RATING IN AREAS THAT ARE SUBJECT TO VEHICLE TRAFFIC. DOORS SHALL BE SPRING LOADED WITH OPEN POSITION LOCK.

12. A GALVANIZED LADDER SHALL BE SET INSIDE THE VAULT FOR ACCESS INTO THE VAULT: IT SHALL BE SECURED TO THE VAULT WITH 1/2 " DIA. BOLTS EPOXIED TO THE VAULT LID AND FLOOR.

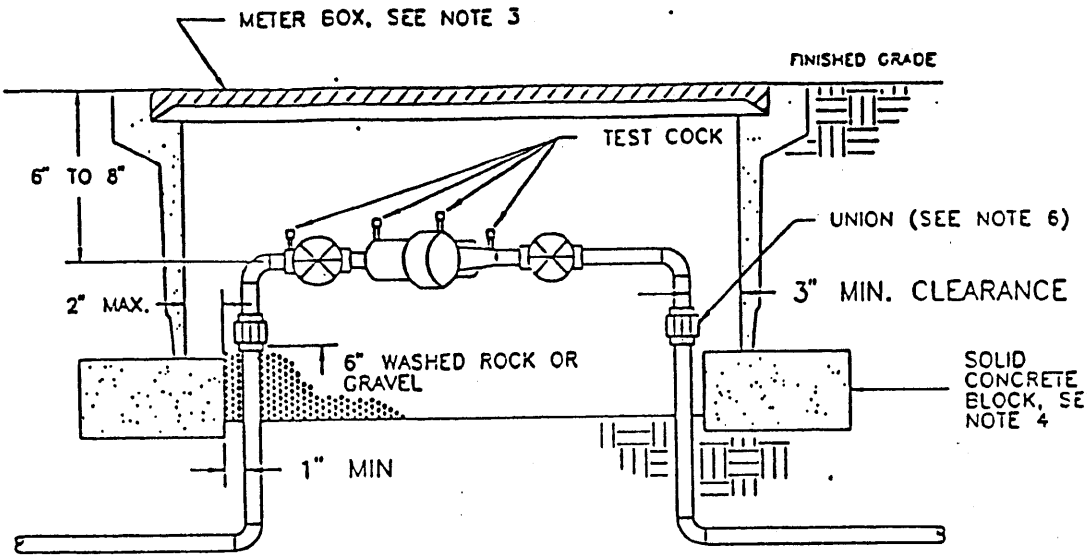
13. A BILCO LADDER UP SAFETY POST MODEL NO. 2 SHALL BE ATTACHED TO THE LADDER STEPS.

14. THE FIRE DEPARTMENT CONNECTION SHALL BE LOCATED WITHIN 15 FEET OF A FIRE HYDRANT BUT NOT LESS THAN 10 FEET.

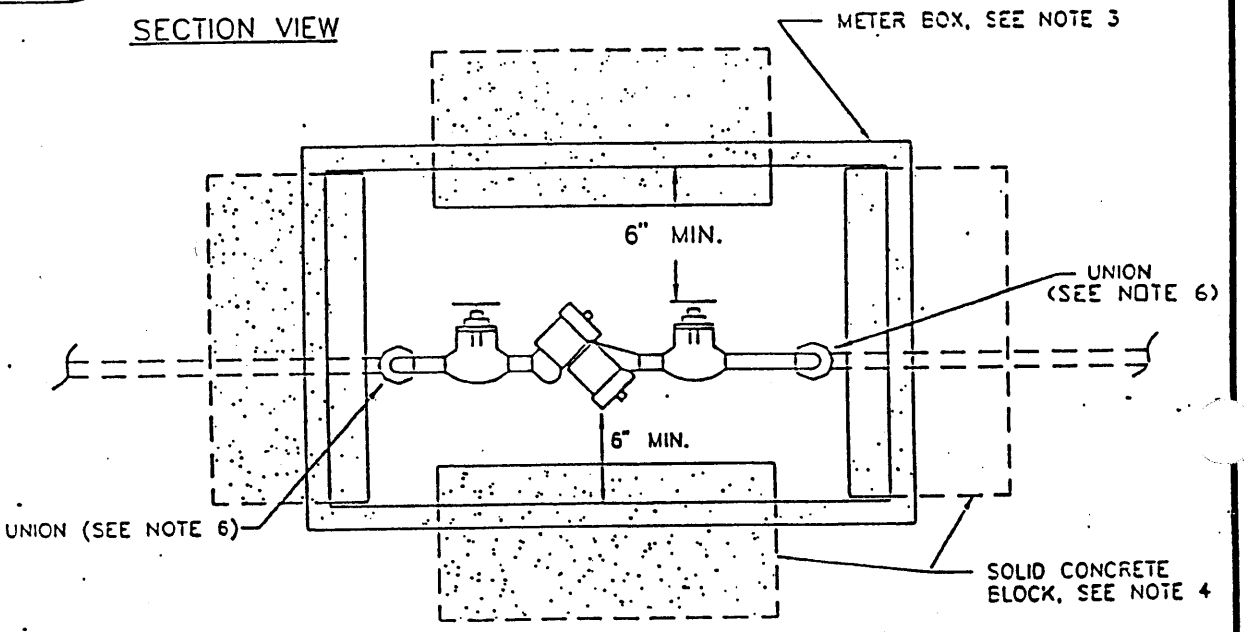
TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

DOUBLE DETECTOR-CHECK VALVE ASSEMBLY INSTALLATION

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	2-25-94	NO. 311.2
FILE NAME \WATER\311DDCVA.DWG		CHECKED BY C. STIDHAM		



SECTION VIEW



PLAN VIEW

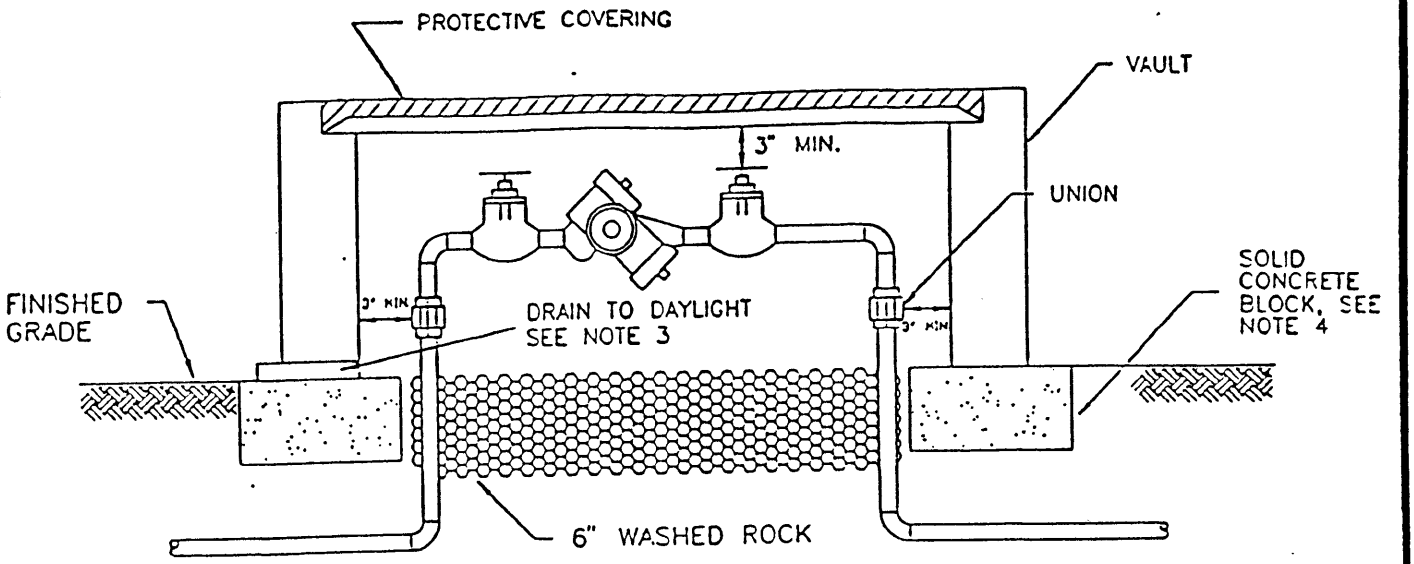
NOTES: 2" AND SMALLER DCVA INSTALLATION

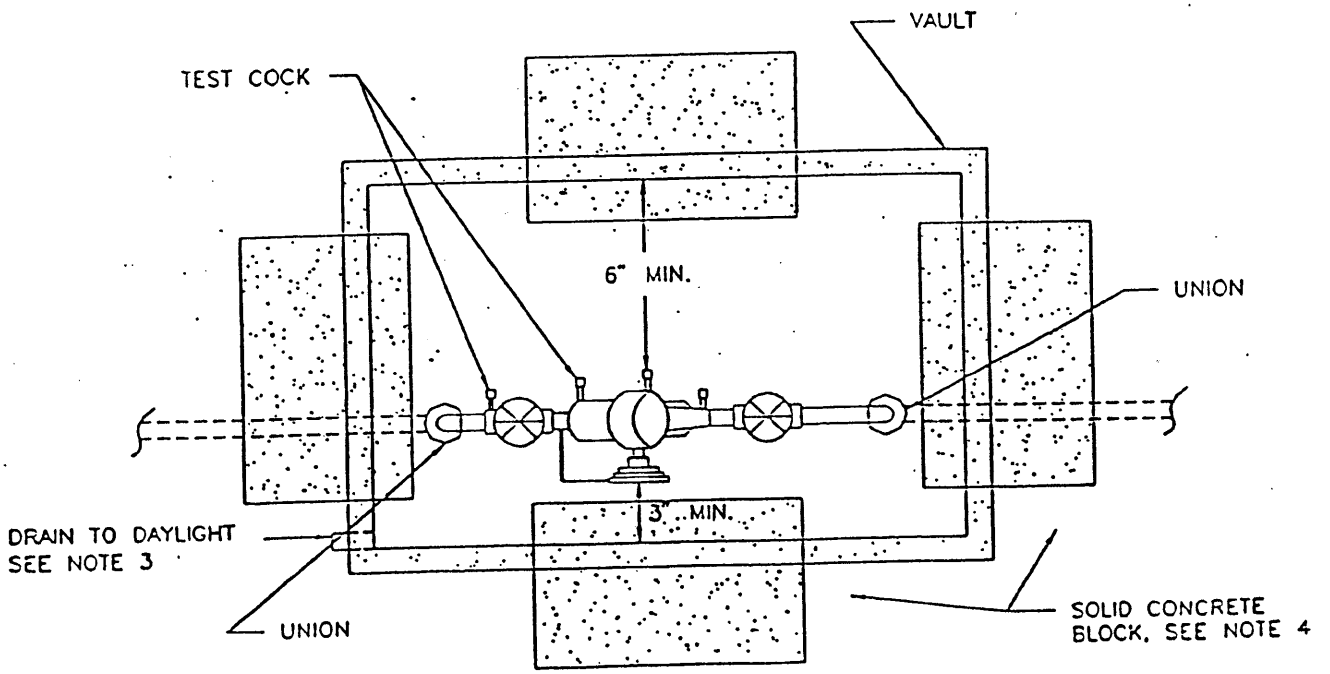
1. DCVA IS TO BE PLACED IMMEDIATELY DOWNSTREAM OF WATER METER.
2. DCVA IS TO BE PROTECTED FROM FREEZING.
3. METER BOX SHALL BE LARGE ENOUGH TO ALLOW THE MINIMUM SET BACKS ILLUSTRATED ABOVE. METER BOX LID SHALL BE A TRAFFIC METER READER LID. H-20 LOADING.
4. METER BOX SHALL BE SUPPORTED BY FOUR 16"x8"x4" SOLID CONCRETE BLOCKS
5. DCVA SHALL BE TESTED, UPON INSTALLATION, BY A WASHINGTON STATE CERTIFIED BACKFLOW ASSEMBLY TESTER, AND THE REPORT FORM SHALL BE RECEIVED BY THE WATER OPERATIONS INSPECTOR PRIOR TO OCCUPANCY.
6. DIELECTRIC UNIONS MUST BE USED TO SEPARATE DISSIMILAR MATERIALS.

TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

2" AND SMALLER DOUBLE CHECK-VALVE ASSEMBLY INSTALLATION

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	2-25-94	NO. 309
FILE NAME \WATER\209DCVA2.DWG		CHECKED BY G. STIDHAM		





TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

2" AND SMALLER REDUCED PRESSURE BACKFLOW ASSEMBLY INSTALLATION

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	9-92	NO. 310.1
FILE NAME \WATER\310RPBA2.DWG		CHECKED BY C. STIDHAM		

1. THE RPBA SHALL BE INSTALLED WITH ADEQUATE SPACE TO FACILITATE MAINTENANCE AND TESTING. IT SHALL BE TESTED AFTER INSTALLATION, BY A WASHINGTON STATE CERTIFIED BACK-FLOW ASSEMBLY TESTER, TO INSURE ITS SATISFACTORY OPERATION.

2. AN RPBA SHALL NOT BE INSTALLED IN A PIT BELOW GROUND LEVEL. SEMI-BURIED PITS MAY BE ACCEPTABLE IF THE RPBA IS INSTALLED ABOVE GROUND OR MAXIMUM FLOOD LEVEL IN A VAULT WITH AN APPROVED AIR GAP BETWEEN THE RELIEF VALVE PORT AND A BORE-SIGHTED DAYLIGHT DRAIN.

3. THE PROTECTIVE COVERING FOR THE RPBA MUST INCLUDE A DAYLIGHT DRAIN. THE DRAIN MUST BE ABLE TO BE BORE SIGHTED. IT MUST BE INSTALLED ABOVE GROUND OR MAXIMUM FLOOD LEVEL, WHICHEVER IS HIGHER. THE DRAIN MUST ALSO BE ABLE TO HANDLE THE VOLUME OF WATER THAT POTENTIALLY COULD BE DISCHARGED FROM THE RELIEF VALVE PORT.

4. RPBA MUST BE INSTALLED WITHIN A VAULT OR OTHER PROTECTIVE COVERING.

5. RPBA MUST BE PROTECTED FROM FREEZING.

6. AN RPBA INSTALLED MORE THAN FIVE (5) FEET ABOVE FLOOR LEVEL MUST HAVE A PLATFORM UNDER IT FOR THE TESTER OR MAINTENANCE PERSON TO STAND ON. THE PLATFORM MUST MEET ALL APPLICABLE SAFETY STANDARDS AND CODES.

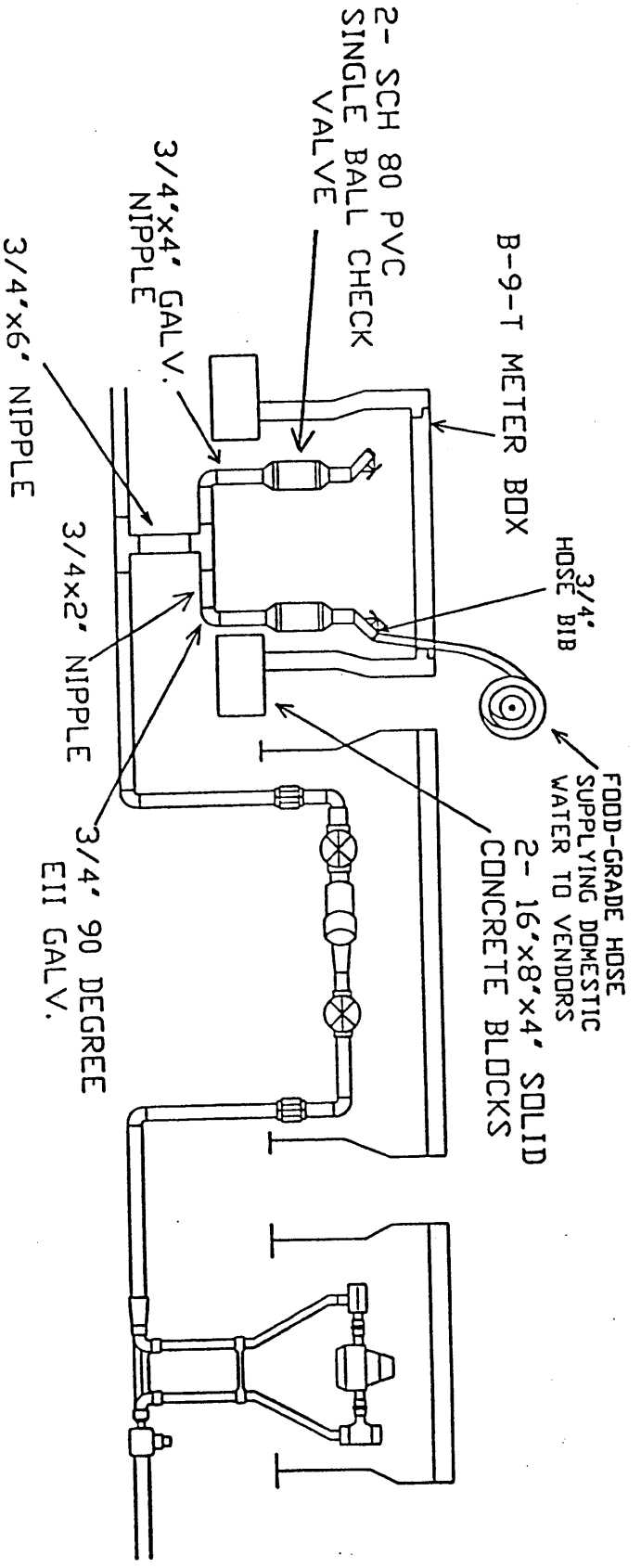
7 WHEN THE RPBA IS LOCATED INSIDE A BUILDING IT SHALL BE INSTALLED IN A LOCATION WHERE BOTH THE OCCASIONAL SPITTING FROM THE RELIEF VALVE PORT AND THE POSSIBLE CONSTANT DISCHARGE DURING A FOULED CHECK VALVE SITUATION WILL NOT BE OBJECTIONABLE. AN APPROVED AIR GAP FUNNEL ASSEMBLY, EITHER PROVIDED BY THE MANUFACTURER OR FABRICATED FOR THE SPECIFIC INSTALLATION, MAY BE INSTALLED TO HANDLE THE OCCASIONAL SPITTING OF THE RELIEF VALVE DUE TO PRESSURE FLUCTUATIONS. A LINE FROM THIS FUNNEL ASSEMBLY MAY THEN BE RUN TO AN ADEQUATELY SIZED FLOOR DRAIN OF EQUAL OR GREATER SIZE. IT MUST BE EMPHASIZED THAT THE AIR GAP FUNNEL ASSEMBLY WILL HANDLE ONLY THE OCCASIONAL SPITTING AND WILL NOT CONTROL FLOW IN A CONTINUOUS RELIEF SITUATION.

8. GOOD PLUMBING PRACTICE RECOMMENDS A STRAINER WITH BLOWOUT TAPPING AHEAD OF THE RPBA.

TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

2" AND SMALLER REDUCED PRESSURE BACKFLOW ASSEMBLY INSTALLATION NOTES

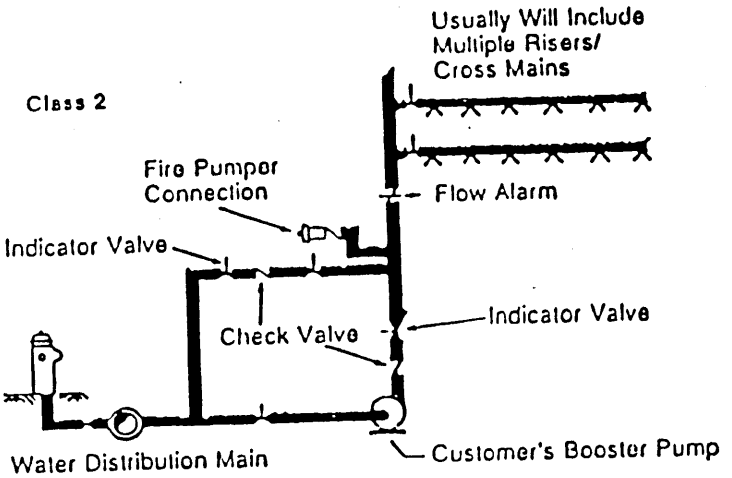
DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	9-92	NO. 310.2
FILE NAME \WATER\310RPBA2.DWG		CHECKED BY G. STIDHAM		



TOWN OF FRIDAY HARBOR PUB. WORKS
P.O. BOX 219 / 501 MARGUERITE ST.
FRIDAY HARBOR, WA 98250

HOSE BIB-
DOUBLE CHECK ASSEMBLY

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	9-92 5-95	?
FILE NAME: F:\COMMON\HOSE.DWG		CHECKED BY: G. STIDHAM		



Exceptions to Class 1 and Class 2

An approved backflow prevention assembly should be installed on a Class 1 or Class 2 system when the following special conditions are experienced:

- When underground fire sprinkler pipelines are parallel to and within 10 feet horizontally of sewer pipelines or other toxic materials.

- When water is supplied to a site or system from two or more water utility service points or from two or more different water utilities.

- Occupancies or changes in occupancies that involve the usage, storage or handling of types and quantities of materials in a manner that could present a significant health hazard to the domestic supply.

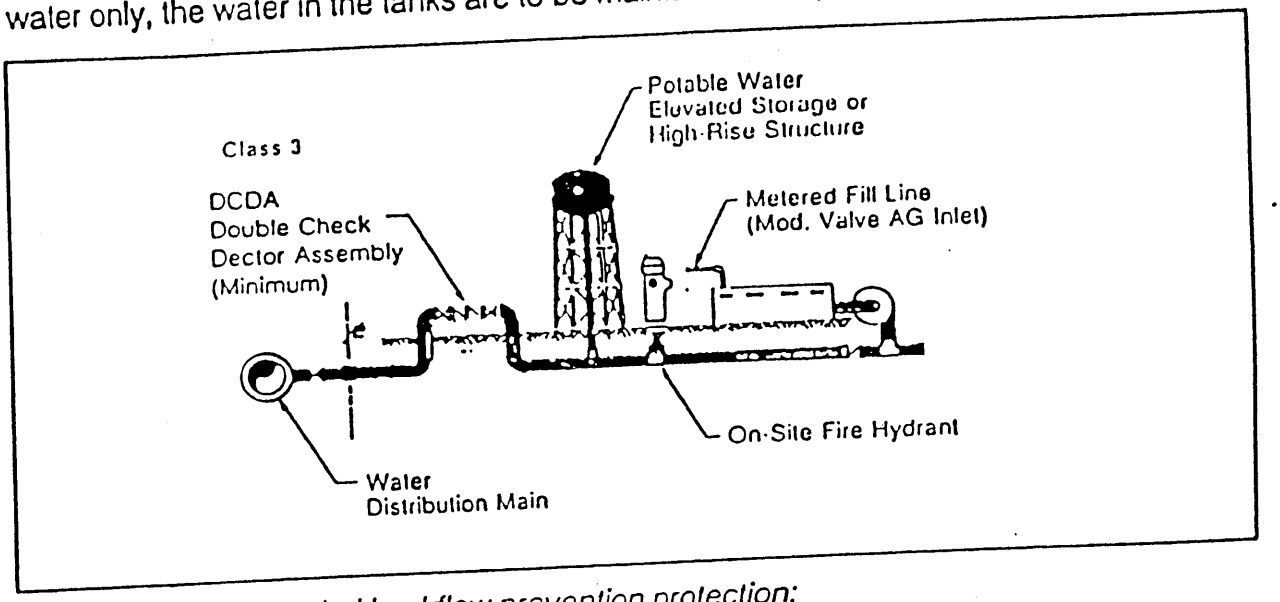
- Premises with unusually complex piping systems (usually these premises will have an approved backflow prevention assembly on the domestic service.)

- Systems with pumper connections in which corrosion inhibitors or other chemicals are added to tanks or fire trucks, or where the water purveyor cannot be assured of the potability of the input to the pumper connection.

Class 1 and 2 with special conditions, recommended backflow prevention protection:

- Approved double check assembly
- Approved double check detector assembly.

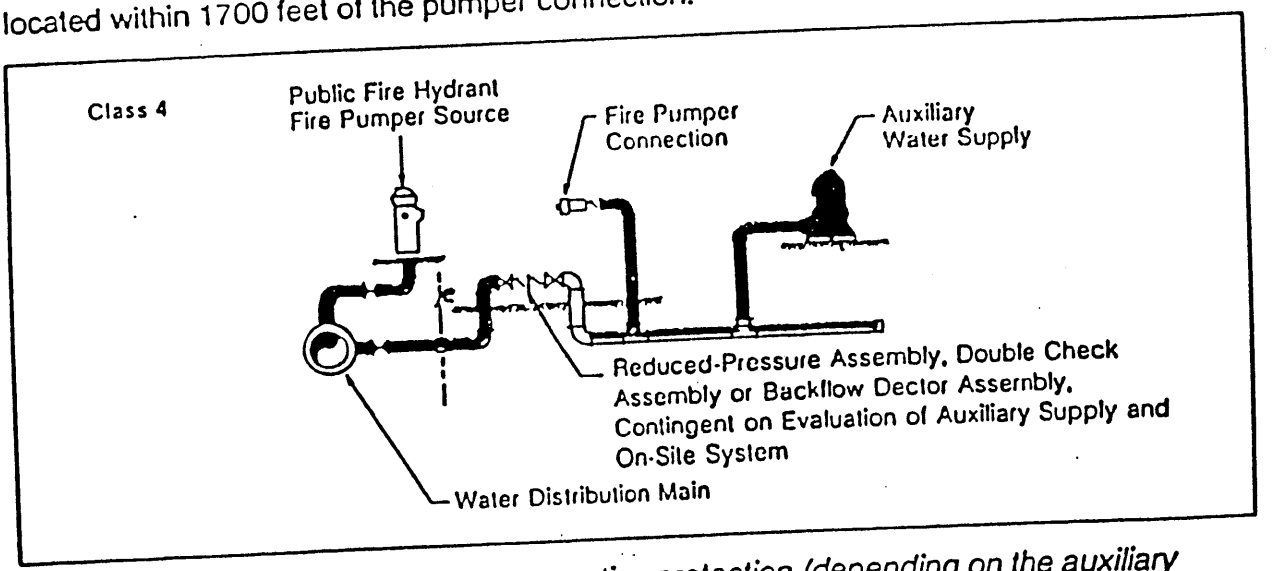
Class 3 - Direct connection from public water supply mains, plus one or more of the following: elevated storage tanks; fire pumps taking suction from above ground covered reservoirs, or tanks; and pressure tanks (all storage facilities are filled or connected to public water only, the water in the tanks are to be maintained in a potable condition).



Class 3 recommended backflow prevention protection:

- Approved double check assembly
- Approved double check detector assembly

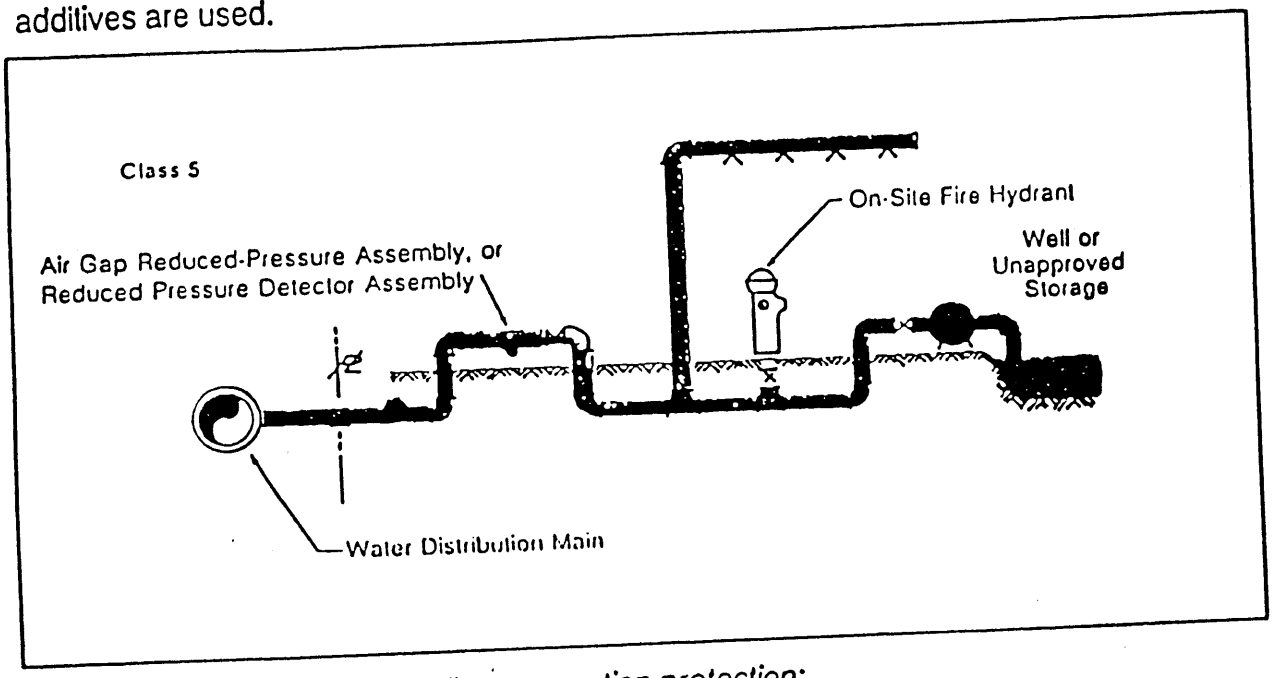
Class 4 - Directly supplied from public mains with an auxiliary water supply dedicated to fire department use and available to the premises, such as an auxiliary supply located within 1700 feet of the pumper connection.



Class 4 recommended backflow prevention protection (depending on the auxiliary supply quality):

- Approved double check assembly
- Approved double check detector assembly
- Approved reduced pressure assembly
- Approved reduced pressure detector assembly
- Approved air gap

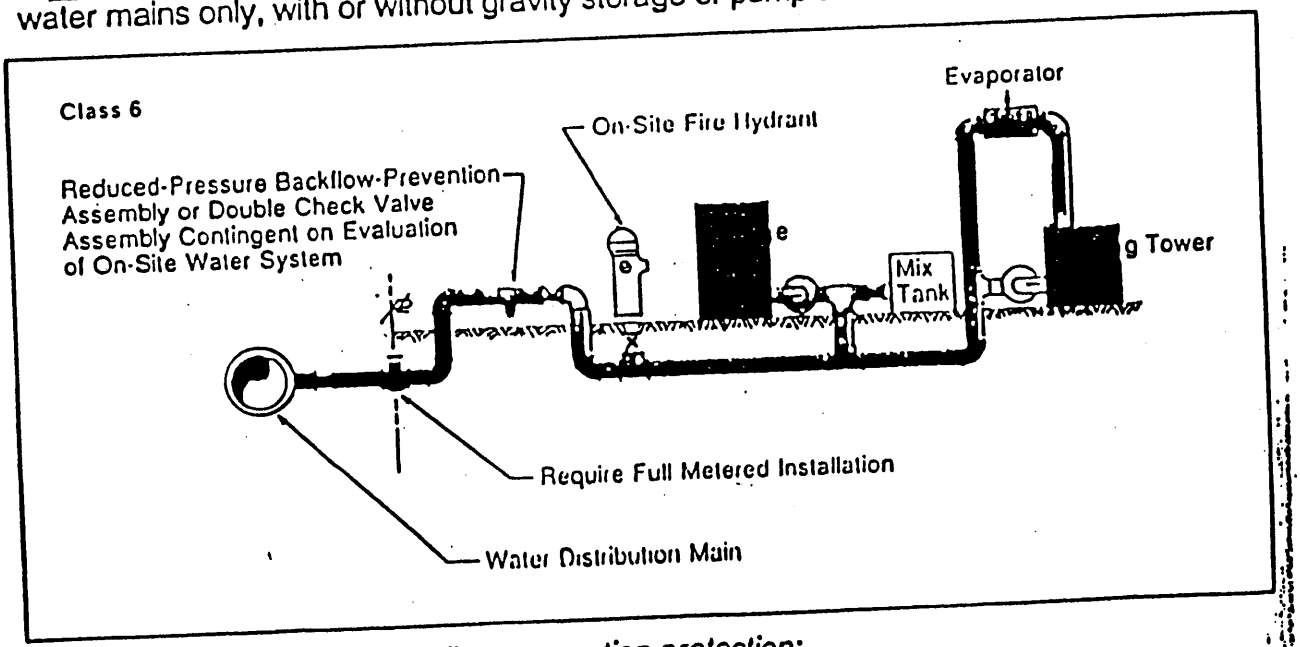
Class 5 - Directly supplied from public mains and interconnected with auxiliary supplies; such as pumps taking suction from reservoirs exposed to contamination, or rivers or ponds; driven wells; mills or other industrial systems; or where anti-freeze or other additives are used.



Class 5 recommended backflow prevention protection:

- Approved reduced pressure backflow prevention assembly
- Approved reduced pressure detector assembly
- Approved air gap

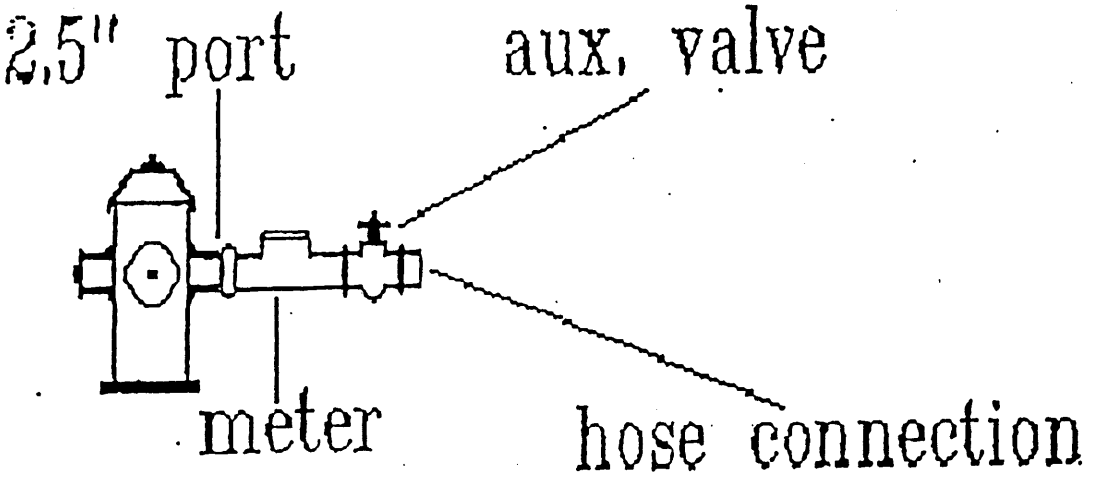
Class 6 - Combined industrial and fire protection system supplied from the public water mains only, with or without gravity storage or pump suction tanks.



Class 6 recommended backflow prevention protection:

A premises survey to determine both the industrial and fire protection requirements.

Hydrant Meter Connection Diagram



Hydrant Operation Procedures

1. Make sure that the hydrant to be used is the one designated on the "Hydrant Use Permit." Hydrants which may be used by permitted users will be designated by the Water Specialist from the Water Division.

2. Always stand to the side of (or behind) a hydrant port cap when removing the cap from the hydrant to prevent injuries from high pressure that might exist within the hydrant body.

3. Connect the meter assembly as shown in the accompanying diagram. **Only this approved form of connection is allowed.**

4. Once the meter and hose assemblies are securely connected, check to ensure that the **GATE VALVE** on the meter is **CLOSED.**

5. Use a **HYDRANT WRENCH** to **SLOWLY** open the hydrant to the **FULLY OPEN** position.

6. When ready to draw water, **SLOWLY** open the meter **GATE VALVE.**

DO NOT USE ANY VALVE OTHER THAN THE METER ASSEMBLY GATE VALVE TO OPEN OR CLOSE HYDRANT FLOW OF WATER.

7. When finished using the hydrant, **SLOWLY** close the meter assembly gate valve, then close the hydrant operating nut snugly. **Do not over tighten.** Bleed off any trapped pressure between the hydrant and the meter assembly by opening the meter assembly gate valve a few turns. Remove meter/hose assembly and replace hydrant cap on port using a hydrant wrench. A list of cautions for hydrant operations is on the next page.

If you have questions about proper hydrant operating procedures, contact the Water Specialist with the Water Division at 841-5524.

OPERATORS OF HYDRANTS ARE FINANCIALLY RESPONSIBLE FOR ANY DAMAGES INCURRED AS A RESULT OF IMPROPER OPERATING OR CONNECTION PROCEDURES.

Hydrant Use Cautions

Listed below are some of the effects the improper operation of a hydrant can cause to the public water system:

Water Hammer

Water hammer is a sudden pressure surge caused by opening or closing a hydrant too quickly. For this reason, only the meter assembly gate valve is to be used to open or close the water flow from the hydrant. Hydrants should be opened and closed SLOWLY to prevent water hammer. Water Hammer can cause broken or ruptured water mains, hydrant meters, domestic meters, equipment connected to the water system, customer piping and hot water tanks and a loss of water supply in the system that, during a fire, could have very serious results.

Back Siphonage (cross-connection)

Under certain conditions, flowing water from a hydrant can cause contamination to be sucked into the water system at other locations. The flow of water from the hydrant can cause a negative pressure (suction).

Back Pressure (cross-connection)

Under certain conditions, equipment connected to a hydrant can cause contamination to be forced back into the hydrant and into the water system. Types of equipment that can cause this back-pressure, back-flow situation include: high-pressure pumps and air compressors directly connected to the hose that is attached to the hydrant. When these types of equipment are connected to the water system, a double-check valve assembly or a reduced pressure backflow assembly must be attached in-line upstream of the pump or compressor.

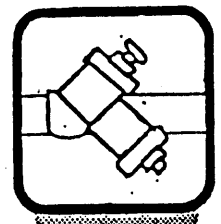
Cross-Connection

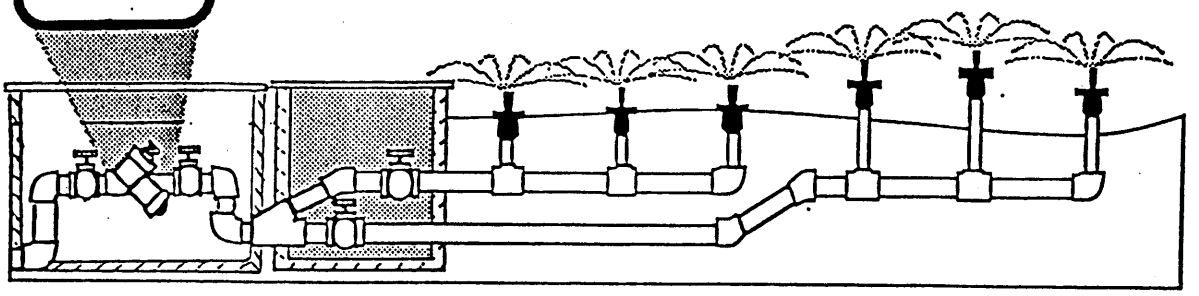
NEVER attach a hose to a hydrant and insert the end of the hose into a sewer connection (like a clean-out or a manhole). This directly connects the potable drinking water system to the sewerage system, and creates an extremely dangerous health hazard.

Any unauthorized, unsanitary or unsafe use of the hydrant is prohibited and will result in the permanent revocation of a hydrant permit.

DCVA...DOUBLE CHECK VALVE ASSEMBLY

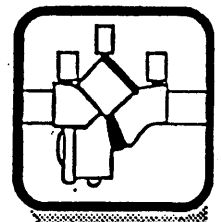
- Only one DCVA required to serve the whole system; control valves can be located downstream of the DCVA.
- Some water suppliers may allow the DCVA to be installed below ground, check for proper clearance on all sides of the assembly.
- DCVA must be tested by a State-certified Backflow Assembly Tester...when installed ...annually ...when moved or repaired.
- No chemical or fertilizer may be introduced into an irrigation system equipped with DCVA's.

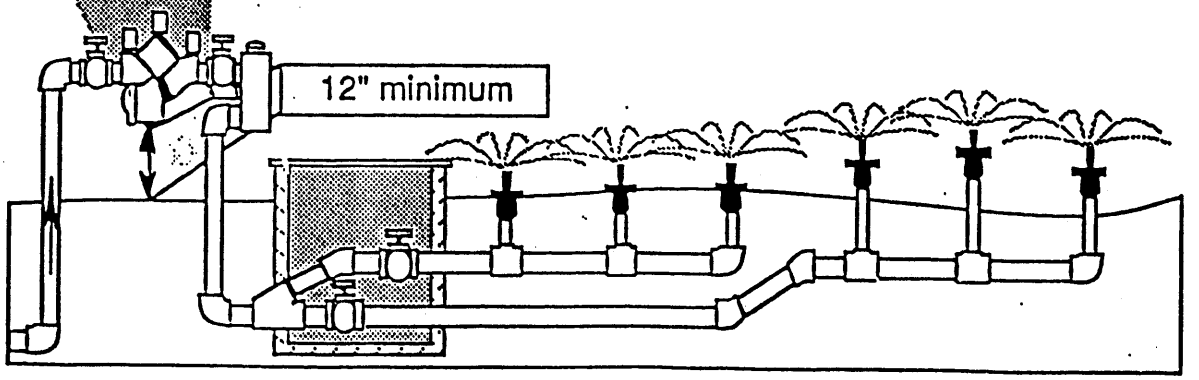




RPBA...REDUCED PRESSURE BACKFLOW ASSEMBLY

- Only one RPBA required to serve the whole system; control valves can be located downstream of the RPBA.
- RPBA's must be installed a minimum of one foot (12") above ground level.
- RPBA's must be tested by a State-certified Backflow Assembly Tester ...when installed ...annually ...when moved or repaired.
- In an RPBA equipped system, fertilizer and other agricultural chemicals may be introduced downstream of (after) the RPBA.





Test Procedures For D.C.V.A.

(Duplex Gauge)

1. Notify the Customer.
2. Blow down test cocks 2, 3, and 4.
3. Attach hoses from gauge to test cocks 2 and 3. Open test cocks 2 and 3 and bleed air from the control valves on the gauge.
4. Close #2 shut-off valve and #1 shut-off valve.
5. Open the control Valve at test cock 2 until it reads 2 psi less than test cock 3. If the 2 psi reading remains steady, check valve #1 is closed tight.
6. Open shut-off valve #1 to get back original line pressure reading.
7. Close test cock 2 and switch hose to test cock #4. Open test cock 4 and bleed air from the control valve on the gauge.
8. Close shut-off valve #1.
9. Open the control valve at test cock 3 until it reads 2 psi less than test cock 4. If the 2 psi reading remains steady, check valve #2 is closed tightly.
10. Open up shut-off valve #1 and slowly open shut-off valve #2. Remove the test equipment.

TEST PROCEDURE FOR R.P.P.B.A.
(DIFFERENTIAL GAUGE)

1. NOTIFY THE CUSTOMER.
2. BLOW DOWN TEST COCKS 2, 3, AND 4.
3. ATTACH HIGH PRESSURE HOSE TO TEST COCK 2 AND LOW SIDE TO TEST COCK 3. OPEN TEST COCKS 2 AND 3.
4. BLEED AIR FROM CONTROL VALVES ON GAUGE. HIGH SIDE FIRST, THEN LOW SIDE.
5. CLOSE SHUT-OFF VALVE #2 AND NOTE THE DIFFERENTIAL READING ON GAUGE.
6. INTRODUCE WATER INTO THE ZONE OF REDUCED PRESSURE BY OPENING THE HIGH CONTROL VALVE AND SLOWLY OPENING THE LOW CONTROL VALVE. RECORD THE FIRST DRIPPING OF WATER FROM THE RELIEF VALVE.
   THIS MUST BE 2 PSI OR GREATER. SUBTRACT THE RELIEF VALVE OPENING FROM THE DIFFERENTIAL READING, THIS MUST BE 3 PSI OR GREATER.
7. RE-ESTABLISH ORIGINAL DIFFERENTIAL BY BLEEDING THE LOW CONTROL VALVE. IF DIFFERENTIAL REMAINS STEADY, #1 CHECK VALVE IS CLOSED TIGHTLY.
8. BLEED AIR FROM BY-PASS HOSE AND ATTACHED IT TO TEST COCK 4 AND OPEN TEST COCK 4.
9. BY-PASS WATER FROM THE HIGH SIDE CONTROL VALVE AT TEST COCK 2 THROUGH THE BY-PASS CONTROL VALVE INTO TEST COCK 4. IF THE DIFFERENTIAL REMAINS CONSTANT, CHECK VALVE 2 IS CLOSED TIGHTLY.
10. OPEN SHUT-OFF VALVE #2 AND REMOVE THE TEST EQUIPMENT.

Reference: Cross Connection Control inspection

Dear

Washington State Board of Health Regulation, WAC 248.54.820 Cross Connection, reads in part:

The purpose of this section is to protect the health of water consumers by the control of actual and/or potential cross-connection through two basic programs.

(1) Through proper installation and backflow assemblies on service lines leading to premises where cross-connections exist, or are likely to occur, and

(2) Through inspection and regulation of plumbing within premises to minimize the danger of contamination of the water on the premises or the public water supply itself.

The regulations also stipulate that the water purveyor is responsible for the prevention of contamination of the public water supply to last flowing tap within the building.

Please be advised that we have tentatively set_____ at _____ date to inspect all water services on your facilities to determine if any cross-connections exist.

Taking part in this inspection will be the Town of Friday Harbor cross-connection specialist representing the Town's water department and a representative of your organization familiar with your plumbing system.

If the above date is not convenient or you desire more information, please contact _____ at 360/378-2154.

Sincerely,

Dear -

A cross-connection survey of the plumbing installations at _____ was made on _____ by _____ (Town of Friday Harbor, Water Department Water Quality Inspector).

The attached report lists the problem areas and recommended corrections. These corrections should be made as soon as possible. In no event should completion be delayed more than thirty (30) days from the above date.

When these problems are corrected, it is our intent to reinspect any newly installed backflow prevention assemblies.

Enclosed for your information is a copy of the Washington Administrative Code 248-54-25 regulations. Also included are schematics as to proper installations, a list of approved assemblies, certified testers, and test reports.

A permit from the Town of Friday Harbor Building Department is required for this installation.

Additional information relative to this matter may he obtained by writing to the Town of Friday Harbor, 60 Second St., Friday Harbor, WA 98250

Sincerely

_____

Water Department Water Quality inspector

Dear_____ 246-290490

The backflow assembly/assemblies installed on your service line are due for their annual test, as required in accordance with Washington Administrative Code (WAC ~~248-54-850~~). Please have this test performed by a backflow prevention assembly tester certified by the Washington State Department of Social & Health Services. A list of certified testers is attached for your reference.

If this test discloses that the assembly is not operating satisfactorily, please have the necessary repairs completed and the assembly retested by the tester. On completion of a test showing that the assembly is operating satisfactorily, the tester shall complete the Backflow Assembly Test Form (attached). Please forward the report to this office no later than _____.

Additional information relative to this matter may he obtained by writing to the Town of Friday Harbor, P.O. Box 219, Friday Harbor, WA 98250 or by calling me at 378-~~2154~~ 2160.

Sincerely,

C:\XY\STAN\LETTER3.TXT

Dear_____

On _____ an inspection and test was made on the backflow assembly/assemblies, installed on your service line.

The assembly/assemblies met all Town of Friday Harbor standards and required tests and therefore have been accepted.

Also, please note that testing of this/these assembly/assemblies is/are required on an annual basis and the results of these tests are to be reported to the Town of Friday Harbor Water Department. It is your responsibility to have these tests conducted.

If you have any questions or concerns, please call me at 378-2154.

Sincerely,

Reference: Annual Test of Backflow Assembly Reminder

Dear

On _____ an annual test form(s) for backflow prevention assembly was forwarded to you and to be returned no later than _____.

Your cooperation to solve this matter within 15 calendar days from above date would be appreciated. We have yet to receive the test report(s).

If within that time , there is no indication of effort on your part to provide the required form(s), we shall implement the other protective alternative; that is, discontinuance of water to your premises as provided for in Washington Administrative Code 248.24.285.

Additional information may be obtained by writing to:

_____
Town of Friday Harbor, Water Department
P.O. Box 219
Friday Harbor, WA 98250

or by contacting me at 378-2154.

Sincerely,

_____
Water Department Water Quality Inspector

Dear

You are hereby notified that the backflow assembly/assemblies installed on property owned or controlled by you at _____, was tested and found defective.

In accordance with the requirements set forth in Town of Friday Harbor Ordinance _____, this assembly/assemblies must be in good operating condition on or before fifteen (15) days from receiving this letter.

Upon repairs, the assembly/assemblies shall be retested by a certified tester and completed test forms forwarded to the Town of Friday Harbor Water Department.

Your cooperation to solve this matter would be appreciated.

Additional information relative to this matter may be obtained by calling me at 378-2154.

Sincerely,

246-290-490

CROSS-CONNECTION CONTROL REGULATION IN WASHINGTON STATE

RULES AND REGULATIONS OF THE STATE BOARD OF HEALTH REGARDING PUBLIC WATER SUPPLIES

WAC 246-290-490 CROSS-CONNECTION CONTROL

(1) GENERAL

(a) Purveyors have the responsibility to protect public water systems from contamination due to cross-connections. Cross-connections which can be eliminated shall be eliminated. The purveyor shall work cooperatively with local authorities to eliminate or control potential cross-connections.

(b) The purveyor shall develop and implement a cross-connection control program acceptable to the department. The scope and complexity of the program shall be directly related to the size of the system and the potential public health risk. A department guideline titled Planning Handbook is available to assist the utility in developing this program. The most recently published edition of the manual titled Accepted Procedure and Practice in Cross Connection Control-Pacific Northwest Section-American Waterworks Association shall be used as a resource to establish:

(I) Minimum cross-connection control operating policies;
(ii) Blackflow prevention assembly installation practices;
(iii) Blackflow prevention assembly testing procedures; and
(iv) Enforcement authority.

Purveyors and local authorities shall have the option of establishing more stringent requirements.

(c) The purpose of a cross-connection control program is to protect the health of water consumers and the potability of the public water system by assuring;

(I) The inspection and regulation of plumbing in existing and proposed piping networks; and

(ii) The proper installation and surveillance of backflow prevention assemblies when actual or potential cross-connections exist and cannot be eliminated.

(d) The cross-connection control program shall be included in the water system's plan under WAC 248-54-065 or small water system management program as outlined under WAC 248-54-196, whichever is appropriate.

(e) When an existing cross-connection poses a potential health or system hazard, the purveyor shall shut off water by the installed service to the premises until the cross-connection has been eliminated or controlled by installation of a proper backflow prevention assembly. The cross-connection control program manager for the department shall be notified when a service has been shut off.

(2) BACKFLOW PREVENTION ASSEMBLY INSTALLATION AND TESTING

(a) If a cross-connection cannot be eliminated, then;

(I) An air-gap separation, reduced pressure principle backflow prevention assembly (Rl 13A), or a reduced pressure principle detector backflow prevention assembly (RPDA) shall be installed if the cross-connection creates an actual or potential health or system hazard.
(ii) An air-gap separation, RPBA, RPDA double-check valve backflow prevention assembly (DCVA), or double-check detector backflow prevention assembly (DCDA) shall be installed if the cross-connection is objectionable, but does not pose an unreasonable risk to health.
(iii) A pressure vacuum breaker assembly (PVBA) or an atmospheric vacuum breaker may be installed where the substance which could backflow is objectionable but does not pose an unreasonable risk to health and where there is no possibility of backpressure in the downstream piping.
(iv) Backflow prevention assemblies, appropriate for the degree of hazard or air gaps and in some cases both, shall be installed at the service connection or within the following facilities, unless in the judgment of the water purveyor and the department, no hazard exists: hospitals, mortuaries, clinics, laboratories, piers and docks, sewage treatment plants, food and beverage processing plants, chemical plants using water process, metal plating industries, petroleum processing or storage plants, radioactive material processing plants or nuclear reactors, car washes, facilities having a nonpotable auxiliary water supply, and others specified by the department.

(b) All installed RPBA's, RPDA's, DCVA's, DCDA's and PVBA's shall be models included on the current list of backflow assemblies, approved for installation in Washington state, and maintained and published by the department. Backflow prevention assemblies in service, but not listed, shall remain in service provided the backflow prevention assemblies:

(I) Are listed on the current Washington state-approved cross-connection control assembly list at the time of installation:
(ii) Are properly maintained;
(iii) Are of a type appropriate for the degree of hazard; and
(iv) Are tested and successfully pass the test annually when unlisted assemblies are moved or require more than minimum maintenance, the unlisted assemblies shall be replaced by assembly listed on the current approved model list.

(c) All air gaps and backflow prevention assemblies shall be installed in accordance with the cross-connection control manual referenced under WAC 248--54-285 (1)(b) of this section.

(d) The purveyor may permit the substitution of a properly installed air gap in lieu of an approved backflow prevention assembly. All such air gap substitutions shall be inspected annually by a Washington State certified backflow assembly tester.

(e) A Washington State certified backflow assembly tester shall inspect and test all:

(I) RPBA's,
(ii) RPDA's,
(iii) DCVA's,
(iv) DCDA's,
(v) New PVBA installations, and
(vi) Existing PVBA's discovered through routine inspections.

(f) Tests and/or inspections shall be conducted:

(I) At the time of initial installation;
(ii) Annually after initial installation, or more frequently if tests indicate repeated failures; and
(iii) After the assembly is repaired.

(g) The assemblies shall be repaired, overhauled, or replaced whenever found to be defective. The purveyor shall require that improperly installed or altered air gaps be replumbed or replaced by an approved RPBA at their discretion. Inspections,

tests, and repairs shall be made under the purveyor. Supervision and records thereof will be kept as required by the purveyor.

(h) The purveyor shall deny or discontinue water service to any customer failing to cooperate in the installation, maintenance, testing, or inspection of backflow prevention assemblies required by the regulations of this chapter.

(3) WASHINGTON STATE CERTIFIED BACKFLOW ASSEMBLY TESTERS

(a) A blackflow assembly tester shall become certified and maintain certification per department backflow assembly tester certification program guidelines.

(b) The department shall maintain a list of persons certified to test backflow prevention assemblies

Statutory Authority: RCW 43.20.050, 91-02-051 (order 124B), recodified as 246-)()-49() 13led 1# # 90. yCCt\C 1/31/91. Statutory Authority: P.L. 99-339. 89-21-020 (Order 336), 248-48 filed 1010 () e{tecti\e } 10 9. Statutory Authority: RCW 34.04.045 88-05-057 (Order 307), 248 54-285 tiled '1788 Ututiv Authc)ritv3 RC\\ 43.20.050. 83-19-002 (Order 266). 248-54-285, filed 9/8/83).

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6/12/96

LEGAL RESPONSIBILITIES AND LIABILITIES OF CROSS-CONNECTION CONTROL

By:

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CROSS-CONNECTION CONTROL PROGRAMS

I. DEFINITION: Any actual or potential physical arrangement/connection to a potable water system which can contaminate the water system as a result of backflow.

II. WAC 246-290-490: The purveyor shall develop and implement a cross-connection control program acceptable to DOH.

III. PURVEYOR ORDINANCE/RESOLUTION: The purveyor must develop and implement cross-connection control operating policies, backflow prevention assembly installation practices, testing procedures, and enforcement authority.

A. Must meet minimum standards set forth in AWWA manual.

B. Maximum standards as purveyor determines.

IV. BACKFLOW PREVENTION DEVICE IS REQUIRED WHEN:

A. A cross-connection creates an actual or potential health or system hazard.

B. A cross-connection is objectionable but not an unreasonable risk to health.

C. Certain facilities such as hospitals, clinics, labs, car washes, etc. unless no hazard exists.

V. BACKFLOW PREVENTION DEVICE TESTING REQUIRED WHEN:

A. At the time of initial installation.

B. After the assembly is repaired.

C. Annually.

D. More often when tests indicate repeated failures.

VI. BACKFLOW PREVENTION DEVICES MUST BE ON THE CURRENT APPROVED LIST UNLESS IN SERVICE AND:

A. Are listed on a current list at the time of installation.

B. Are properly maintained

C. Are of a type appropriate for the degree of hazard.

D. Are tested and successfully pass the test annually.

However, when unlisted assemblies are moved or require more than minimum maintenance, the unlisted assemblies must be replaced by an assembly listed on the current approved list.

VII. WATER SERVICE SHUTOFF: The purveyor may terminate water service when:

A. An existing cross-connection poses a potential health or system hazard.

B. Customer failure to cooperate in the installation, maintenance, testing, or inspection of backflow prevention assemblies.

COMMENT:

1. This is an extraordinary enforcement remedy; nonpayment of water service billings is normally the only other statutory authority allowing water termination.

2. The DOH cross-connection control program manager must be notified when a service has been shutoff due to an existing cross-connection which poses a potential health or system hazard.

VIII. NOTICE PROCEDURE: The purveyor should have a written procedure regarding notice to customers/property owners of objectionable cross-connections. Depending on whether the cross-connection poses an immediate-health hazard, the following notice procedures could be used:

A. Oral notice.

B. Posted notice.

C. Mailed notice--regular and certified--return receipt requested.

IX. RECORD KEEPING: The purveyor should maintain records of all backflow prevention device inspections, testing, and repairs; the purveyor should also maintain records of all enforcement actions.

(ii) When a coliform MCL violation is determined, the eyor shall:

(A) Notify the department within twenty-four hours of determining acute coliform MCL violations;

(B) Notify the department before the end of the next business day when a nonacute coliform MCL is determined; and

(C) Notify water system users in accordance with WAC 246-290-330.

(iii) When a monitoring violation occurs, including nvalid or expired CSEs, the purveyor shall:

(A) Notify the department of the violation within ten lays; and

(B) Notify water system users in accordance with WAC 246-290-330.

(g) Systems monitoring for unregulated VOCs in ccordance with WAC 246-290-300 (8)(b), shall send a copy f the results of such monitoring and any public notice to the epartment within thirty days of receipt of analytical results.

[Statutory Authority: RCW 43.20.050. 94-14-001, § 246-290-480, filed /22/94, effective 7/23/94; 93-08-011 (Order 352D), § 246-290-480, filed /25/93, effective 4/25/93; 92-04-070 (Order 241B), § 246-290-480, filed /2/92, effective 3/6/92; 91-02-051 (Order 124B), recodified as § 246-290-30, filed 12/27/90, effective 1/31/91. Statutory Authority: P.L. 99-339.)-21-020 (Order 336), § 248-54-265, filed 10/10/89, effective 11/10/89. atutory Authority: RCW 34.01.015. 88-05-057 (Order 307), § 248-54-35, filed 2/17/88. Statutory Authority: RCW 43.20.050. 83-19-002)rder 266), § 248-54-265, filed 9/8/83.]

VAC 246-290-490 Cross-connection control. (1) ll.

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(i) Minimum cross-connection control operating policies;

(ii) Backflow prevention assembly installation practices;

(iii) Backflow prevention assembly testing procedures; J

(iv) Enforcement authority.

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(d) The cross-connection control program shall be luded in the water system's plan under WAC 248-54-065 or small water system management program as outlined under WAC 248-54-196, whichever is appropriate.

(e) When an existing cross-connection poses a potential health or system hazard, the purveyor shall shut off water service to the premises until the cross-connection has been eliminated or controlled by the installation of a proper backflow prevention assembly. The cross-connection control program manager for the department shall be notified when a service has been shut off.

(2) Backflow prevention assembly installation and testing.

(a) If a cross-connection cannot be eliminated, then:

(i) An air-gap separation, reduced pressure principle backflow prevention assembly (RPBA) or a reduced pressure principle detector backflow prevention assembly (RPDA) shall be installed if the cross-connection creates an actual or potential health or system hazard.

(ii) An air-gap separation, RPBA, RPDA, double-check valve backflow prevention assembly (DCVA), or double-check detector backflow prevention assembly (DCDA) shall be installed if the cross-connection is objectionable, but does not pose an unreasonable risk to health.

(iii) A pressure vacuum breaker assembly (PVBA) or an atmospheric vacuum breaker may be installed where the substance which would backflow is objectionable but does not pose an unreasonable risk to health and where there is no possibility of backpressure in the downstream piping.

(iv) Backflow prevention assemblies, appropriate for the degree of hazard or air gaps and in some cases both, shall be installed at the service connection or within the following facilities, unless in the judgment of the water purveyor and the department, no hazard exists: Hospitals, mortuaries, clinics, laboratories, piers and docks, sewage treatment plants, food and beverage processing plants, chemical plants using water process, metal plating industries, petroleum processing or storage plants, radioactive material processing plants or nuclear reactors, car washes, facilities having a nonpotable auxiliary water supply, and others specified by the department.

(b) All installed RPBA's, RPDA's, DCVA's, DCDA's, and PVBA's shall be models included on the current list of backflow assemblies, approved for installation in Washington state, and maintained and published by the department. Backflow prevention assemblies in service, but not listed, shall remain in service provided the backflow prevention assemblies:

(i) Are listed on the current Washington state-approved cross-connection control assembly list at the time of installation;

(ii) Are properly maintained;

(iii) Are of a type appropriate for the degree of hazard; and

(iv) Are tested and successfully pass the test annually.

When unlisted assemblies are moved or require more than minimum maintenance, the unlisted assemblies shall be replaced by an assembly listed on the current approved model list.

(c) All air gaps and backflow prevention assemblies shall be installed in accordance with the cross-connection control manual referenced under WAC 248-54-285 (1)(b) of this section.

(d) The purveyor may permit the substitution of a properly installed air gap in lieu of an approved backflow prevention assembly. All such air gap substitutions shall be inspected annually by a Washington state certified backflow assembly tester.

(e) A Washington state certified backflow assembly tester shall inspect and test all:

(i) RPBA's,

(ii) RPDA's,

(iii) DCVA's,

(iv) DCDA's,

(v) New PVBA installations, and

(vi) Existing PVBA's discovered through routine inspections.

(f) Tests and/or inspections shall be conducted:

(i) At the time of initial installation;

(ii) Annually after initial installation, or more frequently if tests indicate repeated failures; and

(iii) After the assembly is repaired.

(g) The assemblies shall be repaired, overhauled, or replaced whenever found to be defective. The purveyor shall require that improperly installed or altered air gaps be replumbed or replaced by an approved RPBA at their discretion. Inspections, tests, and repairs shall be made under the purveyor's supervision and records thereof kept as required by the purveyor.

(h) The purveyor shall deny or discontinue water service to any customer failing to cooperate in the installation, maintenance, testing, or inspection of backflow prevention assemblies required by the regulations of this chapter.

(3) Washington state certified backflow assembly testers.

(a) A backflow assembly tester shall become certified and maintain certification per department backflow assembly tester certification program guidelines.

(b) The department shall maintain a list of persons certified to test backflow prevention assemblies.

[Statutory Authority: RCW 43.20.050. 91-02-051 (Order 1241), recodified as § 246-290-490, filed 12/27/90, effective 1/31/91. Statutory Authority: P.L. 99-339. 89-21-020 (Order 336), § 248-54-285, filed 10/10/89, effective 11/10/89. Statutory Authority: RCW 34.04.045. 88-05-057 (Order 307), § 248-54-285, filed 2/17/88. Statutory Authority: RCW 43.20.050. 83-19-002 (Order 266), § 248-54-285, filed 9/8/83.]

WAC 246-290-500 Severability. If any provision of this chapter or its application to any person or circumstances is held invalid, the remainder of this chapter, or the application of the provision to other persons or circumstances, shall not be affected.

[Statutory Authority: RCW 43.20.050. 91-02-051 (Order 1241), recodified as § 246-290-500, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 34.04.045. 88-05-057 (Order 307), § 248-54-291, filed 2/17/88.]

PART 6.
SURFACE WATER TREATMENT

Subpart A - Introduction and General Requirements

WAC 246-290-601 Purpose of surface water treatment. (1) Part 6 of chapter 246-290 WAC establishes filtration and disinfection as treatment technique requirements for water systems using surface or GWI sources. The Part 6 treatment technique requirements are established in lieu of maximum contaminant levels (MCLs) for the following contaminants:

(a) *Giardia lamblia*;

(b) Viruses;

(c) Heterotrophic plate count bacteria;

(d) *Legionella*; and

(e) Turbidity.

(2) Turbidity MCLs found in WAC 246-290-310 shall remain in effect for systems using surface or GWI sources until applicable Part 6 treatment technique requirements become effective. The effective dates are indicated in Tables 9, 12, 13, or 14, whichever is applicable.

[Statutory Authority: RCW 43.20.050. 93-08-011 (Order 352B), § 246-290-601, filed 3/25/93, effective 4/25/93.]

WAC 246-290-610 Definitions relating to surface water treatment. Abbreviations and acronyms:

C - residual disinfectant concentration in mg/L;

CT - the mathematical product in mg/L - minutes of "C" and "T";

gpm - gallons per minute;

HPC - heterotrophic plate count;

T - disinfectant contact time in minutes; and

SWTR - Surface Water Treatment Rule.

"Alternate filtration technology" means a filtration process for substantial removal of particulates (generally ≥2 log *Giardia lamblia* cysts) by physical straining through a fixed medium. It does not include conventional, direct, diatomaceous earth, or slow sand filtration processes.

"C" means the residual disinfectant concentration in mg/L at a point before or at the first customer.

"Coagulant" means a chemical used in water treatment to destabilize particulates and accelerate the rate at which they aggregate into larger particles.

"Coagulation" means a process using coagulant chemicals and rapid mixing to destabilize colloidal and suspended particles and agglomerate them into flocs.

"Completely treated water" means water from a surface or GWI source which receives filtration or disinfection treatment that fully complies with the treatment technique requirements of Part 6 of chapter 246-290 WAC as determined by the department.

"Continuous monitoring" means determining water quality with automatic recording analyzers which operate without interruption twenty-four hours per day.

"Conventional filtration treatment" means a series of processes including coagulation, flocculation, sedimentation, and filtration which together result in substantial particulate removal (≥2.5 log *Giardia lamblia* cysts).

"CT" or "CTcalc" means the product of "residual disinfectant concentration" (C) and the corresponding "disinfectant contact time" (T) i.e., "C" x "T".

"$CT_{99.9}$" means the CT value required for 99.9 percent(3 log) inactivation of *Giardia lamblia* cysts.

"CTreq" means the CT value a filtered system shall provide to achieve a specific percent inactivation of *Giardia lamblia* cysts as directed by the department.

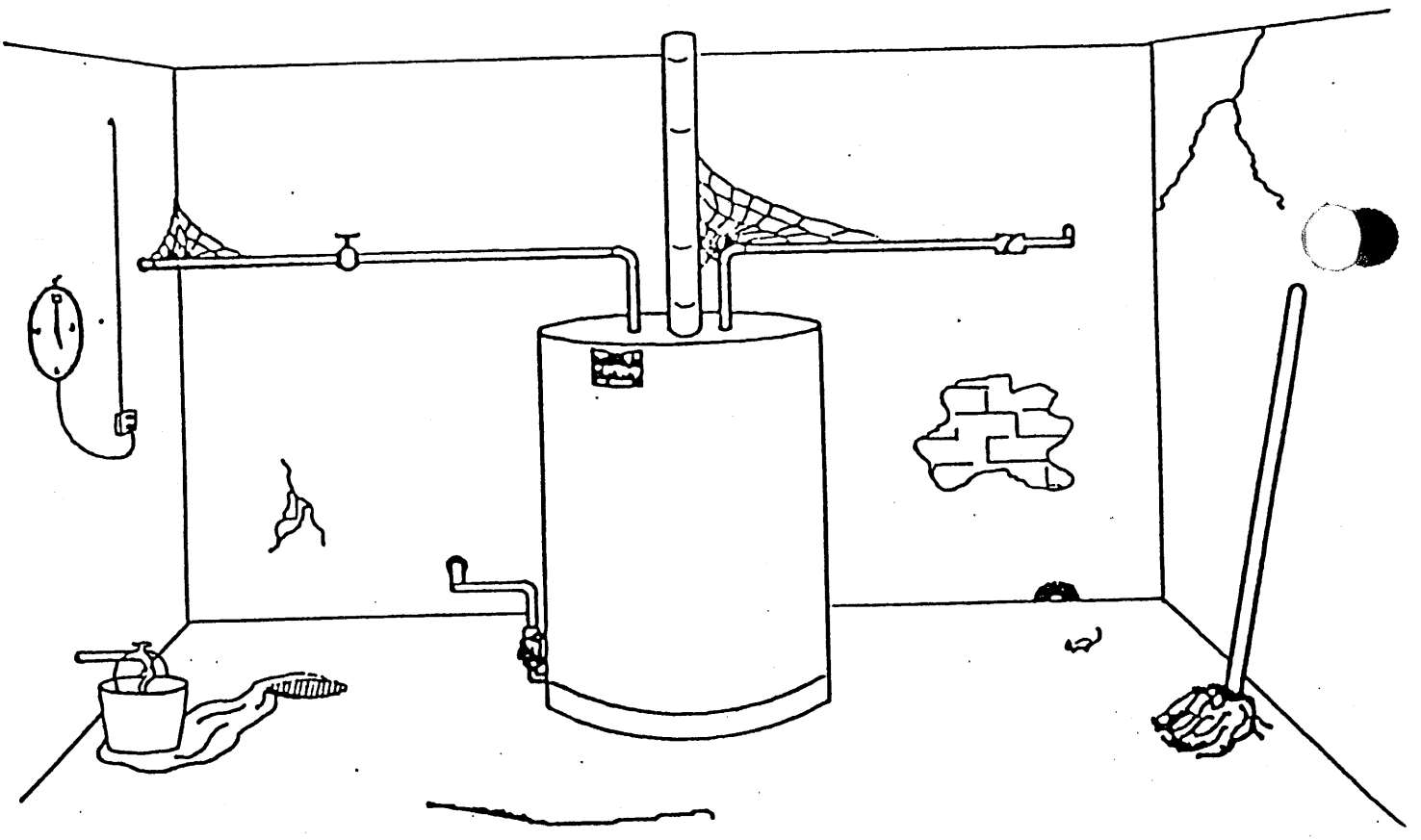
"Diatomaceous earth filtration" means a filtration process for substantial removal of particulates (≥2 log *Giardia lamblia* cysts) in which:

backflow prevention

December 1987

dedicated to water system safety everywhere

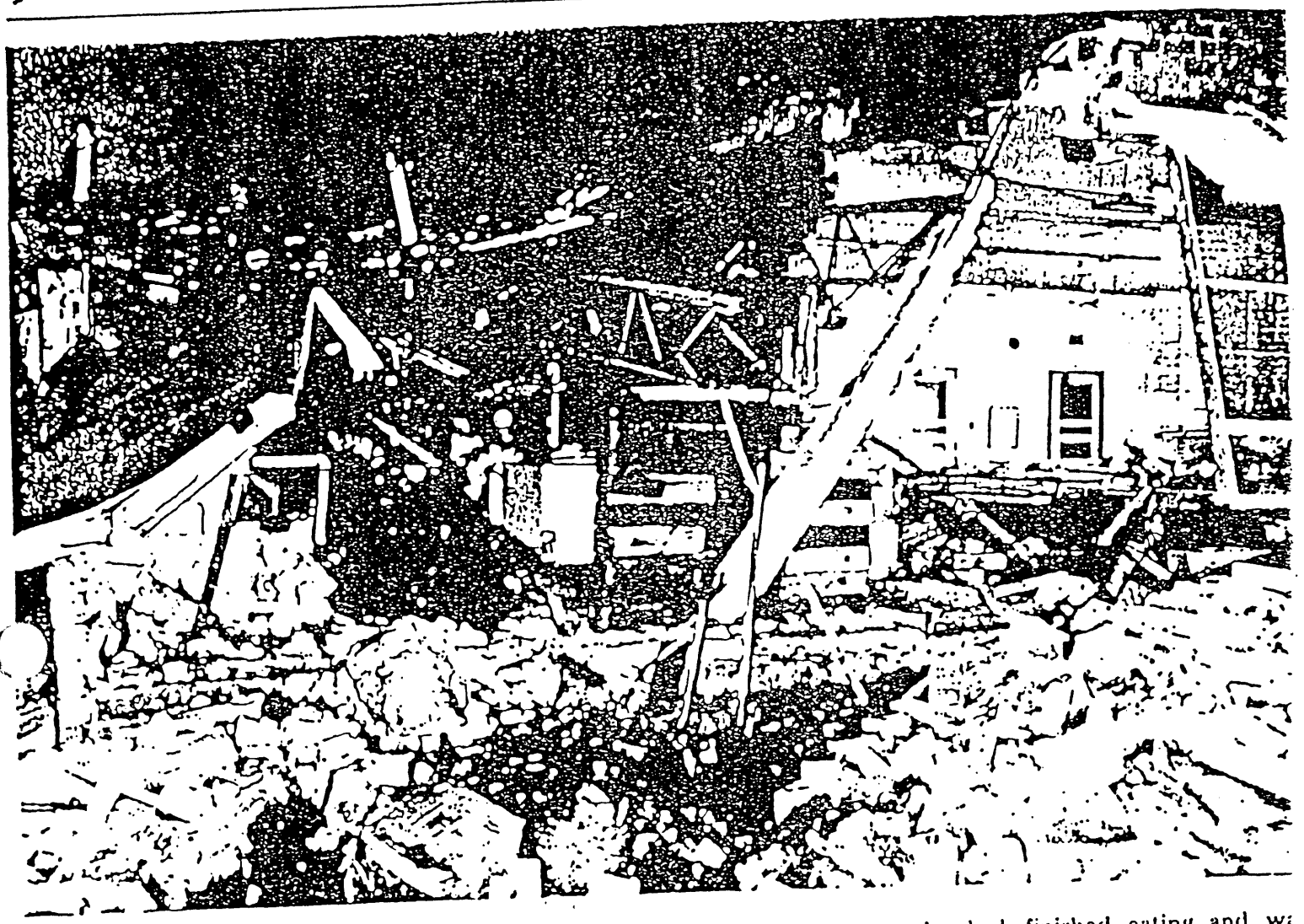
Are You Housing A Plumbing System Bomb?



Basement Bomb Ingredients:

1. Water heater
2. Cold water supply with check valve or backflow preventer
3. Hot water outlet with no usage
4. Source of heat — gas or electrical
5. No temperature & pressure relie valve, expansion tank or regulator

Water Heater Explosion in School



7 Dead - 34 Injured in Water Heater Blast

SPENCER, OKLAHOMA - Jan. 19, 1982

An explosion that killed six children and a teacher in an elementary school cafeteria yesterday was caused by a water heater that malfunctioned a few hours after it had been worked on.

A cook in the school's kitchen turned on a tap around lunch time t the faucet only "coughed eam" said Phil Cooksey, a spokesman for the Oklahoma City Fire Department. He said that the cook went to report the problem. Minutes later an explosion ripped through the kitchen wall blowing off part of the roof and raining glass, metal and concrete blocks on children in the cafeteria.

Thirty-four other students and adults at the Starr Elementary School were hurt, but Oklahoma City School Superintendent, Tom Payzant, said many children playing in the school yard were saved by the unusually warm 65 degree weather. In severe cold, he said, children often huddled against the wall of the one story brick building in this northeastern Oklahoma City suburb.

One woman, Susan Brown, ran three miles to the school after her mother-in-law called her. Her eight year old child, Holly Chase, said she had finished eating and wa waiting for her table to be recesse to the playground when the bla knocked apart the kitchen wa "I ducked my head like they to me to during a tornado and missed me . . . the glass" she sai "Somebody told me they saw brick on a little girl's head and th table fall on top of her. A teach came by and helped me and th other kids out. There were kic running and screaming." She sa they were let outside to wait f their parents.

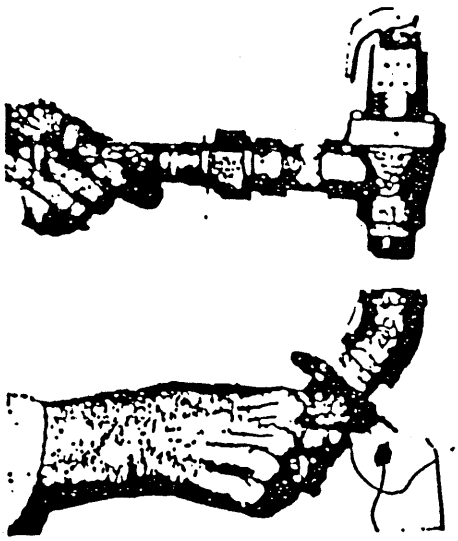
Officials estimated the blast d $100,000 worth of damage. Th explosion was caused by the ov heating of an eighty-five gallon g water heater which was original

Explosion

(Continued from Page 1)

installed in 1972. The heater was equipped with an incorrectly installed temperature and pressure relief valve manufactured in January of 1976. Also, subsequent findings by the State Fire Marshall's Office revealed that some unauthorized person had removed the temperature sensing element (thermostat) from the relief valve, thereby, rendering it useless from a safety standpoint.

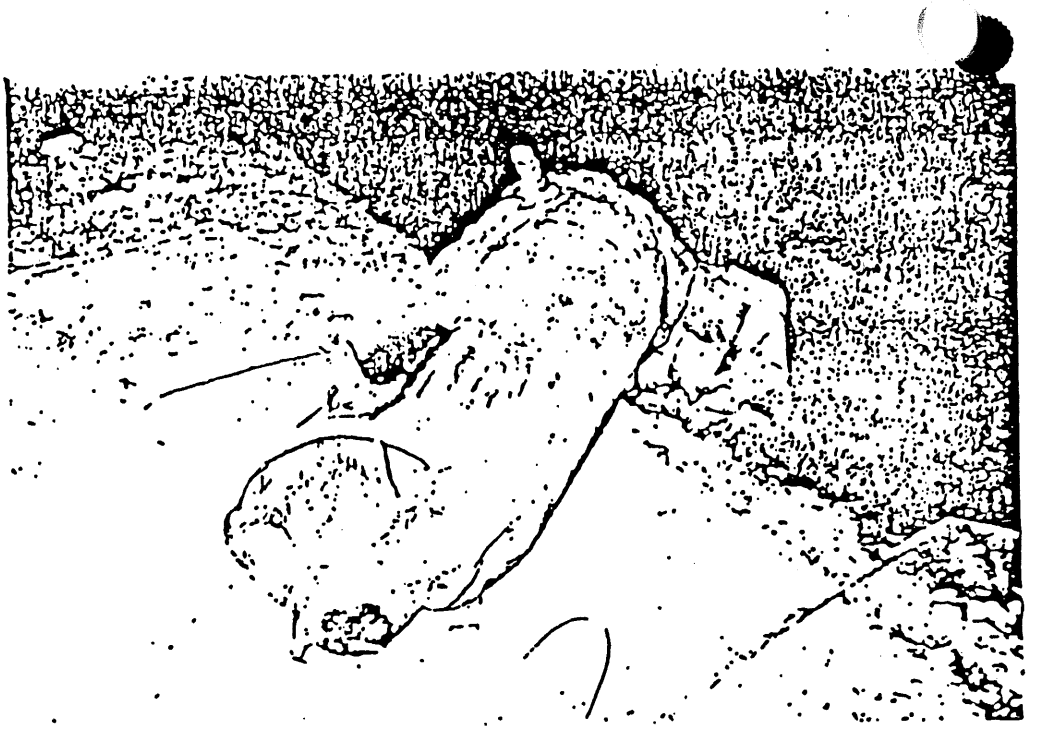
The relief valve was not installed in accordance with the manufacturer's instructions, national standards and plumbing codes requiring that the element be immersed in the tank water in order to properly respond to an excessive temperature condition in the water heater.



Incorrectly installed temperature and pressure relief valve had temperature sensing element removed.

Examination of the piping found at the scene revealed that the valve was incorrectly installed in an elbow. The elbow was connected to the water heater which thereby isolated the relief valve from the tank in violation of the plumbing code.

There are two theories as to why the unidentified person removed the temperature sensing element from the relief valve. One theory is that inasmuch as the element protruded three inches below the inlet of the valve, it would be physically impossible to install the valve in an elbow. Hence, the element was removed. The other theory is that the heater was



Remains of 85 gallon gas water heater.

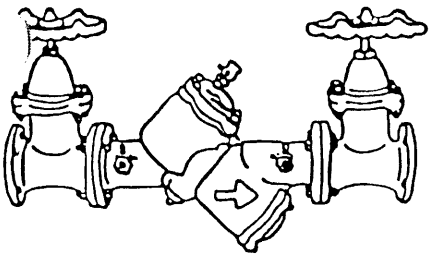
set to maintain temperatures of 180 degrees for dishwashing service and the override of temperature could have caused the temperature (and pressure) relief valve to relieve frequently. Therefore, someone not understanding the safety aspects of the valve, removed the thermostat as a means of preventing the valve from discharging overheated water, which the valve is designed to do to provide temperature safety.

A temperature and pressure relief valve must be of the proper size and installed specifically in accordance with the manufacturer's instructions and local plumbing code in order to prevent a water heater explosion. The valve is designed to sense excessive water temperature and prevent temperatures from exceeding 210° F. It does this by discharging the overheated water and allowing cooler water to enter the tank to safely moderate the temperature. The individual who illegally removed the thermostat rendered the valve useless by eliminating its ability to sense excessive temperature, and tank temperatures were permitted to increase to a dangerous point and ultimately cause an explosion with an equivalent force of two pounds of dynamite.

The fact that an explosion occurred also supports the premise that a pressure only relief valve cannot prevent a domestic water heater explosion. By removing the thermostat, the valve actually became a pressure only relief valve and in order to function under these circumstances, there would have to be 125 lbs. of steam generated in the tank before the valve would actuate on steam pressure. Subsequent testing of the resulting (pressure only) relief valve at the National Board of Boiler and Pressure Vessel Inspectors revealed that the valve operated safely in discharging its full steam rated pressure relief capacity as certified.

Water heaters are safe useful appliances, but they must be properly equipped with both temperature and pressure emergency relief protection to back up an outstanding record of automatic thermostatic temperature control service.

NEW CODE REQUIREMENTS



Thermal Expansion in Water Heating Systems

By Dennis M. Streit
Product Manager, Amtrol Inc.

Water, mankind's most precious natural resource, has become the prime objective of a mammoth movement throughout the country. Its goal is the ultimate protection of water quality in safeguarding the health of the American public, whose very existence depends on its life-sustaining availability.

Better protection of our nation's public potable-water supply is being implemented by municipal water authorities through institutions and the enforcement of national, state and local cross-connection control codes.

Cross-connection control takes many forms and uses many different types of devices. These devices range from ultra-sophisticated backflow preventers that protect against contamination of public-water supplies to simple low-cost devices that can be easily installed by the water authority. These devices protect public mains from possible low-grade contamination from household systems and plumbing lines in general purpose commercial and institutional buildings.

When these devices, either dual-check valves or check valves in water meters, are installed in a residential or commercial building, they do their job extremely well. They seal the household plumbing system from the potable public supply, eliminating completely the backsiphonage of possible contaminated household water into the public supply.

But because they do their job so well, they can also present an opportunity for serious liability for the municipal water authority or water supplier.

Typical system

Let us look at a typical plumbing or potable-water supply system after we get water into a residence.

Some of the water will be used in the cold water service lines, delivering water to faucets, mixing with hot water, going to appliances, showers, and baths.

Some may be used in a secondary closed piping system that connects a boiler that heats water to radiation or heat shedders, which extract heat from the hot water flowing through it to heat living spaces in the home. This use of potable water is usually a one-time filling of the heating system piping, and water is used over and over again just as a medium to convey heat to the radiation. For this reason, this secondary piping system is closed or sealed from the potable plumbing system in the house.

The largest use of potable water in the home quite often is to supply hot water for bathing, clothes washing, and dish washing.

Water in the domestic hot-water system is heated by a water heater, similar to the boiler in a hot-water heating system. However, in the water heater — gas, oil, electric or indirect — we use a continuous supply of fresh water.

As water is heated, or the water heater recovers, hot water is drawn at a rate dictated by demand at the water-use fixtures. As hot water leaves the system through faucets, shower heads or appliances, fresh cold water from the city main is supplied to the heater where it is heated for continuing use.

Typically, a water heater in a home will recover cold water to hot water two or three times a day.

When we heat water from cold to hot, it will expand in volume. Depending upon the final temperature, it will expand by three (3) to four (4) percent. Since water is not compressible, this additional volume of water cannot be accommodated in the rigid piping system through which it travels. If there is no demand for hot water, the expanded volume of water has no place to go.

Since water cannot be compressed and its expansion cannot be accommodated in the rigid piping system, it acts as a hydraulic ram, exerting dramatic and rapid increase in pressure to dangerous levels.

Open systems

In the days before backflow prevention, the expanded water did have some place to go . . . into the potable city main, mixing with a massive amount of cold water where it was easily accommodated. Back in those days, domestic hot water systems were thought of as open systems, because they were open to a city main.

But when we install an effective dual check or a check valve on a water meter, we no longer have an open system. The backflow preventer becomes a very effective non-return barrier, and the system is now a closed system, just as a hot water space heating system is closed. Expanded water cannot find its way back to the city main. So when there is no hot water drawn, the expanded water volume creates a tremendous pressure increase until the heater's safety relief valve, usually set at 150 psi opens. The hot water discharges on the basement floor.

This thermal expansion will occur on the domestic hot-water system in every home equipped with a backflow preventer or water meter check valve. And it is thermal expansion that can be a source of serious liability for the water authority or water supplier.

The first indication that this liability is present is the angry phone call from a subscriber to the water authority or a plumber. The complaint is that the water heater relief valve is continually spilling hot water. The customer is angry. Not only is it causing a mess in the

basement, but the customer paid to heat the water that ends up on the floor and is wasted.

The liability facing the water authority, however, is far more serious than an angry customer, because hot water is spilling from the system.

What the customer and the water authority, even most plumbers, do not realize is that long before the 150 psi relief valve is reached, very dangerous pressures are continually being exerted. The pressures are on the water heater, fittings, fixtures, appliances, and the piping system daily . . . two or three times a day.

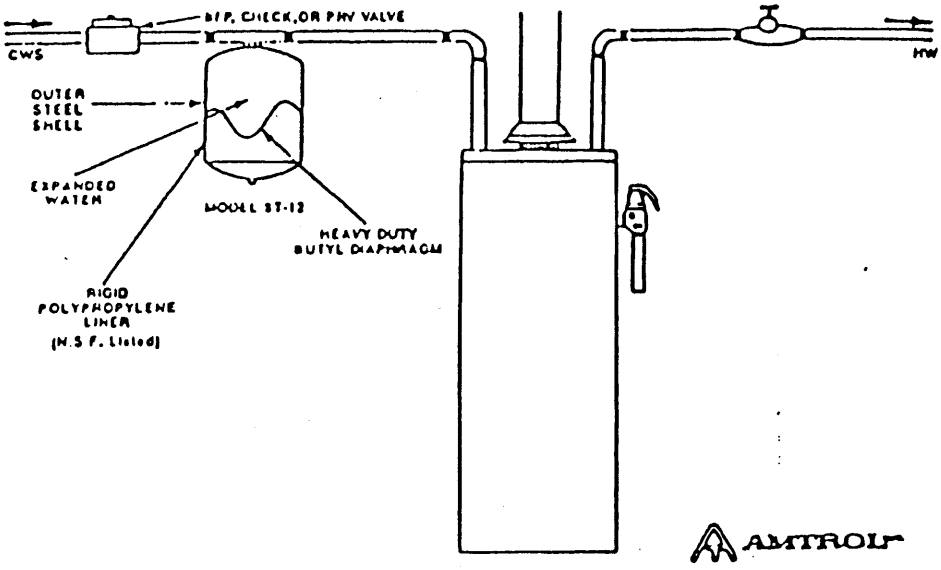
Danger of unchecked thermal expansion

How dangerous? Well, it has been documented that thermal expansion, unchecked and uncontrolled, can rupture piping and fittings, blow solenoid valves, O-ring seals and float valves, even dramatically reduce the life of the water heater itself.

We have seen gas-fired water heaters taken out of service with collapsed center flues. Just think of the liability of possible carbon-monoxide poisoning, home fires started by flame rollout, or a disastrous water heater explosion; a serious liability caused by unchecked thermal expansion. Water-heater manufacturers have recognized this liability.

Most major water-heater manufacturers warn customers that if the heater is installed in a home protected with a backflow prevention device and there is no provision for thermal expansion pressure control, then dangerous pressure conditions will occur that could threaten life and property..A major manufacturer has advised all of its dealers that if its product is installed in a home with backflow prevention, and no approved thermal expansion pressure control is provided, the expected life of the new water heater is from six (6) to thirteen (13) months.

The manufacturer also said that warranties on water heaters installed in his situation are automatically null ind void, and it will not accept liability for any consequential damages attributed to thermal expansion.



The ST-12 THERM-X-TROL® from AMTROL Inc. is designed to fit domestic water heaters up to 120 gallon capacity.

Solution to Thermal expansion

What is the solution to thermal expansion? How does the water authority eliminate serious liability?

If you do nothing to assure proper thermal expansion control is provided, the homeowners or uninformed service personnel will proceed with their own solution. After replacing a constantly operating relief valve two (2) or three (3) times, mistakenly thinking that the relief valve is faulty, the plumber will try the obvious solution. The service or maintenance worker will plug the relief valve drain outlet, tie the lever down, or remove it completely, and there will be no more dripping of hot water.

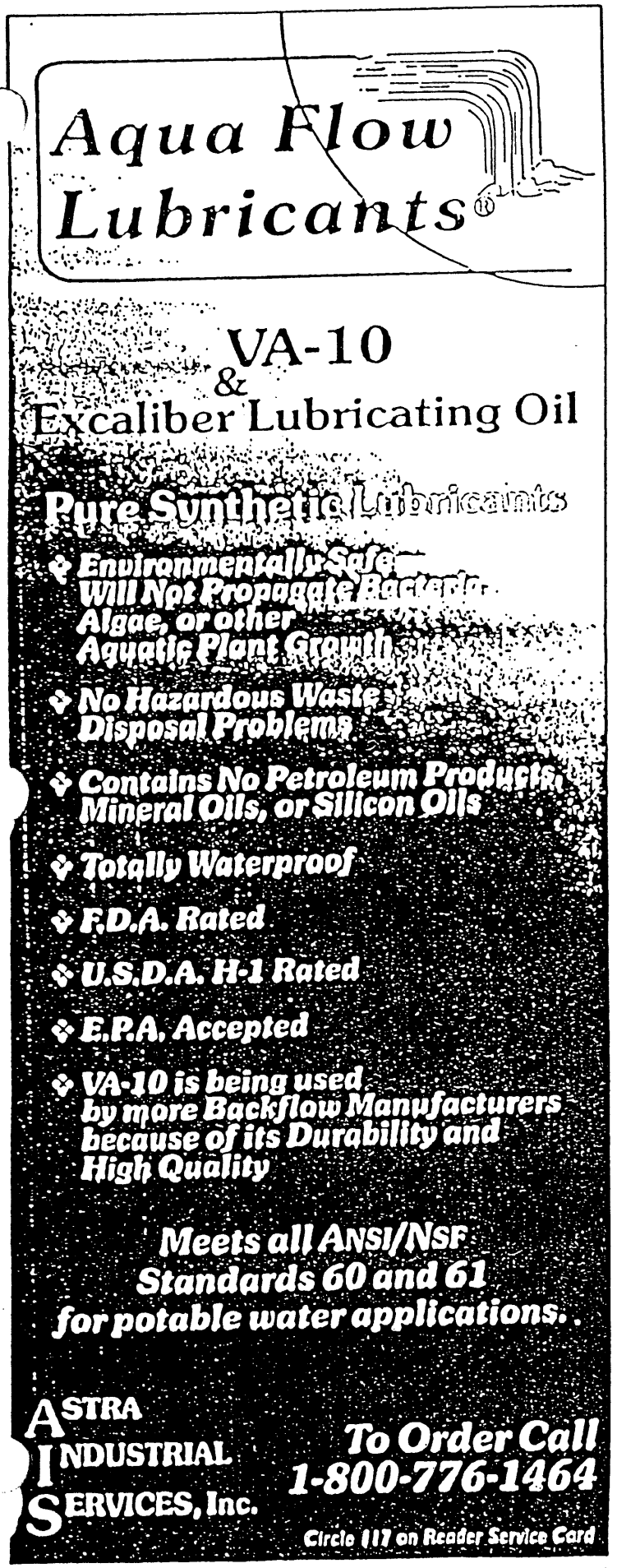
This is not a solution. And it definitely increases the water supplier's liability. The homeowner or the plumber may have stopped the visible system malfunction by removing the only safety emergency device. The water heater has become a potential bomb in the basement or utility room.

Another solution is the installation of a second safety relief valve, piped to a permanent drain. The valve is set to relieve at a lower safe pressure level to protect the system from thermal expansion pressures.

This, too, is not a good solution. All national plumbing codes and standards classify a relief valve as a safety device only. It is prohibited by code from being used as a continually operating control component. It is designed for a one-time use to relieve emergency conditions. Even in the best of operating conditions of the system, it should never be operated.

In fact, if a safety relief valve continually weeps or opens, whether to a permanent drain or not, codes state that it must be considered inoperative and either replaced or repaired.

Common sense dictates that proper thermal expansion control should not



cause a continuous loss of hot water. Imagine the impact of a gallon to a gallon-and-a-half of water loss in a municipal pipe line serving 200,000 homes every day, especially with the current emphasis on conservation of our most valuable resource.

The obvious solution to thermal expansion pressure is the way the plumbing and heating industry has been successfully operating hot water space heating systems for 100 years . . . with a thermal expansion tank.

Since it has been a closed system ever since pressurized central hot water systems have been used, thermal expansion has been accommodated with an expansion tank containing a pressure cushion of air. This cushion of air compresses as hot water expands into it and by sizing the volume of air controlling pressure increase to the desired limit. Without a thermal expansion tank, the hot water space heating system could not operate.

The domestic hot water system, closed by backflow prevention devices, cannot operate without this pressure control. The only provision that must be incorporated into the device is a means of protecting metal water-bearing surfaces from corrosive aggression by the continuous flow of fresh potable water flowing through it.

Pre-pressurized tank

The best design for a thermal expansion tank for a domestic hot water system incorporates a sealed-in air chamber, pre-pressured to the supply pressure at the water heater and separated from the system water by a flexing butyl diaphragm to prevent air absorption and loss into the system water. The water-side incorporates a separate, rigid polypropylene liner, bound with the diaphragm's upper perimeter by a grooving of tank walls into a sturdy steel retaining ring or hoop. The liner protects the tank walls from exposure to aggressive water. Polypropylene liners have been used successfully in water systems pressure tanks for forty (40) years to handle fresh water.

The thermal expansion tank is installed on the supply line to the heater. Since it is pre-pressurized to supply pressure, no water can enter the tank.

As water is heated, the expanded water is forced into the tank, flexing the diaphragm downward, compressing the sealed-in air cushion. As the air cushion compresses, its pressure rises. Knowing the ratio of air volume to pressure increase, the tank can be sized to limit pressure increase to any desired safe limit.

Once recovery is complete, the final pressure is a level well below the safety relief valve setting, and it never operates.

When hot water is drawn from a faucet or water-use fixture, the expanded hot water stored in the tank is returned to the system for use. No waste of water . . . no wasted energy to heat it.

The thermal expansion tank is a low-cost, simple-to-install control that provides a 100 percent sure solution to thermal expansion problems, and it insures liability-free water service to homes equipped with backflow prevention devices.

For example, a four-gallon thermal expansion tank with its standard pre-charge will safely handle thermal expansion

in water heaters up to 120 gallons in volume, at 160° F temperature, with up to 80 psi supply pressure.

Code requirements

All national cross-connection control codes, including Building Officials & Code Administrators (B.O.C.A.) *National Plumbing Code*, International Association of Plumbing and Mechanical Officials (I.A.P.M.O.) *Uniform Plumbing Code*, Southern Building Code Congress International (S.B.C.C.I.) *Standard Plumbing Code*, and the National Association of Plumbing-Heating-Cooling Contractors (N.A.P.H.C.C.) *National Standard Plumbing Code*, now carry mandatory requirements for the provision of an approved thermal expansion control device. The preferred device specified is an approved thermal expansion tank.

All local water authorities and water supply companies that are charged with the responsibility of implementing and enforcing backflow prevention codes should see to it that local codes carry the verbiage of the national codes concerning the mandatory requirements for an approved thermal expansion tank.

This should be done for the protection of the water user's life and property. And perhaps, more importantly, for complete elimination of the water supplier's liability that can occur if thermal expansion dangers are not checked.

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EDITOR'S NOTE: DW&BP is interested in reader opinions regarding a potential water utility liability for the property owner's plumbing system non-compliance with the code. Opinions expressed in contributed articles are those of the authors and may not reflect the views of *DW&BP* magazine. *DW&BP* encourages comments from our readers regarding published articles. Comments should be sent to *DW&BP* 11166 North Huron St. #29, Denver, Colo. 80234, or facsimile (303) 452-9776.

Test Your Skills

Backflow Protection for Domestic Clotheswashers Section 1003 (n) of the *Uniform Plumbing Code*. Reprinted from the July/August 1992 *Official* magazine.

Question:

Would a domestic clothes washing machine, which is typically connected to an internal faucet with threads (hose bibb), be required to have an external (separate from the washing machine) backflow prevention device installed?

Answer:

No, backflow preventers are not required on washing machine hose bibbs or hose bibbs used as water heater drains. Washing machines are provided with air-gap fills at the factory. Therefore, the hose bibb backflow preventer would be redundant.

Although it is conceivable that a home owner would not have a washing machine installed and would use the hose bibb for some other purpose such as getting hot water to the car, it would be an unlikely use for this valve.

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TYPICAL QUESTIONS AND THEIR ANSWERS ABOUT HOT WATER SAFETY

1.
Ques. What causes a hot water storage tank to explode?

Ans. The basic cause of a hot water storage tank explosion is, first, overheating or excessive temperature. A physical cause is corrosion and service weaknesses. With the superheated water, the heat weakening and corrosion factors combined can cause a "pressure-heat rupture". This causes a sudden reduction of the pressure within the tank by exposing its contents to the atmospheric pressure, and the superheated water immediately flashes into steam. This combination of circumstances is the explosion itself. To comment further about what "pressure-heat rupture" means, let us suppose a heater under 212 degrees can satisfactorily withstand its service pressure of say 75 lbs. However, the same tank when overheated above 212 degrees may only be able to stand a pressure of 50 lbs. or less, because of heat weakening effects. Therefore, what was normal pressure can become excessive pressure and cause the rupture of a superheated tank.

2.
Ques. Why is it temperature and not pressure that causes a hot water explosion?

Ans. It has been illustrated and proven in the film, "Explosion Danger Lurks", that it is not water pressure that causes an explosion. Tank pressure was built up to over 500 lbs. and even when a rupture was caused, nothing happened except a squirt of high pressure water. Water pressure is simply the weight of water and water is practically an incompressible solid. Therefore, unless it is superheated, it has no latent heat energy in itself to expand when released. Consequently, there can be conditions of a perfectly normal pressure right up to the time of an explosion. On the other hand, at the time of a heat weakened pressure rupture, the force and energy of the explosion is steam pressure, as a result of the superheated water flashing into steam under the atmospheric pressure condition.

3.
Ques. If excessive pressure is relieved, why does this not give adequate protection against explosion?

Ans. During the explosion demonstrations in the film, a pressure relief valve was connected, and discharged the thermal expansion pressure relief continuously above its setting. This amount of discharge was not sufficient to reduce temperature or prevent the overheating. The reason the volume of pressure discharge is not enough to overcome the BTU heat input is because thermal expansion pressure is approximately 2½% of volume for every 100 degree rise. Fluid heat discharge is necessary to relieve the extra BTU heat input for every 1,000 heat units which is about 20 times greater in volume. Also see Q.A.-9.

4.
Ques. Is a pressure relief valve necessary on the cold water line when a T & P valve is installed on the tank or heater?

Ans. Pressure is common to all parts of a system and since the combination T & P valve gives protection against both excessive temperature and excessive pressure, there is no need for a separate pressure relief valve on the cold water line.

5.
Ques. Does the water pressure increase with temperature on open main systems?

Ans. In an open main system, nothing is closed between the house system and the street main. Therefore, water pressure cannot increase above the street main pressure from the reservoir regardless of any expansion from temperature. Consequently, a straight pressure relief valve cannot operate unless a system is closed.

6.
Ques. Is it safe to install a check valve in the cold water supply main?

Ans. It must be remembered that the original purpose of a check valve was to protect the meter by preventing superheated water from backing up into the cold supply main from range boilers and heaters. However, the very condition that can cause this, can also cause explosions and the temperature and pressure relief valve principle protects against both excessive temperature and pressure, thereby eliminating the need of a check valve. A check valve closes the system allowing pressure to build up from thermal expansion higher than the city main pressure, and therefore should not be used except where required by local codes.

7.
Ques. Should a check valve be used on the cold water line when a temperature and pressure relief valve is installed on a tank or heater?

Ans. A check valve has no value to the system when a temperature and pressure relief valve is installed on a tank or heater. Only when the tank heater temperature is allowed to rise beyond 212 degrees is there danger of meter damage. This has been proven by several tests, even when the meter was within 6 ft. of the tank. The condition which causes meter damage is the greater hazard of superheated water which can cause an explosion should the tank or heater rupture. The use of a check valve causes a pressure rise in the system each time water temperature is raised. Without the check, water pressure is increased as the water is heated only in case of accidental stoppage in the supply line. (Subject refers to municipal water systems.)

8.
Jes. Will a straight pressure relief valve prevent overheating when a check valve is used?

Ans. Definitely No. Overheating is wholly dependent on the BTU heat input from the heating element, and a plain pressure relief valve, regardless of its size, cannot prevent this overheating or reduce temperature.

9.
ues. Since a pressure relief valve will open in a closed system with a check valve, why doesn't this thermal expansion discharge eliminate overheating?

Ans. To prevent overheating, a relief valve must discharge heat at the rate the heater supplies it. In a system with a check and pressure relief valve, the relief valve opening by pressure increase due to expanding water will discharge approximately 1/3 lbs. of water for each 1,000 heat units put into the water because that is the rate at which water expands. To release 1,000 heat units when the temperature is at 210 to 212 degrees, there must be approximately 6 2/3 lbs. of water released from the system. In other words, to prevent overheating, a means must be provided to release about 20 times as much water from the system as a pressure relief valve can discharge from thermal expansion, when there is a check valve in the supply line, or an accidental stoppage, to make the system a closed one. To be safe, the system must be protected by a temperature relieving device which should be capable of releasing heat at a greater rate than the heater input rate.

10.
ues. What is the proper pressure setting for the pressure side of a T & P valve, or for a separate pressure relief valve?

Ans. To determine the correct pressure setting for the pressure part of any relief valve, it should be *at least* and between 20 to 30 lbs. above the maximum working pressure in the area. If a setting is too close to the actual working pressure, it only causes unnecessary and annoying drippage due to water fluctuations and water hammer conditions. The nature of water pressure itself is not so important as to necessitate specifically close setting of a valve to the working pressure, unless the test pressure of the tank is critical. A standard pressure setting of 150 lbs., for example, is suitable for use on todays water heaters most of which have a standard working pressure of 150 lbs. If pressures are in excess of 125 lbs., a pressure reducing valve is recommended to reduce the pressure to around 45-50 lbs., and then a standard set valve can be used.

11.
lues. What effect does water hammer have on the setting of a pressure relief valve?

Ans. If a pressure relief valve is set 20 to 30 lbs. higher than the maximum service pressure it avoids unnecessary momentary relief from water [illegible]mer and minor pressure surges when faucets are closed quick[illegible] Should this setting be in excess of rated tank or heater work[illegible]pressure, it is advisable to install a tank of proper [illegible] pressure reducing valve to lower to normal service pressure in the system. Water hammer shocks increase in intensity as the service pressure rises and where normal pressures are in excess of 75 to 90 lbs., it is recommended practice to use reducing valves to protect and prolong the life of equipment.

12.
Ques. Should a home owner open hot water faucet to allow steam to escape from an overheated hot water storage tank?

Ans. Prevention rather than cure, but if a storage tank has become seriously overheated, the home owner should use his own judgment about shutting off the gas, open a hot water outlet moderately, get away from the tank or out of the house, and then call a plumber and have a temperature and pressure relief valve installed correctly.

13.
Ques. Would opening the hot water faucet connected to an overheated storage tank cause the tank to explode?

Ans. Technically, the opening of a hot water faucet connected with an overheated storage tank would not cause the tank to explode. Since the water pressure would be maintained with the faucet open, the overheated condition in the tank would be affected only on the safe side; that is, would allow cold water to enter as water was being discharged. Depending on the extent of the overheating, the water would flash into steam as it reached the faucet outlet, thus releasing heat until temperature is reduced to its atmospheric boiling point. Resulting cooler temperatures at the bottom of the tank may cause metal stress and a pressure-heat rupture. Again, prevention rather than cure.

14.
Ques. Where is the proper location for a pressure relief valve on a hot water storage system?

Ans. For pressure relief only, it is possible to install a plain pressure relief valve anywhere in the system simply because pressure is common to all parts of a system. It is a recommended practice, however, to install it as close as possible to the equipment which it is to protect from excessive pressure. Pressure relief valves are only recommended for unfired pressure vessels not subject to overheating possibilities. It should also be emphasized that no shut-off valve be installed between a relief valve and the tank.

15.
Ques. If a water tank has 60 lbs. pressure and the temperature happens to be overheated to about 240 degrees, what happens if the water pressure is shut off due to repairs or any other purpose?

Ans. When a faucet was opened to bleed the pressure, it would immediately drop down, not entirely to zero, but to about 10 lbs., which is the pressure at which water boils under 240 degrees. Therefore, because this is a pressure boiling point combination, the water will flash into steam and the steam thus formed instantaneously creates a steam pressure which therefore sustains the 10 lbs. pressure until the escaping steam reduces the tempera[illegible] As the temperature reduces, the pressure reduces correspondin[illegible]cording to pressure boiling points. Finally, the pressure will [illegible] to zero.

nd when it does, the temperature is the boiling point of water ccording to the atmospheric pressure. Therefore, such a condition ; "controlled steam pressure energy" being dissipated. Explosions ccur when a complete rupture of the superheated contents is xposed to atmosphere.

:s. How can a plumber be sure the T & P valve is of ample capacity to properly protect the tank from excessive temperature and pressure?

ıs. All Watts temperature and pressure relief valves are marked as o their BTU discharge capacity and catalog reference material rovides information regarding BTU discharge capacity for various izes and types. To be sure of ample capacity, it is equally important o know the BTU heat output capacity of the heater so that a valve an be selected to equal or exceed this rating in BTU discharge.

7.

es. What could cause an automatic T & P valve to open and close repeatedly when there is very little hot water in the storage tank?

ıs. With a sidearm gas heater, this is a very common condition when a T & P valve operates frequently and still there is but very ittle hot water in the storage tank. Nevertheless, an overheated condition exists at the point of the valve, but most of the overheated water is congested at the top of the tank. Too small circulation piping between heater and tank and return is one cause. This restricts the circulation area, and with the BTU input greater than that area can carry, it cannot enable proper tank circulation, as well as through the coils of the heater itself. Due to this improper circulation, the water overheats in the coils and is slowly circulated to the top of the tank. This congested overheated water does not circulate to heat the tank from top to bottom.

Consequently, a T & P valve is called upon to open and after discharging for just a short time, because there is so little hot water to discharge, it resets again. The cure for this is minimum ¾" size circulation piping and preferably non-ferrous. Unless piping is non-ferrous, even if it is of large size, it can clog up with rust, thereby reducing the area of circulation in the pipe so that it will be no better than a small pipe. Liming conditions are very common and conditions have been experienced in coils of heaters that have become literally plugged up with lime formation, thus restricting the circulation flow. With an automatic gas storage heater installation, either the heater thermostat would have to be acting abnormally and not shutting off or stacking temperature conditions could contribute to this situation.

18.

ues. What should be the correct size of circulating pipe connections to insure balanced temperature in storage tank and to prevent the T & P relief valve from opening up unnecessarily?

ns. Circulation piping should be at least equal to the full size of the circulation connection on the heater, and never less than ¾".

19.

Ques. Will the temperature and pressure relief valve protect the tank against breaking from excessive water hammer?

Ans. An excessive water hammer is an abnormal momentary condition. Consequently, the pressure part of the temperature and pressure relief valve would only be able to discharge a limited amount of the excess pressure condition during the water shock. The temperature factor could not assist in any way except, as it should be reminded, that without it, if this sort of water hammer condition occurred when a tank was overheated above atmospheric boiling point, there could be an explosion. Water hammer conditions are believed to be a partial factor in starting off an explosion of overheated tanks besides "pressure heat rupture".

20.

Ques. Should a temperature and pressure relief valve be installed in an elbow or coupling at the end of a 4" nipple or any size nipple?

Ans. A T & P relief valve must not be installed in an elbow. In a coupling, because of air pocket possibility in a dead end, only extension type valves should be used.

21.

Ques. What would cause a pressure relief valve to open periodically?

Ans. If a pressure relief valve opens periodically, it can be one of four things:

1. Fluctuating pressures in the area:
2. Water hammer condition in the building:
3. These combined with a too low pressure setting to a working pressure (see Q.A.-10)
4. Expansion pressure in a closed system with a check valve installed close to the heater.

22.

Ques. What is Thermal Expansion?

Ans. The use of a water pressure reducing valve normally creates a closed system. When water is heated in a closed system, it expands causing an increase in pressure. This pressure may increase to the set pressure of the relief valve (on the water heater) causing it to drip, thus releasing the expanding water and protecting the system against excessive pressure. This increase in the system pressure over that regulated by the reducing valve is called "thermal expansion pressure". A solution to the drippage is to utilize a by-pass model water pressure regulator which under certain conditions allows the supply water to escape back into the supply main before it can affect the relief valve; however, such regulators can only be effective when the street main pressure is less than the pressure relief valve setting.

23.

Ques. Can air pockets form on the top of tanks?

Ans. As long as the hotoutlet is taken from the top of the tank there can't be any air pocket. Any old style heaters with the outlet taken from the side directly could cause an air pocket at the top of the tank, but have been discontinued to our knowledge.

s. What advantages has a fully automatic T & P relief valve over the ordinary fuse type of valve?

s. The advantages of a fully automatic T & P valve over the ordin-
y fuse plug type of valve are several. For one, a fuse plug type of
ılve can have a fuse plug replaced with an incorrect melting material
hich would defeat the temperature safety factor of the valve. In
ıe fully automatic type, there are no fuses to replace and the valve
:sets automatically. Because of the replacement detail of fuse plugs,
ıe fully automatic is cheaper in the long run since only one service
ıll prevented will more than save the difference in cost to the home
wner, or the contractor, if within the guarantee period. Also, fusible
lugs can be affected by certain water conditions which may affect
ıe melting point of the fusible material, and a lime coating can
lock water flow through the thermo tube. A self-closing T & P valve
an break any lime condition through movement, and latest devel-
ped thermostats are unaffected by corrosive water conditions. Also,
ıse plug type valves do not comply with current national standards.

s. Should the drain pipe from relief valves be reduced in size less than drain opening size in valve?

s. No. The relieving capacity of relief valves is based on a full size
ischarge line. Furthermore, there should be no shut-off valves in
ıis line and it is essential that the drain line be piped to a safe place
f disposal. The function of a T & P valve is to operate by dis-
harging water and, therefore, means must be provided to eliminate
ossible scalding and water damage, during periods of relief.

s. Is it necessary to install T & P valves on a hot water space heating system?

s. We do *not* recommend T & P protection on hot water space
eating systems because the operating factors differ considerably
·om that of domestic hot water supply systems.

:s. What is considered proper and sufficient protection of hot water (space) heating boilers?

ıs. Since the introduction of the latest ASME code recommen-
ations, which require valves with an emergency BTU *steam* dis-
harge capacity rating, such tested and rated valves offer sufficient
rotection. The principle of hot water space heating boiler protection
; diametrically different from that of protecting domestic hot water
upply systems. This is because water is confined in the system
/hich is more or less pure from heating and therefore less corrosive.
:hance of pressure-heat rupture is unlikely, by preventing any fur-
her rise in pressure above 30-33 lbs. regardless of runaway firing
:ondition. ASME BTU steam rated pressure protection can thus
naintain boiler conditions within safe pressure limits.

es. When a [redacted]losing T & P valve opens, how can you tell whether i[redacted] opening on temperature or pressure?

ıs. If a fully [redacted]tomatic T & P valve is relieving a full flow, it generally indicates temperature relief. If it is relieving just a few drops or in dribbles, it indicates pressure relief. Under certain conditions, a minor temperature dribble might be caused due to a low heat input combined with a large capacity of the temperature thermostat part of the T & P valve.

29.
Ques. What is meant by thermal lag on the hot water supply line?

Ans. A thermal (temperature) lag on the hot water outlet line is simply the difference in temperature between a given point in a nipple some distance away from the heater, and the temperature in the top of the tank itself. Water in the hot water outlet lines doesn't have the same free circulation as within the larger area of the tank itself. Consequently, there is a continuous differential of temperature at a point 10" away, compared to the temperature in the tank itself. See Q.A.-39 and 41 for further comments.

30.
Ques. What can be done to prevent a temperature and pressure relief valve from liming up?

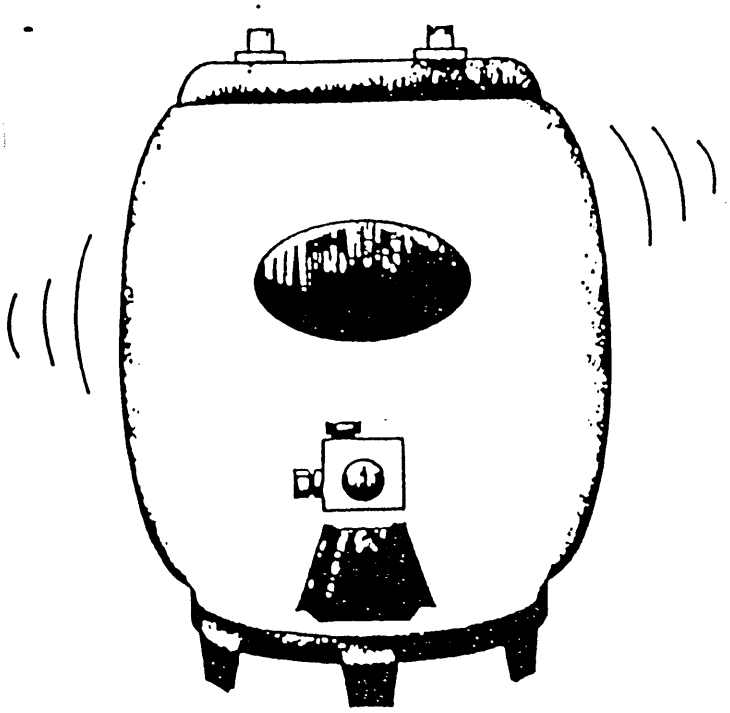
Ans. Removal of minerals from the water by treatment is the only method of preventing the liming up of valves in the system. In districts where liming conditions are common, a safety relief valve should be periodically checked to assure its being in a safe operating condition. Valves with test levers are required whereby it can be manually *opened to check* clearance of waterways.

31.
Ques. What type of relief valve should be used on tankless heaters attached to low pressure hot water and steam heating boilers?

Ans. We do not recommend T & P valves for tankless heaters. This is because the nature of a tankless heater installation is different than that of a storage vessel in which water is heated for domestic hot water supply. Therefore, we recommend plain pressure relief, because it is difficult, and in some cases impossible, to locate a T & P valve correctly enough to serve a practicable purpose of temperature protection.

32.
Ques. Why isn't temperature and pressure protection applicable to tankless heater installations?

Ans. In the average tankless heater, the water in the tubes will reach the temperature of the water in the boiler during periods when there is no demand for domestic use. In cold weather when boiler water temperature may be in excess of 212 degrees, the domestic water would be above the temperature relief valve set temperature and there would be frequent, though short, periods of relief valve operation. There is no means of cooling the temperature of the water in the heater tubes, particularly with a built-in heater. Periodic high temperature entering the tubes is not particularly hazardous because of the small amount of excess heat energy. The danger of high temperature in tankless [redacted]ters is from the high temperature water flowing from the fixt[redacted] It is most advisable to install a water tempering valve which [redacted] limit



New Code Requirements on Thermal Expansion Control in Domestic Service Water Heating Systems

by Dennis M. Streit
Product Manager,
Residential Plumbing and Heating, Amtrol, Inc

Opinions expressed in contributed articles are those of the auth

When dual-check valves and check valves are installed in water meters, they seal off the household plumbing system from the potable public supply, preventing backflow of possibly contaminated household water into the public supply. Because they do their job so well, these backflow devices can contribute to thermal expansion, which can cause serious problems.

Typical Water Heating System

In a typical domestic water supply system some water is used in the cold water service lines. Some water may be used in a secondary 'closed' piping system, sealed from the potable plumbing system, which connects to a hot water boiler. This piping system is usually filled up once and the water is used over and over, only as a medium to convey heat.

The largest use of potable water in the home is usually for hot water for bathing, washing and dishwashing. Water in the domestic hot water system is heated by a water heater—gas, oil, electric, or indirect. The water heater, unlike the hot water boiler system, uses a continuous supply of fresh water.

As water is heated, or as the water heater 'recovers,' hot water is drawn at a rate dictated by the demand at the water-use fixtures. As hot water leaves the system through faucets, shower heads, or appliances, fresh cold water from the city main is supplied to the heater where it is heated for continuing use. Typically, a water heater in a home will heat water two or three times a day.

When water is heated, it expands in volume as much as three to four percent depending upon the initial and final temperature. If there is no demand for hot water, the expanded volume of water has no place to go. Since water is virtually incompressible, t expanded water cannot be accommodated in the rig piping system through which it travels, and it ther fore can act like a hydraulic ram, exerting an increa in pressure to potentially dangerous levels.

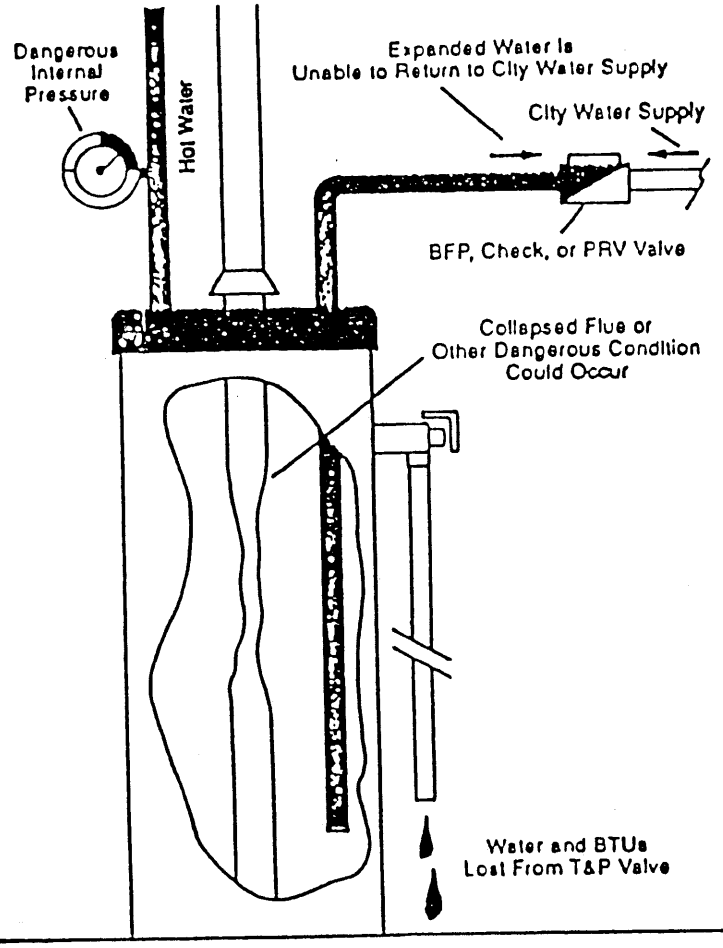
Open Systems

In the days before backflow prevention, the expan ed water did have a place to go... back into the c main, mixing with a massive amount of cold water v ume where it was easily accommodated. Back in the days, domestic hot water systems were 'open' systen because they were 'open' to the city main.

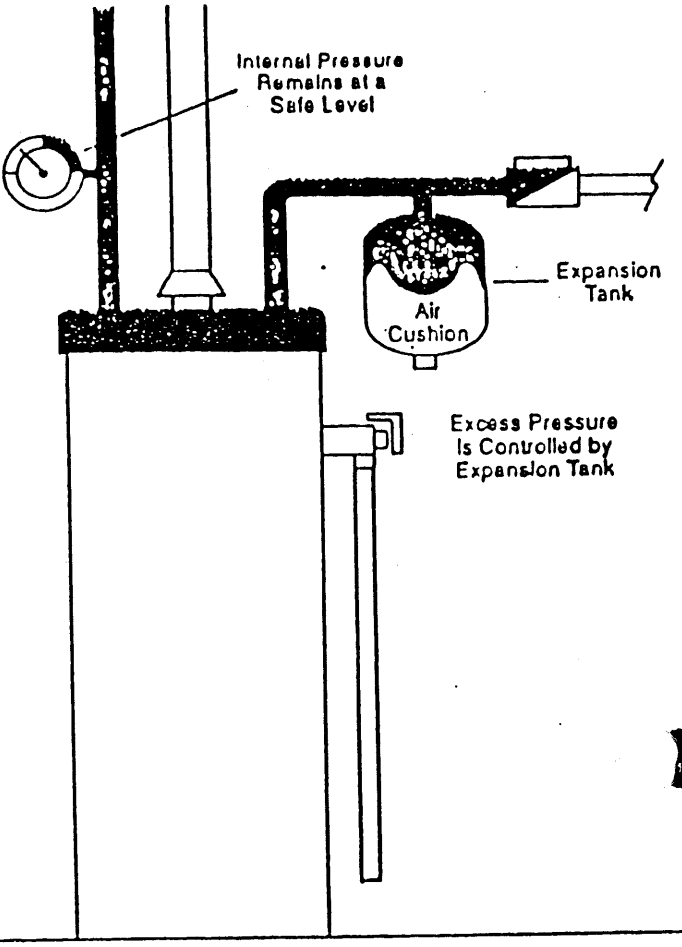
When a dual-check or check valve is installed wi or without a water meter, the backflow prevent becomes an effective 'non-return' barrier, making t system 'closed.' Expanded water cannot find its w back to the city main, so in periods of water heat recovery when there is no hot water drawn, expand water volume can create a pressure increase until t heater's safety relief valve, usually set at 150 psi, po and hot water drains through the relief valve drain.

The first indication of a thermal expansion probl is the phone call from a customer, angry that his wat heater relief valve is continually spilling hot water. T liability facing the Water Authority, however, is far m serious than the customer angry about wasted wat What the customer, the Water Authority, and even ma plumbers don't realize is that long before the 150 p relief valve pops, dangerous pressures are continual being exerted on the water heater, fittings, fixtur appliances, and the piping system on a regular basi two or three times a day.

The Problem



The Solution



The Problem: In the "Good Old" days, before the advent of cross-connection control, expanded water which exceeded the capacity of the water heater flowed back to the City main where it was easily dissipated. But today, with backflow preventers, water meters with check valves, and/or pressure reducing valves without a bypass being installed, expanded water from a water heater cannot return to the City supply. It is now a closed system, and the expanded water has no place to go.

Since water is not compressible, a rapid and dangerous pressure increase is created in the water heater and piping system—similar to a hydraulic ram. The setting on the safety relief valve is quickly reached and the relief valve opens, losing water from the water heater.

The safety valve may operate once or twice a day, which is not only wasteful, but is also dangerous. A T&P valve is designed as an emergency control only, not as an operating control, and this continuous operation may cause premature failure of the valve.

What most people don't realize is that dangerous conditions can exist during thermal expansion long before the relief valve operates.

Internal pressures repeatedly occurring during recovery periods can collapse the center flue of a gas fired water heater, creating a hazardous presence of deadly carbon monoxide gas or even a water heater explosion.

The Solution: The best solution to thermal expansion is to control the pressure it generates within a normal, safe operating range, well below the emergency setting of a relief valve. This can be accomplished by installing an expansion tank which will allow thermal expansion to occur, but without causing a dangerous increase in pressure.

The expansion tank contains a sealed-in compressible air cushion which will compress as thermal expansion occurs, providing a spa hold and store the additional expanded w volume. When hot water is used in the system, the pressurized air cushion forces hot water back into the system for use... not waste.

Danger of Unchecked Thermal Expansion

How dangerous? It has been documented that thermal expansion, unchecked and uncontrolled, can rupture piping and fittings, blow solenoid valves, O-ring seals, and float valves, and even dramatically reduce the life of the water heater itself. We have seen gas-fired water heaters taken out of service with collapsed center flues. Just think of the liability regarding carbon monoxide poisoning, home fires started by flame rollout, or a disastrous water heater explosion.

Water heater manufacturers recognize this liability. Most major water heater manufacturers warn customers that if the heater is installed in a home protected with a backflow prevention device and with no provision for thermal expansion pressure control, dangerous pressure conditions will occur that could threaten life and property. In fact, one major manufacturer has advised that if installed in a home with backflow prevention and without approved thermal expansion pressure control, the expected life of its new water heater is only six to thirteen months and warranties on it are automatically null and void.

Solution to Thermal Expansion

What is the solution to thermal expansion? If the Water Authority does nothing to allow for proper thermal expansion control, the homeowner or his uninformed service man, may proceed with his own solution. After replacing a constantly operating relief valve two or three times, mistakenly thinking that the relief valve is faulty, he may try the obvious solution—to plug the relief valve drain outlet, tie the lever down, or remove it completely. This is not a good solution and actually increases the problem. While he may have stopped the *visible* system malfunction (i.e., the dripping hot water), he has removed the only safety device he has, and his water heater has become a potential bomb in his basement or utility room.

Another 'solution' people might turn to is installing a second safety relief valve, piped to a permanent drain, set to relieve at a lower pressure level to protect the system from thermal expansion pressures. This, too, is not a good solution. The relief valve is a safety device, and ideally should never need to be operated. Common sense and water conservation dictate that proper thermal expansion control should not cause continuous loss of hot water. Imagine the impact of one to one and a half gallons of water loss every day in a municipal pipe line serving 200,000 homes.

The obvious solution to thermal expansion pressure is the way the plumbing and heating industry has been successfully operating hot water space heating systems for 100 years... with a pre-pressurized diaphragm tank.

Pre-Pressurized Thermal Expansion Tank

A common design for a thermal expansion tank for a domestic hot water system incorporates a sealed-in air chamber, pre-pressurized to the supply pressure at the water heater and separated from system water by a flexing diaphragm, installed to prevent air absorption and loss into system water. The water side incorporates a separate, rigid polypropylene liner, bonded with the diaphragm's upper perimeter. The liner protects the tank walls from corrosion due to aggressive water. Polypropylene liners have been used successfully in water system pressure tanks for 40 years.

The thermal expansion tank is installed on the supply line to the heater. Since it is pre-pressurized to supply pressure, no water can enter the tank. As water is heated, the expanded water is forced into the tank, flexing the diaphragm downward, compressing the sealed-in air cushion. As the air cushion compresses, its pressure rises. When hot water is drawn from a faucet or fixture, the expanded hot water stored in the tank is returned to the system for use. No water is wasted and there is no wasted energy to heat it.

Knowing the ratio of air volume to pressure increase, the tank can be sized to limit the pressure increase to any desired safe limit. Once recovery is completed, the final pressure will be at a level well below the safety relief valve setting. For example, a 4-gallon thermal expansion tank with its standard pre-charge will safely handle thermal expansion in water heaters up to 120 gallons in volume, at 160°F (71°C) domestic water temperature, with up to 80 psi supply pressure.

The thermal expansion tank is a low-cost, simple-to-install control that provides a solution to thermal expansion problems, and it assures safe water service to homes equipped with backflow prevention devices.

All national cross-connection codes, including the Uniform Plumbing Code*, now carry requirements for the provision of an approved thermal expansion control device.

All local Water Authorities and water supply companies charged with the responsibility of implementing and enforcing backflow prevention codes should see to it that local codes carry the wording of the model codes on mandatory requirements for thermal expansion prevention. This should be done for the protection of the water user's life and property, and just as important, for elimination of the water supplier's liability for damage from uncontrolled thermal expansion.

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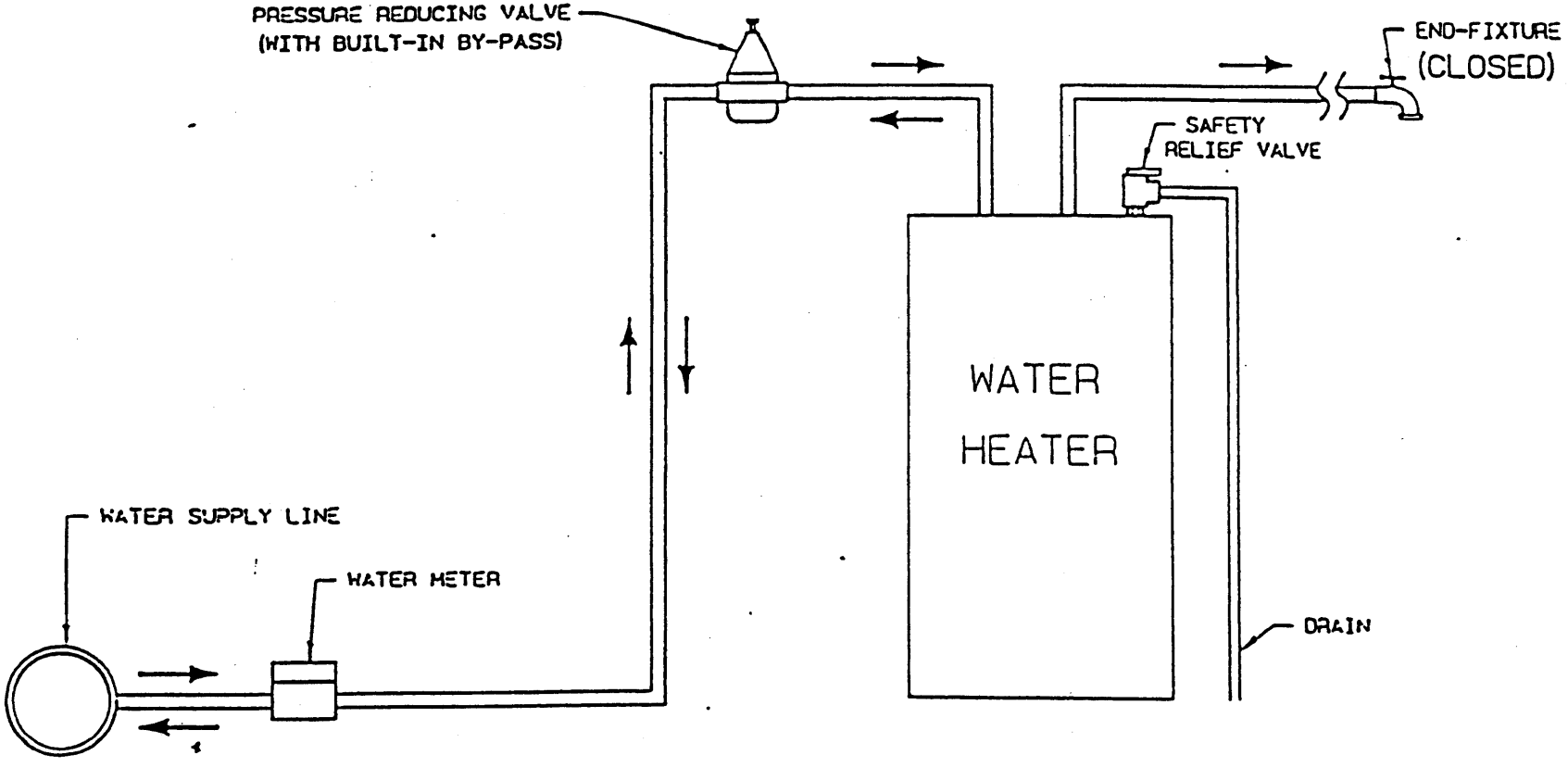
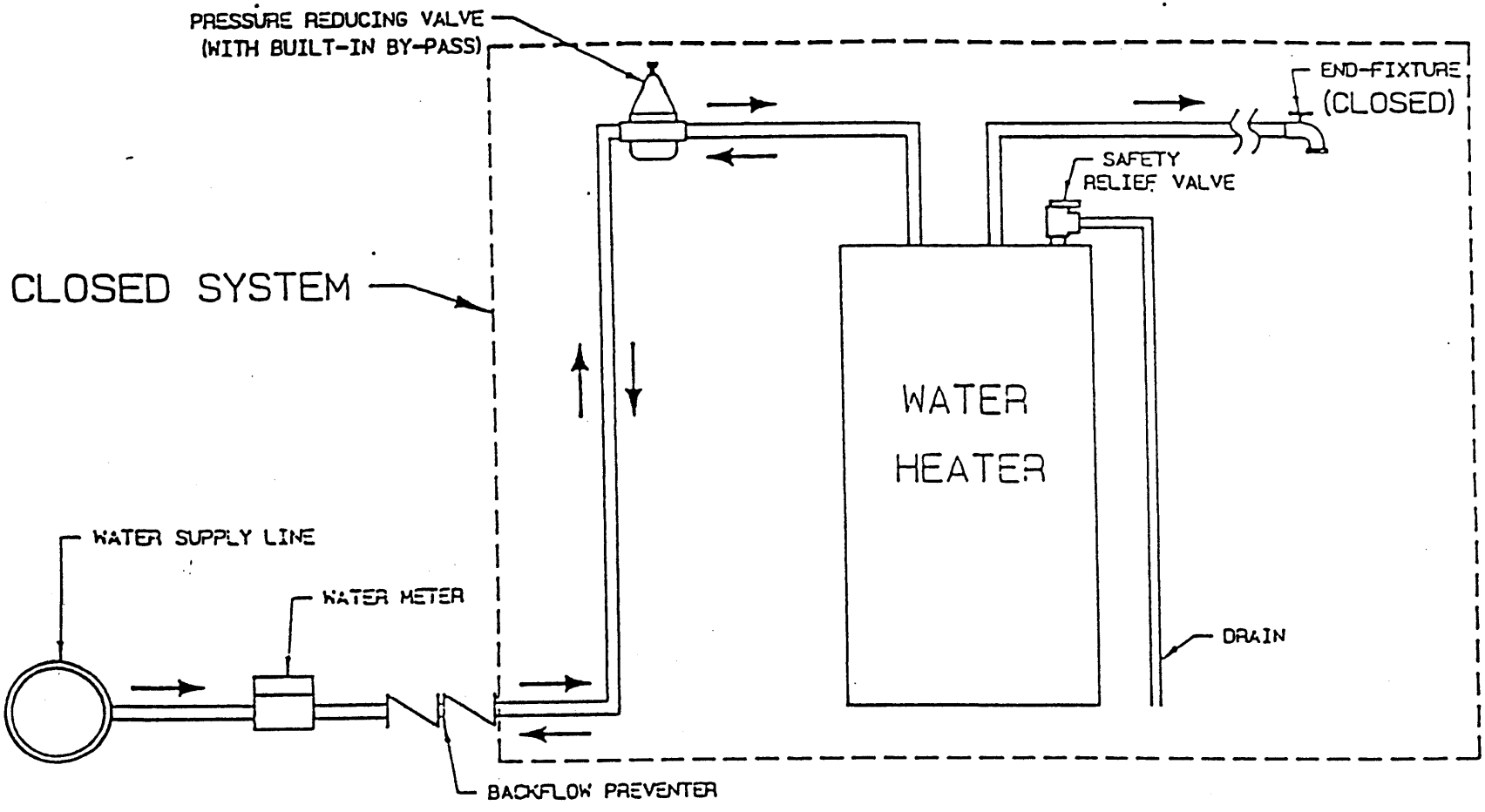
*1991 edition of the Uniform Plumbing Code:
Section 1007
(c) (second paragraph only shown here)
In addition to the required pressure relief valve, an approved, listed expansion tank or other device designed for intermittent operation for thermal expansion control shall be installed whenever the building supply pressure is greater than the required relief valve pressure setting or when any device is installed that prevents pressure relief through the building supply. The tank or device shall be sized in accordance with the manufacturer's recommendation.

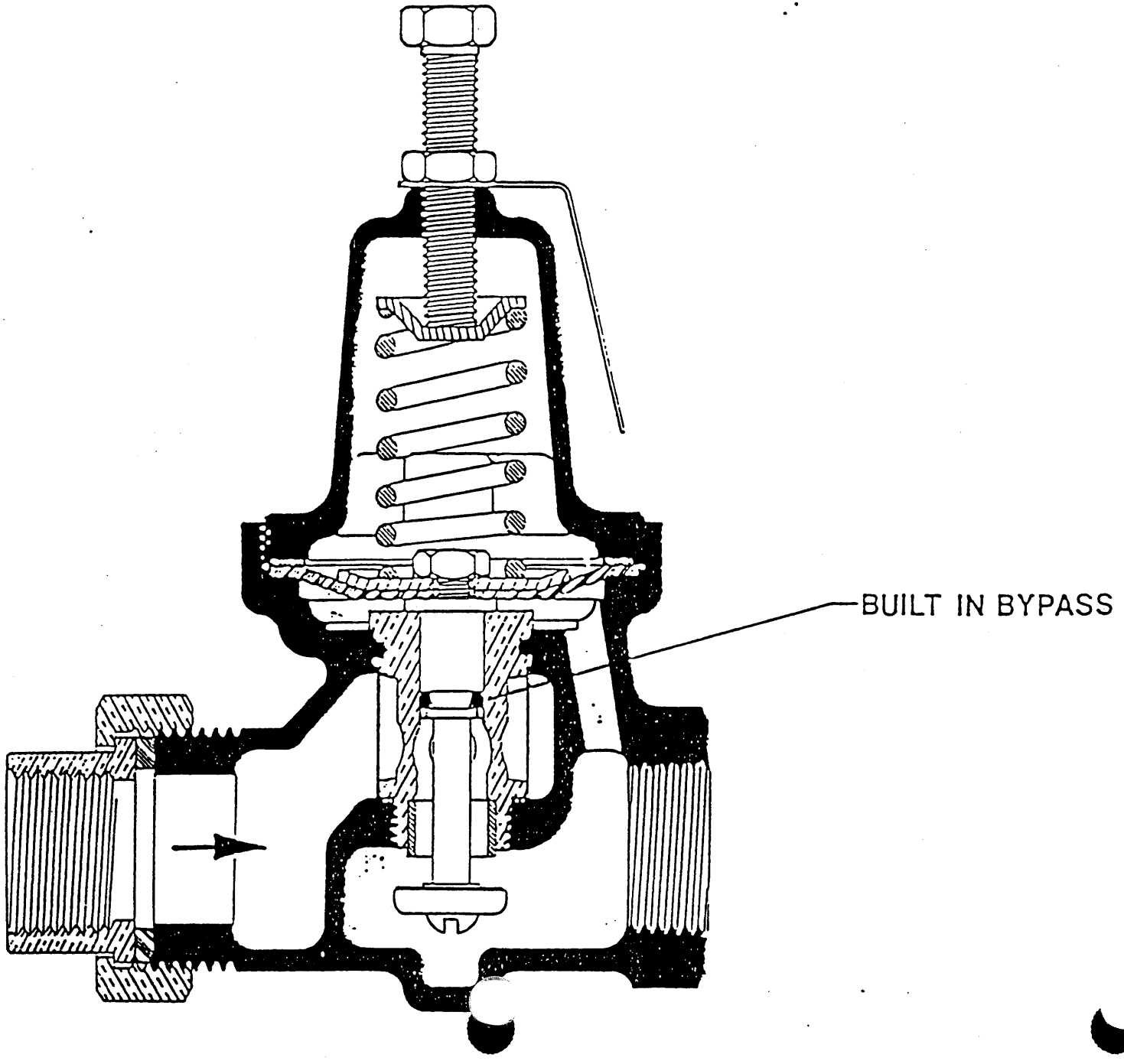


TYPICAL OPEN SYSTEM PIPING
(NO BACKFLOW PREVENTER)



TYPICAL CLOSED SYSTEM PIPING
(NO THERMAL EXPANSION PROTECTION)

Pressure Reducing Valve



SYMPTOMS OF THERMAL EXPANSION

1. THE RELIEF VALVE DRIPS DURING ANY RECOVERY CYCLE IN WHICH NO HOT OR COLD WATER IS BEING USED.

2. HOT WATER PIPES CREAK OR MAKE NOISE WHILE HEATER IS RECOVERING AND ALL VALVES ARE CLOSED.

3. WATER SURGES WHEN A VALVE IS FIRST OPENED AND THEN PRESSURE DROPS.

4. FAUCETS START TO DRIP WHEN HEATER IS OPERATING AND NO WATER IS BEING USED.

5. WATER HEATERS, STORAGE TANKS OR OTHER COMPONENTS OF THE WATER SUPPLY SYSTEMS FAIL PREMATURELY, THAT IS, WATER HEATERS ARE ONLY LASTING A FEW MONTHS AND FAILING AROUND SPUDS AND SEAM WELD AREAS.

6. A METALLIC CREAKING NOISE MIGHT ACTUALLY BE HEARD IN THE LOCATION OF THE HEATER AS THE PRESSURE IS RELIEVED AND THE STRETCHED TANK RETURNS TO ITS ORIGINAL SHAPE.

"WATTS® GOVERNOR 80"

"Watts" Governor 80" augments the existing safety devices such as temperature and pressure relief valves, regulators, backflow preventers and shock arrestors in providing the code-required control of domestic water systems.

FUNCTION

It performs the important function of an operating control which protects the primary safety valve on the water heater from unnecessary blow-off. It controls the excessive pressure build-up within the code requirement of 80 psi (and reduces wear and tear on the system) by discharging into the water closet any volume of water from thermal expansion. There is no expensive plumbing because it's all designed into the "Watts" Governor 80" Ball Cock Relief Valve assembly.

The Governor 80 Anti-Siphon Ball Cock Relief Valve assembly incorporates the simplest "full flow" ball cock principle available. It has a large, non-clogging flow way which allows for quiet operation and snap action shut-off under a wide range of flow pressures. Durable PVC and Celcon® are used in the unified construction which make the Governor 80 completely non-electrolytic and non-corrosive. Reliability has been built into this ball cock from the start.

INSTALLATION

Replaces existing fill valve in minutes. The Governor 80 has a removable cap ring for easy service. For cap removal and service, just turn the cap ring counter-clockwise.

It is good plumbing practice to install on the fixture that is furthermost from the water heater or heat source.

SPECIFICATIONS

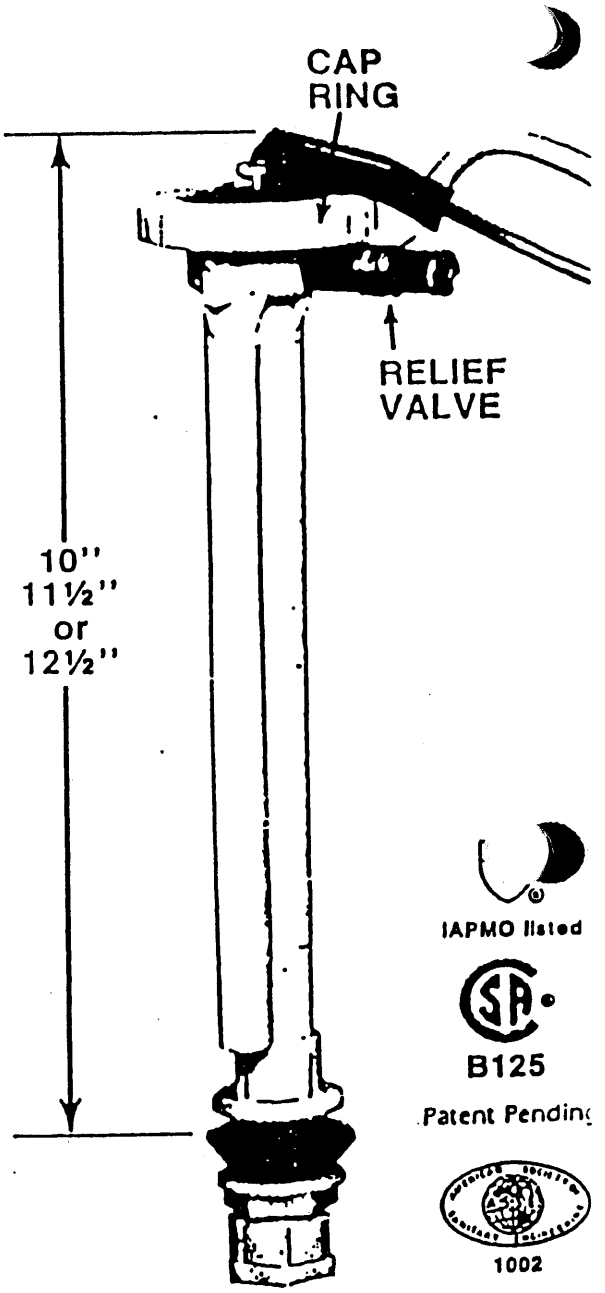
"Watts® Governor 80" meets IAPMO, ASSE and CSA requirements for anti-siphon ball cocks. All materials in contact with water are FDA approved under CFR-21-177-2600. The relief valve is standardly set at 80 psi to meet existing codes and is non-adjustable. However, other settings are available for pressures of 60, 100 and 125 psi with maximum operating temperatures to 140°F. Standard lengths are 10", 11½" or 12½".

ORDERING:

When ordering, specify as follows:

Governor 80-10 for 10" length.
Governor 80-11½ for 11½" length.
Governor 80-12½ for 12½" length.

IMPORTANT: This is a code-required control device. It limits system pressure in the event of thermal expansion. If replaced, it must be replaced with a comparable unit or if repair is necessary, use only Watts replacement parts. Consult a licensed plumber or plumbing contractor.



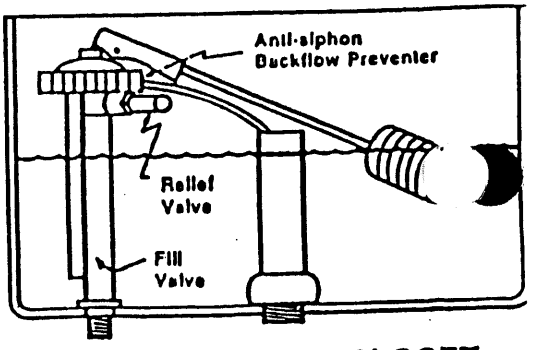
IAPMO listed

B125

Patent Pending

1002

"WATTS® GOVERNOR 80" IS IN THE PICTURE — CODE REQUIRED



TYPICAL WATER CLOSET

Appendix I: Water Quality Monitoring Plan

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Water Quality Monitoring Report for the Year 2012

System: FRIDAY HARBOR, TOWN OF **PWSID:** 26595 0 **Report Date:** 03/15/2012

Contact: MICHAEL B. WILKS **Group:** A - Comm **County:** SAN JUAN **Region:** NORTHWEST

Part 1: List of Active Sources with Water Quality Monitoring Requirements

DOH Source#	Name	Type	Use	Susceptibility Rating
S01	TROUT LAKE+AUG 1&2	Surface	Permanent	High

Part 2: Sampling Schedule for the Year 2012

Coliform Sampling (Routine)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	3	3	4	4	4	5	5	5	4	5	5	3

* Indicates the requirement is an exception from WAC 246-290.

- If the coliform (bacteriological) sampling schedule listed at the bottom of the current Water Facilities Inventory (WFI) form for your system is different from the schedule listed above, follow the schedule on the current WFI.
- Samples must be collected from representative points throughout the distribution system.
- Repeat samples are required following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- A minimum of 5 routine samples are required the month following one or more unsatisfactory samples in accordance with your system's Coliform Monitoring Plan.

Lead and Copper Distribution Sampling

- Lead and copper samples must be collected from indoor faucets within the distribution system after the water has sat unused in the pipes for at least 6 hours but no more than 12 hours.
- Sample faucets should be flushed with cold water the evening prior to collecting the sample.
- Part 2 indicates the month in which samples should be collected. Part 4 indicates the total number of sample required.
- If you are required to sample annually or once every 3 years, samples must be collected between June and September.

Chlorine Residual Sampling

- Systems that use continuous chlorination must take chlorine residual measurements daily (or at a reduced frequency approved by the department), and at the same time and location as routine and repeat coliform samples.

Disinfection Byproducts Sampling

Stage 1

- Systems that use continuous chlorination treatment must collect samples for total trihalomethanes (TTHM) and for haloacetic acids (HAA5) for each chlorination treatment facility identified in your individual disinfection byproducts (DBP) monitoring plan. Collect the samples from the distribution system at the frequency and locations identified in your DBP monitoring plan.

Chemical Sampling Requirements

- Source water chemical samples must be taken from a location as near to the source as possible, but after all treatment, and before entering the distribution system.
- Nitrate, nitrite and arsenic are included as part of a complete IOC.

Month	Source	Monitoring Requirement	Test Panel

Water Quality Monitoring Report for the Year 2012

Month	Source	Monitoring Requirement	Test Panel
January		*No source chemical sampling required this month*	
February		*No source chemical sampling required this month*	
March		HAA5	
March		TRIHALOMETHANES	THM
April		*No source chemical sampling required this month*	
May		HAA5	
May		TRIHALOMETHANES	THM
June	S01	HERBICIDES	HERB1
July		*No source chemical sampling required this month*	
August		HAA5	
August		TRIHALOMETHANES	THM
September		*No source chemical sampling required this month*	
~~October~~ June	S01	NITRATE	NITRATE
November		HAA5	
November		TRIHALOMETHANES	THM
December		*No source chemical sampling required this month*	

Part 3: Waivers

- Automatically granted to all sources based on DOH assessment of source specific information, and regional and state conditions.
- Current susceptibility assessment is required for all sources to obtain a waiver. No waiver application, or fee required.
- State waivers granted for the **2011 - 2013** compliance period are listed in Part 4.

Part 4: Water Quality Monitoring Frequency

- Although waivers may be granted for your system, there may be some monitoring required as a condition of the waiver your system was granted.

Monitoring Group	Test Panel	Sample Location	Schedule/Status
Asbestos	ASB	Distribution	Collect 1 Asbestos sample in 2017
Bacteriological	Coli	Distribution	See routine sample schedule in part 2
Dioxin	Dioxin	All sources	State Waiver Thru Dec 2013
Endothall	Endo	All sources	State Waiver Thru Dec 2013
EDB and other soil fumigants	Fumigant	S01	State Waiver Thru Dec 2013
Glyphosphate	Glyphs	All sources	State Waiver Thru Dec 2013
Halo-Acetic Acids	HAA5		1 sample per treatment plant every 3 months

Water Quality Monitoring Report for the Year 2012

Monitoring Group	Test Panel	Sample Location	Schedule/Status
Herbicides	Herbs	S01	1 sample between Jan 2011 - Dec 2013
Insecticides	Insect	S01	Waiver granted - No sampling required thru Dec 2013
Inorganic Contaminants **	IOC	S01	1 complete IOC sample between Jan 2011 - Dec 2019
Lead/Copper *	LCR	Distribution	LCR 1 Set of 10 samples between Jan 2011 - Dec 2013
Nitrate *	NIT	S01	Collect 1 sample(s) every 1 year
General Pesticides	Pest1	S01	1 sample between Jan 2011 - Dec 2013
Diquat	Diquat	All sources	State Waiver Thru Dec 2013
Total Trihalomethane	THM		1 sample per treatment plant every 3 months
Volatile Organic Contaminants	VOC	S01	1 sample between Jan 2011 - Dec 2013

** These contaminant monitoring groups do not have waiver options under the SDWA.*

*** Your IOC waiver also requires that you sample more frequently for some analytes. You are required to collect a sample for these analytes **ONLY** when they are scheduled in Part 2.*

26595 0

Water Quality Monitoring Report for the Year 2012

Part 5: Regional Water Quality Monitoring Contact

Northwest Regional Office

For further information call the Northwest Regional Office Steve Hulsman

Phone: (253) 395-6777

For questions regarding Disinfection ByProducts (DBP) monitoring, contact: Jolyn Leslie (253) 395-6762

Special Note

For Group A Community Systems Only: Your Consumer Confidence Report, summarizing the results of your 2011 water quality monitoring requirements is due before July 1, 2012 . For further information visit www.doh.wa.gov/ehp/dw/Our_Main_Pages/consumer.htm or contact the CCR Coordinator at your Regional Office.

TOWN OF FRIDAY HARBOR
RECEIVED
MAR 26 2012
FINANCE OFFICE

MICHAEL B. WILKS
FRIDAY HARBOR, TOWN OF
PO BOX 219
FRIDAY HARBOR WA 98250

TOWN OF FRIDAY HARBOR WATER SYSTEM

COLIFORM MONITORING PLAN

SYSTEM INFORMATION

Town of Friday Harbor Water System ID # 265950

Source:	#S01 – Surface Water, Trout Lake
Storage:	3 Storage Tanks 1-1mg; 1-.5mg; 1-.06mg
Pressure Stations:	1-237 zone, 1-460 zone
Pressure Zones:	207, 232, 327, and 460
Active Resident Population:	2180 *

Av. Daily Non-resident Population:

January	0
February	0
March	423
April	570
May	2729
June	2796
July	3331
August	3162
September	2022
October	1339
November	723
December	0

Total Service Connections: 1354

*SOURCE (EMPLOYMENT SECURITY DEPARTMENT WASHINGTON STATE)

mydocuments/water/coliform monitoring plan/6/3/2013

Coliform Monitoring Plan for: Town of Friday Harbor

A. System Information

Water System Name Town of Friday Harbor	County San Juan	System I.D. Number 265950
Attach copy of current WFI		
Number of Routine Samples Required Monthly by Regulation:	Number of Sample Sites Needed to Represent the Distribution System:	

B. Routine and Repeat Sample Locations

Location/Address for Routine Sample Sites	Location/Address for Repeat Sample Sites
1. 2771 San Juan Valley Rd.	1-1. 2891 San Juan Valley Rd 1-2. 2245 San Juan Valley Rd 1-3. 1-4.
2. 920 Gilbert Ln.	2-1. 1561 San Juan Valley Rd. 2-2. 940 Gilbert Ln. 2-3. 2-4.
3. 501 Marguerite Place	3-1. 540 Airport Circle Dr. 3-2. 270 Marguerite Place 3-3. 3-4.

If the number of Routine samples needed to cover the distribution system requires more than three Routine sites, attach additional sheets as needed.

Coliform Monitoring Plan for: TOWN OF FRIDAY HARBOR

B. Routine and Repeat Sample Locations

Location/Address for Routine Sample Sites	Location/Address for Repeat Sample Sites
4. 1033 Harborview Pl.	4-1. 761 Park St. 4-2. 1030 Guard St. 4-3. 4-4.
5 550 Marble St.	5-1. 440 Tucker Ave 5-2. 530 Marble St. 5-3. 5-4.
6 .06 Tank Channel Heights Way	6-1. 194 Channel Heights Way 6-2. 158 Channel Heights Way 6-3. 6-4.

B. Routine and Repeat Sample Locations

Location/Address for Routine Sample Sites	Location/Address for Repeat Sample Sites
7 778 Mullis St. (by Red Barn)	7-1. 501 Marguerite Place 7-2. 635 Spring St. 7-3. 7-4.
8. 550 Argyle Ave.	8-1. 420 Argyle Ave. 8-2. 660 Argyle Ave, 8-3. 8-4.
9. 416 Spruce St.	9-1. 550 Hemlock Court 9-2. 325 Spruce St. 9-3. 9-4.

B. Routine and Repeat Sample Locations

Location/Address for Routine Sample Sites	Location/Address for Repeat Sample Sites
10. 988 Argyle Rd	10-1. 1102 Argyle Rd, 10-2. 972 Argyle Rd, 10-3. 10-4.
11. 217 Pear Pt. Rd.	11-1. 79 Pear Pt. Rd 11-2. 265 Pear Pt. Rd 11-3. 11-4.
12. 1002 Turn Pt. Rd.	12-1. 376 Carter Beach Rd. 12-2. 700 Turn Pt. Rd. 12-3. 12-4.

C. Routine Sample Rotation Schedule

Month	Routine Site(s)	Month	Routine Site(s)
January	2,9,11	July	1,2,4,7,11
February	1,4,8	August	3,5,8,9,12
March	3,6,7,12	September	2,4,7,8
April	4,5,8,10	October	1,3,6,9,10
May	2,7,9,11	November	2,4,5,7,12
June	1,3,6,8,12	December	3,8,11

D. Month Following Unsatisfactory Samples

Location/Address for Routine Sample Site(s) Unsatisfactory the Previous Month	Location/Address for the five Routine Sample Sites
1.	1.
For the five routine samples required after a positive sample, a combination of routine sites and repeat sample sites will be used. Where sampling will be done depends on where contamination was concentrated.	2. 3. 4. 5.

E. Preparation Information

System Name		Date Plan Completed	Dates Modified
Town of Friday Harbor		5/31/2013	5/31/2013
Name of Plan Preparer	**Position**		**Daytime Phone #**
Wayne Haefele	Public Works Director		(360) 378-2154
State Reviewer		**Date Last Review**	

F. System Map

Town of Friday Harbor

Existing Water System Facilities

IDSE

Standard Monitoring Site #1

N
W E
S

Scale 1" = 2,850'

- 12 Inch Water Line
- 10 Inch Water Line
- 8 Inch Water Line
- 6 Inch Water Line
- 4 Inch Water Line
- 460' Pressure Zone
- 327' Pressure Zone
- 232' Pressure Zone
- 207' Pressure Zone
- Water Lines
- Fire Hydrants & #s
- Tank Reservoirs
- Collection Stations
- Town Boundaries

AUG 1 Watershed 180 Acres

AUG 2 Watershed 3,850 Acres

Trout Lake Watershed 840 Acres

AUG 1 Pump Station

Trout Lake Reservoir

AUG 2 Pump Station

Water Treatment Plant

THM, HAA5 #1 Quarterly Investigative Only

10" Transmission Pipeline

232' Pressure Zone

Collection Station #1

Collection Station #2

1 Mil. Gal. Tank Reservoir

Collection Station #4

500,000 Gal. Tank Reservoir

Collection Station #3

Collection Station #7

Southern Cross Loop 8" Line

Collection Station #10

Standard Monitoring Site #3

60,000 Gal. Tank Reservoir

Collection Station #6

Refuse Transfer Station

Hillview Terrace 6" Lines

460' Pressure Zone

232' Pressure Zone

Collection Station #5

Collection Station #8

Collection Station #9

Hillside Loop

Collection Station #11

North Bay View

Standard Monitoring Site #2

Carter Beach

Collection Station #12

Turn Pt Pear Pt Intersection

232' Pressure Zone

Turn & Pear Point Loop 6 Inch Line

THM, HAA5 #2

Stage 1 DBPR

Standard Monitoring Site #4

U:\FastCAD7Maps\Utilities\Water\Entire Water System

Appendix J: Hydraulic Modeling Documentation

Project Inventory: fh model 20101214.wtg

Title	
Engineer	
Company	
Date	10/20/2009
Notes	

Scenario Summary

ID	1092
Label	2030 PHD
Notes	
Active Topology	Existing 2009
Physical	<I> Base
Demand	2030 PHD
Initial Settings	2030 PHD
Operational	<I> Base
Age	<I> Base
Constituent	<I> Base
Trace	<I> Base
Fire Flow	<I> Base
Flushing	<I> Base
Energy Cost	<I> Base
Transient	<I> Base
Pressure Dependent Demand	<I> Base
Failure History	<I> Base Failure History
User Data Extensions	<I> Base
Steady State/EPS Solver Calculation Options	PHD - Hydraulics only
Transient Solver Calculation Options	<I> Base Calculation Options

Network Inventory

Pipes	385	-Constant Speed - No Pump Curve	11
Junctions	308	-Constant Speed - Pump Curve	0
Hydrants	0	-Shut Down After Time Delay	0
Tanks	4	-Variable Speed/Torque	0
-Circular	4	-Pump Start - Variable Speed/Torque	0
-Non-Circular	0	Variable Speed Pump Batteries	0
-Variable Area	0	Pump Stations	0
Reservoirs	1	PRV's	5
Pumps	11	PSV's	3
-Constant Power	1	PBV's	0
-Custom Extended	0	FCV's	1
-Design Point (1 Point)	8	TCV's	0
-Multiple Point	0	GPV's	0
-Standard (3 Point)	2	Isolation Valves	0
-Standard Extended	0	Spot Elevations	0

Transient Network Inventory

Project Inventory: fh model 20101214.wtg

Transient Network Inventory			
Air Valves	0	Rupture Disks	0
-Double Acting	0	Surge Valves	0
-Slow Closing	0	Surge Tanks	0
-Triple Acting	0	-Simple	0
-Vacuum Breaker	0	-Differential	0
Discharges to Atmosphere	0	-Variable Area	0
Orifice	0	Turbines	0
Rating Curve	0	Valves With Linear Area Change	0
Valve	0	Periodic Head-Flows	0
Check Valves	0	-Sinusoidal (Head)	0
-Towards Wye	0	-Not Sinusoidal (Head)	0
-Away from Wye	0	-Sinusoidal (Flow)	0
Hydropneumatic Tanks	0	-Not Sinusoidal (Flow)	0
Orifices Between Pipes	0		

Pressure Pipes Inventory			
2 (in)	3,309.51 ft	8 (in)	65,018.36 ft
4 (in)	8,579.48 ft	12 (in)	26,016.36 ft
6 (in)	83,766.84 ft	All Diameters	186,690.55 ft

Scenario: 2030 PHD
Current Time Step: 0.000Hr
FlexTable: Junction Table

ID	Label	Elevation (ft)	Zone	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Needed) (gpm)
49	78	48	232	2.71	229	78.2	750.00
51	57	104	232	34.29	229	53.9	1,000.00
52	46	108	232	17.00	229	52.4	750.00
55	2	95	232	3.29	230	58.6	1,000.00
56	96	136	232	22.29	233	42.2	1,000.00
57	55	32	232	1.29	228	85.0	500.00
58	123	323	460/460+	1.05	463	60.6	500.00
59	44	102	232	2.13	229	55.2	750.00
61	66	63	232	24.51	227	71.1	750.00
62	60	54	232	3.91	228	75.4	750.00
63	37	92	232	2.30	230	59.6	750.00
64	31	80	232	8.45	229	64.4	750.00
65	26	53	232	11.67	229	76.3	750.00
66	20	101	232	6.14	229	55.5	750.00
68	53	35	232	5.19	229	83.7	500.00
69	91	96	232	2.15	230	58.0	500.00
70	42	230	327	0.74	327	42.0	500.00
71	9	65	232	13.19	230	71.3	750.00
72	75	90	232	3.12	229	60.3	500.00
74	13	36	232	40.15	229	83.4	750.00
76	68	155	327	34.29	327	74.4	500.00
77	35	87	232	0.51	230	61.7	750.00
78	24	121	232	1.72	229	46.6	500.00
79	51	51	232	6.45	229	76.9	1,000.00
80	40	147	327	6.24	327	77.9	500.00
81	93	102	232	4.32	230	55.5	500.00
82	73	129	232	2.33	229	43.2	500.00
83	5	138	232	0.49	235	41.9	1,000.00
84	11	47	232	4.38	229	78.9	750.00
86	33	67	232	2.54	230	70.3	750.00
87	59	59	232	7.22	228	73.2	750.00
88	97	6	232	34.29	229	96.4	750.00
89	48	150	232	5.01	229	34.4	1,000.00
90	86	106	232	3.09	230	53.7	500.00
91	80	121	232	2.26	229	46.6	500.00
92	136	321	460/460+	4.93	462	61.2	0.00
93	19	102	232	4.48	229	55.0	750.00
94	106	198	327	3.23	327	55.8	500.00
97	16	87	232	7.65	230	61.9	750.00
98	95	119	232	31.82	232	48.7	1,000.00
99	12	28	232	28.55	229	87.1	750.00
100	4	119	232	2.59	230	48.1	500.00
101	79	46	232	2.83	229	79.0	750.00
102	88	96	232	2.24	230	58.0	500.00
103	137	302	460/460+	1.93	463	69.6	500.00
104	130	380	460/460+	0.56	462	35.5	500.00
105	131	327	460/460+	6.19	531	88.3	0.00
106	132	421	no service	0.34	462	17.7	0.00
107	39	120	232	4.82	230	47.7	750.00
108	28	91	232	7.00	229	59.9	750.00
109	118	117	460/460+	5.63	469	152.5	500.00
110	119	122	460/460+	1.52	469	149.9	500.00
115	6	151	232	0.29	240	38.5	1,000.00
116	111	183	327	15.31	327	62.2	500.00
117	112	123	460/460+	(N/A)	(N/A)	(N/A)	500.00
119	85	117	232	2.51	230	48.9	500.00

120	1	111	232	1.22	232	52.2	1,000.00
121	54	53	232	0.64	228	75.9	500.00
122	47	125	232	2.13	229	45.1	1,000.00
123	87	92	232	8.62	230	59.8	500.00
124	76	48	232	2.68	229	78.1	500.00
126	14	68	232	14.89	230	70.0	750.00
127	110	175	327	7.99	327	65.7	500.00
128	36	85	232	10.69	230	62.5	750.00
130	135	347	460/460+	1.69	463	50.0	500.00
131	23	160	232	6.26	229	29.8	500.00
132	52	80	232	10.93	229	64.3	500.00
133	45	84	232	2.08	229	62.8	1,000.00
134	133	406	460/460+	3.07	534	55.2	500.00
135	74	138	232	0.06	229	39.5	1,000.00
136	98	32	232	1.07	229	85.2	750.00
137	67	161	327	34.29	327	71.8	500.00
140	34	83	232	6.38	230	63.4	750.00
141	89	95	232	2.83	230	58.5	500.00
142	27	60	232	0.72	229	73.3	750.00
143	21	125	232	3.22	229	45.1	500.00
144	56	77	232	2.55	228	65.5	500.00
145	50	47	232	1.95	229	78.6	1,000.00
146	43	153	327	0.81	327	75.3	1,000.00
147	92	99	232	1.62	230	56.7	500.00
148	72	130	232	10.46	230	43.1	500.00
149	8	80	232	2.33	230	64.9	750.00
150	10	54	232	14.13	230	76.0	750.00
151	82	100	232	2.04	229	55.9	500.00
152	22	129	232	7.91	229	43.4	500.00
153	25	59	232	6.16	229	73.8	750.00
154	29	53	232	8.56	229	76.3	500.00
155	58	36	232	2.48	228	83.3	500.00
156	41	196	327	7.92	327	56.7	500.00
157	90	104	232	2.84	230	54.6	500.00
158	83	121	232	1.94	230	47.0	500.00
159	18	90	232	1.70	229	60.3	750.00
160	32	53	232	2.25	229	76.2	500.00
162	30	88	232	2.87	229	61.1	500.00
164	138	334	460/460+	3.73	463	55.8	0.00
165	139	385	460/460+	4.93	531	63.4	0.00
166	128	327	460/460+	1.23	462	58.6	500.00
168	94	113	232	2.61	232	51.5	1,000.00
169	49	77	232	5.40	229	65.8	1,000.00
170	124	289	460/460+	5.91	463	75.1	500.00
172	126	318	460/460+	4.03	462	62.5	500.00
173	127	316	460/460+	1.26	462	63.3	0.00
174	120	266	460/460+	3.31	469	88.0	500.00
175	121	140	460/460+	4.66	468	141.7	500.00
176	122	301	460/460+	4.28	463	70.1	500.00
179	108	184	327	2.53	327	61.8	500.00
180	109	176	327	21.30	327	65.3	500.00
181	125	202	460/460+	10.41	462	112.7	500.00
182	104	73	232	2.73	230	67.7	750.00
183	105	116	460/460+	1.89	469	152.9	500.00
184	7	98	232	3.34	230	57.2	750.00
186	100	84	232	0.66	228	62.5	500.00
187	101	88	232	3.48	228	60.7	500.00
400	J-1	35	232	0.00	229	83.7	750.00
403	J-2	25	232	2.28	228	88.0	500.00
406	J-3	94	232	0.00	229	58.3	500.00
408	J-4	25	232	5.89	229	88.4	750.00
411	J-5	26	232	0.00	229	88.0	0.00
413	J-6	15	232	9.88	229	92.7	750.00
423	J-11	102	232	2.57	229	54.8	500.00
426	J-12	136	232	1.88	229	40.0	500.00
427	J-13	132	232	4.13	229	41.8	500.00
428	J-14	128	232	1.15	229	43.5	500.00

	J-15	118	232	0.29	229	47.8	500.00
430	J-16	102	232	2.32	229	54.8	500.00
431	J-17	116	232	3.87	229	48.7	500.00
440	J-19	47	232	20.07	229	78.6	750.00
447	J-22	133	232	0.00	230	41.8	500.00
449	J-23	115	232	4.80	230	49.6	500.00
450	J-24	117	232	4.37	230	48.7	500.00
455	J-26	119	232	33.11	230	48.0	500.00
456	J-27	119	232	0.00	230	48.0	500.00
457	J-28	118	232	0.00	230	48.4	500.00
458	J-29	114	232	0.25	230	50.1	500.00
459	J-30	140	232	1.97	230	38.9	500.00
466	J-31	109	232	0.00	230	52.2	750.00
469	J-32	99	232	0.80	230	56.6	750.00
471	J-33	119	232	0.39	230	48.1	500.00
474	J-34	118	232	0.51	230	48.5	500.00
476	J-35	105	232	5.44	230	54.1	750.00
479	J-36	138	232	1.16	230	39.9	500.00
482	J-37	87	232	0.99	230	61.9	750.00
486	J-38	73	232	2.05	230	68.0	750.00
487	J-39	83	232	3.37	230	63.6	750.00
495	J-41	58	232	5.45	230	74.2	750.00
498	J-42	60	232	0.00	230	73.4	0.00
500	J-43	109	232	5.25	231	52.9	1,000.00
504	J-44	92	232	1.20	232	60.6	1,000.00
505	J-45	104	232	2.31	232	55.4	1,000.00
508	J-46	91	232	0.00	230	60.2	1,000.00
509	J-47	93	232	4.35	230	59.3	1,000.00
510	J-48	91	232	0.00	230	60.2	1,000.00
514	J-49	107	232	11.89	231	53.7	1,000.00
515	J-50	106	232	0.95	231	54.2	1,000.00
519	J-51	109	232	0.51	232	53.1	1,000.00
520	J-52	111	232	0.63	232	52.2	1,000.00
524	J-53	129	232	1.06	235	46.0	1,000.00
525	J-54	134	232	0.00	237	44.7	500.00
529	J-55	137	232	0.00	235	42.2	1,000.00
539	J-59	230	327	0.00	327	42.0	500.00
542	J-60	92	232	0.00	230	59.6	750.00
546	J-61	101	232	0.00	229	55.6	750.00
549	J-62	46	232	1.83	229	79.0	1,000.00
553	J-63	56	232	1.80	228	74.5	500.00
562	J-67	72	232	3.93	228	67.6	500.00
566	J-68	95	232	0.00	228	57.6	500.00
568	J-69	92	232	0.00	228	58.8	500.00
569	J-70	82	232	3.88	228	63.0	500.00
570	J-71	98	232	3.75	228	56.1	500.00
574	J-72	110	232	3.86	228	51.0	750.00
576	J-73	94	232	4.14	228	57.9	750.00
579	J-74	102	232	11.92	228	54.5	750.00
580	J-75	101	232	4.15	228	54.9	750.00
585	J-77	112	232	0.00	228	50.0	500.00
588	J-78	85	232	0.92	228	61.8	750.00
590	J-79	141	232	0.00	228	37.6	750.00
591	J-80	160	232	0.00	228	29.4	750.00
592	J-81	184	known problem	0.24	228	19.0	750.00
597	J-83	114	232	17.41	221	46.5	750.00
600	J-84	111	232	59.73	221	47.7	750.00
601	J-85	121	232	0.00	221	43.4	750.00
604	J-86	103	460/460+	0.50	470	158.9	500.00
607	J-87	120	460/460+	0.73	469	151.2	500.00
611	J-88	305	460/460+	1.59	463	68.4	500.00
615	J-89	106	232	0.21	230	53.6	1,000.00
616	J-90	112	232	6.39	230	51.0	500.00
617	J-91	107	232	0.58	230	53.2	500.00
618	J-92	107	232	4.16	230	53.2	1,000.00
625	J-94	91	232	3.21	229	59.5	500.00
626	J-95	93	232	2.23	229	58.7	500.00

	J-96	86	232	14.79	229	61.7	500.00
629	J-98	92	232	0.00	229	59.1	500.00
630	J-99	85	232	6.80	229	62.1	500.00
631	J-100	85	232	0.00	229	62.1	500.00
638	J-101	79	232	3.59	229	64.7	500.00
645	J-104	87	232	0.00	229	61.3	500.00
650	J-106	86	232	1.58	229	61.7	500.00
656	J-109	100	232	0.71	229	55.7	1,000.00
659	J-110	81	232	0.00	229	63.9	500.00
663	J-111	88	232	1.12	229	61.1	750.00
664	J-112	97	232	4.31	229	57.2	750.00
666	J-113	91	232	0.15	229	59.8	750.00
670	J-114	87	232	0.00	229	61.6	750.00
674	J-115	267	327	1.76	327	25.9	500.00
675	J-116	254	327	6.01	327	31.5	500.00
679	J-117	146	232	4.42	229	36.1	1,000.00
682	J-118	222	327	4.10	327	45.4	500.00
685	J-119	215	327	0.00	327	48.4	500.00
687	J-120	192	no service	6.76	230	16.4	500.00
691	J-121	144	232	5.66	327	79.2	750.00
692	J-122	181	327	2.67	327	63.2	500.00
697	J-124	179	327	0.53	327	64.0	500.00
706	J-127	119	232	10.22	230	48.1	750.00
708	J-128	147	232	1.28	230	35.8	500.00
714	J-129	116	232	6.17	230	49.3	750.00
715	J-130	109	232	2.11	230	52.3	750.00
717	J-131	102	232	1.53	230	55.3	750.00
722	J-133	101	232	5.03	231	56.1	1,000.00
726	J-134	102	232	0.90	231	55.7	1,000.00
734	J-136	131	232	6.88	232	43.5	750.00
737	J-137	135	232	0.00	232	41.8	0.00
744	J-141	104	232	0.00	231	55.0	1,000.00
750	J-143	117	232	2.02	231	49.3	750.00
753	J-145	115	232	0.67	231	50.2	750.00
758	J-146	89	232	0.82	229	60.7	750.00
759	J-147	100	232	5.07	229	56.0	750.00
764	J-149	96	232	18.65	230	58.0	750.00
770	J-151	72	232	19.54	230	68.1	750.00
774	J-152	64	232	0.79	230	71.6	750.00
779	J-154	404	no service	0.00	462	25.1	500.00
782	J-155	431	no service	0.88	462	13.5	500.00
784	J-156	384	460/460+	4.11	462	33.9	500.00
788	J-157	236	460/460+	0.00	463	98.0	500.00
789	J-158	252	460/460+	1.44	463	91.1	500.00
792	J-159	305	460/460+	0.00	462	68.0	0.00
793	J-160	347	460/460+	0.45	462	49.8	500.00
797	J-161	368	460/460+	0.00	462	40.8	0.00
798	J-162	337	460/460+	2.46	462	54.2	500.00
802	J-163	426	no service	0.00	462	15.6	500.00
805	J-164	454	460/460+	0.00	534	34.4	0.00
807	J-165	97	460/460+	4.14	472	162.1	500.00
810	J-166	130	460/460+	0.00	472	147.9	0.00
813	J-168	114	207	2.83	230	50.1	1,000.00
814	J-169	129	207	0.00	230	43.6	1,000.00
820	J-171	151	207	0.85	230	34.1	1,000.00
822	J-172	179	207	0.01	230	22.0	1,000.00
824	J-173	65	232	1.64	230	71.3	500.00
826	J-174	26	232	1.39	230	88.2	500.00
829	J-175	94	232	0.00	230	58.8	1,000.00
832	J-176	100	232	0.00	230	56.2	1,000.00
834	J-177	144	207	0.00	230	37.1	1,000.00
837	J-178	162	207	0.00	230	29.3	1,000.00
841	J-179	143	207	0.00	230	37.6	1,000.00
844	J-180	41	232	0.00	230	81.7	500.00
847	J-181	108	232	1.40	230	52.8	1,000.00
850	J-182	111	232	0.00	230	51.5	500.00
853	J-183	101	232	3.81	230	55.7	500.00

	J-184	122	232	3.98	230	46.6	500.00
857	J-185	135	232	4.92	230	41.0	500.00
859	J-186	78	232	5.04	230	65.6	500.00
861	J-187	40	232	7.18	230	82.0	500.00
863	J-188	41	232	5.06	230	81.7	500.00
868	J-190	29	232	4.15	230	86.8	500.00
871	J-191	46	232	1.23	229	79.3	500.00
875	J-193	83	232	1.24	228	62.9	500.00
877	J-194	117	232	1.72	228	48.0	500.00
879	J-195	51	232	9.39	227	76.3	500.00
881	J-196	39	232	9.94	227	81.4	500.00
883	J-197	44	232	2.19	227	79.2	500.00
885	J-198	40	232	5.44	227	80.9	500.00
887	J-199	26	232	11.85	227	86.9	500.00
889	J-200	20	232	5.54	227	89.5	500.00
891	J-201	91	232	4.35	227	58.8	500.00
893	J-202	64	232	3.99	227	70.5	500.00
895	J-203	49	232	1.20	227	77.0	500.00
898	J-204	16	232	1.67	227	91.2	500.00
900	J-205	48	232	1.30	227	77.4	500.00
901	J-206	52	232	2.08	227	75.6	500.00
904	J-207	13	232	5.69	227	92.5	500.00
905	J-208	52	232	4.37	227	75.6	500.00
913	J-211	61	232	0.00	227	71.7	500.00
916	J-212	62	232	0.00	227	71.3	500.00
918	J-213	62	232	0.56	227	71.3	500.00
921	J-214	63	232	1.69	227	70.9	500.00
923	J-215	43	232	4.19	227	79.6	500.00
925	J-216	52	232	8.79	230	76.9	500.00
927	J-217	152	232	0.00	229	33.4	500.00
928	J-218	113	232	5.67	229	50.3	750.00
930	J-219	102	232	28.15	229	55.0	750.00
940	J-221	130	232	3.28	228	42.4	750.00
944	J-222	129	327	0.00	327	85.6	1,000.00
951	J-224	151	232	0.00	238	37.8	1,000.00
955	J-226	75	232	7.41	230	67.1	750.00
958	J-227	139	207	15.80	252	48.7	1,000.00
968	J-230	155	207	16.50	251	41.4	0.00
990	J-232	97	no service	0.00	221	53.5	500.00
1002	J-233	120	232	0.87	232	48.3	1,000.00
1019	J-235	136	327	0.00	230	40.6	1,000.00
1047	J-239	120	207	0.00	230	47.5	1,000.00
1062	J-242	454	460/460+	1.04	534	34.4	0.00
1065	J-243	384	460/460+	0.00	462	33.9	0.00
1067	J-244	404	460/460+	0.59	533	56.0	500.00
1072	J-245	404	460/460+	0.69	533	56.0	0.00
1141	J-246	192	327	0.00	327	58.4	500.00
1145	J-247	157	207	0.00	250	40.3	500.00
1157	J-248	108	207	0.00	264	67.3	500.00
1172	J-249	160	207	0.00	257	42.0	500.00
1186	J-251	180	<None>	(N/A)	(N/A)	(N/A)	750.00

Scenario: 2030 PHD
Current Time Step: 0.000Hr
FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Is Active?	Velocity (Maximum) (ft/s)
193	221	59.61	121	460 to 232 PRV	8	125.0	(N/A)	False	(N/A)
194	201	67.81	460 to 232 PRV	112	8	125.0	(N/A)	False	(N/A)
196	204	81.82	133	460 Pump control	4	125.0	127.35	True	3.25
197	205	62.46	460 Pump control	132	4	125.0	127.35	True	3.25
199	206	51.29	207 Tank	207/232 Small	8	125.0	367.58	True	2.35
200	207	84.01	207/232 Small	6	8	125.0	367.58	True	2.35
203	208	69.63	132	460/460+	4	125.0	143.85	True	3.67
204	209	78.22	460/460+	133	4	125.0	143.85	True	3.67
207	210	111.62	207 Tank	207/327 Small 2	8	125.0	203.66	True	1.30
208	211	203.94	207/327 Small 2	43	8	125.0	203.66	True	1.30
211	202	67.75	207 Tank	207/327 Large	8	125.0	0.00	True	0.00
212	212	153.63	207/327 Large	43	8	125.0	0.00	True	0.00
215	213	94.32	207 Tank	207/327 Small 1	8	125.0	203.70	True	1.30
216	214	179.45	207/327 Small 1	43	8	125.0	203.70	True	1.30
227	219	78.60	207 Tank	207/232 Large 1	8	125.0	0.00	True	0.00
228	222	49.78	207/232 Large 1	6	8	125.0	0.00	True	0.00
231	220	58.66	207 Tank	207/232 Large 2	8	125.0	465.83	True	2.97
232	203	63.90	207/232 Large 2	6	8	125.0	465.83	True	2.97
234	142	78.48	460 Tank	132	12	120.0	-75.69	True	0.21
236	23	244.14	21	22	4	110.0	-19.23	True	0.49
237	100	639.84	93	85	6	125.0	44.17	True	0.50
240	107	567.17	31	79	6	110.0	33.53	True	0.38
241	104	561.75	85	86	8	110.0	65.83	True	0.42
243	167	65.60	Proposed 460 Tank	132	12	120.0	(N/A)	False	(N/A)
244	164	485.93	135	137	6	120.0	-59.35	True	0.67
245	162	240.76	73	23	8	110.0	-18.96	True	0.12
246	98	316.14	91	92	8	125.0	1.62	True	0.01
247	94	135.95	87	88	8	125.0	2.24	True	0.01
249	131	468.41	105	118	6	120.0	-1.89	True	0.02
252	95	307.32	87	89	8	125.0	-64.31	True	0.41
254	86	268.06	76	54	8	110.0	124.43	True	0.79
255	42	460.22	36	44	8	110.0	71.82	True	0.46
261	34	520.36	30	31	4	110.0	24.06	True	0.61
265	47	927.33	45	46	8	110.0	10.40	True	0.07
267	29	295.36	11	26	6	110.0	15.38	True	0.17
268	25	480.42	22	23	4	110.0	29.19	True	0.75
269	81	477.59	21	73	4	110.0	25.49	True	0.65
270	31	241.87	27	28	6	110.0	21.41	True	0.24
271	26	722.92	23	24	6	110.0	1.72	True	0.02
272	22	488.16	19	21	4	110.0	9.48	True	0.24
274	13	230.31	11	12	8	110.0	102.59	True	0.65
275	79	390.68	2	8	8	110.0	131.91	True	0.84
282	150	1,846.21	121	122	6	120.0	144.46	True	1.64
283	110	825.51	47	52	8	110.0	140.59	True	0.90
284	111	174.17	100	101	8	125.0	133.09	True	0.85
289	165	618.35	137	122	6	120.0	-61.29	True	0.70
290	163	145.99	135	136	2	120.0	4.93	True	0.50
291	161	486.51	20	22	6	110.0	-25.93	True	0.29
292	99	197.15	91	93	6	125.0	-73.74	True	0.84
294	96	243.82	89	90	8	125.0	2.84	True	0.02
297	83	445.03	75	30	4	110.0	20.10	True	0.51
300	74	535.45	29	32	6	110.0	33.95	True	0.39
301	62	488.30	59	60	6	110.0	3.91	True	0.04
302	57	271.13	53	55	4	110.0	13.64	True	0.35
303	53	988.62	51	52	6	110.0	9.30	True	0.11
304	40	403.33	33	36	8	110.0	-31.29	True	0.20
305	35	118.76	30	32	4	110.0	-6.83	True	0.17
307	32	577.14	27	29	6	110.0	42.51	True	0.48
308	27	577.30	28	18	4	110.0	-8.80	True	0.22
309	14	554.50	12	13	6	110.0	75.51	True	0.86
315	93	911.85	86	87	8	125.0	-49.10	True	0.31
316	153	1,989.70	124	125	6	120.0	10.41	True	0.12
318	123	262.70	56	100	8	110.0	-36.26	True	0.23
319	120	528.42	96	95	8	110.0	347.27	True	2.22
321	85	148.08	78	31	8	110.0	-24.19	True	0.15
324	125	1,438.20	57	74	8	110.0	-114.47	True	0.73
326	82	232.98	25	27	8	110.0	78.17	True	0.50
327	7	396.43	7	2	8	110.0	-39.74	True	0.25
330	84	235.14	73	31	8	125.0	42.11	True	0.27

331	80	1,058.34	72	22	8	110.0	82.27	True	0.53
332	75	515.21	1	95	8	125.0	-49.38	True	0.32
333	71	1,025.33	43	40	8	125.0	48.54	True	0.31
335	48	414.98	46	47	8	110.0	19.58	True	0.12
337	67	924.55	67	68	8	110.0	34.29	True	0.22
338	54	321.30	50	53	4	110.0	18.82	True	0.48
341	41	502.26	36	37	8	110.0	-113.81	True	0.73
342	36	505.02	78	32	4	110.0	-24.87	True	0.63
344	39	549.30	34	35	6	110.0	0.51	True	0.01
345	33	276.11	28	75	6	110.0	23.22	True	0.26
346	20	218.08	18	19	4	110.0	30.03	True	0.77
348	11	266.95	9	10	8	110.0	137.68	True	0.88
352	138	917.87	108	110	8	120.0	15.50	True	0.10
353	139	607.42	109	110	8	120.0	7.80	True	0.05
357	170	254.64	131	139	2	120.0	-6.19	True	0.63
358	133	244.81	43	67	8	110.0	106.03	True	0.68
360	50	161.50	45	49	8	110.0	112.07	True	0.72
361	30	278.71	26	27	6	110.0	-13.53	True	0.15
362	137	232.95	108	109	8	120.0	29.10	True	0.19
363	134	439.17	67	106	6	110.0	37.46	True	0.43
365	166	99.54	123	138	2	120.0	3.73	True	0.38
367	88	315.23	23	80	6	110.0	2.26	True	0.03
368	156	192.96	126	128	6	120.0	49.47	True	0.56
369	154	310.67	124	126	6	120.0	54.76	True	0.62
370	155	131.38	126	127	2	120.0	1.26	True	0.13
371	90	345.52	19	82	8	110.0	2.04	True	0.01
372	97	125.86	89	91	8	125.0	-69.98	True	0.45
377	60	331.64	54	58	4	110.0	-9.87	True	0.25
379	51	446.33	49	50	8	110.0	165.46	True	1.06
383	24	436.31	83	72	8	110.0	60.73	True	0.39
384	19	1,194.28	14	18	6	110.0	40.53	True	0.46
385	126	416.64	74	48	8	110.0	-114.54	True	0.73
386	149	1,259.92	118	120	6	120.0	3.31	True	0.04
387	21	255.05	19	20	8	110.0	14.03	True	0.09
389	12	243.85	10	11	8	110.0	122.36	True	0.78
391	140	351.78	110	111	8	120.0	15.31	True	0.10
397	148	381.79	119	121	6	120.0	149.12	True	1.69
398	108	416.60	13	97	6	125.0	34.29	True	0.39
399	109	244.93	13	98	6	125.0	1.07	True	0.01
401	P-1	252.41	79	J-1	6	110.0	56.97	True	0.65
404	P-3	399.55	J-1	J-2	6	110.0	56.97	True	0.65
405	P-4	2,353.26	J-2	66	6	110.0	54.69	True	0.62
407	P-5	318.46	73	J-3	8	125.0	0.00	True	0.00
409	P-6	287.61	12	J-4	8	125.0	-1.46	True	0.01
410	P-7	229.13	J-4	26	4	125.0	-17.24	True	0.44
412	P-8	84.31	J-4	J-5	2	125.0	0.00	True	0.00
414	P-9	154.40	J-4	J-6	6	125.0	9.88	True	0.11
420	P-12	506.98	108	106	8	125.0	-47.13	True	0.30
424	P-13	730.89	100	J-11	8	110.0	-63.26	True	0.40
425	P-14	266.17	J-11	57	8	110.0	-79.47	True	0.51
432	P-15	182.96	J-11	J-17	8	125.0	13.64	True	0.09
433	P-16	333.22	J-17	J-16	8	125.0	4.91	True	0.03
434	P-17	522.99	J-16	J-15	8	125.0	2.59	True	0.02
435	P-18	549.39	J-15	J-14	8	125.0	2.30	True	0.01
437	P-19	430.96	J-17	J-12	8	125.0	4.86	True	0.03
438	P-20	618.64	J-12	J-13	8	125.0	2.98	True	0.02
439	P-21	588.61	J-13	J-14	8	125.0	-1.15	True	0.01
441	P-22	101.57	78	J-19	6	110.0	46.35	True	0.53
442	P-23	568.96	J-19	79	6	110.0	26.27	True	0.30
448	P-26	225.91	83	J-22	8	125.0	0.00	True	0.00
451	P-27	513.95	83	J-23	8	125.0	41.17	True	0.26
452	P-28	356.57	J-23	J-24	8	125.0	36.37	True	0.23
453	P-29	539.35	J-24	72	8	125.0	32.00	True	0.20
462	P-32	275.15	J-30	J-26	8	125.0	33.35	True	0.21
463	P-33	283.61	J-26	J-27	8	125.0	0.25	True	0.00
464	P-34	410.20	J-27	J-28	8	125.0	0.25	True	0.00
465	P-35	594.45	J-28	J-29	8	125.0	0.25	True	0.00
467	P-36	599.72	J-30	J-31	8	125.0	104.64	True	0.67
468	P-37	402.19	J-31	83	8	125.0	103.84	True	0.66
470	P-38	447.72	J-31	J-32	8	125.0	0.80	True	0.01
472	P-39	21.50	4	J-33	8	110.0	25.06	True	0.16
473	P-40	92.37	J-33	85	8	110.0	24.17	True	0.15
475	P-41	88.76	J-33	J-34	8	125.0	0.51	True	0.00
477	P-42	311.29	4	J-35	8	125.0	39.53	True	0.25
480	P-44	439.17	J-35	J-36	8	125.0	1.16	True	0.01
481	P-45	442.89	4	J-30	8	125.0	139.96	True	0.89
483	P-46	394.50	J-35	J-37	8	125.0	32.92	True	0.21
484	P-47	195.11	J-37	8	8	125.0	18.86	True	0.12
488	P-49	444.14	J-37	J-39	8	125.0	13.07	True	0.08
489	P-50	342.75	J-39	16	8	125.0	7.65	True	0.05

	P-51	251.44	J-39	J-38	6	125.0	2.05	True	0.02
493	P-53	538.96	8	14	8	125.0	148.44	True	0.95
494	P-54	282.15	14	9	8	125.0	93.03	True	0.59
496	P-55	605.70	9	J-41	8	110.0	89.77	True	0.57
497	P-56	278.25	J-41	25	8	110.0	84.33	True	0.54
499	P-57	87.51	J-41	J-42	2	125.0	0.00	True	0.00
501	P-58	221.18	94	J-43	8	110.0	300.80	True	1.92
503	P-60	672.36	93	J-43	6	125.0	-122.24	True	1.39
506	P-61	836.27	94	J-45	8	125.0	3.51	True	0.02
507	P-62	323.58	J-45	J-44	8	125.0	1.20	True	0.01
511	P-63	445.48	87	J-48	8	125.0	4.35	True	0.03
512	P-64	322.88	J-48	J-47	8	125.0	4.35	True	0.03
513	P-65	98.87	J-48	J-46	8	125.0	0.00	True	0.00
516	P-66	263.80	1	J-50	8	125.0	227.55	True	1.45
518	P-68	274.05	J-50	J-49	8	125.0	11.89	True	0.08
521	P-69	325.35	94	J-52	8	125.0	181.39	True	1.16
522	P-70	173.97	J-52	1	8	125.0	180.26	True	1.15
523	P-71	219.40	J-52	J-51	8	125.0	0.51	True	0.00
526	P-72	503.32	6	J-54	8	125.0	489.36	True	3.12
527	P-73	399.34	J-54	J-53	8	125.0	489.36	True	3.12
528	P-74	644.27	J-53	94	8	125.0	488.30	True	3.12
530	P-75	16.96	5	J-55	8	110.0	719.17	True	4.59
531	P-76	80.93	J-55	96	8	110.0	719.17	True	4.59
541	P-82	253.95	J-59	42	6	120.0	0.74	True	0.01
543	P-83	585.75	44	J-60	8	110.0	-125.11	True	0.80
544	P-84	36.13	J-60	37	8	110.0	-10.00	True	0.06
547	P-86	25.73	44	J-61	8	110.0	194.81	True	1.24
550	P-88	74.10	50	J-62	8	110.0	144.69	True	0.92
551	P-89	201.07	J-62	76	8	110.0	127.11	True	0.81
552	P-90	535.00	51	J-62	6	125.0	-15.75	True	0.18
554	P-91	186.11	54	J-63	8	110.0	133.65	True	0.85
555	P-92	73.67	J-63	59	8	110.0	161.64	True	1.03
563	P-96	695.03	56	J-67	6	125.0	33.72	True	0.38
564	P-97	358.14	J-67	J-63	6	125.0	29.79	True	0.34
567	P-99	687.13	101	J-68	8	125.0	129.61	True	0.83
571	P-100	255.49	J-68	J-69	8	125.0	129.61	True	0.83
572	P-101	747.36	J-69	J-71	8	125.0	129.61	True	0.83
573	P-102	677.74	J-71	J-70	8	125.0	3.88	True	0.02
577	P-104	398.24	59	J-73	8	110.0	150.51	True	0.96
581	P-106	252.60	J-73	J-74	6	125.0	16.07	True	0.18
582	P-107	377.88	J-74	J-75	6	125.0	4.15	True	0.05
583	P-108	263.12	J-73	J-72	6	125.0	8.30	True	0.09
586	P-109	753.25	J-73	J-77	8	110.0	122.00	True	0.78
593	P-112	289.69	J-72	J-79	8	125.0	0.24	True	0.00
594	P-113	323.20	J-79	J-80	8	125.0	0.24	True	0.00
595	P-114	345.30	J-80	J-81	8	125.0	0.24	True	0.00
598	P-115	834.99	J-77	J-83	6	110.0	243.98	True	2.77
602	P-117	250.98	J-83	J-84	6	125.0	59.73	True	0.68
603	P-118	257.42	J-84	J-85	6	125.0	0.00	True	0.00
608	P-121	121.46	118	J-87	6	120.0	-10.83	True	0.12
609	P-122	343.66	J-87	119	6	120.0	150.64	True	1.71
610	P-123	317.87	J-86	J-87	6	125.0	162.20	True	1.84
612	P-124	48.99	122	J-88	6	120.0	78.89	True	0.90
613	P-125	139.70	J-88	123	6	120.0	4.77	True	0.05
614	P-126	916.70	J-88	124	6	125.0	72.52	True	0.82
619	P-127	129.55	86	J-89	8	125.0	111.83	True	0.71
621	P-129	272.69	J-92	J-91	6	125.0	-1.40	True	0.02
622	P-130	524.98	J-91	J-90	8	125.0	-44.08	True	0.28
623	P-131	316.13	J-90	J-89	8	125.0	-50.47	True	0.32
634	P-134	325.57	J-96	J-95	8	125.0	2.23	True	0.01
636	P-136	58.42	J-100	J-99	8	125.0	6.80	True	0.04
637	P-137	268.39	J-99	J-98	8	125.0	0.00	True	0.00
639	P-138	202.68	100	J-101	8	125.0	-106.75	True	0.68
640	P-139	289.17	J-101	52	8	125.0	-113.55	True	0.72
641	P-140	496.61	J-94	J-101	8	125.0	-3.21	True	0.02
648	P-144	34.39	J-99	J-104	8	125.0	0.00	True	0.00
651	P-145	223.38	J-100	J-106	8	125.0	18.61	True	0.12
652	P-146	24.25	J-106	J-96	8	125.0	17.03	True	0.11
657	P-148	180.80	57	J-109	8	125.0	0.71	True	0.00
660	P-150	172.23	52	J-110	8	125.0	25.41	True	0.16
661	P-151	122.75	J-110	J-100	8	125.0	25.41	True	0.16
665	P-153	194.66	J-111	J-112	8	125.0	-48.36	True	0.31
667	P-154	243.75	J-61	J-113	8	110.0	130.12	True	0.83
669	P-156	180.88	J-112	J-113	8	125.0	-52.67	True	0.34
671	P-157	192.99	J-113	J-114	8	110.0	77.31	True	0.49
672	P-158	184.23	J-114	45	8	110.0	124.55	True	0.79
673	P-159	184.35	J-111	J-114	8	125.0	47.24	True	0.30
676	P-160	690.83	106	J-116	6	110.0	-12.91	True	0.15
677	P-161	940.07	J-116	41	6	110.0	-20.68	True	0.23
678	P-162	277.92	J-115	J-116	6	125.0	-1.76	True	0.02

	P-163	609.74	47	J-117	8	110.0	-123.14	True	0.79
681	P-164	33.97	J-117	48	8	110.0	119.55	True	0.76
684	P-166	122.24	J-118	J-59	6	120.0	0.74	True	0.01
686	P-167	127.02	J-118	J-119	6	125.0	0.00	True	0.00
688	P-168	1,107.76	232 Tank	J-120	12	110.0	78.57	True	0.22
689	P-169	1,734.74	J-120	39	12	110.0	-175.31	True	0.50
690	P-170	331.43	J-120	J-117	8	125.0	247.11	True	1.58
694	P-172	308.50	J-122	41	8	125.0	33.44	True	0.21
695	P-173	390.61	J-121	J-122	6	125.0	-5.66	True	0.06
698	P-174	285.33	40	J-124	8	125.0	42.30	True	0.27
699	P-175	18.26	J-124	J-122	8	125.0	41.77	True	0.27
710	P-182	631.59	J-128	46	4	110.0	26.18	True	0.67
711	P-183	639.59	J-128	J-127	4	125.0	-27.45	True	0.70
712	P-184	31.69	J-127	39	8	125.0	-162.60	True	1.04
716	P-186	561.73	J-129	J-130	6	125.0	-6.17	True	0.07
718	P-187	757.11	J-127	J-131	8	125.0	124.93	True	0.80
719	P-188	202.56	J-131	J-60	8	125.0	115.12	True	0.73
720	P-189	248.57	J-130	J-131	6	125.0	-8.28	True	0.09
723	P-190	743.19	J-43	J-133	8	110.0	173.31	True	1.11
724	P-191	392.13	J-133	4	8	110.0	207.14	True	1.32
728	P-194	454.24	J-134	2	8	125.0	174.94	True	1.12
729	P-195	444.22	J-134	J-133	8	125.0	38.86	True	0.25
735	P-199	506.54	39	J-136	8	125.0	-342.73	True	2.19
736	P-200	671.25	J-136	96	8	125.0	-349.61	True	2.23
738	P-201	198.84	J-136	J-137	2	125.0	0.00	True	0.00
745	P-204	84.30	J-50	J-141	8	125.0	214.70	True	1.37
746	P-205	395.91	J-141	J-134	8	125.0	214.70	True	1.37
754	P-209	268.58	95	J-145	8	110.0	266.07	True	1.70
755	P-210	342.96	J-145	7	8	110.0	263.39	True	1.68
756	P-211	147.10	J-143	J-145	4	125.0	-2.02	True	0.05
760	P-213	630.67	49	J-147	6	125.0	-58.80	True	0.67
761	P-214	165.77	J-147	J-61	6	125.0	-64.68	True	0.73
762	P-215	130.83	J-146	J-147	6	125.0	-0.82	True	0.01
765	P-216	497.14	37	J-149	8	110.0	-126.10	True	0.80
766	P-217	349.47	J-149	7	8	110.0	-144.75	True	0.92
771	P-220	260.62	33	J-151	6	110.0	29.16	True	0.33
772	P-221	292.22	J-151	34	6	110.0	6.89	True	0.08
773	P-222	136.36	J-151	104	8	125.0	2.73	True	0.02
775	P-223	198.44	10	J-152	8	110.0	1.20	True	0.01
776	P-224	74.15	J-152	33	8	110.0	0.41	True	0.00
780	P-226	109.61	130	J-154	6	120.0	44.77	True	0.51
786	P-230	677.96	J-156	135	6	120.0	-52.73	True	0.60
787	P-231	857.25	J-155	J-156	6	125.0	-48.62	True	0.55
790	P-232	235.23	J-157	J-158	6	125.0	0.00	True	0.00
791	P-233	1,107.36	J-158	124	6	125.0	-1.44	True	0.02
795	P-235	380.36	J-160	130	6	120.0	45.33	True	0.51
796	P-236	577.68	J-159	J-160	2	125.0	0.00	True	0.00
799	P-237	193.93	128	J-162	6	120.0	48.24	True	0.55
800	P-238	216.01	J-162	J-160	6	120.0	45.78	True	0.52
801	P-239	491.52	J-161	J-162	2	125.0	0.00	True	0.00
803	P-240	181.38	J-154	J-163	6	125.0	44.77	True	0.51
809	P-244	532.18	J-165	J-86	6	125.0	162.70	True	1.85
811	P-245	469.92	J-165	J-166	2	125.0	0.00	True	0.00
815	P-246	401.16	J-168	J-169	6	125.0	-2.83	True	0.03
827	P-253	1,336.07	J-173	J-174	6	125.0	-5.33	True	0.06
831	P-256	677.81	J-175	J-173	6	125.0	-3.69	True	0.04
833	P-257	524.62	J-175	J-176	6	125.0	0.00	True	0.00
835	P-258	249.92	J-172	J-177	6	125.0	-1.84	True	0.02
838	P-260	987.95	J-171	J-178	6	125.0	-3.68	True	0.04
839	P-261	366.78	J-178	J-172	6	125.0	-1.84	True	0.02
842	P-263	356.89	J-177	J-179	6	125.0	1.84	True	0.02
843	P-264	257.13	J-179	J-178	6	125.0	1.84	True	0.02
845	P-265	392.80	J-174	J-180	6	125.0	-15.50	True	0.18
848	P-267	230.91	J-89	J-181	8	125.0	61.15	True	0.39
849	P-268	290.15	J-181	J-92	8	125.0	59.75	True	0.38
851	P-269	86.82	J-181	J-182	8	125.0	0.00	True	0.00
852	P-270	272.69	J-92	J-91	6	125.0	-1.40	True	0.02
854	P-271	636.99	J-91	J-183	6	125.0	40.70	True	0.46
856	P-272	411.36	J-183	J-184	6	125.0	36.90	True	0.42
858	P-273	509.37	J-184	J-185	6	125.0	32.92	True	0.37
860	P-274	693.80	J-185	J-186	6	125.0	28.00	True	0.32
862	P-275	194.38	J-186	J-187	6	125.0	22.96	True	0.26
864	P-276	17.36	J-180	J-188	8	125.0	-15.50	True	0.10
865	P-277	883.94	J-188	J-92	8	125.0	-58.38	True	0.37
869	P-279	1,118.47	J-188	J-190	6	125.0	37.82	True	0.43
870	P-280	478.09	J-190	J-187	6	125.0	33.68	True	0.38
872	P-281	834.73	J-187	J-191	6	125.0	49.46	True	0.56
876	P-283	2,909.51	J-191	J-193	6	125.0	48.22	True	0.55
878	P-284	1,757.89	J-193	J-194	6	125.0	46.98	True	0.53
880	P-285	2,587.86	J-194	J-195	6	125.0	45.26	True	0.51

	P-286	1,445.70	J-195	J-196	6	125.0	35.88	True	0.41
884	P-287	353.28	J-196	J-197	6	125.0	25.94	True	0.29
886	P-288	1,571.98	J-197	J-198	6	125.0	23.75	True	0.27
888	P-289	1,526.87	J-198	J-199	6	125.0	18.31	True	0.21
890	P-290	1,074.95	J-199	J-200	6	125.0	6.46	True	0.07
892	P-291	1,516.34	J-200	J-201	6	125.0	-3.00	True	0.03
894	P-292	899.68	J-201	J-202	6	125.0	-20.80	True	0.24
896	P-293	1,568.97	J-202	J-203	6	125.0	-28.98	True	0.33
897	P-294	1,387.97	J-203	66	6	125.0	-30.18	True	0.34
902	P-296	447.41	J-205	J-206	6	125.0	-1.30	True	0.01
906	P-298	730.16	J-206	J-208	6	125.0	-3.39	True	0.04
907	P-299	1,907.11	J-208	J-201	6	125.0	-13.45	True	0.15
908	P-300	852.75	J-207	J-208	6	125.0	-5.69	True	0.06
914	P-303	583.63	J-204	J-211	6	125.0	-1.67	True	0.02
917	P-305	170.86	J-211	J-212	6	125.0	0.00	True	0.00
919	P-306	41.70	J-211	J-213	6	125.0	-1.67	True	0.02
920	P-307	1,250.31	J-213	J-200	6	125.0	-3.92	True	0.04
922	P-308	223.83	J-213	J-214	6	125.0	1.69	True	0.02
924	P-309	902.58	J-202	J-215	6	125.0	4.19	True	0.05
926	P-310	1,259.99	J-216	J-174	6	125.0	-8.79	True	0.10
929	P-311	379.92	J-217	J-218	8	125.0	0.00	True	0.00
931	P-312	237.54	J-218	J-219	8	125.0	-5.67	True	0.04
932	P-313	78.77	J-219	20	8	125.0	-33.82	True	0.22
941	P-316	126.52	J-72	J-221	6	125.0	4.20	True	0.05
942	P-317	3,472.32	J-221	J-78	6	125.0	0.92	True	0.01
945	P-319	706.88	68	J-222	6	125.0	0.00	True	0.00
952	P-323	256.98	5	J-224	8	110.0	-719.66	True	4.59
953	P-324	132.58	J-224	6	8	110.0	-719.66	True	4.59
956	P-325	334.95	7	J-226	8	110.0	155.03	True	0.99
957	P-326	439.93	J-226	9	8	110.0	147.62	True	0.94
969	P-329	1,592.27	J-227	J-230	12	125.0	442.40	True	1.25
974	P-333	88.26	240 to 232 PSV	6	12	125.0	375.90	True	1.07
978	P-335	55.51	43	327 Pump control	12	130.0	251.97	True	0.71
979	P-336	51.05	327 Pump control	207 Tank	12	130.0	251.97	True	0.71
991	P-338	221.18	J-83	J-232	6	125.0	166.84	True	1.89
995	P-341	92.68	J-232	232/460 Pump 1	6	125.0	0.00	True	0.00
996	P-342	91.24	232/460 Pump 1	J-165	6	125.0	0.00	True	0.00
1000	P-345	110.89	J-232	232/460 Pump 2	6	130.0	166.84	True	1.89
1001	P-346	62.49	232/460 Pump 2	J-165	6	130.0	166.84	True	1.89
1003	P-347	223.85	1	J-233	8	130.0	0.87	True	0.01
1004	P-348	233.64	55	58	4	130.0	12.35	True	0.32
1005	P-349	176.14	J-71	J-77	8	130.0	121.98	True	0.78
1048	P-361	168.71	J-177	J-239	6	130.0	-3.69	True	0.04
1053	P-364	65.61	J-239	327 to 232 PRV	6	130.0	0.00	True	0.00
1054	P-365	130.84	327 to 232 PRV	J-175	6	130.0	0.00	True	0.00
1064	P-372	171.43	J-242	J-164	2	125.0	0.00	True	0.00
1066	P-373	155.50	J-156	J-243	2	130.0	0.00	True	0.00
1070	P-376	114.89	J-163	132	6	125.0	44.77	True	0.51
1071	P-377	336.59	132	J-155	6	125.0	-47.75	True	0.54
1073	P-378	441.25	139	J-245	2	120.0	-11.12	True	1.14
1075	P-380	212.89	J-245	J-244	4	130.0	-11.81	True	0.30
1077	P-381	385.16	J-244	133	4	125.0	-12.39	True	0.32
1078	P-382	809.31	133	J-242	4	125.0	1.04	True	0.03
1142	P-383	497.36	41	J-246	6	120.0	4.84	True	0.05
1143	P-384	1,160.68	J-246	J-118	6	120.0	4.84	True	0.05
1146	P-385	1,059.23	J-230	J-247	12	125.0	425.90	True	1.21
1147	P-386	74.53	J-247	240 to 232 PSV	12	125.0	375.90	True	1.07
1151	P-389	99.84	240 to 207 Tank PRV	207 Tank	12	130.0	50.00	True	0.14
1152	P-390	331.34	J-169	J-235	6	125.0	0.00	True	0.00
1155	P-392	55.40	68	327 to 240 PRV	8	130.0	0.00	True	0.00
1156	P-393	72.87	327 to 240 PRV	J-230	8	130.0	0.00	True	0.00
1162	P-395	436.38	R-2	WTP Pump 1	8	130.0	229.75	True	1.47
1163	P-396	415.18	WTP Pump 1	J-248	8	130.0	229.75	True	1.47
1164	P-397	450.76	R-2	WTP Pump 2	8	130.0	228.44	True	1.46
1165	P-398	505.43	WTP Pump 2	J-248	8	130.0	228.44	True	1.46
1170	P-400	20.42	J-247	FCV for 207 Tank	12	130.0	50.00	True	0.14
1171	P-401	28.48	FCV for 207 Tank	240 to 207 Tank PRV	12	130.0	50.00	True	0.14
1173	P-402	9,177.69	J-227	J-249	12	130.0	-458.19	True	1.30
1174	P-403	10,848.11	J-249	J-248	12	130.0	-458.19	True	1.30
1181	P-404	2,896.20	112	J-72	8	130.0	(N/A)	False	(N/A)
1182	P-405	1,232.41	J-72	J-251	8	130.0	(N/A)	False	(N/A)
1187	P-408	393.77	J-221	J-73	6	130.0	(N/A)	False	(N/A)
1195	P-411	242.09	J-169	J-171	6	130.0	-2.83	True	0.03
1197	P-412	944.99	68	PRV-5	8	125.0	0.00	True	0.00
1198	P-413	77.45	PRV-5	J-235	8	125.0	0.00	True	0.00
1199	P-414	274.54	J-175	J-239	6	130.0	3.69	True	0.04

Scenario: 2030 PHD
Current Time Step: 0.000Hr
FlexTable: Tank Table

ID	Label	Is Active?	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
188	207 Tank	True	157	157	198	207	41.30	938.79	198
189	460 Tank	True	442	442	462	469	19.00	-75.69	462
190	232 Tank	True	208	208	230	232	84.20	78.57	230
191	Proposed 460 Tank	False	442	442	462	469	19.00	(N/A)	(N/A)

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Scenario: 2030 PHD
Current Time Step: 0.000Hr
FlexTable: Pump Table

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
226	207/232 Large 1	156	207/232 Large	Off	198	240	0.00	0.00
230	207/232 Large 2	156	207/232 Large	On	198	240	465.83	42.64
198	207/232 Small	156	207/232 Small	On	198	240	367.58	42.47
210	207/327 Large	156	207/327 Large	Off	198	327	0.00	0.00
214	207/327 Small 1	156	207/327 Small	On	198	327	203.70	129.35
206	207/327 Small 2	156	207/327 Small	On	198	327	203.66	129.40
994	232/460 Pump 1	103	232/460	Off	221	472	0.00	0.00
999	232/460 Pump 2	103	232/460	On	220	472	166.84	251.48
202	460/460+	440	460/460+	On	461	535	143.85	73.86
1160	WTP Pump 1	108	WTP to 207	On	139	264	229.75	124.60
1161	WTP Pump 2	108	WTP to 207	On	139	264	228.44	124.71

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Project Inventory: fh model 20101214.wtg

Title	
Engineer	
Company	
Date	10/20/2009
Notes	

Scenario Summary

ID	1091
Label	2030 MDD + FF
Notes	
Active Topology	Existing 2009
Physical	Peace Health Diameters
Demand	2030 MDD
Initial Settings	2030 MDD + FF
Operational	<I> Base
Age	<I> Base
Constituent	<I> Base
Trace	<I> Base
Fire Flow	<I> Base
Flushing	<I> Base
Energy Cost	<I> Base
Transient	<I> Base
Pressure Dependent Demand	<I> Base
Failure History	<I> Base Failure History
User Data Extensions	<I> Base
Steady State/EPS Solver Calculation Options	<I> MDD - Fireflow
Transient Solver Calculation Options	<I> Base Calculation Options

Network Inventory

Pipes	385	-Constant Speed - No Pump Curve	11
Junctions	308	-Constant Speed - Pump Curve	0
Hydrants	0	-Shut Down After Time Delay	0
Tanks	4	-Variable Speed/Torque	0
-Circular	4	-Pump Start - Variable Speed/Torque	0
-Non-Circular	0	Variable Speed Pump Batteries	0
-Variable Area	0	Pump Stations	0
Reservoirs	1	PRV's	5
Pumps	11	PSV's	3
-Constant Power	1	PBV's	0
-Custom Extended	0	FCV's	1
-Design Point (1 Point)	8	TCV's	0
-Multiple Point	0	GPV's	0
-Standard (3 Point)	2	Isolation Valves	0
-Standard Extended	0	Spot Elevations	0

Transient Network Inventory

Project Inventory: fh model 20101214.wtg

Transient Network Inventory			
Air Valves	0	Rupture Disks	0
-Double Acting	0	Surge Valves	0
-Slow Closing	0	Surge Tanks	0
-Triple Acting	0	-Simple	0
-Vacuum Breaker	0	-Differential	0
Discharges to Atmosphere	0	-Variable Area	0
Orifice	0	Turbines	0
Rating Curve	0	Valves With Linear Area Change	0
Valve	0	Periodic Head-Flows	0
Check Valves	0	-Sinusoidal (Head)	0
-Towards Wye	0	-Not Sinusoidal (Head)	0
-Away from Wye	0	-Sinusoidal (Flow)	0
Hydropneumatic Tanks	0	-Not Sinusoidal (Flow)	0
Orifices Between Pipes	0		

Pressure Pipes Inventory			
2 (in)	3,309.51 ft	8 (in)	64,940.90 ft
4 (in)	8,579.48 ft	12 (in)	26,016.36 ft
6 (in)	83,844.29 ft	All Diameters	186,690.55 ft

Scenario: 2030 MDD + FF
Current Time Step: 0.000Hr
Fire Flow Node FlexTable: Fire Flow Report

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Specify Local Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)
J-251	<None>	(N/A)	(N/A)	True	750.00	(N/A)	0.0	(N/A)	(N/A)
119	460/460+	7	True	False	500.00	1,149.18	20.0	20.0	120
J-159	460/460+	14	True	True	0.00	106.06	0.0	33.1	J-156
J-160	460/460+	11	True	False	500.00	1,306.06	20.0	20.0	J-161
J-161	460/460+	3	True	True	0.00	87.56	0.0	33.0	J-156
J-162	460/460+	6	True	False	500.00	1,163.07	20.0	20.0	J-161
135	460/460+	6	True	False	500.00	1,043.26	20.0	20.0	J-156
J-164	460/460+	4	True	True	0.00	130.88	0.0	29.0	J-242
J-165	460/460+	5	True	False	500.00	1,116.77	20.0	20.0	120
J-166	460/460+	3	True	True	0.00	181.95	0.0	32.4	J-243
127	460/460+	15	True	True	0.00	175.34	20.0	32.9	J-156
120	460/460+	4	True	False	500.00	806.35	20.0	29.5	J-156
J-157	460/460+	9	True	False	500.00	1,101.33	20.0	22.8	J-158
136	460/460+	15	True	True	0.00	158.80	20.0	32.2	J-156
J-156	460/460+	4	True	False	500.00	891.47	20.0	20.0	J-243
122	460/460+	8	True	False	500.00	1,382.04	20.0	20.0	J-156
J-86	460/460+	6	True	False	500.00	1,101.50	20.0	20.0	120
J-87	460/460+	7	True	False	500.00	1,092.94	20.0	20.0	120
133	460/460+	11	False	False	500.00	215.17	20.0	20.0	J-164
125	460/460+	8	True	False	500.00	995.12	20.0	29.4	J-161
105	460/460+	6	True	False	500.00	1,056.00	20.0	20.0	120
137	460/460+	7	True	False	500.00	1,169.48	20.0	20.0	J-243
130	460/460+	4	True	False	500.00	1,341.73	20.0	28.5	J-161
131	460/460+	16	True	True	0.00	85.27	20.0	20.5	139
112	460/460+	(N/A)	(N/A)	False	500.00	(N/A)	20.0	(N/A)	(N/A)
118	460/460+	7	True	False	500.00	1,056.23	20.0	20.0	120
121	460/460+	6	True	False	500.00	1,222.95	20.0	20.0	120
138	460/460+	3	True	True	0.00	181.75	20.0	32.4	J-156
J-242	460/460+	5	True	True	0.00	163.16	20.0	20.0	J-164
J-88	460/460+	8	True	False	500.00	1,400.03	20.0	20.0	J-156
123	460/460+	6	True	False	500.00	1,261.62	20.0	20.0	138
J-243	460/460+	15	True	True	0.00	151.57	0.0	32.2	J-156
J-244	460/460+	22	False	False	500.00	215.35	20.0	20.0	J-242
J-158	460/460+	8	True	False	500.00	1,124.48	20.0	26.4	J-161
J-245	460/460+	22	True	True	0.00	215.18	20.0	20.0	J-242
139	460/460+	3	True	True	0.00	85.86	20.0	33.2	J-156
128	460/460+	6	True	False	500.00	1,216.93	20.0	20.0	J-161
124	460/460+	6	True	False	500.00	1,361.77	20.0	20.0	J-161
126	460/460+	5	True	False	500.00	1,270.99	20.0	20.0	J-161
J-227	207	13	False	True	1,000.00	666.02	0.0	35.9	J-247
J-248	207	14	True	False	500.00	810.75	20.0	34.5	J-249
J-249	207	13	True	False	500.00	727.15	20.0	35.9	J-247
J-247	207	9	True	False	500.00	2,419.84	20.0	27.5	J-230
J-230	207	12	True	True	0.00	655.98	0.0	35.9	J-247
58	232	3	True	False	500.00	1,155.30	20.0	21.0	J-80
29	232	21	True	False	500.00	1,308.82	20.0	20.0	23
83	232	29	True	False	500.00	1,520.38	20.0	20.0	23
104	232	16	True	True	750.00	1,742.34	20.0	20.0	35
18	232	32	True	True	750.00	1,608.02	20.0	20.0	J-217
32	232	7	True	False	500.00	1,099.25	20.0	20.0	23
25	232	6	True	True	750.00	1,835.43	20.0	20.0	23
30	232	7	True	False	500.00	1,058.38	20.0	20.0	23
7	232	5	True	True	750.00	2,559.56	20.0	20.0	23
94	232	5	True	True	1,000.00	2,630.89	20.0	20.0	23
49	232	5	True	True	1,000.00	1,704.80	20.0	20.0	J-80
90	232	4	True	False	500.00	2,154.31	20.0	21.5	23
J-35	232	6	True	True	750.00	2,304.39	20.0	20.0	23
J-27	232	9	True	False	500.00	1,762.57	20.0	20.4	J-28
J-28	232	10	True	False	500.00	1,510.55	20.0	21.7	J-29
J-29	232	4	True	False	500.00	1,311.08	20.0	24.9	23
J-30	232	12	True	False	500.00	1,880.39	20.0	20.0	23
J-31	232	23	True	True	750.00	1,632.99	20.0	20.0	23
J-32	232	21	True	True	750.00	1,633.00	20.0	20.0	23
J-3	232	12	True	False	500.00	714.82	20.0	20.0	23
J-34	232	6	True	False	500.00	2,240.62	20.0	20.0	23
J-23	232	23	True	False	500.00	1,505.88	20.0	20.0	23

J-36	232	4	True	False	500.00	1,767.29	20.0	24.2	23
J-37	232	6	True	True	750.00	2,365.20	20.0	20.0	23
J-38	232	4	True	True	750.00	1,835.74	20.0	24.1	23
J-39	232	6	True	True	750.00	2,365.05	20.0	20.0	23
J-41	232	6	True	True	750.00	1,929.93	20.0	20.0	23
J-42	232	3	True	True	0.00	311.26	0.0	28.9	J-80
J-43	232	6	True	True	1,000.00	2,530.41	20.0	20.0	23
J-33	232	6	True	False	500.00	2,240.62	20.0	20.0	23
J-13	232	4	True	False	500.00	1,338.72	20.0	21.5	J-80
101	232	16	True	False	500.00	1,251.99	20.0	20.0	J-80
J-1	232	12	True	True	750.00	762.53	20.0	20.0	23
J-2	232	7	True	False	500.00	788.95	20.0	20.0	23
22	232	30	True	False	500.00	1,231.88	20.0	20.0	23
J-4	232	5	True	True	750.00	2,147.09	20.0	20.0	23
J-5	232	3	True	True	0.00	348.86	0.0	28.8	J-80
J-6	232	5	True	True	750.00	2,147.47	20.0	20.0	23
J-26	232	6	True	False	500.00	1,880.40	20.0	20.0	23
J-12	232	4	True	False	500.00	1,358.34	20.0	21.3	J-80
J-24	232	29	True	False	500.00	1,495.88	20.0	20.0	23
J-14	232	4	True	False	500.00	1,383.25	20.0	20.6	J-13
J-15	232	23	True	False	500.00	1,467.38	20.0	20.0	J-13
J-16	232	23	True	False	500.00	1,497.62	20.0	20.0	J-80
J-17	232	8	True	False	500.00	1,498.26	20.0	20.0	J-80
J-19	232	12	False	True	750.00	732.97	20.0	20.0	23
J-22	232	11	True	False	500.00	1,514.21	20.0	20.1	23
100	232	6	True	False	500.00	1,336.86	20.0	20.0	J-80
J-11	232	8	True	False	500.00	1,498.19	20.0	20.0	J-80
33	232	4	True	True	750.00	2,424.91	20.0	20.0	23
35	232	3	True	True	750.00	890.01	20.0	27.9	J-80
24	232	5	True	False	500.00	690.35	20.0	20.0	23
51	232	7	True	True	1,000.00	1,405.29	20.0	20.0	J-80
93	232	6	True	False	500.00	2,352.79	20.0	20.0	23
73	232	7	True	False	500.00	715.40	20.0	20.0	23
16	232	4	True	True	750.00	2,182.02	20.0	21.5	23
11	232	4	True	True	750.00	2,173.38	20.0	20.0	23
9	232	5	True	True	750.00	2,218.04	20.0	20.0	23
59	232	15	True	True	750.00	1,031.27	20.0	20.0	J-80
97	232	3	True	True	750.00	1,303.80	20.0	26.2	23
48	232	17	True	True	1,000.00	2,194.91	20.0	20.0	J-80
86	232	8	True	False	500.00	2,338.70	20.0	20.0	23
80	232	7	True	False	500.00	690.35	20.0	20.0	23
45	232	5	True	True	1,000.00	1,834.50	20.0	20.0	J-80
5	232	3	True	True	1,000.00	3,000.00	20.0	22.5	23
37	232	4	True	True	750.00	2,591.58	20.0	20.0	J-80
57	232	8	True	True	1,000.00	1,555.81	20.0	20.0	J-80
46	232	7	True	True	750.00	1,910.30	20.0	20.0	J-80
2	232	4	True	True	1,000.00	2,497.90	20.0	20.0	23
96	232	3	True	True	1,000.00	3,000.00	20.0	22.2	23
55	232	3	True	False	500.00	1,104.94	20.0	21.8	J-80
44	232	5	True	True	750.00	2,196.21	20.0	20.0	J-80
13	232	3	True	True	750.00	1,450.90	20.0	21.7	98
60	232	7	True	True	750.00	1,031.66	20.0	20.0	J-80
75	232	6	True	False	500.00	1,600.11	20.0	20.0	23
31	232	12	False	True	750.00	727.25	20.0	20.0	23
26	232	6	True	True	750.00	2,013.20	20.0	20.0	23
20	232	7	True	True	750.00	944.13	20.0	20.0	J-217
53	232	3	True	False	500.00	1,170.95	20.0	21.4	J-80
91	232	6	True	False	500.00	2,340.82	20.0	20.0	23
95	232	21	True	True	1,000.00	2,789.58	20.0	20.0	23
66	232	5	False	True	750.00	699.72	20.0	20.0	J-201
21	232	4	True	False	500.00	1,019.65	20.0	20.9	23
52	232	6	True	False	500.00	1,459.62	20.0	20.0	J-80
J-44	232	4	True	True	1,000.00	1,908.96	20.0	23.9	J-45
74	232	5	True	True	1,000.00	1,943.52	20.0	20.0	J-80
98	232	3	True	True	750.00	1,293.79	20.0	26.3	23
34	232	5	True	True	750.00	1,246.14	20.0	20.0	35
19	232	7	True	True	750.00	969.80	20.0	20.0	J-217
27	232	6	True	True	750.00	1,759.62	20.0	20.0	23
36	232	4	True	True	750.00	2,528.72	20.0	20.0	J-80
56	232	7	True	False	500.00	1,312.37	20.0	20.0	J-80
50	232	12	True	True	1,000.00	1,352.20	20.0	20.0	J-80
92	232	4	True	False	500.00	2,145.48	20.0	21.6	23
72	232	30	True	False	500.00	1,466.01	20.0	20.0	23
8	232	4	True	True	750.00	2,395.74	20.0	20.0	23
10	232	4	True	True	750.00	2,270.69	20.0	20.0	23
89	232	8	True	False	500.00	2,339.68	20.0	20.0	23
1	232	5	True	True	1,000.00	2,627.83	20.0	20.0	23
12	232	5	True	True	750.00	2,155.20	20.0	20.0	23
4	232	6	True	False	500.00	2,236.38	20.0	20.0	23

	232	12	False	True	750.00	743.41	20.0	20.0	23
88	232	6	True	False	500.00	2,337.22	20.0	20.0	23
39	232	2	True	True	750.00	3,000.00	20.0	22.2	J-80
28	232	21	True	True	750.00	1,683.05	20.0	20.0	23
J-51	232	6	True	True	1,000.00	2,615.76	20.0	20.0	23
85	232	6	True	False	500.00	2,258.51	20.0	20.0	23
23	232	4	True	False	500.00	690.35	20.0	28.4	J-80
54	232	14	True	False	500.00	1,132.71	20.0	20.0	J-80
47	232	7	True	True	1,000.00	1,868.21	20.0	20.0	J-80
87	232	6	True	False	500.00	2,336.94	20.0	20.0	23
76	232	14	True	False	500.00	1,226.23	20.0	20.0	J-80
14	232	5	True	True	750.00	2,240.88	20.0	20.0	23
82	232	7	True	False	500.00	969.80	20.0	20.0	J-217
6	232	3	True	True	1,000.00	3,000.00	20.0	23.2	23
J-149	232	5	True	True	750.00	2,664.78	20.0	20.0	23
J-127	232	2	True	True	750.00	3,000.00	20.0	22.0	J-80
J-187	232	6	True	False	500.00	1,206.59	20.0	20.0	J-185
J-186	232	6	True	False	500.00	1,143.95	20.0	20.0	J-185
J-185	232	4	True	False	500.00	970.66	20.0	28.2	23
J-184	232	6	True	False	500.00	1,115.24	20.0	20.0	J-185
J-183	232	21	True	False	500.00	1,290.69	20.0	20.0	J-185
J-182	232	6	True	False	500.00	2,180.32	20.0	20.0	J-185
J-181	232	6	True	True	1,000.00	2,180.29	20.0	20.0	J-185
J-180	232	7	True	False	500.00	2,034.25	20.0	20.0	J-185
J-176	232	3	True	True	1,000.00	1,112.19	20.0	28.8	J-80
J-175	232	6	True	True	1,000.00	1,488.75	20.0	20.0	J-176
J-174	232	7	True	False	500.00	2,233.54	20.0	20.0	J-185
J-173	232	4	True	False	500.00	1,701.56	20.0	23.4	J-176
J-190	232	21	True	False	500.00	1,343.90	20.0	20.0	J-185
J-137	232	3	True	True	0.00	148.59	0.0	29.2	J-80
J-128	232	3	True	False	500.00	527.52	20.0	28.4	J-80
J-129	232	11	True	True	750.00	977.29	20.0	27.9	J-80
J-130	232	6	True	True	750.00	1,699.52	20.0	20.0	J-129
J-131	232	4	True	True	750.00	2,753.11	20.0	20.0	J-80
J-133	232	5	True	True	1,000.00	2,422.77	20.0	20.0	23
J-152	232	5	True	True	750.00	2,380.18	20.0	20.0	23
J-136	232	3	True	True	750.00	3,000.00	20.0	22.2	J-80
J-151	232	16	True	True	750.00	1,742.34	20.0	20.0	35
J-45	232	4	True	True	1,000.00	2,030.59	20.0	24.1	23
J-143	232	3	True	True	750.00	857.26	20.0	28.3	J-80
J-49	232	6	True	True	1,000.00	2,592.32	20.0	20.0	23
J-146	232	5	True	True	750.00	2,052.54	20.0	20.0	J-80
J-147	232	7	True	True	750.00	2,052.56	20.0	20.0	J-80
J-191	232	6	True	False	500.00	921.48	20.0	20.0	J-194
J-134	232	5	True	True	1,000.00	2,498.91	20.0	20.0	23
J-206	232	3	False	False	500.00	479.77	20.0	21.7	J-205
J-233	232	6	True	True	1,000.00	2,628.00	20.0	20.0	23
J-226	232	4	True	True	750.00	2,398.62	20.0	20.0	23
J-224	232	3	True	True	1,000.00	3,000.00	20.0	23.0	23
J-221	232	6	False	True	750.00	608.91	20.0	20.0	J-80
J-219	232	5	True	True	750.00	920.78	20.0	20.0	J-217
J-218	232	6	True	True	750.00	861.83	20.0	20.0	J-217
J-217	232	4	True	False	500.00	787.61	20.0	25.8	23
J-216	232	3	True	False	500.00	1,015.41	20.0	28.4	J-80
J-215	232	5	True	False	500.00	563.52	20.0	20.0	J-201
J-214	232	2	True	False	500.00	504.10	20.0	22.7	J-212
J-213	232	19	True	False	500.00	516.43	20.0	20.0	J-214
J-212	232	3	True	False	500.00	507.41	20.0	21.6	J-214
J-211	232	19	True	False	500.00	516.43	20.0	20.0	J-214
J-188	232	7	True	False	500.00	2,030.68	20.0	20.0	J-185
J-200	232	5	True	False	500.00	566.69	20.0	20.0	J-201
J-193	232	5	True	False	500.00	572.99	20.0	20.0	J-194
J-194	232	3	False	False	500.00	494.50	20.0	28.8	J-80
J-195	232	5	True	False	500.00	546.25	20.0	20.0	J-194
J-196	232	5	True	False	500.00	576.76	20.0	20.0	J-194
J-197	232	5	True	False	500.00	584.53	20.0	20.0	J-194
J-208	232	3	True	False	500.00	513.88	20.0	20.0	J-206
J-199	232	5	True	False	500.00	590.09	20.0	20.0	J-201
J-207	232	5	True	False	500.00	513.88	20.0	20.0	J-206
J-201	232	3	True	False	500.00	536.13	20.0	27.1	23
J-202	232	5	True	False	500.00	563.50	20.0	20.0	J-201
J-203	232	5	True	False	500.00	624.09	20.0	20.0	J-201
J-204	232	5	True	False	500.00	516.78	20.0	20.0	J-214
J-205	232	3	False	False	500.00	469.76	20.0	22.1	J-206
J-141	232	5	True	True	1,000.00	2,579.65	20.0	20.0	23
J-198	232	7	True	False	500.00	621.26	20.0	20.0	J-194
J-84	232	12	False	True	750.00	402.54	20.0	20.0	J-85
J-73	232	14	True	True	750.00	882.91	20.0	20.0	J-80
J-74	232	12	True	True	750.00	882.61	20.0	20.0	J-80

	232	6	True	True	750.00	883.32	20.0	20.0	J-80
J-77	232	14	True	False	500.00	988.52	20.0	20.0	J-80
J-78	232	3	False	True	750.00	502.11	20.0	22.3	J-80
J-79	232	6	False	True	750.00	570.00	20.0	20.0	J-80
J-98	232	7	True	False	500.00	1,459.59	20.0	20.0	J-80
J-83	232	13	False	True	750.00	434.23	20.0	20.0	J-85
J-70	232	13	True	False	500.00	1,003.56	20.0	20.0	J-80
J-85	232	11	False	True	750.00	379.90	20.0	25.8	J-84
J-89	232	6	True	True	1,000.00	2,240.44	20.0	20.0	J-185
J-145	232	5	True	True	750.00	2,676.86	20.0	20.0	23
J-91	232	6	True	False	500.00	2,038.39	20.0	20.0	J-185
J-94	232	7	True	False	500.00	1,383.83	20.0	20.0	J-80
J-95	232	7	True	False	500.00	1,459.59	20.0	20.0	J-80
J-96	232	7	True	False	500.00	1,459.60	20.0	20.0	J-80
J-80	232	4	False	True	750.00	534.48	20.0	29.1	J-79
J-60	232	4	True	True	750.00	2,598.63	20.0	20.0	J-80
J-46	232	4	True	True	1,000.00	2,033.74	20.0	22.3	J-47
J-47	232	4	True	True	1,000.00	1,843.17	20.0	23.8	23
J-48	232	6	True	True	1,000.00	2,098.81	20.0	20.0	J-47
78	232	12	False	True	750.00	731.52	20.0	20.0	23
J-50	232	5	True	True	1,000.00	2,591.94	20.0	20.0	23
J-52	232	5	True	True	1,000.00	2,615.73	20.0	20.0	23
J-53	232	5	True	True	1,000.00	2,977.93	20.0	20.0	23
J-72	232	12	False	True	750.00	608.32	20.0	20.0	J-80
J-55	232	3	True	True	1,000.00	3,000.00	20.0	22.5	23
J-71	232	15	True	False	500.00	1,003.68	20.0	20.0	J-80
J-61	232	5	True	True	750.00	2,151.07	20.0	20.0	J-80
J-62	232	12	True	True	1,000.00	1,323.81	20.0	20.0	J-80
J-63	232	14	True	False	500.00	1,072.02	20.0	20.0	J-80
J-67	232	14	True	False	500.00	1,167.09	20.0	20.0	J-80
J-68	232	15	True	False	500.00	1,117.20	20.0	20.0	J-80
J-69	232	15	True	False	500.00	1,083.86	20.0	20.0	J-80
J-92	232	6	True	True	1,000.00	2,092.03	20.0	20.0	J-185
J-54	232	4	True	False	500.00	3,000.00	20.0	21.3	23
J-100	232	7	True	False	500.00	1,459.60	20.0	20.0	J-80
J-90	232	6	True	False	500.00	2,165.30	20.0	20.0	J-185
J-113	232	5	True	True	750.00	1,995.87	20.0	20.0	J-80
J-110	232	7	True	False	500.00	1,459.61	20.0	20.0	J-80
J-101	232	6	True	False	500.00	1,383.85	20.0	20.0	J-80
J-114	232	5	True	True	750.00	1,947.71	20.0	20.0	J-80
J-112	232	6	True	True	750.00	1,979.21	20.0	20.0	J-80
J-111	232	6	True	True	750.00	1,971.55	20.0	20.0	J-80
J-104	232	7	True	False	500.00	1,459.60	20.0	20.0	J-80
J-121	232	4	True	True	750.00	1,659.76	20.0	29.5	J-80
J-106	232	7	True	False	500.00	1,459.60	20.0	20.0	J-80
J-109	232	8	True	True	1,000.00	1,555.78	20.0	20.0	J-80
J-99	232	7	True	False	500.00	1,459.60	20.0	20.0	J-80
J-117	232	5	True	True	1,000.00	2,238.40	20.0	20.0	J-80
J-116	327	5	True	False	500.00	593.47	20.0	20.0	J-115
68	327	27	True	False	500.00	1,588.47	20.0	20.0	J-115
J-115	327	3	False	False	500.00	456.99	20.0	27.9	J-116
J-59	327	2	True	False	500.00	514.48	20.0	20.0	42
43	327	21	True	True	1,000.00	1,645.23	20.0	20.0	J-115
J-118	327	19	True	False	500.00	532.16	20.0	20.0	42
J-119	327	5	True	False	500.00	532.39	20.0	20.0	42
J-222	327	3	True	True	1,000.00	1,364.89	20.0	23.7	J-115
41	327	9	True	False	500.00	1,124.82	20.0	20.0	J-115
J-122	327	9	True	False	500.00	1,236.44	20.0	20.0	J-115
J-246	327	5	True	False	500.00	897.37	20.0	20.0	42
42	327	17	False	False	500.00	482.30	20.0	22.5	J-59
108	327	7	True	False	500.00	886.10	20.0	20.0	J-115
111	327	5	True	False	500.00	885.94	20.0	20.0	J-115
J-124	327	9	True	False	500.00	1,244.28	20.0	20.0	J-115
67	327	26	True	False	500.00	1,587.66	20.0	20.0	J-115
109	327	7	True	False	500.00	886.10	20.0	20.0	J-115
40	327	9	True	False	500.00	1,392.92	20.0	20.0	J-115
106	327	7	True	False	500.00	885.99	20.0	20.0	J-115
110	327	7	True	False	500.00	886.13	20.0	20.0	J-115
J-120	no service	1	False	False	500.00	0.00	20.0	12.1	J-155
132	no service	1	False	True	0.00	0.00	20.0	12.1	J-155
J-232	no service	1	False	False	500.00	0.00	20.0	12.1	J-155
J-155	no service	1	False	False	500.00	0.00	20.0	14.1	J-163
J-163	no service	1	False	False	500.00	0.00	20.0	12.1	J-155
J-154	no service	1	False	False	500.00	0.00	20.0	12.1	J-155
J-81	known problem	1	False	True	750.00	0.00	20.0	19.1	J-81
J-168	327 Weber Way	14	True	True	1,000.00	1,301.97	20.0	20.0	J-172
J-171	327 Weber Way	22	False	True	1,000.00	279.35	20.0	60.0	J-172
J-172	327 Weber Way	18	False	True	1,000.00	309.93	20.0	62.6	J-178
J-177	327 Weber Way	8	False	True	1,000.00	897.99	20.0	20.0	J-172

	327 Weber Way	20	False	True	1,000.00	101.61	20.0	63.0	J-172
J-169	327 Weber Way	8	True	True	1,000.00	1,301.97	20.0	20.0	J-172
J-235	327 Weber Way	23	True	True	1,000.00	2,147.33	0.0	0.0	J-172
J-239	327 Weber Way	21	False	True	1,000.00	270.00	20.0	56.9	J-172
J-179	327 Weber Way	8	False	True	1,000.00	892.60	20.0	20.0	J-172

P:\Friday Harbor\Potable Water\137804 Friday Harbor WSP\400 Hydraulic Model Update\WaterCAD\fh model 20101214.wtg

Scenario: 2030 MDD + FF
Current Time Step: 0.000Hr
FlexTable: Tank Table

ID	Label	Is Active?	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
188	207 Tank	True	157	157	203	207	41.30	1,196.05	203
189	460 Tank	True	442	442	458	469	19.00	-256.98	458
190	232 Tank	True	208	208	228	232	84.20	-577.82	228
191	Proposed 460 Tank	False	442	442	458	469	19.00	(N/A)	(N/A)

P:\Friday Harbor\Potable Water\137804 Friday Harbor WSP\400 Hydraulic Model Update\WaterCAD\fh model 20101214.wtg

Scenario: 2030 MDD + FF
Current Time Step: 0.000Hr
FlexTable: Pump Table

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
226	207/232 Large 1	156	207/232 Large	Off	203	242	0.00	0.00
230	207/232 Large 2	156	207/232 Large	On	202	243	481.90	40.48
198	207/232 Small	156	207/232 Small	On	202	243	389.42	40.32
210	207/327 Large	156	207/327 Large	On	201	332	1,205.53	130.96
214	207/327 Small 1	156	207/327 Small	On	202	328	207.57	125.10
206	207/327 Small 2	156	207/327 Small	On	202	328	207.53	125.15
994	232/460 Pump 1	103	232/460	Off	222	470	0.00	0.00
999	232/460 Pump 2	103	232/460	On	222	470	168.23	247.55
202	460/460+	440	460/460+	On	457	535	137.61	77.11
1160	WTP Pump 1	108	WTP to 207	On	139	264	229.61	124.61
1161	WTP Pump 2	108	WTP to 207	On	139	264	228.29	124.73

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Appendix K: 2010 WSDOH Sanitary Survey

TOWN OF FRIDAY HARBOR
RECEIVED
OCT 11 2010
FINANCE OFFICE

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
20435 72nd Ave. S. , Suite 200, K17-12 • Kent, Washington 98032 -2358

October 4, 2010

MICHAEL WILKS
FRIDAY HARBOR, TOWN OF
PO BOX 219
FRIDAY HARBOR, WA 98250

Subject: Friday Harbor Water System ID#265950
San Juan County
2010 Routine Sanitary Survey

Dear Mr. Wilks:

This letter is in follow up to my inspection of the Friday Harbor Water System on September 24, 2010. My inspection was part of the Department's routine sanitary survey program. The purpose of this program is to inspect water system facilities and their O & M programs to ensure compliance with drinking water regulations and to help ensure that safe and reliable water is delivered to users. I appreciate the time spent by you, Jason Miniken and Mike Deegan showing me the water system. A copy of my inspection summary is enclosed, please check it for accuracy. All of the items listed in the recommendation section of the summary should be completed by the water system.

I have been conducting surveys of the Town's water system for over 20 years. During this time, the Town has made huge improvements in the water quality and service reliability of the water system. Your staff and the Town's leadership should be proud of the improvements that you have all helped bring about in to this most critical of public works systems. In addition to infrastructure improvements, the water system has also made significant operational improvements in the way that you provide water service to the citizens of Friday Harbor. The Town met water filtration optimization requirements for 2009. These optimization goals are voluntary filtration criteria that exceed regulatory minimums and represent improved public health protection. The Town's continued efforts in implementing a cross connection control program is another example of improved water operations sustained over time. Keep up the good work.

The Drinking Water Regulations require that all Group A public water systems have a sanitary survey every 5 years. In order to receive credit for the survey, a sanitary survey fee must be paid. Enclosed is an invoice for $1836.00. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **DOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099**.

Once again thank you for your time, if you have any questions please call me in Kent at (253) 395-6767.

Sincerely,

Robert O. Jones For

Stephen Deem, PE
Regional Engineer
NW Drinking Water Operations

Enclosures

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
20435 72nd Ave. S., Suite 200, K17-12 • Kent, Washington 98032 -2358

MEETING SUMMARY/SYSTEM INSPECTION

September 24, 2010

System: Friday Harbor Water System
ID# 265950
San Juan County

Persons Attending: Mike Wilks, Public Works Director
Steve Deem, DOH
Jason Miniken, System Operator
Mike Deegan, System Operator

Purpose: Routine Water System Sanitary Survey
(Excluding the Water Treatment Plant)

System Summary & Findings:

General:

The system had a water treatment plant survey in October 2009. Significant findings from that survey included ongoing Disinfection-By-Products (DBP), continued optimization of the treatment plant, and maintenance and operations of critical alarms. The last complete system survey was done in February of 2005. The Town of Friday Harbor did participate in the Department San Juan Performance Based Training optimization effort. There are no complaints on file for the last five years. The system is operating under a green permit with an unspecified connection number.

Friday Harbor has three sources of supply. The primary supply is Trout Lake. Trout Lake is formed by a dam and has approximately 468 million gallons volume. The watershed is approximately 840 acres of which the town owns about 570 acres. Most of the water shed is undeveloped. The Town has two augmentation supplies to the Trout Lake Supply: Aug 1 pumps overflow water from Lake 310, which drains a 190-acre watershed. Aug 2 is a seasonal diversion of water from a stream in section 17 east of

Trout Lake. This stream collects water from a 3,850-acre watershed. All of these sources have high organic levels. Aug 2 has higher organic levels than Aug 1 and Trout Lake. A detailed Trout Lake capacity has been completed concluding that the Trout Lake system has a sustainable yield of 168 million gallons per year, and 193 million gallons utilizing dead storage. Three solar bees have been installed in Trout Lake and have been successfully operating for several years. The solar bees continually circulate water from the bottom of the lake to the top of the water column. The solar bees were installed to mitigate / minimize blue green algae blooms. Town staff is very satisfied with their operation. Solar Bee provides annual maintenance.

Water flows by gravity from Trout Lake to the water treatment plant. The plant consists of three sand and anthracite filters, these filters all operate with up-flow clarifiers. The filters have been rated at 4 gallons per minute per square foot. Currently contact time limits production to 700 gpm from the total plant. Two filters are run at a time with the third in standby. Refer to 2009 water treatment plant summary for further details.

Treated water from the treatment plant is pumped to the town through a 10-inch AC pipeline to a 500,000 gallon steel storage tank. The town does have direct service connections off of the transmission main. This zone of service off of the transmission line is known as the 207-foot pressure zone. There are three additional pressure zones 232-feet, 327-zone, and the 460-zone. A booster pump station located at the 0.5mg storage reservoir supplies water to the 327-pressure zone; there are approximately 91 service connections in this zone. Three pumps located at the 0.5 MG reservoir supplies water to the one million gallon storage tank, which creates a 232-foot pressure zone, this zone supplies most of the water for the downtown core. Additionally water is supplied to the Hill View Terrace area by two 120 GPM pumps that feed a 50,000 gallon concrete reservoir. This area is known as the 460-pressure zone.

Table 1-3 Water Storage

Tank	Pressure Zone	Volume
Storage Tank #1	232'Zone & overflow, 327'zone	1,000,000 gallons
Storage Tank #2	207' Zone & overflow	500,000 gallons
Storage Tank #3	460' Zone (outside FHUGA)	50,000 gallons

Table 1-4 Pumping Stations

Pump Station Location	Use	No.	Capacity (gpm)	Head (Pressure)	Standby Power Available
AUG 1	Raw water	2	800/each	180	No
AUG 2	Raw Water	2	1340/each	235	No
Water Treatment Plant	Supply	3	350	230ft(100psi)	Yes
Reservoir Pump Station	Distribution	2 1	360 340	55 45	Yes
327 Zone Pump Station	Distribution	2	150	180	Yes
460 Zone Pump Station	Distribution	2	120/each	365	No

Water Quality Monitoring:

Coliform Monitoring:

The system is required to collect between 3 and 5 routine monthly samples depending on the population. The system is in compliance with coliform monitoring and there have been no positive samples in the last two years.

Disinfection-By-Products (DBP)

The water system continues to exceed the MCL for THM's. The system is out of compliance with the DBP MCL. The water system has been submitting copies of their Tier 2 public notification as required. The system has submitted a design for installing Granular Activated Carbon (GAC). The system design is similar to the treatment system installed at Roche Harbor. The town appears committed to addressing this issue.

Lead and Copper:

The system is on reduced monitoring for lead and copper. The system is required to collect 10 distribution samples during 2010. Mike reports samples have been collected and results are below action levels for both lead and copper.

Source Monitoring:

Both Aug 1 and Aug 2 pump directly into Trout Lake and are mixed in Trout Lake consequently the system is required to only sample from Trout Lake which is designated as S01. This year the system is required to collect insecticides and nitrates from Trout Lake.

Water Treatment Plant Reports:

The water system is submitting water treatment plant reports as required in a timely manner. On the chlorine entry part of the monthly report, the water system does not have to collect grab samples every four hours since they are continuously monitoring the chlorination entry with a continuous monitoring instrument.

Facility Approval Status:

The system has a water system plan that was approved in September of 2003. The next plan is due in September of 2009. The water system is late in submitting an updated water system plan. Mike indicates that Brown and Caldwell are currently working on a plan update. The system is approved to serve its defined service area as shown in the water system plan the system is currently operating with an unspecified connection limit.

Operations and Maintenance:

The water system does have written operations and maintenance plans that were included with the previous water system plan approval. The system has a very good cross connection control plan and program. The system should work on improving communication and documentation with the town building officials to track and notify the water department staff on change of use effecting cross connections. The system has a water system conservation plan and a emergency response plan as required.

Recommendations made to Mike:

1. Cross connection control: Ongoing communication with the building department to notify water staff of changes in existing building / business use is a common challenge for all cross connection control programs. Annual or semiannual interdepartmental meetings have been successfully implemented by other water systems.

2. Watershed protection continues to be a cost effective way to minimize contaminant loading to the drinking water supply and to reduce treatment costs in the long run. The town should continue to advocate to the county planning department and to large property owners located in Aug 1 and Aug 2 watersheds the importance of protecting the water supply that all of the people of San Juan Island utilize. These efforts can be limited to continued reminders to these owners of the importance of their activities and how they can impact the water that the whole island community drinks.

3. Regarding monthly water treatment plant reporting, the town is using continuous chlorine analyzers to monitor chlorine at the entrance of the distribution system. The system is noting this on the report form and marking the lowest residual as required. Therefore the system does not have to take grab samples every 4 hours. (This additional monitoring is optional for the town and maybe warranted).

4. The Town should consider installing a recirculation pump and re-chlorination system on the Hill View Terrace storage tank. A continuous recirculation and re-chlorination system at Hill View may allow the town to reduce chlorine dosing at the water treatment plant that is currently needed to maintain the distribution residual in the Hill View Terrace tank.

5. The Town should review and document its flushing program as well as other non-revenue water use activities. As the town implements its GAC contactor treatment, any unnecessary water use that can be reduced will potentially extend the GAC filter runs and decrease costs associated with media replacement.

6. The Town is out of compliance with water system planning requirements. Please submit your updated plan as soon as possible.

DOH Follow up:

1. Complete summary, photos were taken.
2. Send follow up letter.

Appendix L: WTP O&M Manual

TOWN OF FRIDAY HARBOR

WATER TREATMENT PLANT OPERATIONS & MAINTENANCE MANUAL

CONTENTS

	Page
Introduction	2
Manual Backwash	3
Manual Scour for Clarifiers	5
Adjusting Filter Flow Rates	6
Adjusting Filter Scour & Backwash Times	7
Filter Change Over	8
Set Points	10
Chlorine Residual Test	13
pH and Alkalinity Tests	14
Color: True and Apparent Tests	16
Iron Ferrous Test	17
Nitrate, NR Test	18
Modified Jar Test	19
Chemical Feeder Calibration	24
Terms, Formulas, Conversions	25
CAUTION	30
Mixing Chemicals	31
Mixing Sumaclear P-10	32
Refilling Sumaclear 820B	33
Sumaclear Calibration	34
Chlorine Room	35
Emergency Chlorine	36
Calibrating 1720C Turbidimeters	37
Cleaning Turbidity Chambers	38
Generator	39
Power Failures	40
Troubleshooting	41
Aug I Start-up	42
Aug 2 Start-up	43
Water Treatment Plant Color Code Chart	
Monitoring Locations	
Vendors & Technical Support	44

INTRODUCTION

This manual is a guide to daily operations of the Town of Friday Harbor Water Treatment Plant only. For more advanced operations and maintenance of equipment refer to the appropriate operations and maintenance manuals. All of the operations and maintenance manuals are located in the water treatment plant office on Wold Road. Duplicates are located at the water department office in town. Maintenance and calibration schedules are posted in the water treatment plant office. Daily plant operations and monitoring forms are located on the south wall of the water treatment plant lab, along with the daily water quality monitoring forms.

As-built drawings and documents are located in the office library above the desk at the water treatment plant. Duplicates are at the water department office. Operations and maintenance manuals for all equipment are located on the desk bookshelf and in the third drawer down in the file cabinet at the water treatment plant. The piping and valve chart is on the south wall of the water treatment plant office along with the pipe color code chart.

Steve Dubail, Systems Administrator, has all the passwords for the water treatment plant computer. All the information is under ICON on the computer, PLC date, and shortcut to current. Mike Wilks, Bob Low, and Frank Byrne also have the password to the computer. Templates for all forms and equations are on a backup disc in the computer desk.

This manual will be updated anytime procedures or conditions change.

MANUAL BACKWASH

(Locate all switches and pumps before you start.)

1. Go to the PLC in the filter room.

2. Determine which filter you wish to backwash. (They are labeled filter #1, filter #2, and filter #3.)

3. Turn the filter inlet and effluent valves to "manual".

4. Press "k1" on the computer above the valve switches.

   a. Note on "influent/effluent" at the top of the display which ones read "manual".

   b. If necessary, scroll down to the appropriate filter by using the blue pointer arrows to the right of the display.

5. First, zero out "influent" 10% at a time by keying in the appropriate figure and pushing "enter". Repeat until you reach zero. Repeat the above steps on "effluent".

6. Turn the "filter to waste" valve to "open". Drain the filter down 18" below the trough. Return the switch to "auto".

7. Turn on the blower.

   a. The blower controls are located on the wall in the filter room opposite the computer. They are labeled "blower 1" and "blower 2". Select whichever blower you want and turn the switch to "hand". (It will be loud.)

   b. Quickly turn the "filter media air scrub" valve to "open" on the computer.

   c. Depending on the need, leave air scrub on for 2 to 5 minutes.

   d. Close the "air scrub" valve.

   e. Turn the blower back to "auto".

8. Then:
   a. Turn the backwash valve to "open". Quickly go to the chemical room and turn on the backwash pump #212 which is located on the left wall as you come in the back door.

   b. Run until the filter water is clean.

   c. Shut off the backwash pump #212.

   d. Turn the backwash valve on the computer to "auto".

9. Turn the filter inlet and effluent valve switches to "auto".

MANUAL SCOUR FOR CLARIFIERS

1. Go to the PLC in the filter room.

2. Determine which clarifier you want to scour.

3. Open the diverter valve switch.

4. Turn the filter effluent switch to "manual".

5. Press "k1" on the computer above the switches.

   a. Note on the influent/effluent screen which one reads "manual".

   b. If necessary, scroll down to the appropriate filter by using the blue pointer arrows to the right of the screen.

6. Zero out the "effluent" 10% at a time by keying in the appropriate figure and pushing "enter".

7. Go to the blower panel which is located to the right behind the air compressor. Turn one blower to "hand". Then go back to the computer and turn the "flocculate air scour" valve to "open". Allow the clarifier to scour for about 5 minutes.

8. Now, put the "flocculator air scour" valve back to "auto" and then turn the blower back to "auto".

9. Allow the water in the clarifier to flow until the water is clean.

10. Now, put the "flocculator diverter" valve back on "auto".

11. If you wish for the filter to come back on, put the "filter effluent" valve back to "auto". If not, put the "inlet" valve to "manual" and zero it out.

ADJUSTING FILTER FLOW RATES

Filter flow rates must be synchronized with the amount of water being sent to town. Normally, we want the filters to produce a total of approximately 40 GPM more than the flow to town.

To adjust the filter flow first determine which filter(s) you wish to adjust. Select the filter by going to the PLC located on the side of filter #1. Note Siemens panel labeled Coros OP25 (the PLC). At the bottom of the panel you will see a row of buttons labeled k1 through k10. Button k3 brings up a display for filter #1, k4 for filter #2, and k5 for filter #3.

1. Press the appropriate "k" button. At the top of the display, it will indicate the filter # on-line in "auto". Below that, you will see filter information with a flashing cursor on the left.

2. Move the cursor by using the appropriate arrow button to the right of the "k" buttons. Move the cursor until it appears on the right side of the display at SP _____ GPM. The blank drawn here represents a number value. Example: SP_220_ GPM.

3. To change the GPM, use the numerical keyboard above the arrows. When you have selected the desired GPM, press "enter" (yellow button to the right of the arrows).

4. At no time should the filter run under 150 GPM.

5. Generally, if more than one filter is running, we like to split the 40 GPM between them.

ADJUSTING FILTER SCOUR & BACKWASH TIMES

Throughout the year the optimum scour and backwash times tend to vary. As an example, summer optimum time seems to be 35 hours for a backwash cycle, and 4.5 hours for a scour cycle.

TO CHANGE BACKWASH TIMES

1. Go to the Siemens panel labeled Coros OP 25 (the PLC) on the left side of filter #1. On the bottom of the panel is a row of buttons labeled k1 through k10. Press "k10". The top of the display will read "Backwash Operation". Below that will be much information and a flashing cursor.

2. Using the arrow buttons to the right of the "k" buttons, move the cursor to the desired run time location under the appropriate filter. Note that above each run time will be displayed filter #1, filter #2, and filter #3.

3. Change the run time by using the numerical key pad located above the arrow buttons. When you have punched in the desired time, press the yellow "enter" button next to the arrow buttons.

CHANGING SCOUR TIMES

1. The scour time location is two lines down from the backwash information. It is labeled "FRT": Arrow the cursor down to the desired filter and make the adjustments following the same instructions listed above.

FILTER CHANGE-OVER

1. When a new filter is about to be put on-line, try to coordinate it with a backwash time on the filter you are going to turn off. The filter you are turning off must go through a complete backwash before it is shut down.

2. When starting up a filter that has been off-line for more than 4 days, it must be bleached out first.

    a. Open the diverter valve on the clarifier after it has drained down. Open the manual valve at the bottom of the clarifier until the water is below the divert pipes and then close. Now, add 2 gallons of bleach and drain about half the remaining water so the bleach can get into the media. Let it sit overnight.

    b. Open the "filter to the waste" valve on the filter. Drain out about half the water. Add 6 gallons of bleach and drain out about half the remaining water. Let it sit overnight.

    c. Next day, drain the remaining water out of the clarifier and the filter, and close the valves.

    d. Now, leave the diverter valve open and start the flow to the filter by going to the PLC, pushing "k1", pushing the arrow key down to the correct filter influent, and pushing in 10% flow, then "enter". If no water starts flowing, add another 10% until you get about 250 GPM. Next, scour the clarifier for 5 minutes and turn off the air. Let the clarifier run over for about 15 minutes or until the water is totally clear. Then, turn off the diverter at the PLC.

    e. Now, let the water run into the filter until approximately 10" of water is over the media, zero out the influent, and turn on the air scour for the filter for about 5 minutes. Turn off the air.

    f. Now, you need to backwash the filter from the clearwell. First, go to the lab/chemical building and turn on the backwash pump #212 to "hand". Then RUN over to the filter room to the PLC and switch the backwash valve to "open". Let it backwash until the water is clear. Then

turn the backwash valve back to "auto". Run back over to the lab/chemical building and turn the pump #212 back to "auto".

c. Now wait about 5 minutes and turn on the filter to "auto".

SET POINTS

K-2 Set Points

High	20.0
Low	3.0
Reset lwco	9.3
Low water co	7.0
BW pump reset	4.0
BW pump lwco	3.5
Stop filters	18.0
Start filters	14.0

K-3 Set Points (Filter #1)

Hi>	8.0"
SP>	4.2"
	5.9"
Hi	0.85 ntu
	0.09 ntu

K-4 Set Points (Filter #2)

Hi>	8.0"
SP>	2.8"
	2.2"
Hi>	.85 ntu
	.03 ntu

K-5 Set Points (Filter #3)

Hi>	8.0"
SP>	3.0"
	0.1"
Hi>	0.85 ntu
	0.34 ntu

K-9 Set Points

0.5 mg Stand Pipe

High	49.0
Low	17.0

Fill Stand Pipe

Stop pumps	45.0'

Start lead pump	36.0
Start lag pump	500 gpm

Run duration on telemetry fail 3.0 hr.

K-10 Set Points

Backwash when EFF.turb>=0.7 ntu

	Filter #1	Filter #2	Filter #3
Run:	35.0	35.0	35.0
Turb:	600	600	600
F RT	4.5	4.5	4.5
F HL:	600	600	600

Air Scour Flocculator	300	0S
Rinse Flocculator	300	0S
Air Scrub Filter	120	0S
BW Filter	600	
Rinse Filter	300	
Low Turb. End BW	0.6 ntu	
Max Time Reach Low Turb.	6000	
Delay Pond Drain Valve	0.2	0.1 hr.
Minimum Between BW	0	

Chemical Feed Set Up

Hit F-9, then
Hit F-7

	Feed	Divisor
Raw Water Flow		140 gpm
Primary Coagulant	34%	400
Secondary Coagulant	28%	500
Finished Water Flow	111 gpm	
Chlorine	0%	1000
Soda Ash	27%	420

CHLORINE RESIDUAL TEST

1. Go to the bottom of page 79 in the DR/2000 spectrophotometer handbook: USING ACCUVAC AMPULS. The handbook is located on the shelf above the desk in the office. Follow these directions.

2. Record your reading on the daily long form. This test is to be performed a minimum of 3 times a day – morning, afternoon, and evening.

3. The accuvacs are located in a blue styrofoam box on the shelf above the spectrophotometer. Spares are located in the blue styrofoam boxes above the cabinets above the sink in the chemical/lab room.

pH and Alkalinity Tests

1. Get your test solutions ready.

   a. Change pH buffers (the yellow and blue liquid in the small beakers). The yellow is a 7 pH solution and the blue is a 10 pH solution. Keep them in the same beakers. Make sure there is a magnet in each beaker.

   b. Fill a beaker with 70 ml of finish water. Place a magnet in it

   c. Fill a beaker with 70 ml of raw water. Place a magnet in it.

   d. Fill a beaker with 70 ml of clearwell water. Place a magnet in it.

2. Turn on the stirrer and set the yellow 7 pH solution on it.

3. Now, turn on the Orrin pH meter by pushing the "power" button. After you turn on the "power" button, push the green button that says "2nd", and then push the button that says "cal".

4. The arrow in the display window should be over "pH".

5. Now, take the black electrode tube out of the storage solution and rinse the tip with the distilled water in the squeeze bottle with the blue lid. Wipe it with lint free paper. Put the rinsed electrode into the yellow 7 pH solution on the stirrer. If the stirrer is not on yet, turn it on. The switch is on the back of the stirrer on the right. Next, wait for the pH meter to let you know when it is ready for the blue solution. It does this with a small beep, and the display reads "ready" on the right side.

6. When the Orrin meter beeps and the display reads "ready", push the "yes" button. Take the electrode out of the yellow 7 pH solution, rinse it with the distilled water in the squeeze bottle with the blue lid, wipe it with the lint free paper, insert it in the blue 10 pH solution, and put it on the stirrer.

7. When the Orrin meter beeps again and the display says "ready", push the "yes" button, take the electrode out of the blue 10 pH solution, rinse it with the distilled water in the bottle with the blue lid, wipe it with the lint free paper, insert it in the beaker with the raw water, and put it on the stirrer.

8. When the Orrin meter beeps again and the display reads "ready", record the pH reading for raw water on the chart, push the "yes" button, take the electrode out of the raw water, rinse it with the distilled water in the bottle with the blue lid, wipe it with the lint free paper, insert it in the beaker with the finish water, and put it on the stirrer. Save the raw water.

9. When the Orrin meter beeps again and the display reads "ready", record the pH reading for finish water on the chart, push the "yes" button, take the electrode out of the finish water, rinse it with the distilled water in the bottle with the blue lid, wipe it with the lint free paper, insert it in the beaker with the clearwell water, and put it on the stirrer. Save the finish water.

10. When the Orrin meter beeps again and the display reads "ready", record the pH reading for the clearwell water on the chart, take the electrode out of the clearwell water, rinse with the distilled water in the blue bottle, wipe it with the lint free paper, and insert it in the storage solution.

11. To do the ALKALINITY tests, use the 70 ml samples of raw water and finish water. Put one back on the stirrer. Add one (1) packet of Bromcresol green-methyl red powder pillow into the sample. The stirrer will mix the solution. Take up the digital titrator, turn the back knob until some of the solution comes out in order to free the titrator of any air bubbles. Set the reading to zero. Put the titrator into the test beaker and slowly turn the back knob releasing solution into the beaker until the water changes color permanently. Enter the reading on the daily log sheet. Repeat the test with the other beaker of sample water. Record the results again.

COLOR
TRUE AND APPARENT TEST

1. Go to page 103 and 104 of the DR/2000 Spectrophotometer handbook. The handbook is located on the shelf aove the desk in the office. Follow the directions carefully.

2. Record your reading on the appropriate sheet.

3. All of the equipment for this test is located in the cabinets by the sink on the left hand side. The glass ware is on the rack which is located on the front door of the chemical/lab room.

IRON FERROUS TEST

1. Go to page 158 in the DR/2000 Spectrophotometer handbook. The handbook is located on the shelf above the desk in the office. Follow the directions at the bottom of the page: USING ACCUVAC AMPULS.

2. Record your reading on the appropriate sheet.

3. Accuvacs are located in the chemical room above the cabinets by the sink in the blue box labeled "FerroVer Iron Reagent".

NITRATE, NR TEST

1. Go to page 214 in the DR/2000 Spectrophotometer handbook. The handbook is located on the shelf above the desk in the office. Follow the directions at the bottom of the page: USING ACCUVAC AMPULS.

2. Record your readings on the appropriate sheet.

3. Accuvacs are located in the chemical/lab room above the cabinets by the sink in the blue box labeled "NitraVer 5 Nitrate Reagent".

MODIFIED JAR TEST

Jar-testing is one of the most accepted methods in the industry for determining suitable treatment chemical dosages. It is commonly employed in filtration plants, providing a practical tool for investigating the effectiveness of various coagulants or combinations of coagulants, the effects of coagulant dilution, and of changing the sequence of chemical addition. It has also been used in studies of mixing and flocculation intensities and times.

Most often, the treatment plant operator is interested in determining a new optimum coagulant dose for a change in raw water quality. In this case, conditions established in the jar test are designed to match actual plant operating parameters as closely as possible.

It is important to remember that jar testing, at best, will provide only an approximation of plant conditions. Chemicals and dosages which are found to work in jar testing should be further investigated in the plant.

For accurate jar testing:

1. Use only fresh samples of the raw water actually entering the plant.

2. Apply chemicals in the same order as actually occurs in the plant, and

3. Mix and flocculate water at the same intensities and for the same length of time as actually encountered in the plant.

For mixing intensities, the following values are typically used in the jar testing (with a typical, multiple paddle jar test stirrer, equipped using 1000 ml samples in round beakers).

Rapid mixing or in-line blending .....100+ rpm
Flocculation..... 25 rpm

In many experiments, square "Wagner" jars have demonstrated significantly better mixing characteristics than the standard cylindrical beakers. These are recommended and can either be purchased (Hach or Phipps-Bird), or easily constructed from Plexiglas material.

<u>Equipment Required for Jar Tests</u>

1. Variable speed, multiple spindle stirring apparatus, e.g. Phipps-Bird (6 paddle version preferred)

2. Beakers: 6 – 1500 ml capacity

3. Plastic pail: 2 gallon minimum capacity (for collection of a homogenous raw water sample for each jar-test run)

4. Graduated cylinder: 1 – 1000 ml capacity

5. Plastic syringes: 6 each of 1, 5, and 10 cc ml

6. Grocery store turkey baster

7. Filter paper: 15 cm dia. (Schleicher & Schuell #604 or Whitman #4)

8. Funnels: 6 ribbed, conical 2.5" diameter, short stemmed

9. Erlenmeyer flasks: 6 – 250 ml capacity

For use in coagulant solution preparation:

10. Measuring pipets, including the following sizes: 10 x .1 ml, 1 x .1 ml, 1 x .01 ml. Also, pipet filler or safety bulb. These pipets should be thoroughly rinsed with distilled water after using to prevent the caking of solutions.

11. 100 ml and 1000 ml volumetric flasks. Additional flasks are needed if more than one coagulant/coagulant air is used.

12. Scale: accurate to 1/20th of a gram

For analysis

13. Benchtop turbidimeter, pH meter, thermometer, and titration equipment for both alkalinity and hardness tests.

14. A test kit for iron is recommended if iron is present in the raw water, or if an iron coagulant is used. If aluminum coagulants are utilized, an aluminum test kit is recommended.

<u>Chemical Solutions for Jar Testing</u>

Chemical solutions used in jar testing should be prepared in convenient concentrations, avoiding excess dilution which can reduce shelf life or alter performance from that actually occurring in the plant.

1. Alum

   a. Dry Alum ($[Al_2SO_4]_3.14.3\ H_20$).

      Dissolve 10.0 g of dry alum in approximately 500 ml of tap water contained in a 1000 ml volumetric flask. Fill to the mark with tap water. This solution contains 10 mg of alum/ml. The shelf life is less than 1 week.

   b. Commercial liquid alum ($Al_2[SO_4]_3.49.6H_20$) is usually available as a 48.5% solution (by weight) of dry alum, containing 8.0 to 8.5% Al_2O3. The specific gravity of this solution is approximately 1.35, and can be verified by the operator using a hydrometer.

      1.00 ml 48.5% liquid alum = 1.35 g liquid alum
      1.35 g liquid alum x 48.5% = 0.65 g dry alum
      1.54 ml liquid alum = 1.00 g of dry alum

      Add 1.54 ml of liquid alum to a 100 ml volumetric flask. Fill to the mark with tap water. This solution contains 10 mg of dry alum/ml. Shelf life is less than 1 week.

2. Polymers

   The individual chemical manufacturers should be contacted for information regarding preparation of the jar-test solutions from their products.

   For example: a typical liquid cationic polymer used in water treatment, "Polymer Z", has a specific gravity of 1.16.

   1 ml Polymer Z = 1.16 g
   0.86 ml Polymer Z = 1.00 g

   In this case, you would add 0.86 ml of Polymer Z to a 1000 ml volumetric flask. Fill to the mark with tap water. This solution contains 1.0 mg of Polymer Z/ml. Shelf life of most polymers at this concentration is typically only a few days.

Procedure

1. In a clean, rinsed plastic pail, collect a fresh two-gallon sample of the water to be tested.

2. Using a graduated cylinder, measure six 1000 ml quantities and place into each of the 6 clean, 1500 ml beakers.

3. Place all 6 beakers on the stirring apparatus.

4. Note on the test report sheet the amount of coagulant that will be added to each beaker. This amount will vary from beaker to beaker, with the coagulant usually added in increasing amounts to each successive jar. For example, 10 mg/L to beaker #1, 15 mg/L to beaker #2, etc. Select a range of dosages which will bracket the expected optimum dose. For reference, the plant dose currently being used can be one of the jar dosages.

5. Premeasure coagulant for each jar in each of 6 syringes. Note: 1 ml of 1% solution in 1000 ml of water is 10 mg/L.

6. Start the stirrer and set it at maximum speed (usually 100+ rpm).

7. With the tip of the syringe near the stirrer spindle, just below the water surface, quickly add premeasured coagulant dosages to the respective jars.

8. After the coagulant dosage has been added to the last beaker, continue running the stirrer at maximum speed (100+ rpm) for another minute.

9. Reduce the speed to 25 rpm and allow the stirring to continue for another 15 to 30 minutes. (Adjust the mixing speed and detention times to match actual plant operating conditions.)

10. Observe floc formation differences in beakers. Note how long it takes before floc begins to form. Note how well floc withstands some stirring without breaking up.

11. Shut off the stirrer, and using the turkey baster as a sampler, filter the supernatant through the S & S #604 or Whitman #4 filter paper.

12. Since many filter papers will give off particulate matter early in the filter run, the first 76 – 100 ml (approximately one funnel–full) of filtered water should be discarded.

13. Filter at least another 100 – 150 ml of sample through the rinsed filter paper.

14. Perform turbidity, pH, alkalinity, color, and residual aluminum tests on the filtrate. If an iron coagulant is used, or a high level of iron is present in the raw water, carry out an iron test on the filtered water.

    The alkalinity test is important in poorly buffered water. In general, for every 2 mg/L of alum fed, 1 mg/L of alkalinity will be consumed. As a rule of thumb, there should be at least 10 mg/L of alkalinity left over after coagulation.

15. Evaluate performance. The jar that gives the best results, using the least amount of coagulant, should indicate the proper coagulant dosage for the plant. However, when applying jar test results to a plant, it is sometimes found that the plant operates better at a chemical dosage slightly different than that indicated by the jar tests. Records of past performance are invaluable and should be consulted in these cases.

Procedure for Testing with Coagulant Aids

To determine if a coagulant aid (e.g. polymers) can help the coagulation-filtration process, do the following:

1. Repeat the jar test using a coagulant dosage slightly below the "best dosage" as determined in step 15 above, and add varying amounts of the coagulant aid or flocculant (as described in step 4 above for addition of the coagulant). The amount of aid used may vary, but is usually about 10% of the alum dosage used.

2. When determining the use of coagulant aids, keep one jar with the coagulant only. Then compare the results when using only the coagulant to the results obtained when a coagulant aid or flocculant is added.

The water treatment specialist of your state drinking water program or Rural Water Association may be consulted when difficulties arise either in trying to run the jar test, or in trying to apply jar test results to the plant.

CHEMICAL FEEDER CALIBRATION

Procedure:

1. Install the calibration cylinder to the suction line of the chemical feed pump following the arrangement shown in either fig. 1 or 2.

2. With the calibration cylinder full, start the metering pump and run it at full output until all the air is exhausted from the suction line and the pump head. The pump is now fully primed.

3. Refill the calibration cylinder (with the chemical actually being fed).

4. Start the pump and, using a stop watch or timer, note the volume pumped over time. Repeat for at least 4 different pump settings.

5. Calculate the applied chemical dose for each pump setting using the attached sheet as a guide.

6. Prepare a graph of dose (in mg/L versus pump setting).

TERMS

MG	=	Million Gallons
MDG	=	Million Gallons per Day
ppm	=	Parts per Million
mg/L	=	Milligrams per Liter
psi	=	Pounds per Square Inch
g.p.g. or Gr.P.Gal.	=	Grains per Gallon
Cu.Ft.	=	Cubic Feet or $ft.^3$
Sq.Ft.	=	Square Feet or $ft.^2$
GPM	=	Gallons per Minute
GPD	=	Gallons per Day
GPS	=	Gallons per Second
cfs	=	Cubic Feet per Second
lbs.	=	Pounds
gr.	=	Grain
g	=	Gram
ft.lbs./hr.	=	Foot Pounds/Hour
ft.lbs./min.	=	Foot Pounds/Minute

HEAD AND PRESSURE

1 lb. per sq. inch of pressure (psi)	=	2.31 feet of H_20
1 foot of H_2O	=	.433 psi

FLOW

Gal. per day ÷ 1440 = GPM

Q	=	VA	Q	=	Quantity (volume in given time)
V	=	Q/A	V	=	Velocity (distance in given time)
A	=	Q/V	A	=	Area (width x length or cross section);

If it is area of a square or a rectangle, Area = length x width;

If it is area of a circle, Area=$(\pi)(\text{Radius})^2$

Million Gallons Per Day = $\frac{\text{gal. per day}}{\text{1 million}}$ or gal. per day ÷ 1 mil.

Volume of Pyramid = Area of base times 1/3 the height

Circumference of Circle = π x D

FORMULAS

Million lbs. Of flow = MGD x 8.34 lbs./gal.

ppm = $\frac{\text{lbs. of Chemical}}{\text{Million lbs.of flow}}$ lbs./day of Chemical = (Flow, in MGD) (mg/L) (8.34)

Velocity = $\frac{\text{Distance}}{\text{Time}}$ or Velocity, ft./sec. = $\frac{\text{Distance in feet}}{\text{Time in seconds}}$

Water Horsepower = $\frac{\text{(GPM) (Head in feet) (8.34)}}{\text{33,000 ft.-lbs./min. (1 h.p.)}}$

Brake Horsepower = $\frac{\text{Water Horsepower}}{\text{Pump Efficiency}}$ or

$\frac{\text{TDH x Flow, GPM x 8.34}}{\text{33,000 x Pump Efficiency}}$

Wire Horsepower = $\frac{\text{Brake Horsepower}}{\text{Motor Efficiency}}$

Detention Time (Minutes) = Volume of Tank or Basin in cubic feet / Flow in Minutes

Rate of Filtration = GPM / Sq. ft. Filter Area

Celcius = 5/9 (° Fahrenheit – 32)

Fahrenheit = 9/5 (° Celcius) + 32° F

Decimal equivalent of a fraction = numerator (or) numerator ÷ denominator / Denominator

Average daily water use

Per capita = Total Water Used / Number People served or Total Water Used ÷ Number people served

AC Circuit
Watts = (volts) (Amps) (Power Factor)

DC Circuit = (volts) (Amps)

AVAILABLE CHLORINE

Household Bleach – 5 ¼% by Weight

Liquid Chlorine (gas) – 100% available by Weight

Commercial Bleach – 12 ½ - 15% by Weight

Granular Hypochlorite (Sodium or calcium hypochlorite – 65-70% by Weight)

CONVERSIONS

1 mg/L	=	1 ppm
1 sq.ft.	=	144 square inches
1 cubic foot	=	7.48 gallons
1 gallon (WATER)	=	8.34 pounds
1 pound	=	454 grams
1 cubic ft. water	=	62.4 pounds
1 pound	=	7,000 grains
1 grain/gal	=	17.12 mg/L
1gram	=	15.43 grains
1 horsepower	=	33,000 ft. lbs./min.
1 horsepower	=	746 watts
1 inch	=	2.54 centimeters
39.37 inches	=	1 meter
1 meter	=	1.09 yards
1 gallon	=	3.785 liters
1 part per million	=	1 milligram per liter
1 ounce	=	28.35 grams
1 cubic yard	=	27 cubic feet
¼ π	=	.785
1 cubic ft.	=	1,728 cubic inches
1 acre	=	43,560 square feet
1 acre foot	=	43,560 cubic feet

1 MGD	=	1.547 cfs or 694.4 gpm
1 psi	=	2.31 feet of H_2O

AREAS AND VOLUMES

π = 3.14		(π = C/D)
Area of Triangle	=	(Base) (Height)/2 or ½ base x height
Area of Square	=	(Length) (Width)
Area of Rectangle	=	(Length) (Width)
Area of Circle	=	πR^2 or $\frac{1}{4} \pi D^2$ (Height)
Volume of Cylinder (or round tank)	=	πR^2 (Height) or $\frac{1}{4} \pi D^2$ (Height)
Volume of Tank (square or rectangular)	=	(Length) (Width) (Height)
Volume of Cone	=	$1/3 \pi (R)^2$ (L)
Volume of Sphere	=	$1/6 \pi (D)^3$
Volume of Triangular Shaped Tank		(Base) (Height) /2 (Length)

CAUTION

WHEN HANDLING *ANY* CHEMICALS,

PERSONNEL NEED TO WEAR

1. RUBBER GLOVES &
2. SAFETY GLASSES or FULL FACE RESPIRATOR

(Gloves and glasses are located in the locker on the left wall in the chemical/lab room.)

MIXING CHEMICALS

SODA ASH

1. The ratio of soda ash to water is 1 lb. of soda ash to 1 gal. of water.

2. Put about 75 gallons of water in the soda ash tank and turn on the mixer switch which is located on the wall and is labeled "mixer tank 2".

3. Put the screen frame on the tank and the screen on top of that.

4. Put a bag of soda ash on top of the screen, cut it open, and sift it into the tank. Each bag weighs 50 lbs. It takes 150 lbs. of soda ash to make 150 gallons of solution. (Don't forget the gloves and the full face respirator.)

5. When done adding the total amount of soda ash, remove the screen and frame, and add water up to the mark on the side of the tank that says 150.

6. Let mix for at least an hour.

7. Now, you can add it to the large white tank by plugging in the pump that is already in the mixer tank. Remember to watch that it does not overflow.

MIXING SUMACLEAR P-10

1. Don't forget the surgical gloves.
   Turn on the water at the meter and put in 50 gallons.

2. Turn on the mixer.

3. Add 1.5 gallons of P-10. This is 8 full line arm pumps. Make sure the air is out of the line before you start counting.

4. Stir at least 5 minutes and no more than 15.

REFILLING SUMACLEAR 820B

1. Put the spigot that is located on the workbench into a new barrel of 820B.

2. It now takes at least 2 people to put the new barrel on the orange hydraulic stand.

3. After putting the new barrel on the stand, take one of the small boards that is on the stand and lay it against the side of the barrel so that it won't roll.

4. Loosen the remaining cap so the barrel can get air in it.

5. Roll the stand up to the barrel of 820B that is feeding the pump.

6. Check the scale weight and write down the weight on the weight sheet.

7. Now, open the spigot to fill the old barrel and keep an eye on it until it is full, and then, turn off the spigot.

8. Write down the new weight on the weight sheet.

SUMACLEAR CALIBRATION

FLOW (plant gpm) x DESIRED DOSE (mg/L) ÷ 1,000,000 mg/L = x

Multiply x by 3,785 ml/gal.

This will equal the ml/min. that you should be feeding.

1. Now, take this amount of the chemical that you are feeding and put it into the calibration tube.

2. Close the valve that is feeding from the tank, and open the valve that is going to the calibration tube.

3. Time the draw down so it equals the number of mls. you are supposed to feed in a minute.

4. Now, close the valve on the calibration tube, and open the valve on the tank feed line. Be sure to do it in this order.

CHLORINE ROOM

PROCEDURE FOR CHANGING CL_2

1. Always have a backup person at the door in case something goes wrong. The backup person should have S.C.B.A. equipment on and know how to use it. The S.C.B.A. equipment is located by the door in the chemical/lab room.

2. Turn off the tank that is to be changed with the valve wrench. Disconnect the gauge with the valve wrench and then replace the small brass cap where the gauge was.

3. Put the large blue cap back on the tank and remove the tank from the scales.

4. Carefully move the full tank onto the scale position with the opening towards the door just like the tank that was removed. Remove the large blue cap.

5. When you remove the small brass cap, have your ammonia swab ready. The ammonia swabs are located on top of the chlorinator which is the square box with the rotometer to the right of the tanks on the wall. As you remove the cap, wave the ammonia by the opening to make sure there is no leak. White smoke will appear when ammonia is in contact with chlorine gas which would indicate a leak.

6. Now, replace the lead gasket that is on the gauge and put the gauge on the tank with the valve wrench.

7. After making sure the gauge is on tight, prepare to open the main valve on the tank.

8. Have your ammonia swab ready by the valve. Open the valve a small amount. Test the fittings with the ammonia. If no smoke appears, open the valve about a quarter of a turn. (These procedures should by done by experienced personnel only.)

9. Set the scales to 150 lbs.

10. Make sure all the tanks (empty or full) are chained.

11. Close and lock the door upon leaving.

EMERGENCY CHLORINATION

1. There is a 55 gallon tank in the filter room at the base of the finish water pipe that is surrounded by a yellow wood frame box. Mix 20 oz. of HTH into the 55 gallons of water. Mix well.

2. There is a yellow valve at the base of the finish water pipe. Turn it off.

3. Turn on the Alldose pump that is feeding out of the 55 gallon tank.

4. Check the chlorine residual at the base of the clearwell every 15 minutes and adjust the feed rate on the Alldose pump until there is a steady reading of 1.8 to 2.0 on the spectrophotometer in the lab area.

CALIBRATING 1720C TURBIDIMETERS

We have 8 turbidimeters. Two are in the chemical room. The chambers with the turbidimeter heads are located by the soda ash mixing tank. The control panels for each of these are located on the wall above the sink. The other six are located in the filter room. Three are on the side of filter #1 and the other 3 are located on the front of each filter.

CALIBRATION PROCEDURE

1. Pour exactly 1 liter of low turbidity water into a clean, dry cylinder. (The calibration cylinders are located in the chemical/lab room on a shelf under the counter by the sink. The water used is in a jug on the counter by the sink. This jug is refilled with distilled or low turbidity water.) Pour the contents of two 500 ml beakers into the cylinder.

2. Place a clean, dry turbidimeter head on the cylinder and gently swirl. (For convenience, use the fold-out tray on the step ladder to hold the cylinder.)

3. Press the "System Reset" button.

4. Enter "6 SIG AUG" and let the measurement stabilize. Enter "0.0 STD".

5. Shake the bottle of formazin and dispense 5 ml of formazin into the cylinder using a tensitte pipet and mix with a stir rod. Replace the head, gently swirl the cylinder, and allow the measurement to stabilize. Enter "20.0 STD". (The formazin turbidity standard 4000 ntu bottles are located in the cupboard above the sink. The tensitte pipet box is located on a shelf under the counter. Instructions for the tensitte pipet are located on pages 2 & 3 in the manual located in the box.)

CLEANING TURBIDITY CHAMBERS

While waiting for the numbers to stabilize when calibrating, there is plenty of time to clean the chambers.

1. Reach inside the chamber and remove the spiral shaped insert. This insert fills the chamber and can become dirty. Take it to the sink and use the scrub brushes to clean.

2. Use the same scrub brushes to scour the inside of the chamber.

3. Located on the bottom of each chamber is a plug. Turn the metal fitting on the plug to the right to loosen it. Hold the bucket under the chamber and remove the plug. Replace the plug and tighten the fitting. (It's not a bad idea to flush the chamber with the clean water to remove any debris before replacing the plug.)

GENERATOR

Start-up Procedure

1. It usually takes 2 people for these steps.
2. Pull the electrical cable out of the back of the generator.
3. Plug it into the electric panel that is located between the chemical room and the turbine room.
4. Make sure the pin that is located in the outlet at the base of the panel is lined up with the cord that you are going to push in.
5. When you have plugged in, start the generator by looking in the same door you took the cable out of. You will see a panel there.
6. In the lower right hand side, there are 2 toggle switches. The one on the right should be on "test". After making sure the one in the right is on "test", push the left one to "on" and leave it there. This should be done with ear protection which is on the panel.
7. Now that the generator is started, go back to the panel and flip the toggle switch located at the tip of the panel to "emergency power". Everything should come back on.
8. When the power comes back on, flip the switch back to "normal", and flip the toggle switch on the left of the generator to the center position.

POWER FAILURES

1. First, make sure the filters are back on. If they are not, simply turn the top 2 knobs for each filter to "manual", then back to "auto".

2. Sumaclear 820B has a battery backup. Make sure it is working. Recalibrate, if necessary. (See the procedure for recalibrate.)

3. The P-10 motor will need to be restarted by pushing up on the lower right hand switch.

4. Make sure the soda ash pump has restarted. If not, push up on the lower right hand switch to start it.

5. Now, go to the orange control panel in the chlorine room. Open the clear case and read what percentage is being pumped. Then, push the blue arrow that lowers the percentage until you reach zero. Now, turn the black knob above the glass tube clockwise until the ball in the glass tube goes all the way down to the bottom. Now, just barely open the knob until the ball moves and then adjust the blue up arrow until the ball is around 9 lbs. per day. This is written on the glass tube. The air pack is located inside the main building on the left wall right by the hot water heater under a bright yellow cover. Make sure all tanks, empty or full, are chained after they are moved.

6. Take a look around and make sure everything is operating correctly.

TROUBLE SHOOTING

PLC

Sometimes when we get a power phase failure, the PLC in the filter room will show zeros on the standpipe, clearwell, raw water flow, and finished water flow. The Problem is actually with the PLC in the turbine room. Because of the phase failure, the PLC in the turbine room has quit sending a clear signal to the one in the filter room. What you need to do is open the door of the PLC in the turbine room. When looking inside you will see a plug receptacle on the left side labeled PLC and TCAM. There will be a yellow plug and a black plug plugged in. Unplug the black plug for a few seconds. This will shut down the whole computer. Plug it back in. This should reset everything.

AUG 1
START-UP

1. Check to make sure the current meter reading is entered in the log. Then make sure the motor hours are in the log. If not, enter all the readings.

2. Check oil levels on the side of the turbines.

3. Check valves to make sure they are open.

4. Turn the switch that is in the center of the panel to "manual". Then, turn the switch that is far left (turbine 1) on, and push the black button.

5. Watch the pressure gauge which is to the left of the meter and wait for it to reach 60 lbs.

6. Now, turn on the switch that is on the right panel (turbine 2) and push the black button.

7. Turn the center switch to "auto" and then turn turbine 1 and turbine 2 switches to the "off" position.

AUG 2
START-UP

1. Make sure the valve is open. The valve is located just outside of the back door going into the filter room.

2. Record the meter reading inside the filter room. The meter is located on the olive green pipe near the wall.

3. Record the pump hours in the blue notebook.

4. Check oil levels on the side of the turbines.

5. Make sure the valves are open (usually always open).

6. Turn the lead pump switch to whatever pump you want to use. Then turn that turbine to "auto". Watch the pressure gauge that is located on the large pipe against the back wall, and make sure it is not pegged out. If it is, turn off the turbine quickly because you have a closed valve.

7. Record flows from the meter in the filter room daily.

WATER TREATMENT PLANT PIPE COLOR CODE CHART

RAW WATER	OLIVE GREEN
AUG #2	PURPLE
AIRLINES	DARK GREEN
WASTEWATER	BEIGE
POLYMER (820B)	ORANGE
SODA ASH	LIGHT GREEN
FINISH WATER	BLUE
CHOLRINE	YELLOW

TABLE B-2
MONITORING LOCATIONS

TYPE OF SAMPLE	NUMBER OF SAMPLES	LOCATION OF SAMPLES
(Raw Water)		
Bacteriological	1 per month	Trout Lake #S01
Complete inorganic chem. and physical	1 annually	Aug. 1 and Aug. 2
Nitrate/Nitrite	1 annually	Aug. 1 and Aug. 2
Turbidity	Daily	Trout Lake #S01/Entry to WTP
Radionuclides	1 every 4 years	Trout Lake #S01
(Finished Water)		
Bacteriological	Min. 2-6 mo./changes annually per WFI	Representative points throughout distribution system
Asbostos	1every 9 years	Distribution system
Complete Inorganic Chem. and physical	1 annually	Source, after trmt., prior to entry into the distribution system
Lead/Copper	1 every 3 years	Targeted sample locations
Nitrate/Nitrite	1 annually	Source, after trmt., prior to entry into the distribution system
Trihalomethanes	1 every 3 months	Extreme end of distribution sys.
Organic Chem. (VOC's & SOC's)	1 every 3 years	Source, after trmt. prior to entry into distribution system
Other substances (un-regulated chemicals)	1 every 3 years	Source, after trmt., prior to entry into distribution system
(For TOFH records only)		
TOC, Nitrate/Nitrite, Phosphate	1 prior to pumping season 2 during pumping season	Aug 1 and Aug 2
TOC, Nitrate/Nitrite, Phosphate	Quaterly	Trout Lake #501
TOC	Sametime as THM's	1 at raw water sample tap 1 after trmt. before distribution

VENDORS & TECHNICAL SUPPORT

Analytical Measurement
Phone: 800/635-5580
Fax: 908/9646622

Apex Services (Inspection and cleaning of water supply tanks)
2200 Queen St.
Bellingham, WA 98226-9975
Phone: 206/6762739

Baker, Steve D.O.H., Water Treatment Operation Specialist
360/586-5214

Barrett, John I.D.I., Quality Control Manager
800/446-1150 ext. 1747

Berg Vault Co.
1671 Cedar Dale Rd.
P.O. Box 1205
Mt. Vernon, WA 98273
Phone: 360/424-4999

Bergener, Cheryl D.O.H. Drinking Water Division
Water Works Operator Certification Program
P.O. Box 47829
Olympia, WA 98504-7829
Phone: 360/753-7433
Fax: 360/664-4500
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Croy, Jim Familian N.W
800/253-2380

Cutec
Jerry Pennington
360/425-6532

Cuz Concrete
800/659-1941

Deem, Steve D.O.H. Regional Engineer
206/464-7963

D.O.E. Dam Inspection
Dave Cummings
360/407-6620

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800/446-1150 ext. 1691

Economy Fence
425/335-3327

Edge Analytical
1151 Knudson Rd.
Burlington, WA 98233
Phone: 800/755-9295
Fax: 360/757-1402

Edwards, Mark Linn Benton Comm. College Tech. Trainer
Water/Wastewater Technology
6500 Pacific Blvd. SW
Albany, Oregon 97321
Phone: 541/917-4634
E-mail: edwardm@gw.lbcc.cc.or.us

Evergreen Rural Water
Phone: 509/962-6326
Fax: 509/925-6859

Facility, Water Treatment
530 Wold Rd.
Friday Harbor, WA 98250
Phone: 360/378-2160 (work)
360/378-4685 (home)
360/317-8163 (mobile)
Fax: 360/378-5065
E-mail: tfhwtp@fridayharbor.org

Friday Harbor Electric
150 Nichols St.
Friday Harbor, WA 98250
360/378-4166 (work)
360/378-8397 (home)
360/317-8397 (cell)

Friday Harbor Freight
360/378-2012

Tom Gazdik T.M.G. Services, Inc.
Fax: 425/432-5012
e-mail: tmgsrvs@aol.com

Graphic Controls Recorder Charts
800/669-1535

Great Lakes Instruments
Phone: 414/362-6554
Fax: 414/355-8346

Greaves Co. Clay Val Parts
4411 23rd Ave. W.
P.O. Box 99267
Seattle, WA 98199
206/284-0660

Hach
800/227-4224

Hamilton, Greg
360/856-5031

Heaton, Lyle
Phone: 800/872-7263 (w)
425/277-9794 (h)
Fax: 425/454-0084

Hodges, Jim Town of Friday Harbor Building Inspector
Phone 360/378-2390 (w)
360/378-4794 (h)
360/317-8925 (cell)

Industrial Electric Co., Inc.
1120 W. Division
Mt. Vernon, WA 98273
360/424-3239

Jones Chemical Chlorine
800/562-7920
Customer Service # 543-32-985

K.C.M. Warren, Lowell
206/443-2779

Lab Safety Supply
800/356-0783

Landskov, Gregg Summit Research Labs
Phone: 206/285-8288
Fax: 206/822-5607

Liqui Vision Technology Reservoir Inspection and Cleaning
Phone: 800/229-6959
Fax: 503/883-1104

Magee, Ron
800/446-1150

Manufacturer's Minerals Lew Spader
206/228-2120

Musick, Brad — Brown & Caldwell Operations Specialist
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Fax: 541/758-1439
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Pacific Pipe
206/623-7772

Pacific Water Works
800/446-5370

Paco Pumps
206/433-2600

Raysby, Lisa — D.O.H. Drinking Water Division
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Fax: 360/586-5529
E-mail lar0303@hub.doh.wa.gov

Ripple, Gus — Honeywell Recorders
800/487-5290

Shop — Town of Friday Harbor Maintenance Shop
Phone: 360/378-2154
Fax: 360/378-5065
E-mail: tfhshop@fridayharbor.org

Skagit County Health Department
360/336-9380

Stead, Randy — S. & B., Inc.
425/644-1700

Technical Systems, Inc.
Phone: 206/775-5696
Fax: 206/775-9074

Telemetry Control Circuits
360/014-0503 or
360/014-0613

Treatment Equipment Co.
4504 S.. Hewett Blvd.
Portland, Oregon 97221
Phone: 800/454-3832
Fax: 503/292-4694

Unit Process Co.
206/822-0241

V.W.R. Soda Ash
253/872-5000

Water Systems Supply Co.
4120 S.E. International Way A 108
Millwallkie, Oregon 97222
800/535-3741

Western Utilities
800/562-1065

WETC
253/833-9111 ext. 3369

WETRIC
800/562-0858

Whitney
14636 NE 95
Redmond, WA 98052
800/255-2580

Wilks, Mike
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   1. Water Treatment Plant Operator 2
   2. Cross Connection Control Specialist
   3. Backflow Assembly Tester

2. **Michael Deegan**, Water Department Supervisor **Certification #6074**

   1. Water Distribution Specialist 2
   2. Water Distribution Manager 2
   3. Water Treatment Plant Operator 2
   4. Cross Connection Control Specialist

3. **Norm Hanson**, Water Treatment Plant Operator **Certification #9696**

   1. Water Treatment Plant Operator 1

4. **Shane Mason** – six months water distribution experience

5. **Andrea Rose**, Clerk II **Certification #7073**

   1. Water Treatment Plant Operator 2
   2. Water Distribution Manager 1

6. **Mike Wilks**, Utilities Superintendent **Certification #4072**

   1. Water Treatment Plant Operator 2
   2. Water Distribution Manager 2
   3. Water Distribution Speicalist 2
   4. Cross Connection Specialist

Appendix M: GAC System O&M Manual

Friday Harbor GAC Adsorption System Operations Manual

Prepared for
Town of Friday Harbor
Friday Harbor, Washington
November 11, 2011

Friday Harbor GAC Adsorption System Operations Manual

Prepared for

Town of Friday Harbor, Friday Harbor, Washington

November 11, 2011

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Brown AND Caldwell

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Table of Contents

General 1

Process Overview 1

Connections to Other Plant Processes 2

- Inlet and Outlet 2
- Backwash Inlet 2
- Drain 2

Operating Modes 4

- Lead-Lag (Series) 4
- Parallel 4
- Single Unit 4

Monitoring 4

Backwashing 5

- When to Backwash 5
- Backwash Flow Rate: Standard Determination 5
- Backwash Flow Rate: Alternative Determination 5
- Backwash Tips 6

Filter to Waste 6

Media Replacement and Startup 8

Maintenance 8

Troubleshooting 9

Appendix A: Granular Activated Carbon Adsorption System Process Drawings ..... A

- Figure A-1: Piping and Equipment Symbols ..... A
- Figure A-2: Granular Activated Carbon System ..... A

Appendix B: Adsorbate Profile Document Form ..... B

List of Tables

Table 1. Monitoring Parameters 5
Table 2. Maintenance Recommendations 8
Table 3. Troubleshooting Tips 9

List of Figures

Figure 1. GAC Adsorption System Connections and Valves in Filter Building 3
Figure 2. Filter-to-Waste Intertie as Viewed From Behind GAC Pipe Rack 7

General

Certain organic compounds present in drinking water supplies can combine with water disinfection chemicals to form disinfection by-product (DBP) contaminants, including trihalomethanes (THMs) and haloacetic acids (HAAs). The Calgon Granular Activated Carbon (GAC) Adsorption System was installed at the Town of Friday Harbor Water Treatment Facility in June 2011 to reduce concentrations of total organic carbon (TOC) in the filtered water, reduce subsequent DBP formation consistent with associated water quality regulatory limits, and improve water aesthetic quality.

This manual provides general information on overall operation of the GAC Adsorption System in relation to the Town's water treatment and supply system as a whole, and operational information that pertains specifically to the Town water treatment facility. For specific and detailed information on operation and maintenance of the GAC Adsorption System, refer to the Calgon Operation and Maintenance (O&M) Manual, which was provided in both bound hard-copy and electronic (PDF file) formats with the system.

Safety

Refer to all Town of Friday Harbor safety documents and requirements.

See safety information in Calgon Operation and Maintenance Manual.

WARNING! A hazardous low-oxygen condition could exist inside the GAC vessels. Activated carbon absorbs oxygen. See warning information in the Calgon Operation and Maintenance Manual.

Process Overview

The GAC Adsorption System includes two treatment vessel tanks, each containing 20,000 pounds of GAC. Connecting piping and valves allow the two GAC vessels to be operated in series, parallel, or individually. The system is installed in the GAC Building downstream of the sand filter process to remove TOC (DBP precursors) from the filtered water. For details on the adsorption process, refer to Section 6 of the Calgon O&M Manual.

Water from the sand filters is pumped directly through the GAC Adsorption System to the clearwell. The water enters each GAC vessel at the top and exits through nozzles at the bottom. Chlorine is injected downstream of the GAC Adsorption System to provide water disinfection in the clearwell. Any chlorine injected upstream of the GAC Adsorption System is removed by the carbon and reduces the life of the carbon.

As the water is treated, the GAC Adsorption System is subject to accumulations within the GAC media via adsorption, physical filtration of suspended solids, and biological activity. These processes are discussed in detail in the Calgon O&M Manual.

Adsorption is the process by which certain types of molecules (including TOC) are adsorbed into small pores and active sites within the carbon. Adsorption saturates and exhausts the active adsorption sites of the carbon; however, it does not generally cause increased pressure drop through the system. Physical filtration of suspended solids of size greater than 10 microns generally occurs within the top few inches of the carbon media and causes an increase in system pressure drop. Biological growth can also occur within the GAC media and form a slime layer in the top few inches of the media. Such growth can also cause an increase in system pressure drop. Backwashing removes the trapped suspended solids and biological slime layer, restoring the pressure drop to lower values.

The rate of adsorption is affected by several factors including temperature, concentrations of adsorbable contaminants, flow rate, and pH. Refer to the Calgon O&M Manual for more information on adsorption factors.

Connections to Other Plant Processes

There are four interconnections between the GAC Adsorption System and other water treatment plant processes: filtered water inlet to the GAC, treated water outlet from the GAC, backwash inlet, and drain. These connections can be seen on the schematic included as Figure A-2 in Appendix A.

Inlet and Outlet

The filtered water inlet and treated water outlet are connected to the riser at the south end of the sand filter discharge manifold. A bypass valve is located between the inlet and outlet valves. A photo of the valves at this location is shown in Figure 1. To put the GAC Adsorption System in operation, the inlet and outlet valves are OPEN and the bypass valve is CLOSED. To take the GAC Adsorption System offline, the inlet and outlet valves are CLOSED, and the bypass valve is OPEN. **Note: The GAC Adsorption System does not need to be taken offline for backwashing. Refer to the Calgon O&M Manual for detailed instructions on backwashing one absorption unit while the other unit remains in service.**

Backwash Inlet

The backwash connection is at the top of the 8-inch backwash supply riser in the Filter Building, south of the filters. The backwash supply valve at this connection is OPEN for backwashing and CLOSED at all other times. This connection and valve are shown in Figure 1.

Drain

The drain from the GAC Adsorption System is connected to the 16-inch drain from the sand filter backwash system. This drain discharges to the backwash pond. An air gap is provided between the GAC Adsorption System piping and the drain riser.

Figure 1. GAC Adsorption System Connections and Valves in Filter Building

Operating Modes

The two GAC Adsorption System vessels can be operated in three modes: lead-lag (series), parallel, and single unit. The normal mode is lead-lag (series); however, there are occasions when one of the other modes is necessary. For detailed drawings showing the valve settings to operate in each mode, refer to Section 8 of the Calgon O&M Manual. A table summarizing the valve positions for each mode is presented in Section 3.6 of the O&M Manual.

Lead-Lag (Series)

This is the mode that is normally used, with the two GAC vessels operating sequentially in series service. Either vessel can serve as the upstream lead; the other serves as the downstream lag. The media in the lead vessel will be exhausted and require replacement first. After media replacement, the lead-lag functions should be reversed and the vessel that was the lag vessel becomes the lead vessel. Note that while media is being replaced in one vessel, the other vessel can continue to operate.

The total pressure drop through the GAC Adsorption System is greatest when operating in lead-lag (series) mode. During periods of very high flow demand (typically greater than 500 gallons per minute [gpm]), the pressure loss may reach the limit of the filter effluent pump capacity. If greater flow is necessary, switching to the parallel mode operation can reduce the pressure loss by a factor of about 4, allowing much greater throughput. However, TOC removal performance is also reduced.

Parallel

In parallel mode, both GAC vessels operate in parallel, with flows split between the two. Thus, each vessel receives only half the total system flow, resulting in a pressure loss about one fourth as great as for series operation. However, TOC removal efficiency is generally reduced when operating in parallel mode, especially if the GAC in one vessel is nearly exhausted. This mode is generally used only if flow demand is greater than can be accommodated by the sand filter effluent pumps given the pressure drop through the GAC Adsorption System when operating in series mode.

Single Unit

All flow can be directed through a single GAC unit if necessary. This mode is used when one vessel is taken offline for backwashing, media replacement, or other maintenance. Operating with a single GAC vessel reduces the TOC removal efficiency.

Monitoring

Consistent and regular monitoring of the GAC Adsorption System performance is important in maintaining efficient operation and avoiding treatment performance problems. The typical parameters to monitor include system pressures, differential pressures (DP), ultraviolet (UV) transmittance, TOC concentrations, and pH. These parameters should be tracked in a spreadsheet or other format that allows trends to be observed.

The recommended monitoring parameters along with locations and frequencies for sampling are presented in the table below. Frequencies can be variable, depending on judgment and experience of the operator, and operating conditions. For example, pH should be monitored frequently immediately after GAC media replacement, but as the pH stabilizes, monitoring frequency can be reduced.

Table 1. Monitoring Parameters			
Parameter	Location	Frequency	Comments
System pressures and flow	Influent, effluent, inter-vessel	Daily	Differences between pressures should agree approximately with DP gauges. Always maintain positive effluent pressure to prevent air intake.
Vessel differential pressure and flow	Each vessel	Daily	Pressure switch allows alarming of high DP. Most increases in DP over time should be observed in the lead vessel. Because DP is a function of flow rate, always record flow rate along with DP.
UV transmittance	Influent, mid-bed, effluent	Every 1–2 days	Concentrate in area near mass transfer zone, which will migrate downstream over time. See Section 6.2 of the Calgon O&M Manual for information on the mass transfer zone.
TOC	Effluent	Weekly	Check correlation with UV transmittance.
pH	Effluent	Daily at first, then weekly	Reduce frequency when pH drops to stable value.

Backwashing

The backwashing procedure consists of pumping clean water backward through a GAC vessel to remove accumulated solids.

When to Backwash

Backwashing is performed in the following two situations:

When new media has been installed.

When pressure drop across a vessel becomes excessive due to accumulation of solids and/or biofouling. *Note: Pressure drop is proportional to the square of the flow rate and must be monitored and evaluated in terms of flow rate. A good indicator of excessive pressure drop is when the drop across the lead vessel is substantially greater than the drop across the lag vessel. A loss of 15 pounds per square inch (psi) through one vessel at maximum flow is generally indicative of the need to backwash. The loss through a single vessel should never be allowed to exceed 20 psi.*

Backwash Flow Rate: Standard Determination

GAC backwashing requires strict adherence to proper procedures to accomplish effective removal of accumulated solids and to avoid damage to the internal GAC vessel structures/equipment, improper classifying of the media, and excessive loss of media. The procedures outlined in Section 3.4 of the Calgon O&M Manual should be reviewed and followed carefully. The backwash flow rate should be controlled to provide a bed expansion of 25 percent. The flow rate required to attain this level of expansion depends on water temperature as well as other factors, as discussed in the Calgon O&M Manual.

Backwash Flow Rate: Alternative Determination

An alternative method for setting the flow rate for backwashing has been recommended by Calgon field personnel. This method is based on observing the backwash waste characteristics and is performed as follows (*Note: See Fig. 6 or 7 in Section 8 of the Calgon O&M Manual for valve number references*):

Open the backwash supply valve in the Filter Building. Refer to Figure 1.

Open the backwash waste valve (Valve V-5 or V-6) 100 percent.

Turn on the backwash pump and slowly open the backwash water supply valve (Valve V-8 or V-7). For an initial backwash following GAC media replacement, limit the flow to 230–300 gpm at first. This classifies the carbon, as described in Section 3.4.1 of the Calgon O&M Manual (at least 225 gpm is required to expand the bed, allowing classification to occur).

Observe the backwash waste by collecting some in a clear glass beaker. Adjust the flow rate so that only two or three larger pieces of carbon appear in 1 or 2 inches of water in the beaker.

As samples clear up (fewer than two or three larger pieces of carbon), gently increase flow rate.

Continue until backwash flow rate reaches 700 gpm.

Once the backwash waste water is clean, slowly reduce the backwash flow (over a 4- to 5-minute period).

Shut off the backwash pump when the flow drops to about 150 gpm, and then slowly close the backwash supply valve (Valve V-8 or V-7) all the way. **Never close valves quickly; resulting water hammer could damage distribution nozzles in vessels!**

Close the backwash waste valve (Valve V-5 or V-6).

Close the backwash supply valve in the Filter Building (ref. Figure 1).

Backwash Tips

Top up the water system reservoirs and water treatment plant clearwell before commencing backwash to ensure adequate supplies of water during GAC backwashing processes. This is especially important for the initial backwashing following replacement of the GAC media, which takes longer than subsequent backwashes.

Time the GAC backwash so it does not coincide with a sand filter backwash.

Increase the GAC backwash flow rate ***slowly*** to the recommended rate. Likewise, decrease the flow rate ***slowly*** when finishing the backwash. Rapid changes in flow rate could cause water hammer, which could damage the distribution nozzles inside the GAC vessels.

For the initial backwash with new GAC media, maintain a lower backwash rate (200–300 gpm) for several minutes to classify the carbon.

Never interrupt a backwash; complete it in one session.

Filter to Waste

The GAC Adsorption System includes a filter-to-waste capability outside the Calgon vendor package; hence it is not shown in the Calgon O&M Manual. Filter-to-waste is typically used for a few minutes upon restarting the system after a GAC backwash as some solids may be present in the GAC effluent.

To run GAC in filter-to-waste mode, set the GAC Adsorption System to operate in the normal mode as for online filtration. For filter-to-waste, make the following changes:

1. **OPEN** the valve on the intertie pipe to the drain. The intertie valve is behind the GAC Adsorption System piping rack. Refer to the photo in Figure 2.
2. **CLOSE** the treated water outlet valve on the Treated Water (TW) line in the Filter Building. Refer to Figure 1.
3. **OPEN** the filtered water inlet valve on the Filtered Water (FW) line in the Filter Building. Refer to Figure 1.
4. **CLOSE** the bypass valve in the Filter Building. Refer to Figure 1.

Figure 2. Filter-to-Waste Intertie as Viewed From Behind GAC Pipe Rack

To terminate the wasting and run the GAC Adsorption System online, there is no need to interrupt pumping: first **OPEN** the treated water outlet valve to the TW line in the Filter Building and then **CLOSE** the valve on the intertie pipe to drain.

Media Replacement and Startup

GAC media replacement is recommended when the TOC concentration of the lead vessel effluent shows a marked increase. UV transmittance of samples can provide an early warning of this condition, but it should be verified through TOC analysis.

Before arranging for GAC media replacement, the carbon acceptance canister should be sent to the carbon supplier along with a filled in Adsorbate Profile Document form. A copy of this form is included in Appendix B; check with Calgon for the latest version. Detailed instructions on dealing with the canister are found in the Calgon O&M Manual, starting on page 8.10.

In preparation for the GAC media delivery truck arrival, place steel plates in the unpaved driveway area to protect buried pipes in that area.

Try to arrange GAC media replacement for lower demand periods as a large quantity of water is used in the media replacement process.

Ensure that water system reservoirs and the water treatment plant clearwell are topped up for the day of media replacement.

Ensure that the backwash pond level is as low as possible prior to GAC media replacement.

Arrange to have an air compressor on site for GAC media replacement.

Inspect the GAC vessel interior with assistance from Calgon personnel. Pay particular attention to nozzles in the internal cone and lining in weld and crevice areas.

WARNING! A hazardous low-oxygen condition could exist inside the GAC vessels. Activated carbon absorbs oxygen. See warning information in the Calgon Operation and Maintenance Manual.

GAC media transfer is performed by the supplier.

After water is added to the new GAC media, it must sit for at least 24 hours, depending on temperature, to properly wet the carbon before backwashing.

Maintenance

Maintenance requirements for the GAC Adsorption System are minimal. The following table summarizes maintenance recommendations.

Table 2. Maintenance Recommendations

Item	Frequency	Comments
Inspect GAC vessel interior	When changing GAC media	
Grease access hatch gasket	When inspecting GAC vessel interior	
Replace GAC vessel rupture discs	3 years	
Check pressure gauges	As needed	If unusual or unexpected readings are observed, or when performing critical troubleshooting pressure measurements, verify calibration of gauges
Coating touchup	As needed	Piping flange hardware and crevice locations tend to exhibit coating failure first

Troubleshooting

A troubleshooting guide is included in Section 3.8 of the Calgon O&M Manual. Some additional troubleshooting tips are presented here.

Table 3. Troubleshooting Tips

Symptom	Possible cause	Remedy
Excessive pressure loss *Note: Sudden increase or greater increase in lag GAC vessel pressure loss indicates likelihood of issues other than a need to backwash.*	See Calgon O&M Manual for additional causes not listed here.	
	Air binding	Refer to Calgon O&M Manual. In addition, release air from effluent sample port (below interior cone).
	Carbon in effluent ("witch's hat") strainer (failed nozzle in cone)	Verify by opening 2" drain valve. Presence of carbon indicates nozzle failure. Also, can measure pressure loss across strainer: install pressure gauge on 2" drain connection and compare to pressure on tank effluent gauge with flow passing through system. The difference between the two pressure readings should be less than 5 psi (verify accuracy of gauges).
	Clogged carbon	Eliminate all other causes. Perform second backwash. If pressure loss still excessive, perform air scour. Connect air supply to 2" drain connection and supply air slowly and carefully. **Do not over-pressurize system!** Release air from air relief valves, carbon fill port, and effluent sample port.
Air drawn into GAC vessel	Pressure within GAC vessel below atmospheric	May occur when pressure drop across vessels is low and clearwell level is low. Solutions include: Increase pressure in system by throttling effluent valve. Maintain higher level in clearwell. Pump through GAC system at a higher rate, thereby increasing pressure drop. If this becomes a troublesome issue, install pressure sustaining valve on effluent piping.

Appendix A: Granular Activated Carbon Adsorption System Process Drawings

Figure A-1: Piping and Equipment Symbols

Figure A-2: Granular Activated Carbon System

EQUIPMENT

PUMPS

- PUMP, CENTRIFUGAL
- PUMP, DIAPHRAGM
- PUMP, GEAR
- PUMP, METERING
- PUMP, PERISTALTIC
- PUMP, SUBMERSIBLE
- PUMP, VERTICAL

BLOWERS & COMPRESSORS

- BLOWER OR CENTRIFUGAL FAN
- COMPRESSOR, ROTARY SCREW
- COMPRESSOR, PISTON

VESSELS AND TANKS

- RECEIVER OR PRESSURE VESSEL
- TANK, DOUBLE WALLED
- TANK, NON-PRESSURE TYPE

MOTORS AND POWER

- VFD — VARIABLE FREQUENCY DRIVE (AC)
- VSD — VARIABLE SPEED DRIVE (DC)
- S — SOLENOID
- M — MOTOR
- M — MOTOR STARTER
- R — REVERSE MOTOR STARTER
- ENGINE
- GENERATOR

HVAC RELATED

- FAN, INLINE
- FILTER OR FILTER-SILENCER, INLET AIR
- BOILER

MIXERS

- MIXER
- MIXER, INLINE STATIC

MISCELLANEOUS EQUIPMENT

- SILENCER
- REDUCED PRESSURE BACKFLOW PREVENTER
- HEAT TRACE
- DIFFUSER HEADER
- SPRAY NOZZLES

PIPE LINE DEVICES

- T — TRAP
- SEDIMENT TRAP
- DT — GAS DRIP TRAP
- SEPARATOR
- PIPELINE FILTER
- RUPTURE DISK (VACUUM RELIEF)
- RUPTURE DISK (PRESSURE RELIEF)
- CONNECTION BETWEEN NEW AND EXISTING PIPING
- UNION
- QUICK CONNECTOR
- CAP OR PLUG
- BLIND FLANGE
- FLEX CONNECTION
- VENT TO ROOF
- VENT
- STEAM VENT
- MANUAL VENT
- STRAINERS
- FOOT VALVE
- AIR SEPARATOR
- D — DRAIN
- DV — DRAIN VALVE
- CALIBRATION CHAMBER
- PULSATION DAMPENER
- AIR GAP
- INJECTOR
- SAMPLING AND FLUSHING CONNECTIONS
- SUCTION DIFFUSER
- TEMPERATURE WELL
- FLOW STRAIGHTENING VANES
- PRA — PRESSURE REDUCING ASSEMBLY
- AMMONIA UNION
- DAMPER
- SIGHT GLASS
- PIG LAUNCHER/ RECEIVER
- REDUCER
- FC — FLUSH CONNECTION

VALVES

NORMALLY OPEN	NORMALLY CLOSED
GATE VALVE	
PLUG VALVE	
BALL VALVE	
GLOBE VALVE	
NEEDLE VALVE	
KNIFE GATE VALVE	
BUTTERFLY VALVE	
DIAPHRAGM VALVE	
ANGLE VALVE	
THREE WAY VALVE	
FOUR WAY VALVE	
FLOAT VALVE	
PINCH VALVE	
BALANCING COCK	
THERMOSTATICALLY CONTROLLED VALVE	

- DOUBLE LEAF CHECK VALVE
- CHECK VALVE
- BALL CHECK VALVE
- PUMP DISCHARGE VALVE
- GAUGE OR ROOT VALVE
- PRESSURE AND VACUUM RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE RELIEF VALVE
- IN-LINE, SPRING LOADED RELIEF VALVE
- PRESSURE REGULATING VALVE (SELF-CONTAINED)
- BACK PRESSURE REGULATING VALVE (SELF-CONTAINED)
- AIR RELEASE VALVE
- AIR RELEASE VALVE
- COMBINATION AIR VALVE
- S — SOLENOID VALVE
- DIAPHRAGM OPERATED VALVE
- PRESSURE BALANCE OPERATED VALVE
- M — MOTOR OPERATED VALVE
- M — MOTOR OPERATED VALVE, MODULATING

NOTE:
USE VALVE BODY SYMBOL TO MATCH TYPE OF VALVE.

- PISTON OPERATED VALVE
- TELESCOPING VALVE
- MUD VALVE

PIPING SYSTEM IDENTIFICATION

BW	BACKWASH WATER
D	DRAIN
FW	FILTERED WATER
TW	TREATED WATER
1W	POTABLE WATER (TOWN WATER)
CLS	CHLORINE SOLUTION

INSTRUMENTATION AND CONTROLS

- PI — PRESSURE GAUGE
- PDS — PRESSURE DIFFERENTIAL SWITCH

Brown AND Caldwell

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: JDB
DRAWN: JHM
CHECKED: JDB
CHECKED: BTF
APPROVED:

EXTERNAL REFERENCE FILES

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		RECORD DRAWING	JHM	8/11	JDB

TOWN OF FRIDAY HARBOR

WATER TREATMENT PLANT
GRANULAR ACTIVATED CARBON
ADSORPTION SYSTEM

FIGURE A-1
PROCESS AND INSTRUMENTATION

PIPING AND EQUIPMENT SYMBOLS

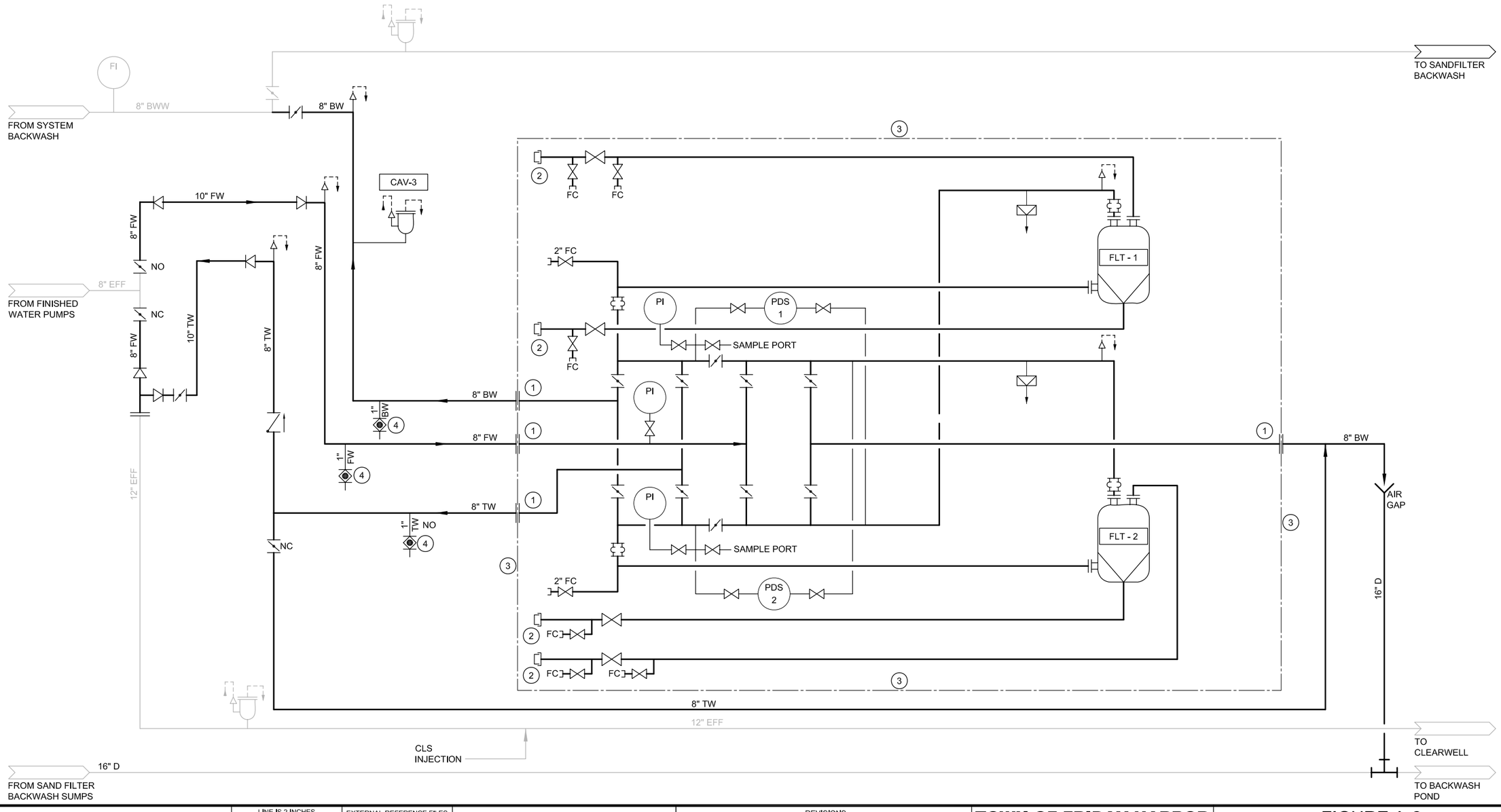
FILENAME 138994-P-001
BC PROJECT NUMBER
CLIENT PROJECT NUMBER
DRAWING NUMBER P-001
SHEET NUMBER 8 OF 14

P:\Friday Harbor\Potable Water\138994 FH GAC Design_CADD-Project Figures\138994-FIG A-1.dwg

MAY 19, 2010

KEY NOTES:

1. FLANGED CONNECTION TO VENDOR PACKAGE.
2. 4" QUICK-CONNECT COUPLING FOR CARBON LOADING / REMOVAL.
3. VENDOR PACKAGE BOUNDARY.
4. 1" DRAIN.



Brown AND Caldwell

DESIGNED:	JDB
DRAWN:	JHM
CHECKED:	JDB
CHECKED:	BTF
APPROVED:	

LINE IS 2 INCHES AT FULL SIZE

EXTERNAL REFERENCE FILES

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		RECORD DRAWING	JHM	8/11	JDB

TOWN OF FRIDAY HARBOR

WATER TREATMENT PLANT
GRANULAR ACTIVATED CARBON ADSORPTION SYSTEM

FIGURE A-2
PROCESS AND INSTRUMENTATION

GRANULAR ACTIVATED CARBON SYSTEM

FILENAME	138994-P-101
BC PROJECT NUMBER	138994
CLIENT PROJECT NUMBER	
DRAWING NUMBER	P-101
SHEET NUMBER	9 OF 14

P:\Friday Harbor\Potable Water\138994 FH GAC Design_CADD\Project\Figures\138994-FIG A-2.dwg

MAY 18, 2010

Appendix B: Adsorbate Profile Document Form

ADSORBATE PROFILE DOCUMENT

CALGON CARBON CORPORATION

Fill in the required areas of the form and ship to the address at right along with the **Carbon Acceptance Canister** or **Sample Bottle** containing the spent carbon. If carbon returns will be RCRA manifested, also include the *Certification of Generator Form* and the *Chain of Custody Document.*	Ship completed paperwork and spent carbon sample to: **Calgon Carbon Corporation** **Attention: Reactivation Acceptance Dept.** **500 Calgon Carbon Drive** **Pittsburgh, PA 15205** **e-mail: carbonacceptance@calgoncarbon.com**

Section 1 – Generator Information **Date Completed:**

Company Name		Facility Name	
Mailing Address		Shipping address	
City, State, Zip		City, State, Zip	
Technical Contact		Title	
Telephone #		E-Mail Address	
Fax #		Cell #	

Note that it is the responsibility of the generator/customer to characterize the spent carbon, including determination and declaration of RCRA status, disclosure of contaminants present in the stream being treated, etc. If you have specific questions on these subjects or if you need help completing this document call 1-800-422-7266 and ask for the Carbon Acceptance Department or refer to our web site at www.calgoncarbon.com/serviceplatform/carbon_return_procedures.htm

Section 2 – Billing Information

The fee for carbon acceptance testing is $400 (USD) for non-hazardous projects and $1000 (USD) for RCRA-hazardous projects, plus tax where applicable. Please provide the following billing information. This information is required in order for carbon acceptance testing to begin.

Calgon Carbon Technical Sales Representative	
Purchase Order # for Carbon Acceptance Testing	

Bill to Name			
Address		Telephone #	
City, State, Zip		Fax #	
Attention		Cell #	

Section 3 – Notice to RCRA Spent Carbon Generators

As a requirement of 40 CFR 264.12(b), Calgon Carbon Corporation is required to notify hazardous waste generators that its facilities have the proper permits in place to accept hazardous spent carbon. The facilities covered under this notification are:

Facility	**EPA ID Number**
Catlettsburg, KY	KYD005009923
Neville Island, PA	PAD000736942

Generator Name	Date

Section 4 – Regulatory Profile

Is the spent carbon generated at a SUPERFUND Site?	**YES**	**NO**
Is the sample submitted for carbon acceptance testing representative as defined in 40 CFR 261 – Appendix I or by using an updated or equivalent method?	**YES**	**NO**
Has TCLP testing been performed on the spent carbon sample? If "YES", **attached lab report** and provide PA Laboratory Registration Number. If "NO", **attach a detailed explanation** supporting use of generator process knowledge in lieu of actual chemical analysis.	**YES**	**NO**
Has a hazardous waste determination been done for the waste stream as defined in 40 CFR Part 262.11?	**YES**	**NO**
Is the spent carbon a RCRA hazardous waste as defined in 40CFR Part 261?	**YES**	**NO**
If "YES", list EPA waste code number(s): _____ If "YES", list Facility EPA ID#:		
Is the spent carbon a hazardous waste in the facility's state or province?	**YES**	**NO**
If "YES", list state or provincial waste code number (s): _____ If "YES", list Facility State ID#: _____		
Is the carbon treating a stream which is subject to the Benzene NESHAP Standard (40CFR Part 61)?	**YES**	**NO**
Is the carbon treating a stream which is subject to the Hazardous Organic NESHAP Standard (40 CFR Part 63)?	**YES**	**NO**
Does the spent carbon contain substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372?	**YES**	**NO**
If "YES", list substances:		

Does the spent carbon contain any of the following chemicals?

1. Polychlorinated Biphenyls (PCBs)? If "NO" proceed to **Question** 2. If "YES", complete below.	**YES**	**NO**
Total PCBs on the spent carbon must be below 50 mg/kg to be accepted for reactivation. You must report and certify the actual concentration as determined by a test of a representative composite sample of the spent activated carbon from the adsorber. Calgon Carbon Corporation can arrange to have this testing done for you at an additional cost. Contact your Technical Service Representative for additional information.	**Total PCBs _____mg/kg** **(Attach Lab Report)**	
2. Dioxins	**YES**	**NO**
3. 1,2-Dibromo-3-chloropropane (DBCP)	**YES**	**NO**
Is the spent carbon known to have radioactive characteristics? If yes, please explain.	**YES**	**NO**
Does the spent carbon have the potential to possess radioactive characteristics based on radioactivity in the treated application? If yes, please explain.	**YES**	**NO**
Does the carbon treat an aqueous stream or a vapor stream from an aqueous source?	**YES**	**NO**

Check the appropriate DOT shipping name for the spent carbon.

□ Not Regulated □ Scrap Carbon

□ Hazardous Waste, Solid, N.O.S., 9, NA 3077, III, (list waste codes) _____

□ RQ, Hazardous Waste, Solid, N.O.S., 9, NA 3077, III, (list waste codes) _____

□ Other (if other, give description) _____

ADSORBATE PROFILE DOCUMENT

Generator Name	Date

Section 5 – Carbon Identification and Return Information **Circle One**

Carbon Type			**Granular Pellet**
			Liquid Vapor
U.S. Mesh Size			**_____ X _____**
Carbon Product Name			
Calgon Carbon Product ?			**Yes No**
If "NO", indicate type	Coal Base	Coconut Base Other _____	
Is spent carbon free-flowing ?			**Yes No**
Are there any other filter media present in the carbon system (i.e. sand, gravel)?			**Yes No**
Does the spent carbon contain silt, sand, gravel or other foreign material?			**Yes No**
If "YES", describe			
Adsorption Equipment by:	Calgon Carbon Customer Other _____		
Pounds of spent carbon per return			
Frequency of spent carbon returns	____ Times per Week, Month, Year or _____ One Time Only		
Spent Carbon return via:	Bulk Truck	1800 lb. Vapor Pac–Plastic	2000 lb. Cyclesorb–FRP
Circle One	Calgon Bins	1800 lb. Vapor Pac–SS	2000 lb. Cyclesorb-SS
	Super Sack	Vapor Pac 10	1000 lb. Cyclesorb-FRP
	55 Gal. Drum	Ventsorb	Flowsorb
	Other _____		

Section 6 – Stream Profile

Type of Stream	**√ Check all that Apply**	**Stream Components**
Liquid Phase Treatment	**Vapor Phase Treatment**	**List the principal components and their concen – tration in the stream (ppm, mg/L, wt%, etc.)**
□ Spill Clean-up	□ Air Stripper	**Component Amount Unit**
□ Industrial Process	□ Industrial Process Vapor	
□ Food-Grade Process	□ Food-Grade Process	
□ Potable Water – Surface	□ Solvent Recovery	
□ Potable Water – GW	□ Tank Vent	
□ Industrial Wastewater	□ Industrial WW Vapor	
□ Groundwater	□ Soil Extraction	
□ Other – Describe below	□ Other – Describe below	

Describe the stream and how it is generated.

What is the stream flow rate?	**_____ gpm or _____ cfm**	
Is the stream treated at elevated temperature?	**YES NO**	**If "YES", Temperature ___ º F or C**
Is the stream saturated with inorganic salts ?	**YES NO**	

Section 7 – Disposal Methods

Acceptable methods of spent carbon disposal:	
Alternate Fuels Blending (thermal destruction/incineration)	**Yes No**
Calgon Carbon Reactivation	**Yes No**
Landfill	**Yes No**

Section 8 – Environmental Audit of Facilities

Will it be necessary for you to perform an environmental audit of the disposal facilities prior to the return of spent carbon?	**YES NO**

ADSORBATE PROFILE DOCUMENT

Generator Name	Date

Section 9 – Safety Profile (attach any analyses, toxilogical studies, safety data, MSDS, etc. that are relevant)

Are any of the following types of compounds, materials, or conditions present in the spent carbon? If "YES", describe or identify condition in the column to the right.

	Circle One	
OSHA regulated Carcinogens (per 29 CFR 1910)	YES NO	
Halogenated Organics	YES NO	
Sulfur-Containing Organics	YES NO	
Pesticides/Herbicides	YES NO	
Highly Toxic Organics	YES NO	
Explosive (Self-Igniting/Shock Sensitive Material)	YES NO	
Biological or Disease-Causing Agents	YES NO	
Reactive Cyanide or Sulfide	YES NO	
Odorous Compounds	YES NO	
Metals (As, Ba, Cd, Cr, Pb, Hg, Se, Cu, Mn, Ni, Zn)	YES NO	

Are there any unique safe handling requirements necessary for processing the spent carbon? If "YES", describe	YES NO

If the spent carbon contains proprietary chemicals, list any acute or chronic hazards associated with or alleged to be associated with human contact or exposure to the material.

Section 10 – Generator Certification

I, the Generator and/or Authorized Agent, certify this **Adsorbate Profile Document** and all the attachments, contain true and accurate descriptions of the spent activated carbon and all of the relevant information within the possession of the Generator regarding known or suspected hazards pertaining to the spent carbon has been disclosed to Calgon Carbon Corporations. I, the Generator and/or Authorized Agent, acknowledge that Calgon Carbon Corporation must rely on the Generator certification of all chemical and physical characteristics of hazardous substances managed or processed by Calgon Carbon Corporation.

To the best of my knowledge and information, the spent activated carbon to be returned to Calgon Carbon Corporation for reactivation does not contain PCBs greater than or equal to 50 ppm; dioxins above 20 ppb TCDD International Toxicity Equivalents; 1,2-dibromo-3-chloropropane greater than 1.5% by weight; nor is it a characteristically ignitable, corrosive or reactive water.

I acknowledge that any changes in character or loading, which deviate from this profile warrant completion of a new Adsorbate Profile Document. Calgon Carbon Corporation reserves the right to rescind any spent carbon returns, which substantially differ from the approved profile.

Name _____ Title _____

Signature _____ Date _____

Section 11 – Confidentiality

Calgon Carbon Corporation, as a consideration of the customer's release of the above information and any Calgon subsequent data provided, agrees to treat such information as confidential property and will not disclose such information to others except as required by law and facility operating permits.

Name _____ Title _____

Signature _____ Date _____

TCLP List

Waste Code	Constituent	Regulatory Limit mg/L	DOT Reportable Quantity, pounds	Chronic Toxicity Level mg/L
D004	Arsenic	5	1	0.05
D005	Barium	100	1000	1
D018	Benzene	0.5	10	0.005
D006	Cadmium	1	10	0.01
D019	Carbon Tetrachloride	0.5	10	0.005
D020	Chlordane	0.03	1	0.0003
D021	Chlorobenzene	100	100	1
D022	Chloroform	6	10	0.06
D007	Chromium	5	10	0.05
D023	o-Cresol	200	1000	2
D024	m-Cresol	200	1000	2
D025	p-Cresol	200	1000	2
D026	Cresol	200	1000	2
D016	2,4-D	10	100	0.1
D027	1,4-Dichlorobenzene	7.5	100	0.075
D028	1,2-Dichloroethane	0.5	100	0.005
D029	1,1-Dichloroethylene	0.7	100	0.007
D030	2,4-Dinitrotoluene	0.13	10	0.0005
D012	Endrin	0.02	1	0.0002
D031	Heptachlor (and Hypoxide)	0.008	1	0.00008
D032	Hexachlorobenzene	0.13	10	0.0002
D033	Hexachloro-1,3-butadiene	0.5	1	0.005
D034	Hexachloroethane	3	100	0.03
D008	Lead	5	*	0.05
D013	Lindane	0.4	1	0.004
D009	Mercury	0.2	1	0.002
D014	Methoxychlor	10	1	0.1
D035	Methyl ethyl ketone	200	5000	2
D036	Nitrobenzene	2	1000	0.02
D037	Pentachlorophenol	100	10	1
D038	Pyridine	5	1000	0.04
D010	Selenium	1	10	0.01
D011	Silver	5	1	0.05
D039	Tetrachloroethylene	0.7	100	0.007
D015	Toxaphene	0.5	1	0.005
D040	Trichloroethylene	0.5	100	0.005
D041	2,4,5-Trichlorophenol	400	10	4
D042	2,4,6-Trichlorophenol	2	10	0.02
D017	2,4,5-TP (Silvex)	1	100	0.01
D043	Vinyl chloride	0.2	1	0.002

* not available

The regulatory level has been set at ~100 x the chronic toxicity level.

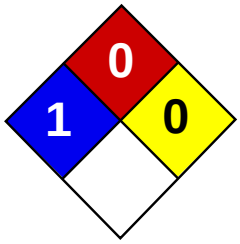
General Carbon Acceptance Criteria for RCRA and Non-RCRA Spent Carbon Returns to Calgon Carbon

Characteristic/Property	Limits of Acceptability
Volatile Sulfur	1.0 % Maximum
Volatile Halides:	
Chloride	1.7 % Maximum - Neville Island; 4.0% Maximum - Big Sandy
Bromide	0.3% Maximum
Fluoride	0.4 % Maximum
High Exotherm During Reactivation	Require Case-by-Case Approva
Potassium	Maximum of 0.1 wt. %
Sodium	Maximum of 1.0 wt. %
Metals	Require Case-by-Case Approval
Lead	<50 mg/kg
Mercury	Not acceptable
Acutely Toxic, Odorous, or OSHA regulated compounds	Require Case-by-Case Approval
Size	Greater than or equal to 12 x 40 Mesh
pH Range	Greater than 2.0 and less than 12.5
Ignitable (per RTM-10)	Not Acceptable (Although BSP is permitted to receive D001 manifested material, they may not receive any spent carbon which exhibits the characteristic of ignitability.)
Instantaneously Ignitable (per RTM-10)	Not Acceptable
Dioxins	Not Acceptable at BSP; Must be < 20 ug/kg TEQs at NIP
Polychlorinated Biphenyls (PCB's)	< 50 mg/kg
1,2-Dibromo-3-chloropropane (DBCP)	Not Acceptable
Unacceptable RCRA Waste Codes	Not Acceptable: D001 (NIP), D002, D003, F020, F021, F022, F023, F026, F027, F028, F032
Pending Waste Codes	The following waste codes are pending approval from the respective agencies. Calgon Carbon may not accept spent carbon which has been mainfested using these codes until agency approval has been granted: **Acceptable NIP/Pending BSP:** F035, K064, K065, K066, K088, K090, K091, K107, K108, K109, K110, K141, K142, K143, K144, K145, K147, K148, K149, K150, K151, P120, P121, P122, U277, U373, U379, U381, U382, U385, U386, U387, U389, U401, U402, U404, U409, U410, U411
Total Cyanide	<250 mg/kg
Total Sulfide	<500 mg/kg
Radioactivity	Not to Exceed Background Level

Note 1: Spent Granular Activated carbon to be returned for reactivation shall be free of any foreign debris (rock, wood, metal, etc.) or extraneous impurities, free of oil and grease, easily wetted by water, and free-flowing.

Note 2: Acceptance for reactivation of spent carbon which has not been supplied by Calgon Carbon Corporation must be investigated on case-by-case basis.

Appendix N: Material Safety Data Sheets (MSDS)



Material Safety Data Sheet
Potassium permanganate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Potassium permanganate

Catalog Codes: SLP4912, SLP3892, SLP1075

CAS#: 7722-64-7

RTECS: SD6475000

TSCA: TSCA 8(b) inventory: Potassium permanganate

CI#: Not available.

Synonym: Potassium Permanganate, Biotech Grade

Chemical Name: Potassium Permanganate

Chemical Formula: KMnO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Potassium permanganate	7722-64-7	100

Toxicological Data on Ingredients: Potassium permanganate, Biotech: ORAL (LD50): Acute: 1090 mg/kg [Rat]. 2157 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Possibly corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: organic materials, metals, combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of organic materials, of metals.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Spontaneously flammable on contact with ethylene glycol. Potassium Permanganate being conveyed through propylene tube ignited the tube. When solid hydroxylamine is brought into contact with solid potassium permanganate, there is produced immediately a with flame. Potassium permanganate decomposes hydrogen trisulfide so rapidly that sufficient heat is liberated to ignite the trisulfide. When Antimony or arsenic and solid potassium permanganate are ground together, the metals ignite.

Special Remarks on Explosion Hazards:
Take care in handling as explosions may occur if it is brought in contact with organic or other readily oxidizable substances, either in solution or in dry state. Explosive in contact with sulfuric acid or hydrogen peroxide. Potassium permanganate + acetic acid or acetic anhydride can explode if permanganate is not kept cold. Explosions can occur when permanganates come on contact with benzene, carbon disulfide, diethyl ether, ethyl alcohol, petroleum, or oganic matter. Contact with glycerol

may produce explosion. Crystals of potassium permanganate explode vigorously when ground with phosphorous. A mixture of .5% potassium permanganate + ammonium nitrate explosive caused an explosion 7 hrs. later. Addition of Potassium permanganate + dimethylformamide to give a 20% solution led to an explosion after 5 min. During a preparation of chlorine by addition of the concentrated acid (Hydrochloric acid) to solid potassium permanganate, a sharp explosion occurred on one occasion.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as organic materials, metals, acids.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Sweetish, astringent.

Molecular Weight: 158.03 g/mole

Color: Purple. (Dark.)

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 2.7 @ 15 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, acetone.

Solubility:
Easily soluble in methanol, acetone. Partially soluble in cold water, hot water. Soluble in Sulfuric Acid

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:
Highly reactive with organic materials, metals, acids. Reactive with reducing agents, combustible materials.

Corrosivity: Not available.

Special Remarks on Reactivity:
It is a powerful oxidizing agent. Incompatible with reducing agents, acids, formaldehyde, ammonium nitrate, dimethylformamide, glycerol, combustible materials, alcohols, arsenites, bromides, iodides, charcoal, organic substances, ferrous or mercurous salts, hypophosphites, hyposulfites, sulfites, peroxides, oxalates, ethylene glycol, Manganese salts in air oxidize the toxic sulfur dioxide to more toxic sulfur trioxide. Can react violently with most metal powders, ammonia, ammonium salts, phosphorous, many finely divided organic compounds (materials), flammable liquids, acids, sulfur.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1090 mg/kg [Rat]. Lowest Published Lethal Dose: LDL[Woman] - Route: Oral; Dose: 100 mg/kg LDL[Human] - Route: Oral; Dose: 143 mg/kg.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of eye contact (corrosive), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (Male and Female fertility) based on animal data. May affect genetic material (mutagenetic) based on animal data.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Potassium permanganate UNNA: 1490 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Potassium permanganate Illinois toxic substances disclosure to employee act: Potassium permanganate Illinois chemical safety act: Potassium permanganate New York release reporting list: Potassium permanganate Rhode Island RTK hazardous substances: Potassium permanganate Pennsylvania RTK: Potassium permanganate Massachusetts RTK: Potassium permanganate Massachusetts spill list: Potassium permanganate New Jersey: Potassium permanganate New Jersey spill list: Potassium permanganate Louisiana spill reporting: Potassium permanganate California Director's list of Hazardous Substances: Potassium permanganate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive solid.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R22- Harmful if swallowed. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:50 PM

Last Updated: 11/06/2008 12:00 PM

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MATERIAL SAFETY DATA SHEET **ISSUED: 10/23/97**

CHLORINE **REVISED: 11/01/99**

SECTION I - PRODUCT IDENTIFICATION

Westlake CA&O
2468 Industrial Parkway
P O Box 527
Calvert City, KY 42029

Telephone No.: (270) 395-4151
Transportation Emergency No.:
CHEMTREC: (800) 424-9300
Medical Emergency No.:
POISON CENTER: (216) 379-8562

Chemical Family: Halogen
Chemical Name/Synonyms: Chlorine
Trade Mark: None
Formula: Cl_2; (Cl-Cl)
C.A.S. Registry No.: 7782-50-5
TSCA Inventory Status: All ingredients are listed on the USEPA's TSCA inventory
Canadian Domestic Substances List Status: All ingredients have been nominated or are eligible for inclusion.
Workplace Hazardous Materials Information System (WHMIS) Classification: C,E
Product Use: Various Applications
SARA 313 Information: This product contains a toxic chemical or chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

SECTION II - HAZARDOUS INGREDIENTS

Hazard Summary Statement: WARNING! HIGHLY TOXIC. CORROSIVE. May be fatal if inhaled. Strong oxidizer. Most combustibles will burn in chlorine as they do in oxygen. Read entire Material Safety Data Sheet (MSDS).

Material	C.A.S. Number	Amount in Product	ACGIH TLV-TWA	OSHA PEL-TWA
Chlorine [1,2,4,5,6]	7782-50-5	> 99.5%	0.5 ppm 1 ppm short term exposure limit (STEL)	1 ppm - ceiling

N.A. - Not Applicable **N.E. - Not Established**

Legislative Footnotes

[1]Ingredient listed on SARA Section 313 List of Toxic Chemicals.

[2]Ingredient listed on the *Pennsylvania Hazardous Substances List.*

[3]Ingredient listed on the California listing of *Chemicals Known to the State to Cause Cancer or Reproductive Toxicity*.

[4]Ingredient listed on the *Massachusetts Substance List.*

[5]*Workplace Hazardous Materials Information System* ingredient found on the Ingredient Disclosure List - Canada.

[6]Ingredient listed on the *New Jersey Right to Know Hazardous Substance List.*

Notes:

TLV-TWA - Threshold Limit Value - Time Weighted Average guideline for concentration of the chemical substance in the ambient workplace air. (The skin notation calls attention to the skin as an additional significant route of absorption of the listed chemical.) American Conference of Governmental Industrial Hygienists (ACGIH).

OSHA PEL - OSHA Permissible Exposure Limit, 8-hour TWA. 29 CFR 1910.1000, Transitional Limits column, Table Z-1-A, Table Z-2, and Table Z-3.

SECTION III - PHYSICAL DATA

Appearance: Greenish-yellow gas or amber liquid
Odor: Pungent, suffocating bleach like odor
Percent Volatiles: >99.5
Solubility in Water: Slight
Physical State: Gas (liquid under pressure)

Specific Gravity: Dry Gas (2.48 @ 0°C)
Liquid (1.47 @ 0/4°C)
Melting Point: -101°C (-150°F)
Molecular Weight: 70.9
Vapor Pressure: 73 psia @ 50°F
Vapor Density: 2.5 (Air=1)

SECTION IV - FIRE & EXPLOSION HAZARD DATA

Flash Point: Test is not applicable to gases. Not combustible. Chlorine can support combustion and is a serious fire risk.

Flammable Limits in Air: Not Applicable

Note:

Flash Point: The lowest initial temperature of air passing around the specimen at which sufficient combustible gas is evolved to be ignited by a small external pilot flame.

Extinguishing Media: For small fires use dry chemical or carbon dioxide. For large fires use water spray, fog or foam.

Special Firefighting Procedures: Wear full face positive pressure self-contained breathing apparatus (SCBA). Wear full protective gear to prevent all body contact (moisture or water and chlorine can form hydrochloric and hypochlorous acids which are corrosive). Personnel not having suitable protection must leave the area to prevent exposure to toxic gases from the fire. Use water to keep fire-exposed containers cool (if containers are not leaking). Use water spray to direct escaping gas away from workers if it is necessary to stop the flow of gas. In enclosed or poorly ventilated areas, wear SCBA during cleanup immediately after a fire as well as during the attack phase of firefighting operations.

Unusual Fire and Explosion Hazards: Chlorine and water can be very corrosive. Corrosion of metal containers can make leaks worse. Although non-flammable, chlorine is a strong oxidizer and will support the burning of most combustible materials. Flammable gases and vapors can form explosive mixtures with chlorine. Chlorine can react violently when in contact with many materials and generate heat with possible flammable or explosive vapors. Chlorine gas is heavier than air and will collect in low-lying areas.

Explosive Characteristics: Containers heated by fire can explode.

SECTION V - Reactivity

Stability: Stable

Hazardous Polymerization: Will not occur.

Hazardous Decomposition Products: Hydrogen chloride may form from chlorine in the presence of water vapor.

CAUTION! Oxidizer. Extremely reactive.

Incompatibility (Materials to Avoid): Chlorine is extremely reactive. Liquid or gaseous chlorine can react violently with many combustible materials and other chemicals, including water. Metal halides, carbon, finely divided metals and sulfides can accelerate the rate of chlorine reactions. Hydrocarbon gases, e.g., methane, acetylene, ethylene or ethane, can react explosively if initiated by sunlight or a catalyst. Liquid or solid hydrocarbons, e.g., natural or synthetic rubbers, naphtha, turpentine, gasoline, fuel gas, lubricating oils, greases or waxes, can react violently. Metals, e.g., finely powdered aluminum, brass, copper, manganese, tin, steel and iron, can react vigorously or explosively with chlorine. Nitrogen compounds, e.g., ammonia and other nitrogen compounds, can react with chlorine to form highly explosive nitrogen trichloride. Non-metals,

e.g., phosphorous, boron, activated carbon and silicon can ignite on contact with gaseous chlorine at room temperature. Certain concentrations of chlorine-hydrogen can explode by spark ignition. Chlorine is strongly corrosive to most metals in the presence of moisture. Copper may burn spontaneously. Chlorine reacts with most metals at high temperatures. Titanium will burn at ambient temperature in the presence of dry chlorine.

SECTION VI - HEALTH HAZARD DATA

Threshold Limit Value: See Section II.

Primary Routes of Exposure: Inhalation, skin and eye contact.

Effects of Overexposure:

Acute: Low concentrations of chlorine can cause itching and burning of the eyes, nose, throat and respiratory tract. At high concentrations chlorine is a respiratory poison. Irritant effects become severe and may be accompanied by tearing of the eyes, headache, coughing, choking, chest pain, shortness of breath, dizziness, nausea, vomiting, unconsciousness and death. Bronchitis and accumulation of fluid in the lungs (chemical pneumonia) may occur hours after exposure to high levels. Liquid as well as vapor contact can cause irritation, burns and blisters. Ingestion can cause nausea and severe burns of the mouth, esophagus and stomach.

Chronic: Prolonged or repeated overexposure may result in many or all of the effects reported for acute exposure (including pulmonary function effects).

Emergency and First Aid Procedures:

Inhalation (of process emissions): Take proper precautions to ensure rescuer safety before attempting rescue (wear appropriate protective equipment and utilize the "buddy system"). Remove source of chlorine or move victim to fresh air. If breathing has stopped, trained personnel should immediately begin artificial respiration or, if the heart has stopped, cardiopulmonary resuscitation (CPR). Avoid mouth-to-mouth contact. Oxygen may be beneficial if administered by a person trained in its use, preferably on a physician's advise. Obtain medical attention immediately.

Eye Contact: Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 20 minutes while the eyelid(s) are open. Take care not to rinse contaminated water into the non-affected eye. If irritation persists, obtain medical attention immediately.

Skin Contact: As quickly as possible, flush contaminated area with lukewarm, gently running water for at least 20 minutes. Under running water, remove contaminated clothing, shoes, and leather watchbands and belts. If irritation persists, obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before re-use, or, discard.

Ingestion: Not an anticipated hazard.

SECTION VII - SPILL & LEAK PROCEDURE

Steps to be taken in case material is released or spilled: Restrict access to the area until completion of the cleanup. Issue a warning: POISON GAS. DO NOT TOUCH SPILLED LIQUID. Do no use water on a chlorine leak (corrosion of the container can occur, increasing the leak). Shut off leak if safe to do so. Wear NIOSH/MSHA-approved, self-contained, full-face, positive pressure respirator and full protective clothing capable of protection from both liquid and gas phases. Persons without suitable respiratory and body protection must leave the area.

The following evacuation guide was developed by the U.S. Department of Transportation (DOT): Spill or leak from a smaller container or small leak from a tank - isolate in all directions 250 feet. Large spill from a tank or from a number of containers - first, isolate 520 feet in all directions; secondly, evacuate in a downwind direction 1.3 miles wide and 2.0 miles long. Keep upwind from leak. Vapors are heavier than air and pockets of chlorine are likely to be trapped in low-lying areas. Use water spray on the chlorine vapor cloud to reduce vapors. Do not flush into public sewer or water systems. Chlorine can be neutralized with caustic soda or soda ash. Alkaline solutions for absorbing chlorine can be prepared as follows:

For 100 pound containers: 125 lbs. of caustic soda and 40 gallons of water
For 2,000 pound containers: 2,500 lbs. of caustic soda and 800 gallons of water
For 100 pound containers: 300 lbs. of soda ash and 100 gallons of water
For 2,000 pound containers: 6,000 lbs. of soda ash and 2,000 gallons of water

CAUTION: Observe appropriate safety precautions for handling alkaline chemicals. Heat will be generated during the neutralization process.

Waste Disposal Method: Due to its inherent properties, hazardous conditions may result if the material is managed improperly. It is recommended that any containerized waste chlorine be managed as hazardous waste in accordance with all applicable federal, state, and local health and environmental laws and regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Effective exhaust ventilation should always be provided to draw fumes or vapors away from workers to prevent routine inhalation. Ventilation should be adequate to maintain the ambient workplace atmosphere below the legislated levels listed in Section II.

Respiratory Protection: Use NIOSH approved acid gas cartridge or canister respirator for routine work purposes when concentrations are above the permissible exposure limits. Use full facepiece respirators when concentrations are irritating to the eyes. A cartridge-type escape respirator should be carried at all times when handling chlorine for escape only in case of a spill or leak. Re-enter area only with NIOSH approved, self-contained breathing apparatus with full facepiece. The respiratory use limitations made by NIOSH or the manufacturer must be observed. Respiratory protection programs must be in accordance with 29 CFR 1910.134.

Eye/Face Protection: Non-ventilated chemical safety goggles or a full face shield.

Skin Protection: Wear impervious gloves, coveralls, boots and/or other resistance protective clothing. Safety shower/eyewash fountain should be readily available in the work area. Some operations may require the use of an impervious full-body encapsulating suit and respiratory protection.

Note: Neoprene, polyvinyl chloride (PVC), Viton, and chlorinated polyethylene show good resistance to chlorine.

Additional: Do not eat, drink or smoke in work areas. Maintain good housekeeping.

SECTION IX - SPECIAL PRECAUTIONS

Material Handling: Do not use near welding operations, flames or hot surfaces. Move cylinders by hand truck or cart designed for that purpose. Do not lift cylinders by their caps. Do not handle cylinders with oily hands. Secure cylinders in place in an upright position at all times. Do not drop cylinders or permit them to strike each other. Leave valve cap on cylinder until cylinder is secured and ready for use. Close all valves when not in actual use. Insure valves on gas cylinders are fully opened when gas is used. Open and shut valves at least once a day while cylinder is in use to avoid valve "freezing". Use smallest possible amounts in designated areas with adequate ventilation. Have emergency equipment for fires, spills and leaks readily available. Wash thoroughly after handling product. Provide a safety shower/eyewash station in handling area. An emergency contingency program should be developed for facilities handling chlorine.

Storage: Store in steel pressure cylinders in a cool, dry area outdoors or in well-ventilated, detached or segregated areas of noncombustible construction. Keep out of direct sunlight and away from heat and ignition sources. Cylinder temperatures should never exceed 51°C (125^{o}F). Isolate from incompatible materials. Store cylinders upright on a level floor secured in position and protected from physical damage. Use corrosion resistant lighting and ventilation systems in the storage area. Keep cylinder valve cover on. Label empty cylinders. Store full cylinders separately from empty cylinders. Avoid storing cylinders for more than six months. Comply with applicable regulations for the storage and handling of compressed gases.

SECTION X - HAZARD CODES

NFPA (National Fire Protection Association)		HMIS (Hazardous Materials Identification System)	
Health:	4	Health:	3
Flammability:	0	Flammability:	0
Reactivity:	0	Reactivity:	0
Special:	OXY	Personal Protection:	X*

Key:
0 = Insignificant
1 = Slight
2 = Moderate
3 = High
4 = Extreme

* See MSDS for specified protection

USER'S RESPONSIBILITY

This bulletin cannot cover all possible situations which the user may experience during processing. Each aspect of the user's operation should be examined to determine if, or where, additional precautions may be necessary. All health and safety information contained within this bulletin should be provided to the user's employees or customers. Westlake CA&O Corporation must rely upon the user to utilize this information to develop appropriate work practice guidelines and employee instructional programs for his or her operation.

DISCLAIMER OF LIABILITY

As the conditions or methods of use are beyond our control, we do not not assume any responsibility and expressly disclaim any liability for any use of this material. Information contained herein is believed to be true and accurate but all statements or suggestions are made without warranty, expressed or implied, regarding the accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Compliance with all applicable federal, state and local laws and regulations remains the responsibility of the user.

SHIPPING INFORMATION

IDENTIFICATION - DOMESTIC TRANSPORTATION

Proper Shipping Name (172.101(c)): **Chlorine**
(Technical Name(s)) 172.203(k): **N/A**
Hazard Class 172.101(d): **2.3**
UN/NA# 172.101(e): **UN 1017**
Haz. Substance 171.8: **RQ (Chlorine)**
Reportable Quantity (Appendix A to 172.101): **10 LB**
Inhalation Hazard 172.2a(b): **Zone B, Poison-Inhalation Hazard, Marine Pollutant**
Package Code 172.101(f): **N/A**
Placarded: **Poison Gas**

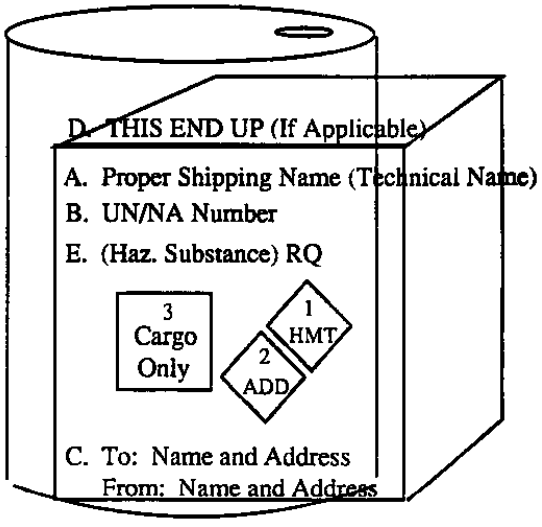
PACKAGING (Part 173)

- Packaging Section (172.101(i)) - Col. 8(a): None
  Col. 8(b): 173.304
  Col. 8(c): 173.314, 173.315

- General Packaging Section - General 173.24 Hazard Class: **POISON GAS**

MARKING

A. Proper Shipping Name (172.301(a)) (Technical Name) (172.301(b))
B. UN / NA Number (172.301(a))
C. Name & Address (172.301(d))
D. THIS END UP (172.312(a))
E. Hazardous Substance RQ (Name) (172.324)
ORM Designation (172.316(a))
Inhalation Hazard (172.313(a))

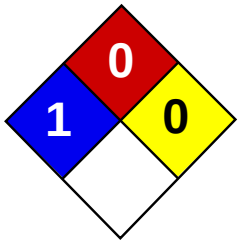


DOMESTIC LABELING

1. HMT LABELS (172.400)
2. Additional SubsidiaryHazard (172.402(a)):
   8 (Corrosive)

DANGEROUS GOODS DETERMINATION (38th Edition) IATA

- Air Transport of This Material if Forbidden (Passenger and Cargo)



Material Safety Data Sheet
Sodium Hypochlorite, 5% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Hypochlorite, 5%

Catalog Codes: SLS1654

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Sodium hypochlorite; Sodium hydroxide; Water

CI#: Not applicable.

Synonym: Chlorine Bleach, Bleach, Soda Bleach, Chlorox; Sodium Hypochlorite, Solution, 5% Available Chlorine

Chemical Name: Hypochlorous acid, sodium salt, solution

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hypochlorite	7681-52-9	4-7
Sodium hydroxide	1310-73-2	<1
Water	7732-18-5	>92

Toxicological Data on Ingredients: Sodium hypochlorite: ORAL (LD50): Acute: 5800 mg/kg [Mouse]. 8910 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Sodium hypochlorite]. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. [Sodium hypochlorite]. Mutagenic for mammalian somatic cells. [Sodium hydroxide]. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: combustible materials, metals, organic materials

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Releases chlorine when heated above 35 deg. C. The substance itself is non-combustible and does not burn. However, when heated to decomposition it emits corrosive and/or toxic fumes. May ignite combustibles. Fire risk in contact with organic materials. Contact with metals may evolve flammable hydrogen gas.

Special Remarks on Explosion Hazards:
Anydrous Sodium Hypochlorite is very explosive. Primary amines and calcium hypochlorite or sodium hypochlorite react to form normal chloroamines, which are explosive. Interaction of ethyleneimine with sodium (or other) hypochlorite gives the explosive N-chloro cmpd. Removal of formic acid from industrial waste streams with sodium hypochlorite soln becomes explosive at 55 deg C. Several explosions involving methanol and sodium hypochlorite were attributed to formation of methyl hypochlorite, especially in presence of acid or other esterification catalyst. Use of sodium hypochlorite soln to destroy acidified benzyl cyanide residues caused a violent explosion, thought to have been due to formation of nitrogen trichloride. (Sodium hypochlorite)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Air Sensitive Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Sodium hypochlorite TWA: 1 CEIL: 1 (ppm as Cl2) STEL: 1 (ppm as Cl2) from ACGIH (TLV) [United States] Sodium hydroxide STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States] CEIL: 2 (mg/m3) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Characteristic. Chlorine-like (Slight.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light greenish yellow

pH (1% soln/water): Neutral.

Boiling Point: Decomposition temperature: 40°C (104°F)

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: 1.07 - 1.093 (Water = 1)

Vapor Pressure: 2.3 kPa (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials. light, air, heat

Incompatibility with various substances: Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Extremely corrosive in presence of aluminum. Corrosive in presence of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Decomposed by carbon dioxide from air. Slowly decomposes on contact with air. Unstable in air unless mixed with sodium hydroxide. Incompatible with ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate. Decompostion of sodium hypochlorite takes place within a few seconds with these salts. Also incompatible with primary amines, phenyl acetonitrile, ethyleneimine, methanol, acidified benzyl cyanide, formic acid, urea, nitro compounds, methylscellulose, celloluse, aziridine, ether, ammonia. Mixing this product with chemicals (e.g. ammonia, acids, detergents, etc.) or organic matter (e.g. urine, feces, etc.) will release chlorine gas. Chloramine gas may be evolved when ammonia and bleach are mixed. Decomposed by hot water. Sensitive to light. Exposure to light accelerates decompositon.

Special Remarks on Corrosivity:
Sodium Hypochlorite is extremely corrosive to brass, and moderately corrosive to bronze. There is no corrosivity information for copper.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 5800 mg/kg [Mouse]. (Sodium hypochlorite).

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Sodium hypochlorite]. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. [Sodium hypochlorite]. Mutagenic for mammalian somatic cells. [Sodium hydroxide]. Contains material which may cause damage to the following organs: lungs, mucous membranes, skin, eyes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer, lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic) (Sodium hypochlorite)

Special Remarks on other Toxic Effects on Humans:
Potential Health Effects: Can cause severe irritation and possible burns to skin and eyes. Eye contact may also cause corneal and conjunctival edema, conjunctival hemorrhages. Contact with skin may also cause vesicular eruptions and eczematoid dermatitis which becomes evident upon re-exposure. Prolonged or repeated eye contact may cause conjunctivitis. Ingestion can cause burns to the digestive tract. Symptoms may include: 1. pain and inflammation of the mouth, pharynx, esophagus, and stomach, 2. erosion of the mucous membranes (chiefly of the stomach), nausea, vomiting, choking, coughing, hemorrhage, 3. circulatory collapse with cold and clammy skin (due to methemoglobinemia), cyanosis, and shallow respirations, 4. confusion, delirium, coma, 5. edema of the pharynx, glottis, larynx with stridor and obstruction, 6. perforation of the esophagus, or stomach, with mediastinitis or peritonitis. Inhalation causes slight to severe respiratory tract irritation and delayed pulmonary edema. Prolonged or repeated inhalation may cause allergic respiratory reaction (asthma).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Dilute with water and flush to sewer of local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hypochlorite solution UNNA: 1791 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hypochlorite; Sodium hydroxide Florida: Sodium hypochlorite Minnesota: Sodium hypochlorite; Sodium hydroxide Massachusetts RTK: Sodium hypochlorite; Sodium hydroxide New Jersey: Sodium hypochlorite; Sodium hydroxide Louisiana spill reporting: Sodium hydroxide TSCA 8(b) inventory: Sodium hypochlorite; Sodium hydroxide; Water CERCLA: Hazardous substances.: Sodium hypochlorite: 100 lbs. (45.36 kg); Sodium hydroxide: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive liquid.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R31- Contact with acids liberates toxic gas. R36/38- Irritating to eyes and skin. S28- After contact with skin, wash immediately with plenty of water. S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 11/06/2008 12:00 PM

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SUMMIT RESEARCH LABS - HUGUENOT DIVISION
MATERIAL SAFETY DATA SHEET

MATERIAL NAME: SUMACLEAR 801B

EMERGENCY TELEPHONE NUMBER: (845) 856-5261

SECTION 1 - GENERAL INFORMATION

MANUFACTURER'S NAME: SUMMIT RESEARCH LABS - HUGUENOT DIVISION
ADDRESS: 15 BIG POND ROAD
HUGUENOT, NEW YORK, USA 12746-0626

PRODUCT AND TECHNICAL INFORMATION NUMBER: (908) 782-9500

DESCRIPTION: PROPRIETARY BLEND

NSF LISTED NAME: SUMACLEAR 801B
MAXIMUM USE OF PRODUCT IN POTABLE WATER IS: 200mg/L

NFPA HAZARD RATINGS	
HEALTH	2
FLAMMABILTY	0
REACTIVITY	0

SECTION 2 - HAZARDOUS INGREDIENTS

CAS NO.	INGREDIENT	TLV-TWA
PROPRIETARY	CONTAINS WATER SOLUBLE ALUMINUM COMPOUNDS	OSHA PEL FOR ALUMINUM, SOLUBLE SALTS: TWA 2 mg/M3 AS ALUMINUM

SECTION 3 - EFFECTS OF OVEREXPOSURE

EYES: DIRECT CONTACT IRRITATES SLIGHTLY TO MODERATELY WITH REDNESS & SWELLING.

SKIN: SINGLE, RELATIVELY SHORT EXPOSURE CAUSES NO KNOWN ADVERSE EFFECT. REPEATED EXPOSURES MAY CAUSE IRRITATION.

INHALATION: INHALING DUST OR MIST CREATED DURING USE MAY INJURE THE RESPIRATORY SYSTEM AND CAUSE AN ADVERSE LUNG REACTION.

ORAL: SMALL AMOUNTS TRANSFERRED TO THE MOUTH BY FINGERS DURING USE, ETC., SHOULD NOT INJURE. SWALLOWING LARGE AMOUNTS MAY CAUSE INJURY.

COMMENTS: THIS PRODUCT, AS WITH ANY CHEMICAL, MAY ENHANCE ALLERGIC CONDITIONS ON CERTAIN PEOPLE.

SECTION 4 - EMERGENCY AND FIRST AID PROCEDURES

EYES: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES; GET IMMEDIATE MEDICAL ATTENTION.

SKIN: FIRST FLUSH WITH CLEAR WATER, THEN WASH WITH SOAP AND WATER.

INHALATION: GET MEDICAL ATTENTION FOR ANY DISCOMFORT.

ORAL: GET MEDICAL ATTENTION IF LARGE AMOUNT SWALLOWED OR THERE IS ANY DISCOMFORT.

SECTION 5 - FIRE AND EXPLOSION DATA

FLASH POINT: NONE, PRODUCT IS NOT FLAMMABLE.

UNUSUAL FIRE AND EXPLOSION HAZARDS: HAZARDOUS CHLORINE COMPOUNDS MAY FORM WHEN EXPOSED TO FIRE OR HIGH HEAT.

EXTINGUISHING MEDIA: COOL CONTAINERS WITH WATER FOG.

SPECIAL FIRE FIGHTING PROCEDURES: SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING SHOULD BE WORN IN FIGHTING FIRES INVOLVING CHEMICALS.

SECTION 6 - PHYSICAL DATA

BOILING POINT:	WATER PORTION WILL BOIL OFF AT 100C AT 760mm Hg.
SPECIFIC GRAVITY AT 25C:	1.33
MELTING POINT:	APPROX. 0C
VAPOR PRESSURE:	AS WATER
PERCENT VOLATILE BY WEIGHT:	50%
SOLUBILITY IN WATER	100%
APPEARANCE, COLOR, ODOR	CLEAR, SLIGHTLY YELLOW LIQUID, SLIGHT ODOR.

NOTE: ABOVE INFORMATION IS NOT INTENDED FOR USE IN PREPARING SPECIFICATIONS.

SECTION 7 - REACTIVITY DATA

STABILITY: STABLE; HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG OXIDIZERS MAY REACT WITH PRODUCT; CAUSTICS WILL PRECIPITATE ALUMINUM HYDROXIDE.

CONDITIONS TO AVOID: EXPOSURE TO ABOVE AND CONTINUOUS HIGH TEMPERATURE.

HAZARDOUS DECOMPOSITION PRODUCTS: CHLORIDE COMPOUNDS, NITROGEN AND CARBON OXIDES AND COMPOUNDS THAT MAY BE HAZARDOUS.

SECTION 8 - SPILL, LEAK AND DISPOSAL

IF MATERIAL IS SPILLED, USE ABSORBANT MATERIAL TO COLLECT AND CONTAIN. WASH SPILL AREA WITH CLEAR WATER ONLY; SOAP MAY PRECIPITATE ALUMINUM HYDROXIDE.

PERSONAL PROTECTIVE EQUIPMENT:
EYES: SAFETY GLASSES AS A MINIMUM. GOGGLES IF SPLASHING COULD OCCUR.
SKIN: WASHING AT MEALTIME AND END OF SHIFT IS ADEQUATE.
INHALATION: NO RESPIRATORY PROTECTION IS NEEDED UNLESS PRODUCT FORMS MIST.

WASTE DISPOSAL METHOD: MUST CONFORM WITH LOCAL, STATE AND FEDERAL REGULATIONS CONCERNING HEALTH AND POLLUTION. CONTACT MANUFACTURER IF YOU HAVE ANY QUESTIONS.

D.O.T. (49CFR 171.8)/E.P.A. (40CFR 117) SPILL REPORTING INFORMATION:

SECTION 9 - ROUTINE HANDLING PRECAUTIONS

PERSONAL PROTECTIVE EQUIPMENT:

EYES: SAFETY GLASSES AT A MINIMUM, GOGGLES IF SPLASHING COULD OCCUR.

SKIN: SAFE HANDLING PRACTICES ARE TO AVOID CONTACT WITH ANY CHEMICALS; IF EXPOSED, REMOVE AS SOON AS POSSIBLE, WASH BEFORE MEALS AND AT END OF SHIFT.

INHALATION: RESPIRATORY PROTECTION NOT NEEDED UNLESS PRODUCT PRODUCES A MIST IN HANDLING, IN WHICH CASE USE DUST/MIST RESPIRATOR.

VENTILATION: NO SPECIAL REQUIREMENTS.

THESE PRECAUTIONS ARE FOR ROOM TEMPERATURE HANDLING. USE AT ELEVATED TEMPERATURES OR AEROSOL/SPRAY APPLICATIONS MAY REQUIRE ADDED PRECAUTIONS.

COMMENTS: AVOID EYE CONTACT.

SECTION 10 - SPECIAL PRECAUTIONS

USE REASONABLE CARE AND CAUTION IN STORAGE AND HANDLING. STORE BETWEEN 0C AND 49C .

SECTION 11 - COMMENTS

ADDITIONAL SARA REGULATORY COMPLIANCE INFORMATION:
SEC. 312 HAZARD CLASS: IMMEDIATE AND DELAYED.

SEC. 313 NOTIFICATION: NONE PRESENT IN REGULATED QUANTITIES

THIS INFORMATION IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EITHER EXPRESSED OR IMPLIED IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

PREPARED BY: JOHN KRUPUNICH DATE: 20JULY2006
FILECODE: S801B

SUMMIT RESEARCH LABS - HUGUENOT DIVISION
MATERIAL SAFETY DATA SHEET

MATERIAL NAME: SUMACLEAR P20

EMERGENCY TELEPHONE NUMBER: (845) 856-5261

DISTRIBUTED BY: SUMMIT RESEARCH LABS - HUGUENOT DIVISION
15 BIG POND ROAD
HUGUENOT, NEW YORK 12746-0626
PRODUCT AND TECHNICAL INFORMATION NUMBER: (908) 782-9500

MATERIAL IDENTIFICATION

PRODUCT NAME: SUMACLEAR P20
CHEMICAL NAME: POLYQUATERNARY AMINE SOLUTION
CAS NUMBER: PRODUCT IS A BLEND OF PROPRIETARY MATERIALS

NSF LISTED NAME: SUMACLEAR P20
MAXIMUM USE OF PRODUCT IN POTABLE WATER: 20 mg/L

NFPA HAZARD RATINGS	
HEALTH	2
FLAMMABILITY	0
REACTIVITY	0

HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENTS	HAZARD DATA
PRODUCT DOES NOT CONTAIN SECTION 313 REPORTABLE CHEMICALS	NO TLV OR STEL ON INGREDIENTS

HEALTH HAZARDS

INHALATION: MIST, IF FORMED, MAY IRRITATE RESPIRATORY TRACT.

INGESTION: MAY IRRITATE GASTROINTESTINAL TRACT.

SKIN: MAY CAUSE IRRITATION, ESPECIALLY AFTER PROLONGED OR REPEATED CONTACT.

EYES: MAY CAUSE IRRITATION, ESPECIALLY AFTER PROLONGED OR REPEATED CONTACT.

UNUSUAL CHRONIC TOXICITY: NONE KNOWN.

FIRST AID MEASURES

EYES AND FACE: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL ATTENTION.

SKIN: FLUSH WITH WATER FOR AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, GET MEDICAL ATTENTION.

INHALATION: REMOVE TO FRESH AIR. GET IMMEDIATE MEDICAL ATTENTION.

INGESTION: DO NOT INDUCE VOMITING DUE TO LOW ORAL TOXICITY, GET IMMEDIATE MEDICAL ATTENTION.

FIRE AND EXPLOSION HAZARDS

FLASHPOINT AND METHOD OF DETERMINATION: NONE, PRODUCTS ARE NOT FLAMMABLE.
UNUSUAL FIRE HAZARDS: NONE KNOWN

UNUSUAL EXPLOSION HAZARDS: NONE KNOWN

PRECAUTIONS AND PROCEDURES

FIRE EXTINGUISHING AGENTS RECOMMENDED: COOL CONTAINERS WITH WATER FOG.

SPECIAL FIRE FIGHTING: WEAR SELF-CONTAINED BREATHING APPARATUS APPROVED BY NIOSH. USE WATER SPRAY TO KEEP CONTAINERS COOL. SOLUTIONS OF PRODUCTS ARE SLIPPERY.

VENTILATION: LOCAL EXHAUST-IF MISTY CONDITIONS PREVAIL, NATURAL VENTILATION IS ADEQUATE IN THE ABSENCE OF MIST AND FOR NON-ENCLOSED AREAS.

NORMAL HANDLING: AVOID CONTACT WITH SKIN, EYES OR CLOTHING. DO NOT INHALE MISTS. USE NORMAL PERSONAL HYGIENE AND HOUSEKEEPING PRACTICES.

STORAGE: STORE ABOVE THE FREEZING POINT OF WATER AND BELOW 40 DEGREES CENTIGRADE.

LEAK AND SPILL PROCEDURES

DIKE AND ABSORB SPILL WITH INERT MATERIAL SUCH AS SAND, VERMICULITE OR DIRT. SHOVEL INTO DRUMS FOR DISPOSAL. DO NOT ALLOW SPILLS TO ENTER WATERWAYS. WATER MAY BE USED TO COMPLETE CLEANING.

OTHER PRECAUTIONS: MATERIAL AND ITS SOLUTIONS MAY BE EXTREMELY SLIPPERY.

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION: IF PRODUCT FORMS A MIST, WEAR NIOSH DUST/MIST APPROVED RESPIRATOR.

EYES AND FACE: WEAR SAFETY GLASSES AS A MINIMUM, GOGGLES FOR RISK OF CONTACT.

HANDS, ARMS AND BODY: RUBBER GLOVES AND FULL WORK CLOTHING. ADD PROTECTIVE CLOTHING (RUBBER) IF SPLASHING OR REPEATED CONTACT WITH MATERIAL IS LIKELY.

OTHER CLOTHING & EQUIPMENT: EYE WASH AND QUICK DRENCH SHOWER.

PHYSICAL DATA

PHYSICAL STATE: LIQUID
APPEARANCE AND ODOR: AMBER COLORED LIQUID
BOILING POINT: 100 DEGREES C
SPECIFIC GRAVITY (H_2O=1): 1.13 - 1.14
VAPOR PRESSURE(MM HG @ 20c).NDA (NO DATA AVAILABLE)
SOLUBILITY IN WATER: COMPLETE
pH: 5.5 - 6.6
% VOLATILES BY VOLUME (AT 20C): NOT TESTED
EVAPORATION RATE: (NO DATA AVAILABLE)

REACTIVITY DATA

CONDITIONS TO AVOID: FREEZING TEMPERATURES AND HEAT GREATER THATN 40C

INCOMPATIBILITY (MATERIALS TO AVOID): .STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: MAY PRODUCE CARBON DIOXIDE AND/OR CARBON MONOXIDE; OXIDES OF NITROGEN AND SOME HYDROCHLORIC ACID VAPORS.

HAZARDOUS POLYMERIZATION:WILL NOT OCCUR.

ENVIRONMENTAL

DEGRADABILITY: (NO DATA AVAILABLE)

AQUATIC TOXICITY: CATIONIC POLYMERS ARE TOXIC TO FISH

WASTE DISPOSAL METHODS INCINERATION AND/OR DISPOSAL IN CHEMICAL LANDFILL. DISPOSER MUST COMPLY WITH FEDERAL, STATE AND LOCAL DISPOSAL OR DISCHARGE LAWS.

RCRA STATUS OF UNUSED MATERIAL IF DISCARDED: NOT A HAZARDOUS WASTE.

HAZARDOUS WASTE NUMBER: NONE

REPORTABLE QUANTITY (RQ): NONE

THRESHOLD PLANNING QUANTITY: NONE

TOXIC CHEMICAL RELEASE REPORTING: NOT APPLICABLE

EPA HAZARD CLASSIFICATION CODE

ACUTE HEALTH HAZARD: YES

FIRE: NO

CHRONIC HEALTH HAZARD: NO

PRESSURE: NO

COMMENTS

THESE DATA ARE OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

PREPARED BY: JOHN KRUPUNICH DATE: 20July2006

Filecode: P20

National Chemicals Incorporated
PO Box 32 ◥ 105 Liberty Street ◥ Winona, MN 55987 ◥ Phone: 800-533-0027 or 507-454-5640 ◥ Fax: 507-454-5641

FOR CHEMICAL EMERGENCY
Involving Shipping and Handling Spills, Leak, Fire, Exposure or Accident
Call CHEMTREC 1-800-424-9300

Complies with OSHA's Hazard Communication Standard 29 CFR 1910.1200

Section 1 - Product Identification

PRODUCT NAME: Sodium Carbonate/Soda Ash

GENERAL USE: Glass manufacture, detergent manufacture, sodium chemicals and carbonate chemicals manufacture, pulp and paper, brine treatment, water hardness removal, pH adjustment in water or wastewater, flue gas desulfurization, coal treatment, ion exchange resin regeneration.

Section 2 - Hazardous Identification

EMERGENCY OVERVIEW: White, odorless, granular solid. Product is non-combustible. Reacts with acid to release carbon dioxide gas and heat. Irritating to the eyes and continuous contact may irritate the skin. Not expected to be toxic to the environment, nor to aquatic organisms.

POTENTIAL HEALTH EFFECTS: Direct contact with the product causes irritation of the eyes and continuous contact may cause skin irritation (red, dry, cracked skin). Excessive levels of airborne dust may irritate the mucous membranes and upper respiratory tract.

Section 3 - Composition/Information on Ingredients

CHEMICAL NAME (COMMON NAME)	CAS NO.	WT. %	EC NO.	EC CLASS
Sodium Carbonate Anhydrous	497-19-8	99.8%	207-838-8	R36; S2-22-26

Section 4 - First Aid Measures

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist as necessary.

SKIN: Wash with plenty of soap and water. Get medical attention if irritation occurs and persists.

INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficultly or discomfort occurs and persists, obtain medical attention.

Notes to Medical Doctor: While internal toxicity is low, irritant effects of high concentrations may produce corneal opacities and vesicular skin reactions in humans with abraded skin only. Treatment is symptomatic and supportive.

Section 5 - Fire Fighting Measures

EXTINGUISHING MEDIA: Water, water fog, carbon dioxide (CO2), dry chemical

FIRE/EXPLOSION HAZARDS: not applicable

FIRE FIGHTING PROCEDURES: Wear full protective clothing and self-contained breathing apparatus.

FLAMMABLE LIMITS: not applicable

HAZARDOUS COMBUSTION PRODUCTS: Fumes of sodium oxide.

SENSITIVITY TO IMPACT: none

SENSITIVITY TO STATIC DISCHARGE: none

Section 9 - Accidental Release Measures

PERSONAL PRECAUTIONS: Refer to Section 8 Exposure Controls/Personal Protection.

CONTAINMENT: Prevent large quantities of this product from contacting vegetation or waterways; large spills could kill vegetation and fish.

CLEAN UP: This product, if spilled, can be recovered and re-used if contamination does not present a problem. Vacuum or sweep up the material. If the spilled product is unusable due to contamination, consult state or federal environmental agencies for acceptable disposal procedures and locations. See Section 13 Disposal Considerations.

NOTIFICATION REQUIREMENTS: Federal regulations do not require notification for spills of this product. State and local regulations may contain different requirements; consult local authorities.

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Section 7 - Handling and Storage

HANDLING: Use air conveying/mechanical systems for bulk transfer to storage. For manual handling or bulk transfer use mechanical ventilation to remove airborne dust from rail car, ship or truck. Use approved respiratory protection when ventilation systems are not available. Selection of respirators is based on the dust cloud generation. Keep material out of lakes, streams, ponds and sewer drains.

STORAGE: Store in cool, dry area, away from acids.

Section 8 - Exposure Controls / Personal Protection

ENGINEERING CONTROLS: Where possible, provide general mechanical and/or local exhaust ventilation to prevent release of airborne dust into work environment.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Appropriate eye and face protection equipment (ANSI Z87 approved) should be selected for the particular use intended for this material. Safety glasses with side shields are recommended.

RESPIRATORY: Whenever dust is in the worker's breathing zone cannot be controlled with ventilation or other engineering means, workers should wear respirators or dust masks approved by NIOSHA/MSHA, EU CEN or comparable certification organization to protect them against airborne dust.

PROTECTIVE CLOTHING: Dry product is generally non-irritating to intact skin. However, this product can be irritating where skin has been damaged and can create skin irritation after long exposures when moisture is present. Under such conditions, gloves and long-sleeved clothing are recommended to minimize skin contact.

ADDITIONAL EXPOSURES GUIDELINES: Federal guidelines treat the ingredients in this product as a nuisance dust, as no product-specific guidelines have been issued for exposure. As with all nuisance dusts, worker breathing zone concentrations should be measured by validated sampling and analytical methods. The following limits (OSHA and MSHA) apply to this material:

Particulates not otherwise regulated: OSHA (PEL/TWA): 15 mg/m3 (total dust); 5mg/m3 (resp fraction)
MSHA (PEL/TWA): 10 mg/m3 (total dust)

The information noted above provides general guidance for handling this product. Specific work environments and material handling practices will dictate the selection and use of personal protection equipment (PPE).

Section 9 - Physical and Chemical Properties

ODOR:	Odorless
APPEARANCE:	White, granular solid
AUTO-IGNITION TEMPERATURE:	not applicable
BOILING POINT:	Decomposes
COEFFICIENT OF OIL/WATER:	not applicable
DENSITY/WEIGHT PER VOLUME:	(g/mL) Dense Grades = 0.86 - 1.12; Light Grades = 0.70 - 0.90
EVAPORATION RATE:	not applicable
FLASH POINT:	Non-combustible
FREEZING POINT:	851° C (1564° F)
ODOR THRESHOLD:	not applicable
OXIDIZING PROPERTIES:	not applicable
PERCENT VOLATILE:	not applicable
EVAPORATION RATE:	not applicable
pH:	11.4 (1% solution)
SOLUBILITY IN WATER:	33.2% maximum
VAPOR DENSITY:	not applicable
VAPOR PRESSURE:	not applicable

Section 10 - Stability and Reactivity

CONDITIONS TO AVOID: Contact with acids except under controlled conditions.

STABILITY: Stable

POLYMERIZATION: Will not occur

INCOMPATIBLE MATERIALS: Reacts with acids with release of large volumes of carbon dioxide gas and heat.

HAZARDOUS DECOMPOSITION PRODUCTS: Heated to decomposition, it emits fumes of sodium oxide.

MATERIALS TO AVOID: Aluminum powder, acids, fluorine, molten lithium

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Section 11 - Toxicological Information

EYE EFFECTS: Severe irritant (rabbit) (Toxicology 23:281 (1982)).

SKIN EFFECTS: Non-irritating to intact skin. Minor irritation may occur on abraded skin. (Toxicol. Appl. Pharmacol. 31:481 (1975))

DERMAL LD50: No data available for the product.

ORAL LD50: Harmful if swallowed.

INHALATION LC50: 2.3mg/1 (2h) (rat) (Environ, Res. 31:138 (1983)).

SENSITIZATION: 0.25% sodium carbonate: Non-sensitizing (human) (Toxicol. Appl. Pharmacol. 31:481 (1975)).

TARGET ORGANS: Eyes.

ACUTE EFFECTS FROM OVEREXPOSURE: May cause severe irritation of the eyes, including corneal opacities. Dusts and mists may be irritating to the skin, mucous membranes and upper respiratory tract. No significant acute toxicological effects expected.

CHRONIC EFFECTS FROM OVEREXPOSURE: No data available for the product.

EYES: Immediately flush with cool, running water for at least 15 minutes.

SKIN: Immediately wash skin and clothing with soap and water.

INHALATION: Remove to fresh air. If breathing is difficult, get medical attention.

INGESTION: Rinse mouth at once; give vinegar or juice of lemon, orange or grapefruit. Do not induce vomiting.

CARCINOGENICITY:

NTP: not listed

IARC: not listed

OSHA: not listed

OTHER: (ACGIH) not listed

Section 12 - Ecological Information

ECOTOXICOLOGICAL INFORMATION: 96-hour LC50 = 265-565 mg/L (daphnia magnia) (low toxicity)
96-hour LC50 = 300-320 mg/L (bluegill sunfish) (low toxicity)

CHEMICAL FATE INFORMATION: Biodegradability does not apply to inorganic substances. No significant toxicity to aquatic organisms is expected.

Section 13 - Disposal Method

DISPOSAL METHOD: When this product is discarded or disposed of, as purchased, it is neither a characteristic nor a listed hazardous waste according to US Federal RCRA regulations (40 CFR 261). As a non-hazardous waste the material may be disposed of in a landfill in accordance with government regulations; check local or state regulations for applicable requirements prior to disposal. Any processing, usage, alteration, chemical additions to, or contamination of, the product may alter the disposal requirements. Under Federal regulations, it is the generator's responsibility to determine if a waste is a hazardous waste.

Section 14 - Transportation Information

US DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME: not regulated

PRIMARY HAZARD CLASS/DIVISION: not applicable

UN/NA NUMBER: none

LABEL(S): not applicable

PLACARD(S): not applicable

MARKING(S): not applicable

ADDITIONAL INFORMATION: Hazardous Substance/RQ: not applicable 49 STCC Number: not applicable

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

ADDITIONAL INFORMATION: not regulated

ADR - EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD

ADDITIONAL INFORMATION: not regulated

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Section 15 - Regulatory Information

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A): not listed

SECTION 311 HAZARD CATEGORIES (40 CFR 370): Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370): The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lb; however, this product contains the following ingredients with a TPQ of less than 10,000 lb: None

SECTION 313 HAZARD REPORTABLE INGREDIENTS (40 CFR 370): not listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION AND REPORTABLE QUANTITIES (RQ) (40 CFR 302.4): not listed

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA INVENTORY STATUS (40 CFR 710): listed

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA IDENTIFICATION OF HAZARDOUS WASTE (40 CFR 261): Waste Number: Refer to Section 13 Disposal Methods for RCRA status.

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM)

PRODUCT IDENTIFICATION NUMBER: not applicable

HAZARD CLASSIFICATION / DIVISION: D.2.B, E

INGREDIENT DISCLOSURE LIST: listed

DOMESTIC SUBSTANCE LIST: listed

E NUMBERS: E500

EU EINECS NUMBERS: 011-005-00-2

INTERNATIONAL LISTINGS

AUSTRALIA (AICS): listed

CHINA: listed

JAPAN (ENCS): (1)-164

KOREA: KE-31380

PHILIPPINES (PICCS): listed

INTERNATIONAL LISTINGS

AUSTRALIA (AICS): listed

HAZARD, RISK AND SAFETY PHRASE DESCRIPTIONS

SODIUM CARBONATE:

EC Symbols: Xi (irritant)

EC Risk Phrases: R36 (Irritating to eyes)

EC Safety Phrases: S2 (Keep out of reach of children)
S22 (Do not breathe dust)
S26 (In case of contact with eyes, rinse immediately with plenty of water and seek medical advice)

FOR CHEMICAL EMERGENCY

Involving Shipping and Handling Spills, Leak, Fire, Exposure or Accident

Call CHEMTREC 1-800-424-9300

The information and recommendations in this Material Safety Data Sheet are based upon data believed to be correct and does not relate to its use in combination with any other material or process. Since use conditions vary, we assume no liability for failure to follow product use direction and safety precautions. As data, standards and regulations change; NO WARRANTY, EXPRESS OR IMPLIED, IS MADE AS TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION.

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VITA-D-CHLOR™ Tablets

Manufactured by:
Integra Chemical Co
1216 6th Ave N
Kent WA 98032
253.479.7000

MATERIAL SAFETY DATA SHEET

MSDS Number: V325, Revision 005
Revision date: 4/8/08

24 Hour Emergency Response: CHEMTREC 800-424-9300
(Outside USA: 703-527-3887)

PRODUCT IDENTIFICATION

Product name: Vita-D-Chlor, Tablets
Functional use: Dechlorinator
Chemical formula: Proprietary
Chemical family: Organic acid
Product number: V325.50

HAZARD OVERVIEW

HMIS Rating: 0-1-0-B
NPFA: None established

Warning Label: Caution. Use safe chemical handling practices. Keep container closed. Use with adequate ventilation. Avoid breathing dust. Avoid contact with skin, eyes, and clothing. Wash thoroughly after handling.

COMPOSITION/INFORMATION ON INGREDIENTS

		ACGIH TLV/TWA	OSHA PEL/TWA
Organic acid	75%	Not listed	Not listed
Organic binder	25%	Not listed	Not listed

PHYSICAL DATA

Boiling point: NA
Melting point: NA
Specific gravity: NA
Evaporation rate: NA
Vapor pressure: NA
Vapor density: NA
Solubility: 33g/100mL water @25°C
pH (1% solution): 2 to 3
Appearance: 2 5/8” tablets, slight citrus odor

FIRE AND EXPLOSION DATA

Flash point: NA
Auto-ignition temperature: NA
Flammable limits (% by volume in air)
Upper: NA
Lower: NA
Fire extinguishing media: Water spray, CO_2, dry chemical, or foam
Special firefighting procedures: Use water to cool nearby containers and structures. Wear full protective equipment, including suitable respiratory protection.
Unusual fire and explosion hazards: As with most organic solids, combustion is possible at elevated temperatures.

HEALTH HAZARD INFORMATION

Effects of overexposure:
Contact: Contact may cause skin or eye irritation.
Ingestion: No harmful effects expected.
Inhalation: Inhalation may irritate the nose, throat and upper respiratory tract.
Chronic effects of overexposure: None identified
Medical conditions aggravated by exposure: None identified
Target organs: None identified
Reproductive effects: None identified
Exposure limits: None established
Toxicity data: No information available
Carcinogenicity: No listings by NTP, IARC, or OSHA

VITA-D-CHLOR™ Tablets

Manufactured by:
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24 Hour Emergency Response: CHEMTREC 800-424-9300
(Outside USA: 703-527-3887)

EMERGENCY FIRST AID PROCEDURES

Skin contact: Wash with soap and water. Seek medical attention if irritation develops.
Eye contact: Flush eyes with water for at least 15 minutes. If irritation persists, seek medical attention.
Inhalation: Remove to fresh air. If adverse symptoms develop, seek medical attention.
Ingestion: If adverse symptoms develop, seek medical attention.

REACTIVITY DATA

Stability: Stable
Hazardous polymerization: Will not occur
Incompatibles: Incompatible with strong acids, strong bases, strong oxidizers
Decompostion products: Oxides of carbon (CO, CO2)
Conditions to avoid: Exposure to light, air, moisture and high temperatures.

SPILL AND DISPOSAL PROCEDURES

Spill and leak procedures: Sweep or scoop into clean, dry disposal container. Wear protective equipment. Flush spill area with water.
Disposal procedures: Dispose in accordance with all Local, State and Federal regulations.

PROTECTIVE EQUIPMENT

Ventilation: Use adequate general or local exhaust ventilation to keep fume dust levels as low as possible.
Respiratory protection: None needed unless use generates annoying or irritating dusts. Use a dust respirator mask if necessary.
Skin and eye protective equipment: Safety glasses. Use good chemical handling practices.

STORAGE AND HANDLING PRECAUTIONS

Storage area: General. Store in a cool, dry area. Keep away from incompatible substances. Protect from direct light and minimize contact with air. Protect containers from physical damage. Keep material dry.

TRANSPORTATION INFORMATION

Material is not regulated via either ground or air transportation.

REGULATORY INFORMATION

TSCA Inventory: ☑ SARA EHS TPQ: ☐
CERCLA RQ: ☐ SARA 313 Toxic Release de minimus:

SARA hazard categories:	Acute	Chronic	Flammability	Pressure	Reactvity
	☐	☐	☐	☐	☐

Clean Air Act categories:	SOCMI	HAP	Volatile HAP	Organic HAP	Ozone depleting
	☐	☐	☐	☐	☐

MSDS Revision History:
001 - Original MSDS
002 - Updated header information
003 - Zip Code Change
004 - Overall review, reformat
005 - Updated header information

NE = Not established; NA = Not applicable or Not available

The information presented above is offered for informational purposes only. This MSDS, and the associated product, is intended for use only by technically qualified persons, and at their own discretion and risk. Since conditions and manner of use are outside the control of Integra Chemical Company, we make no warranties, either expressed or implied, and assume no liability in connection with any use of the information.

Appendix O: Financial Plan Rate Models

Friday Harbor
Water Utility Rate Study
Summary

Revenue Requirements	2013	2014	2015	2016	2017	2018
Revenues						
Rate Revenues Under Existing Rates	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Non-Rate Revenues	9,020	9,238	9,986	10,781	11,621	11,775
Total Revenues	**$ 1,746,020**	**$ 1,753,186**	**$ 1,760,910**	**$ 1,768,709**	**$ 1,776,580**	**$ 1,783,794**
Expenses						
Cash Operating Expenses	$ 1,256,017	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	138,607	449,215	667,219	712,368
Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
Total Expenses	**$ 1,756,017**	**$ 1,784,045**	**$ 1,967,221**	**$ 2,324,765**	**$ 2,592,246**	**$ 2,689,603**
Net Surplus (Deficiency)	**$ (9,997)**	**$ (30,859)**	**$ (206,311)**	**$ (556,056)**	**$ (815,665)**	**$ (905,809)**
% of Rate Revenue	0.58%	1.77%	11.78%	31.63%	46.21%	51.12%
Annual Rate Adjustment	**7.00%**	**9.00%**	**9.00%**	**9.00%**	**9.00%**	**3.00%**
Cumulative Rate Adjustment	**7.00%**	**16.63%**	**27.13%**	**38.57%**	**51.04%**	**55.57%**
Rate Revenues After Rate Increase	$ 1,797,795	$ 2,033,967	$ 2,225,892	$ 2,435,927	$ 2,665,781	$ 2,756,737
Additional Taxes from Rate Increase	$ 3,057	$ 14,585	$ 23,886	$ 34,097	$ 45,302	$ 49,521
Net Cash Flow After Rate Increase	**47,741**	**244,574**	**244,771**	**87,846**	**39,854**	**29,388**
Coverage After Rate Increases	3.37	n/a	n/a	n/a	n/a	n/a
Sample Bill (SF in Town, 5/8" meter, 4,100 gallons per month)	$ 74.63	$ 81.35	$ 88.67	$ 96.65	$ 105.35	$ 108.51
Monthly Increase	$ 4.88	$ 6.72	$ 7.32	$ 7.98	$ 8.70	$ 3.16

Friday Harbor
Water Utility Rate Study
Summary

Fund Balance	2013	2014	2015	2016	2017	2018
Operating Fund						
Beginning Balance	**$ 188,000**	**$ 206,469**	**$ 211,076**	**$ 218,402**	**$ 226,118**	**$ 234,251**
Net Cash Flow after Rate Increase	47,741	244,574	244,771	87,846	39,854	29,388
Transfer of Surplus to Capital Fund	(29,272)	(239,967)	(237,445)	(80,131)	(31,721)	(20,806)
Ending Balance	**$ 206,469**	**$ 211,076**	**$ 218,402**	**$ 226,118**	**$ 234,251**	**$ 242,833**
Minimum Target Balance	*$ 206,469*	*$ 211,076*	*$ 218,402*	*$ 226,118*	*$ 234,251*	*$ 242,833*
Days	60	60	60	60	60	60
Capital Fund						
Beginning Balance	**$ 2,867,350**	**$ 3,061,448**	**$ 3,679,201**	**$ 2,841,473**	**$ 2,560,979**	**$ 2,837,633**
plus: Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
plus: Transfer from Major Repairs Reserve	19,850	19,500	19,500	19,500	19,500	19,500
plus: Transfer from Equipment Reserve	-	-	-	-	-	-
plus: Transfer from Study Reserve	13,000	-	-	-	-	-
plus: Grants / Donations / CAIC	-	-	-	-	-	-
plus: Additional Proceeds (Costs)	-	-	-	-	-	-
plus: General Facilities Charge	115,000	118,439	122,480	126,659	130,980	135,450
plus: Revenue Bond Proceeds	-	-	-	-	-	-
plus: PWTF Loans	-	-	2,031,000	2,985,000	908,000	-
plus: Other Low Interest Loan Proceeds	-	-	2,031,000	2,985,000	908,000	-
plus: Interest Earnings	2,500	7,654	18,396	21,311	25,610	28,376
plus: Transfer of Surplus from Operating Fund	29,272	239,967	237,445	80,131	31,721	20,806
Total Capital Funding Sources	3,546,972	3,947,007	8,639,022	9,559,073	5,084,791	3,541,765
less: Capital Expenditures (inlfated)	(485,524)	(267,806)	(5,797,549)	(6,998,094)	(2,247,158)	(1,796,753)
Ending Balance	**3,061,448**	**3,679,201**	**2,841,473**	**2,560,979**	**2,837,633**	**1,745,012**
Minimum Target Balance	*$ 204,844*	*$ 210,200*	*$ 326,151*	*$ 466,113*	*$ 511,056*	*$ 546,991*

Friday Harbor
Water Utility Rate Study
Assumptions

Economic & Financial Factors	2013	2014	2015	2016	2017	2018
1 General Cost Inflation	2.07%	2.50%	3.00%	3.00%	3.00%	3.00%
2 Construction Cost Inflation	3.19%	3.50%	4.00%	4.00%	4.00%	4.00%
3 Labor Cost Inflation	2.07%	2.50%	3.00%	3.00%	3.00%	3.00%
4 Benefit Cost Inflation	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
5 Customer Growth	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
6 ERU Growth	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
7 General Inflation plus Growth	2.48%	2.91%	3.41%	3.41%	3.41%	3.41%
8 No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Fund Earnings (3-year average of the LGIP)	0.19%	0.25%	0.50%	0.75%	1.00%	1.00%
Local / State Excise Tax	5.029%	5.029%	5.029%	5.029%	5.029%	5.029%
State B&O Tax	1.65%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions		2013	2014	2015	2016	2017	2018
FISCAL POLICY RESTRICTIONS							
Min. Op. Fund Balance Target (days of O&M expense)		60	60	60	60	60	60
Max. Op. Fund Balance (days of O&M expense)		60	60	60	60	60	60
Minimum Capital Fund Balance Target							
Select Minimum Capital Fund Balance Target	1	**Defined as % of Plant**					
1 - Defined as % of Plant							
Plant-in-Service in 2012	$ 9,756,686						
Minimum Capital Fund Balance - % of plant assets		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>		$ -	$ -	$ -	$ -	$ -	$ -
RATE FUNDED SYSTEM REINVESTMENT							
Select Reinvestment Funding Strategy	3	**User Input**					
Amount of Annual Cash Funding from Rates							
1 - Equal to Annual Depreciation Expense							
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments							
3 - Equal to Amount at Right ==>		$ -	$ -	$ -	$ -	$ -	$ -
4 - Do Not Fund System Reinvestment							

Friday Harbor
Water Utility Rate Study
Assumptions

Capital Financing Assumptions		2013	2014	2015	2016	2017	2018
General Facilities Charge (GFC)							
General Facilities Charge		$ 10,124	$ 10,377	$ 10,688	$ 11,009	$ 11,339	$ 11,680
Total Equivalent Residential Units (Estimate Based on WSP)		2,853	2,865	2,876	2,888	2,899	2,911
Additional Units Per Year		11	11	11	12	12	12
GFC Revenues		**$ 115,000**	**$ 118,439**	**$ 122,480**	**$ 126,659**	**$ 130,980**	**$ 135,450**
FUNDING SOURCES							
Grants		$ -	$ -	$ -	$ -	$ -	$ -
Additional Proceeds (Costs)							
[Extra line]		$ -	$ -	$ -	$ -	$ -	$ -
[Extra line]		-	-	-	-	-	-
[Extra line]		-	-	-	-	-	-
Total Additional Proceeds		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
REVENUE BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	**1.25**						
PWTF LOAN							
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20
Interest Cost		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Actual 2012	Budget 2013	Projection 2014	Projection 2015	Projection 2016	Projection 2017	Projection 2018
Rate revenues									
Usage Charge	6	ERU Growth	$ 779,828	$ 767,000	$ 770,068	$ 773,148	$ 776,241	$ 779,346	$ 782,463
Base Charge	5	Customer Growth	972,213	970,000	973,880	977,776	981,687	985,613	989,556
[Other]	5	Customer Growth	-	-	-	-	-	-	-
Total Rate revenue			**$ 1,752,041**	**$ 1,737,000**	**$ 1,743,948**	**$ 1,750,924**	**$ 1,757,927**	**$ 1,764,959**	**$ 1,772,019**
Non-rate revenues									
Installation Charge	5	Customer Growth	$ 15,357	$ 5,000	$ 5,020	$ 5,040	$ 5,060	$ 5,080	$ 5,101
Main Extension	1	General Cost Inflation	-	100	103	106	109	112	115
Labor & Material Charge	1	General Cost Inflation	90	500	513	528	544	560	577
Reconnect Fees	5	Customer Growth	1,530	1,300	1,305	1,310	1,316	1,321	1,326
Interest Income	1	General Cost Inflation	-	-	-	-	-	-	-
Equipment Rental	1	General Cost Inflation	-	100	103	106	109	112	115
Lease	1	General Cost Inflation	-	100	103	106	109	112	115
Sale of Timber	1	General Cost Inflation	-	10	10	11	11	11	12
Labor & Industries Refund	1	General Cost Inflation	413	100	103	106	109	112	115
Main Extension Reimbursements	1	General Cost Inflation	-	100	103	106	109	112	115
Miscellaneous Revenue	8	No Escalation	1,029	1,000	1,000	1,000	1,000	1,000	1,000
Sale of Recyclables	1	General Cost Inflation	255	100	103	106	109	112	115
Wellness Baskets	1	General Cost Inflation	132	100	103	106	109	112	115
Prior Year Refund/Reimbursement	1	General Cost Inflation	-	10	10	11	11	11	12
Total Non-rate revenues			**$ 18,806**	**$ 8,520**	**$ 8,576**	**$ 8,639**	**$ 8,703**	**$ 8,768**	**$ 8,834**
TOTAL REVENUES			**$ 1,770,847**	**$ 1,745,520**	**$ 1,752,524**	**$ 1,759,562**	**$ 1,766,630**	**$ 1,773,727**	**$ 1,780,853**

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

Expenditures		FORECAST BASIS	Actual	Budget 2013	Projection 2014	Projection 2015	Projection 2016	Projection 2017	Projection 2018
Revenue Taxes		*Excise Tax Rate*	84,583	$ 87,354	$ 87,703	$ 88,054	$ 88,406	$ 88,760	$ 89,115
State Tax on Hookups and Non-Rate Revenue		*B&O Tax Rate*	6,095	2,038	1,905	1,967	2,030	2,096	2,164
Utilities Administration									
Personnel	3	Labor Cost Inflation	$ 29,285	$ 30,600	$ 31,365	$ 32,306	$ 33,275	$ 34,273	$ 35,302
Benefits	4	Benefit Cost Inflation	8,295	9,000	9,900	10,890	11,979	13,177	14,495
Supplies	1	General Cost Inflation	846	750	769	792	816	840	865
Fuel	1	General Cost Inflation	110	200	205	211	217	224	231
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Legal	1	General Cost Inflation	1,203	1,500	1,538	1,584	1,631	1,680	1,730
Professional Services	3	Labor Cost Inflation	152	100	103	106	109	112	115
Communications	1	General Cost Inflation	837	950	974	1,003	1,033	1,064	1,096
Travel / Training	1	General Cost Inflation	29	1,000	1,025	1,056	1,087	1,120	1,154
Advertising	1	General Cost Inflation	44	50	51	53	54	56	58
Equipment Rental	1	General Cost Inflation	-	50	51	53	54	56	58
Utilities	1	General Cost Inflation	784	800	820	845	870	896	923
Repairs & Maintenance	1	General Cost Inflation	435	1,100	1,128	1,161	1,196	1,232	1,269
Miscellaneous	1	General Cost Inflation	1,249	1,450	1,486	1,531	1,577	1,624	1,673
San Juan County	1	General Cost Inflation	74	-	-	-	-	-	-
Intergovernmental	8	No Escalation	-	200	200	200	200	200	200
Improvements	1	General Cost Inflation	231	100	103	106	109	112	115
Equipment	1	General Cost Inflation	2,834	1,150	1,179	1,214	1,251	1,288	1,327
Administration Planning									
Personnel	3	Labor Cost Inflation	19,546	20,300	20,808	21,432	22,075	22,737	23,419
Benefits	4	Benefit Cost Inflation	5,594	6,100	6,710	7,381	8,119	8,931	9,824
Professional Services	3	Labor Cost Inflation	2,667	100	103	106	109	112	115
Travel / Training	1	General Cost Inflation	1,033	400	410	422	435	448	461
Miscellaneous	1	General Cost Inflation	-	100	103	106	109	112	115
Equipment	1	General Cost Inflation	375	100	103	106	109	112	115
System Administrator									
Personnel	3	Labor Cost Inflation	14,952	13,900	14,248	14,675	15,115	15,569	16,036
Benefits	4	Benefit Cost Inflation	3,385	3,100	3,410	3,751	4,126	4,539	4,993
Supplies	1	General Cost Inflation	-	100	103	106	109	112	115
Small Tools	1	General Cost Inflation	17	100	103	106	109	112	115
Professional Services	3	Labor Cost Inflation	1,272	1,125	1,153	1,188	1,223	1,260	1,298
Travel / Training	1	General Cost Inflation	406	1,000	1,025	1,056	1,087	1,120	1,154
Repair & Maintenance	1	General Cost Inflation	-	100	103	106	109	112	115
Miscellaneous	1	General Cost Inflation	62	200	205	211	217	224	231
Equipment	1	General Cost Inflation	1,530	1,200	1,230	1,267	1,305	1,344	1,384

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Actual	Budget	Projection	Projection	Projection	Projection	Projection
Finance / Customer Service									
Personnel	3	Labor Cost Inflation	32,250	33,200	34,030	35,051	36,102	37,185	38,301
Overtime	3	Labor Cost Inflation	40	250	256	264	272	280	288
Benefits	4	Benefit Cost Inflation	10,447	11,700	12,870	14,157	15,573	17,130	18,843
Supplies	1	General Cost Inflation	-	500	513	528	544	560	577
Professional Services	3	Labor Cost Inflation	3,434	4,600	4,715	4,856	5,002	5,152	5,307
Communications	1	General Cost Inflation	628	50	51	53	54	56	58
Travel / Training	1	General Cost Inflation	598	800	820	845	870	896	923
Repair & Maintenance	1	General Cost Inflation	-	50	51	53	54	56	58
Miscellaneous	1	General Cost Inflation	-	50	51	53	54	56	58
Intergovernmental	1	General Cost Inflation	4,183	4,600	4,715	4,856	5,002	5,152	5,307
Equipment	1	General Cost Inflation	1,655	100	103	106	109	112	115
Meter Reading									
Personnel	3	Labor Cost Inflation	6,920	5,500	5,638	5,807	5,981	6,160	6,345
Overtime	3	Labor Cost Inflation	-	100	103	106	109	112	115
Benefits	4	Benefit Cost Inflation	2,582	2,200	2,420	2,662	2,928	3,221	3,543
Supplies	1	General Cost Inflation	33	100	103	106	109	112	115
Fuel	1	General Cost Inflation	863	1,000	1,025	1,056	1,087	1,120	1,154
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Repair & Maintenance	1	General Cost Inflation	2,033	2,100	2,153	2,217	2,284	2,352	2,423
Miscellaneous	1	General Cost Inflation	81	50	51	53	54	56	58
Equipment	1	General Cost Inflation	7,160	600	615	633	652	672	692
Treatment									
Personnel	3	Labor Cost Inflation	106,022	112,000	114,800	118,244	121,791	125,445	129,208
Overtime	3	Labor Cost Inflation	40,817	40,000	41,000	42,230	43,497	44,802	46,146
Benefits	4	Benefit Cost Inflation	38,898	35,600	39,160	43,076	47,384	52,122	57,334
Supplies	1	General Cost Inflation	50,830	60,000	61,500	63,345	65,245	67,203	69,219
Fuel	1	General Cost Inflation	1,823	2,500	2,563	2,639	2,719	2,800	2,884
Small Tools	1	General Cost Inflation	-	250	256	264	272	280	288
Professional Services	3	Labor Cost Inflation	5,669	7,750	7,944	8,182	8,428	8,680	8,941
Communications	1	General Cost Inflation	2,707	3,050	3,126	3,220	3,317	3,416	3,519
Travel / Training	1	General Cost Inflation	3,827	1,500	1,538	1,584	1,631	1,680	1,730
Advertising	1	General Cost Inflation	68	50	51	53	54	56	58
Equipment Rental	1	General Cost Inflation	-	250	256	264	272	280	288
Utilities	1	General Cost Inflation	58,202	60,000	61,500	63,345	65,245	67,203	69,219
Repairs & Maintenance	1	General Cost Inflation	66,937	112,800	115,620	119,089	122,661	126,341	130,131
Miscellaneous	1	General Cost Inflation	446	900	923	950	979	1,008	1,038
Intergovernmental	1	General Cost Inflation	4,665	5,200	5,330	5,490	5,655	5,824	5,999
Improvements	1	General Cost Inflation	-	32,500	15,000	15,450	15,914	16,391	16,883
Equipment	1	General Cost Inflation	9,827	8,325	8,533	8,789	9,053	9,324	9,604

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Actual	Budget	Projection	Projection	Projection	Projection	Projection
Distribution									
Personnel	3	Labor Cost Inflation	116,315	150,800	154,570	159,207	163,983	168,903	173,970
Overtime	3	Labor Cost Inflation	6,467	5,500	5,638	5,807	5,981	6,160	6,345
Benefits	4	Benefit Cost Inflation	44,424	58,800	64,680	71,148	78,263	86,089	94,698
Supplies	1	General Cost Inflation	31,588	25,000	25,625	26,394	27,186	28,001	28,841
Fuel	1	General Cost Inflation	5,887	6,500	6,663	6,862	7,068	7,280	7,499
Small Tools	1	General Cost Inflation	41	250	256	264	272	280	288
Professional Services	3	Labor Cost Inflation	9,614	8,250	8,456	8,710	8,971	9,240	9,518
Communications	1	General Cost Inflation	1,491	1,500	1,538	1,584	1,631	1,680	1,730
Travel / Training	1	General Cost Inflation	2,039	5,000	5,125	5,279	5,437	5,600	5,768
Advertising	1	General Cost Inflation	68	50	51	53	54	56	58
Equipment Rental	1	General Cost Inflation	-	100	103	106	109	112	115
Utilities	1	General Cost Inflation	15,175	15,400	15,785	16,259	16,746	17,249	17,766
Repairs & Maintenance	1	General Cost Inflation	17,063	7,800	7,995	8,235	8,482	8,736	8,998
Miscellaneous	1	General Cost Inflation	168	1,250	1,281	1,320	1,359	1,400	1,442
Intergovernmental	1	General Cost Inflation	1,962	2,300	2,358	2,428	2,501	2,576	2,653
Improvements	1	General Cost Inflation	5,283	11,000	11,275	11,613	11,962	12,320	12,690
Equipment	1	General Cost Inflation	2,332	10,675	10,942	11,270	11,608	11,956	12,315
Cross Connection									
Personnel	3	Labor Cost Inflation	24,727	23,800	24,395	25,127	25,881	26,657	27,457
Overtime	3	Labor Cost Inflation	66	100	103	106	109	112	115
Benefits	4	Benefit Cost Inflation	5,511	6,400	7,040	7,744	8,518	9,370	10,307
Supplies	1	General Cost Inflation	89	100	103	106	109	112	115
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Professional Services	3	Labor Cost Inflation	332	450	461	475	489	504	519
Communications	1	General Cost Inflation	144	-	-	-	-	-	-
Travel / Training	1	General Cost Inflation	519	500	513	528	544	560	577
Miscellaneous	1	General Cost Inflation	10	50	51	53	54	56	58
Intergovernmental	1	General Cost Inflation	-	50	51	53	54	56	58
Watershed									
Personnel	3	Labor Cost Inflation	504	100	103	106	109	112	115
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Professional Services	3	Labor Cost Inflation	2,246	3,400	3,485	3,590	3,697	3,808	3,922
Communications	1	General Cost Inflation	-	-	-	-	-	-	-
Travel / Training	1	General Cost Inflation	-	100	103	106	109	112	115
Equipment Rental	1	General Cost Inflation	-	500	513	528	544	560	577
Miscellaneous	1	General Cost Inflation	-	50	51	53	54	56	58
Intergovernmental	1	General Cost Inflation	1,208	1,250	1,281	1,320	1,359	1,400	1,442
Improvements	1	General Cost Inflation	4,897	-	-	-	-	-	-
Equipment	1	General Cost Inflation	-	8,100	8,303	8,552	8,808	9,072	9,345

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Actual	Budget	Projection	Projection	Projection	Projection	Projection
Other Operating									
Physical / CDL Costs	1	General Cost Inflation	241	200	205	211	217	224	231
Supplies	1	General Cost Inflation	245	200	205	211	217	224	231
Professional Services	3	Labor Cost Inflation	-	100	103	106	109	112	115
Personnel Issues	1	General Cost Inflation	17,116	-	-	-	-	-	-
Communications	1	General Cost Inflation	1,538	3,000	3,075	3,167	3,262	3,360	3,461
Advertising	1	General Cost Inflation	137	200	205	211	217	224	231
Equipment Rental	1	General Cost Inflation	760	800	820	845	870	896	923
Insurance	1	General Cost Inflation	40,609	41,950	42,999	44,289	45,617	46,986	48,395
Repairs & Maintenance	1	General Cost Inflation	66	200	205	211	217	224	231
Miscellaneous	1	General Cost Inflation	1,748	2,900	2,973	3,062	3,154	3,248	3,346
Intergovernmental	1	General Cost Inflation	294	1,000	1,025	1,056	1,087	1,120	1,154
Main Extension									
Professional Services	3	Labor Cost Inflation	15,819	500	513	528	544	560	577
Connection Costs									
Personnel	3	Labor Cost Inflation	1,156	500	513	528	544	560	577
Benefits	4	Benefit Cost Inflation	474	100	110	121	133	146	161
Supplies	1	General Cost Inflation	-	1,500	1,538	1,584	1,631	1,680	1,730
Legal	1	General Cost Inflation	-	100	103	106	109	112	115
Professional Services	3	Labor Cost Inflation	-	500	513	528	544	560	577
Miscellaneous	1	General Cost Inflation	-	100	103	106	109	112	115
Intergovernmental	1	General Cost Inflation	-	-	-	-	-	-	-
Improvements									
Professional Services	3	Labor Cost Inflation	-	500	513	528	544	560	577
Improvements	7	General Inflation plus Growth	-	13,500	10,000	10,341	10,694	11,059	11,436
Other Uses (Transfers)									
To Separation Reserve	8	No Escalation	3,850	500	500	500	500	500	500
To Wellness Reserve	8	No Escalation	1,611	1,500	1,500	1,500	1,500	1,500	1,500
To Bond Redemption	8	No Escalation	137,300	-	-	-	-	-	-
To Public Works Fund	8	No Escalation	20,000	20,000	20,000	20,000	20,000	20,000	20,000
To Capital Projects Fund	8	No Escalation	400,000	500,000	500,000	500,000	500,000	500,000	500,000
To Repair Reserve	8	No Escalation	19,500	19,500	19,500	19,500	19,500	19,500	19,500
To Land Reserve	8	No Escalation	-	100	100	100	100	100	100
To Studies Reserve	2	Construction Cost Inflation	20,000	20,000	33,333	34,667	36,053	37,495	38,995
To Equipment Reserve	8	No Escalation	34,600	34,600	34,600	34,600	34,600	34,600	34,600
Non Expenditures									
Prior Year Refund	8	No Escalation	204	100	-	-	-	-	-
Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-	-
Total Cash O&M Expenditures			**$ 1,669,004**	**$ 1,756,017**	**$ 1,784,045**	**$ 1,828,614**	**$ 1,875,550**	**$ 1,925,027**	**$ 1,977,234**
Depreciation Expense in	2012	$ -							
Depreciation Expense [b]	*Last year's plus annual additions from CIP*		$ 8,163	$ 16,325	$ 21,681	$ 137,632	$ 277,594	$ 322,537	$ 358,472
TOTAL EXPENSES			**$ 1,677,167**	**$ 1,772,342**	**$ 1,805,726**	**$ 1,966,246**	**$ 2,153,144**	**$ 2,247,564**	**$ 2,335,707**

Friday Harbor
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2012

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	2013	2014	2015	2016	2017	2018	Life in Years
1	**2013 BUDGET - Water Capital**							50
2	Water System Improvement Advertising	500						50
3	Sodium Hypochlorite System (Treatment 2)	-						50
4	Water Mains	-						50
5	Media Change (repairs)	1,000						50
6	Leak Detection (repairs)	1,000						50
7	Complete Comprehensive Plan	13,000						50
8								50
9	**CIP - BROWN AND CALDWELL**							50
10	Source – 1							50
11	Treatment – 1							50
11	Treatment – 2	75,000						50
12	Storage – 1					355,000		50
13	Water Supply Pipeline – 1	65,000		3,611,000	3,611,000			50
14	Water Supply Pipeline – 2	65,000			1,492,000	1,492,000		50
15	Distribution – 1			731,000				50
16	Distribution – 2						1,251,000	50
17	Distribution – 3						169,000	50
18	Distribution – 4	160,000	160,000					50
19	Distribution – 5	90,000	90,000					50
20	Distribution – 6			812,000				50
21	Distribution – 7				879,000			50
22	Management – 1							50
23								50
24								50
50								50
	Total Capital Projects	**$ 470,500**	**$ 250,000**	**$ 5,154,000**	**$ 5,982,000**	**$ 1,847,000**	**$ 1,420,000**	
	Total Upgrade/Expansion Projects	468,500	250,000	5,154,000	5,982,000	1,847,000	1,420,000	
	Total R&R Projects	2,000	-	-	-	-	-	
	Projects by Grants / Developer Donations							
	Projects by Enterprise Fund							

Friday Harbor
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2012

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	TOTAL ESCALATED COSTS	2013	2014	2015	2016	2017	2018
1	**2013 BUDGET - Water Capital**	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Water System Improvement Advertising	516	516	-	-	-	-	-
3	Sodium Hypochlorite System (Treatment 2)	-	-	-	-	-	-	-
4	Water Mains	-	-	-	-	-	-	-
5	Media Change (repairs)	1,032	1,032	-	-	-	-	-
6	Leak Detection (repairs)	1,032	1,032	-	-	-	-	-
7	Complete Comprehensive Plan	13,415	13,415	-	-	-	-	-
8		-	-	-	-	-	-	-
9	**CIP - BROWN AND CALDWELL**	-	-	-	-	-	-	-
10	Source – 1	230,918	-	-	-	-	-	-
11	Treatment – 1	230,918	-	-	-	-	-	-
11	Treatment – 2	77,395	77,395	-	-	-	-	-
12	Storage – 1	431,912	-	-	-	-	431,912	-
13	Water Supply Pipeline – 1	8,353,319	67,076	-	4,061,884	4,224,359	-	-
14	Water Supply Pipeline – 2	3,627,751	67,076	-	-	1,745,429	1,815,246	-
15	Distribution – 1	822,276	-	-	822,276	-	-	-
16	Distribution – 2	1,582,914	-	-	-	-	-	1,582,914
17	Distribution – 3	213,839	-	-	-	-	-	213,839
18	Distribution – 4	336,505	165,109	171,396	-	-	-	-
19	Distribution – 5	189,284	92,874	96,410	-	-	-	-
20	Distribution – 6	913,390	-	-	913,390	-	-	-
21	Distribution – 7	1,028,306	-	-	-	1,028,306	-	-
22	Management – 1	1,017,571	-	-	-	-	-	-
23		-	-	-	-	-	-	-
24		-	-	-	-	-	-	-
50		-	-	-	-	-	-	-
	Total Capital Projects	**$ 19,072,292**	**$ 485,524**	**$ 267,806**	**$ 5,797,549**	**$ 6,998,094**	**$ 2,247,158**	**$ 1,796,753**
	Total Upgrade/Expansion Projects	19,070,228	483,460	267,806	5,797,549	6,998,094	2,247,158	1,796,753
	Total R&R Projects	2,064	2,064	-	-	-	-	-
	Projects by Grants / Developer Donations	-	-	-	-	-	-	-
	Projects by Enterprise Fund	19,072,292	485,524	267,806	5,797,549	6,998,094	2,247,158	1,796,753

Friday Harbor
Water Utility Rate Study
Existing Debt Input

Existing Debt Service - Revenue Bonds	2013	2014	2015	2016	2017	2018
2004 Water Bond						
Annual Interest Payment	$ 8,410	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment	155,000	-	-	-	-	-
Total Annual Payment	$ 163,410	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service	163,410	-	-	-	-	-
TOTAL REVENUE BONDS						
Annual Interest Payment	$ 8,410	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment	155,000	-	-	-	-	-
Total Annual Payment	$ 163,410	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service	163,410	-	-	-	-	-
Annual Debt Reserve Target on Existing Revenue Bonds	-	-	-	-	-	-

Friday Harbor
Water Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2013	2014	2015	2016	2017	2018
EXPENSES						
Cash Operating Expenses	$ 1,256,017	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	138,607	449,215	667,219	712,368
Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
Total Expenses	$ 1,756,017	$ 1,784,045	$ 1,967,221	$ 2,324,765	$ 2,592,246	$ 2,689,603
REVENUES						
Rate Revenue	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Other Revenue	8,520	8,576	8,639	8,703	8,768	8,834
Operating Fund & Debt Reserve Fund Interest Earnings	500	662	1,348	2,079	2,853	2,941
Total Revenue	$ 1,746,020	$ 1,753,186	$ 1,760,910	$ 1,768,709	$ 1,776,580	$ 1,783,794
NET CASH FLOW (DEFICIENCY)	**$ (9,997)**	**$ (30,859)**	**$ (206,311)**	**$ (556,056)**	**$ (815,665)**	**$ (905,809)**

Coverage Sufficiency Test	2013	2014	2015	2016	2017	2018
EXPENSES						
Cash Operating Expenses	$ 1,256,017	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
Revenue Bond Debt Service	163,410	-	-	-	-	-
Revenue Bond Coverage Requirement at 1.25	40,853	-	-	-	-	-
Total Expenses	$ 1,460,279	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
ALLOWABLE REVENUES						
Rate Revenue	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Other Revenue	8,520	8,576	8,639	8,703	8,768	8,834
Interest Earnings - All Funds	3,000	8,316	19,744	23,390	28,463	31,317
Total Revenue	$ 1,748,520	$ 1,760,839	$ 1,779,306	$ 1,790,020	$ 1,802,190	$ 1,812,170
Coverage Realized	3.01	n/a	n/a	n/a	n/a	n/a
COVERAGE SURPLUS (DEFICIENCY)	**$ 288,241**	**$ 476,795**	**$ 450,692**	**$ 414,470**	**$ 377,163**	**$ 334,936**

Friday Harbor
Water Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2013	2014	2015	2016	2017	2018
Sufficiency Test Driving the Deficiency	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ 9,997	$ 30,859	$ 206,311	$ 556,056	$ 815,665	$ 905,809
less: Net Revenue From Prior Rate Increases	-	(115,937)	(276,535)	(452,886)	(646,478)	(858,941)
Revenue Deficiency	$ 9,997	$ -	$ -	$ 103,170	$ 169,187	$ 46,867
Plus: Adjustment for State Excise Tax	529	-	-	5,463	8,959	2,482
Total Revenue Deficiency	**$ 10,526**	**$ -**	**$ -**	**$ 108,633**	**$ 178,146**	**$ 49,349**

Rate Increases	2013	2014	2015	2016	2017	2018
Rate Revenue with no Increase	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Revenues from Prior Rate Increases	-	122,076	291,179	476,868	680,711	904,425
Rate Revenue Before Rate Increase (Incl. previous increases)	1,737,000	1,866,024	2,042,102	2,234,795	2,445,670	2,676,444
Required Annual Rate Increase	0.61%	0.00%	0.00%	4.86%	7.28%	1.84%
Number of Months New Rates Will Be In Effect	6	12	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*1.21%*	*0.00%*	*0.00%*	*4.86%*	*7.28%*	*1.84%*
Policy Induced Rate Increases	7.00%	9.00%	9.00%	9.00%	9.00%	3.00%
ANNUAL RATE INCREASE	**7.00%**	**9.00%**	**9.00%**	**9.00%**	**9.00%**	**3.00%**
CUMULATIVE RATE INCREASE	**7.00%**	**16.63%**	**27.13%**	**38.57%**	**51.04%**	**55.57%**

Impacts of Rate Increases	2013	2014	2015	2016	2017	2018
Rate Revenues After Rate Increase	$ 1,797,795	$ 2,033,967	$ 2,225,892	$ 2,435,927	$ 2,665,781	$ 2,756,737
Full Year Rate Revenues After Rate Increase	*1,858,590*	*2,033,967*	*2,225,892*	*2,435,927*	*2,665,781*	*2,756,737*
Additional State Taxes Due to Rate Increases	3,057	14,585	23,886	34,097	45,302	49,521
Net Cash Flow After Rate Increase	47,741	244,574	244,771	87,846	39,854	29,388
Coverage After Rate Increase	3.37	n/a	n/a	n/a	n/a	n/a

Friday Harbor
Water Utility Rate Study
Fund Activity

Funds	2013	2014	2015	2016	2017	2018
OPERATING FUND						
Beginning Balance	$ 188,000	$ 206,469	$ 211,076	$ 218,402	$ 226,118	$ 234,251
plus: Net Cash Flow after Rate Increase	47,741	244,574	244,771	87,846	39,854	29,388
less: Transfer of Surplus to Capital Fund	(29,272)	(239,967)	(237,445)	(80,131)	(31,721)	(20,806)
Ending Balance	**$ 206,469**	**$ 211,076**	**$ 218,402**	**$ 226,118**	**$ 234,251**	**$ 242,833**
Minimum Target Balance	*206,469*	*211,076*	*218,402*	*226,118*	*234,251*	*242,833*
Maximum Funds to be Kept as Operating Reserves	*206,469*	*211,076*	*218,402*	*226,118*	*234,251*	*242,833*
Info: No of Days of Cash Operating Expenses	*60*	*60*	*60*	*60*	*60*	*60*
CAPITAL PROJECTS FUND						
Beginning Balance	$ 2,867,350	$ 3,061,448	$ 3,679,201	$ 2,841,473	$ 2,560,979	$ 2,837,633
plus: Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
plus: Transfer from Major Repairs Reserve	19,850	19,500	19,500	19,500	19,500	19,500
plus: Transfer from Equipment Reserve	-	-	-	-	-	-
plus: Transfer from Study Reserve	13,000	-	-	-	-	-
plus: Transfer from Land Acquisition Reserve	-	-	-	-	-	-
plus: Grants / Donations / CAIC	-	-	-	-	-	-
plus: Additional Proceeds (Costs)	-	-	-	-	-	-
plus: General Facilities Charge	115,000	118,439	122,480	126,659	130,980	135,450
plus: Revenue Bond Proceeds	-	-	-	-	-	
plus: PWTF Loans	-	-	2,031,000	2,985,000	908,000	-
plus: Other Low Interest Loan Proceeds	-	-	2,031,000	2,985,000	908,000	-
plus: Interest Earnings	2,500	7,654	18,396	21,311	25,610	28,376
plus: Transfer of Surplus from Operating Fund	29,272	239,967	237,445	80,131	31,721	20,806
Total Capital Funding Sources	**3,546,972**	**3,947,007**	**8,639,022**	**9,559,073**	**5,084,791**	**3,541,765**
less: Capital Expenditures	(485,524)	(267,806)	(5,797,549)	(6,998,094)	(2,247,158)	(1,796,753)
Ending Balance	**$ 3,061,448**	**$ 3,679,201**	**$ 2,841,473**	**$ 2,560,979**	**$ 2,837,633**	**$ 1,745,012**
Minimum Target Balance	*$ 204,844*	*$ 210,200*	*$ 326,151*	*$ 466,113*	*$ 511,056*	*$ 546,991*

Friday Harbor
Water Utility Rate Study
Fund Activity

Funds	2013	2014	2015	2016	2017	2018
DEBT RESERVE FUND						
Beginning Balance	$ 84,350	$ 58,340	$ 58,486	$ 58,778	$ 59,219	$ 59,811
plus: Transfer from Water Bond Reserve	137,300	-	-	-	-	-
plus: Reserve Funding from New Debt	-	-	-	-	-	-
plus: Interest Earnings	100	146	292	441	592	598
less: Use of Reserves for Debt Service	(163,410)	-	-	-	-	-
Ending Balance	**$ 58,340**	**$ 58,486**	**$ 58,778**	**$ 59,219**	**$ 59,811**	**$ 60,409**
Minimum Target Balance	-	-	-	-	-	-
STUDY RESERVE						
Beginning Balance	$ 36,900	$ 44,000	$ 77,333	$ 112,000	$ 148,053	$ 185,549
plus: Reserve Funding from Operations	20,000	33,333	34,667	36,053	37,495	38,995
plus: Interest Earnings	100	-	-	-	-	-
less: Use of Reserves	(13,000)	-	-	-	-	-
Ending Balance	**$ 44,000**	**$ 77,333**	**$ 112,000**	**$ 148,053**	**$ 185,549**	**$ 224,544**
LAND ACQUISITION RESERVE						
Beginning Balance	$ 224,000	$ 224,500	$ 224,600	$ 224,700	$ 224,800	$ 224,900
plus: Reserve Funding from Operations	100	100	100	100	100	100
plus: Interest Earnings	400	-	-	-	-	-
less: Use of Reserves	-	-	-	-	-	-
Ending Balance	**$ 224,500**	**$ 224,600**	**$ 224,700**	**$ 224,800**	**$ 224,900**	**$ 225,000**

Friday Harbor
Water Utility Rate Study
Summary

Revenue Requirements	2013	2014	2015	2016	2017	2018
Revenues						
Rate Revenues Under Existing Rates	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Non-Rate Revenues	9,020	9,238	9,986	18,473	21,954	22,211
Total Revenues	**$ 1,746,020**	**$ 1,753,186**	**$ 1,760,910**	**$ 1,776,401**	**$ 1,786,913**	**$ 1,794,230**
Expenses						
Cash Operating Expenses	$ 1,256,017	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	1,025,598	1,025,598	1,025,598	1,025,598
Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
Total Expenses	**$ 1,756,017**	**$ 1,784,045**	**$ 2,854,212**	**$ 2,901,148**	**$ 2,950,625**	**$ 3,002,833**
Net Surplus (Deficiency)	**$ (9,997)**	**$ (30,859)**	**$ (1,093,302)**	**$ (1,124,747)**	**$ (1,163,712)**	**$ (1,208,602)**
% of Rate Revenue	0.58%	1.77%	62.44%	63.98%	65.93%	68.20%
Annual Rate Adjustment	**7.00%**	**25.00%**	**25.00%**	**3.00%**	**3.00%**	**3.00%**
Cumulative Rate Adjustment	**7.00%**	**33.75%**	**67.19%**	**72.20%**	**77.37%**	**82.69%**
Rate Revenues After Rate Increase	$ 1,797,795	$ 2,332,530	$ 2,927,326	$ 3,027,206	$ 3,130,494	$ 3,237,307
Additional Taxes from Rate Increase	$ 3,057	$ 29,600	$ 59,161	$ 63,832	$ 68,673	$ 73,689
Net Cash Flow After Rate Increase	**47,741**	**528,124**	**23,939**	**80,699**	**133,150**	**182,996**
Coverage After Rate Increases	3.37	n/a	1.53	1.64	1.66	1.69
Sample Bill (SF in Town, 5/8" meter, 4,100 gallons per month)	$ 74.63	$ 93.29	$ 116.61	$ 120.11	$ 123.72	$ 127.43
Monthly Increase	$ 4.88	$ 18.66	$ 23.32	$ 3.50	$ 3.60	$ 3.71

Friday Harbor
Water Utility Rate Study
Summary

Fund Balance	2013	2014	2015	2016	2017	2018
Operating Fund						
Beginning Balance	**$ 188,000**	**$ 206,469**	**$ 211,076**	**$ 218,402**	**$ 226,118**	**$ 234,251**
Net Cash Flow after Rate Increase	47,741	528,124	23,939	80,699	133,150	182,996
Transfer of Surplus to Capital Fund	(29,272)	(523,516)	(16,612)	(72,984)	(125,017)	(174,414)
Ending Balance	**$ 206,469**	**$ 211,076**	**$ 218,402**	**$ 226,118**	**$ 234,251**	**$ 242,833**
Minimum Target Balance	*$ 206,469*	*$ 211,076*	*$ 218,402*	*$ 226,118*	*$ 234,251*	*$ 242,833*
Days	60	60	60	60	60	60
Capital Fund						
Beginning Balance	**$ 2,867,350**	**$ 3,061,448**	**$ 3,962,750**	**$ 10,343,607**	**$ 4,142,233**	**$ 2,711,995**
plus: Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
plus: Transfer from Major Repairs Reserve	19,850	19,500	19,500	19,500	19,500	19,500
plus: Transfer from Equipment Reserve	-	-	-	-	-	-
plus: Transfer from Study Reserve	13,000	-	-	-	-	-
plus: Transfer from Land Acquisition Reserve	-	-	-	-	-	-
plus: Grants / Donations / CAIC	-	-	-	-	-	-
plus: Additional Proceeds (Costs)	-	-	-	-	-	-
plus: General Facilities Charge	115,000	118,439	122,480	126,659	130,980	135,450
plus: Revenue Bond Proceeds	-	-	11,500,000	-	-	-
plus: PWTF Loans	-	-	-	-	-	-
plus: Other Low Interest Loan Proceeds	-	-	-	-	-	-
plus: Interest Earnings	2,500	7,654	19,814	77,577	41,422	27,120
plus: Transfer of Surplus from Operating Fund	29,272	523,516	16,612	72,984	125,017	174,414
Total Capital Funding Sources	3,546,972	4,230,557	16,141,156	11,140,327	4,959,153	3,568,478
less: Capital Expenditures (inlfated)	(485,524)	(267,806)	(5,797,549)	(6,998,094)	(2,247,158)	(1,796,753)
Ending Balance	**3,061,448**	**3,962,750**	**10,343,607**	**4,142,233**	**2,711,995**	**1,771,725**
Minimum Target Balance	*$ 204,844*	*$ 210,200*	*$ 326,151*	*$ 466,113*	*$ 511,056*	*$ 546,991*

Friday Harbor
Water Utility Rate Study
Assumptions

Economic & Financial Factors		2013	2014	2015	2016	2017	2018
1	General Cost Inflation	2.07%	2.50%	3.00%	3.00%	3.00%	3.00%
2	Construction Cost Inflation	3.19%	3.50%	4.00%	4.00%	4.00%	4.00%
3	Labor Cost Inflation	2.07%	2.50%	3.00%	3.00%	3.00%	3.00%
4	Benefit Cost Inflation	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
5	Customer Growth	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
6	ERU Growth	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
7	General Inflation plus Growth	2.48%	2.91%	3.41%	3.41%	3.41%	3.41%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (3-year average of the LGIP)	0.19%	0.25%	0.50%	0.75%	1.00%	1.00%
	Local / State Excise Tax	5.029%	5.029%	5.029%	5.029%	5.029%	5.029%
	State B&O Tax	1.65%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions			2013	2014	2015	2016	2017	2018
FISCAL POLICY RESTRICTIONS								
	Min. Op. Fund Balance Target (days of O&M expense)		60	60	60	60	60	60
	Max. Op. Fund Balance (days of O&M expense)		60	60	60	60	60	60
	Minimum Capital Fund Balance Target							
	Select Minimum Capital Fund Balance Target	1	**Defined as % of Plant**					
	1 - Defined as % of Plant							
	Plant-in-Service in 2012	$ 9,756,686						
	Minimum Capital Fund Balance - % of plant assets		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
	2 - Amount at Right ==>		$ -	$ -	$ -	$ -	$ -	$ -
RATE FUNDED SYSTEM REINVESTMENT								
	Select Reinvestment Funding Strategy	3	**User Input**					
	Amount of Annual Cash Funding from Rates							
	1 - Equal to Annual Depreciation Expense							
	2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments							
	3 - Equal to Amount at Right ==>		$ -	$ -	$ -	$ -	$ -	$ -
	4 - Do Not Fund System Reinvestment							

Friday Harbor
Water Utility Rate Study
Assumptions

Capital Financing Assumptions		2013	2014	2015	2016	2017	2018
General Facilities Charge (GFC)							
General Facilities Charge		$ 10,124	$ 10,377	$ 10,688	$ 11,009	$ 11,339	$ 11,680
Total Equivalent Residential Units (Estimate Based on WSP)		2,853	2,865	2,876	2,888	2,899	2,911
Additional Units Per Year		11	11	11	12	12	12
GFC Revenues		**$ 115,000**	**$ 118,439**	**$ 122,480**	**$ 126,659**	**$ 130,980**	**$ 135,450**
FUNDING SOURCES							
Grants		$ -	$ -	$ -	$ -	$ -	$ -
Additional Proceeds (Costs)							
[Extra line]		$ -	$ -	$ -	$ -	$ -	$ -
[Extra line]		-	-	-	-	-	-
[Extra line]		-	-	-	-	-	-
Total Additional Proceeds		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
REVENUE BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	**1.25**						
PWTF LOAN							
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20
Interest Cost		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Actual 2012	Budget 2013	Projection 2014	Projection 2015	Projection 2016	Projection 2017	Projection 2018
Rate revenues									
Usage Charge	6	ERU Growth	$ 779,828	$ 767,000	$ 770,068	$ 773,148	$ 776,241	$ 779,346	$ 782,463
Base Charge	5	Customer Growth	972,213	970,000	973,880	977,776	981,687	985,613	989,556
[Other]	5	Customer Growth	-	-	-	-	-	-	-
Total Rate revenue			**$ 1,752,041**	**$ 1,737,000**	**$ 1,743,948**	**$ 1,750,924**	**$ 1,757,927**	**$ 1,764,959**	**$ 1,772,019**
Non-rate revenues									
Installation Charge	5	Customer Growth	$ 15,357	$ 5,000	$ 5,020	$ 5,040	$ 5,060	$ 5,080	$ 5,101
Main Extension	1	General Cost Inflation	-	100	103	106	109	112	115
Labor & Material Charge	1	General Cost Inflation	90	500	513	528	544	560	577
Reconnect Fees	5	Customer Growth	1,530	1,300	1,305	1,310	1,316	1,321	1,326
Interest Income	1	General Cost Inflation	-	-	-	-	-	-	-
Equipment Rental	1	General Cost Inflation	-	100	103	106	109	112	115
Lease	1	General Cost Inflation	-	100	103	106	109	112	115
Sale of Timber	1	General Cost Inflation	-	10	10	11	11	11	12
Labor & Industries Refund	1	General Cost Inflation	413	100	103	106	109	112	115
Main Extension Reimbursements	1	General Cost Inflation	-	100	103	106	109	112	115
Miscellaneous Revenue	8	No Escalation	1,029	1,000	1,000	1,000	1,000	1,000	1,000
Sale of Recyclables	1	General Cost Inflation	255	100	103	106	109	112	115
Wellness Baskets	1	General Cost Inflation	132	100	103	106	109	112	115
Prior Year Refund/Reimbursement	1	General Cost Inflation	-	10	10	11	11	11	12
Total Non-rate revenues			**$ 18,806**	**$ 8,520**	**$ 8,576**	**$ 8,639**	**$ 8,703**	**$ 8,768**	**$ 8,834**
TOTAL REVENUES			**$ 1,770,847**	**$ 1,745,520**	**$ 1,752,524**	**$ 1,759,562**	**$ 1,766,630**	**$ 1,773,727**	**$ 1,780,853**

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

Expenditures		FORECAST BASIS	Actual	Budget 2013	Projection 2014	Projection 2015	Projection 2016	Projection 2017	Projection 2018
Revenue Taxes		*Excise Tax Rate*	84,583	$ 87,354	$ 87,703	$ 88,054	$ 88,406	$ 88,760	$ 89,115
State Tax on Hookups and Non-Rate Revenue		*B&O Tax Rate*	6,095	2,038	1,905	1,967	2,030	2,096	2,164
Utilities Administration									
Personnel	3	Labor Cost Inflation	$ 29,285	$ 30,600	$ 31,365	$ 32,306	$ 33,275	$ 34,273	$ 35,302
Benefits	4	Benefit Cost Inflation	8,295	9,000	9,900	10,890	11,979	13,177	14,495
Supplies	1	General Cost Inflation	846	750	769	792	816	840	865
Fuel	1	General Cost Inflation	110	200	205	211	217	224	231
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Legal	1	General Cost Inflation	1,203	1,500	1,538	1,584	1,631	1,680	1,730
Professional Services	3	Labor Cost Inflation	152	100	103	106	109	112	115
Communications	1	General Cost Inflation	837	950	974	1,003	1,033	1,064	1,096
Travel / Training	1	General Cost Inflation	29	1,000	1,025	1,056	1,087	1,120	1,154
Advertising	1	General Cost Inflation	44	50	51	53	54	56	58
Equipment Rental	1	General Cost Inflation	-	50	51	53	54	56	58
Utilities	1	General Cost Inflation	784	800	820	845	870	896	923
Repairs & Maintenance	1	General Cost Inflation	435	1,100	1,128	1,161	1,196	1,232	1,269
Miscellaneous	1	General Cost Inflation	1,249	1,450	1,486	1,531	1,577	1,624	1,673
San Juan County	1	General Cost Inflation	74	-	-	-	-	-	-
Intergovernmental	8	No Escalation	-	200	200	200	200	200	200
Improvements	1	General Cost Inflation	231	100	103	106	109	112	115
Equipment	1	General Cost Inflation	2,834	1,150	1,179	1,214	1,251	1,288	1,327
Administration Planning									
Personnel	3	Labor Cost Inflation	19,546	20,300	20,808	21,432	22,075	22,737	23,419
Benefits	4	Benefit Cost Inflation	5,594	6,100	6,710	7,381	8,119	8,931	9,824
Professional Services	3	Labor Cost Inflation	2,667	100	103	106	109	112	115
Travel / Training	1	General Cost Inflation	1,033	400	410	422	435	448	461
Miscellaneous	1	General Cost Inflation	-	100	103	106	109	112	115
Equipment	1	General Cost Inflation	375	100	103	106	109	112	115
System Administrator									
Personnel	3	Labor Cost Inflation	14,952	13,900	14,248	14,675	15,115	15,569	16,036
Benefits	4	Benefit Cost Inflation	3,385	3,100	3,410	3,751	4,126	4,539	4,993
Supplies	1	General Cost Inflation	-	100	103	106	109	112	115
Small Tools	1	General Cost Inflation	17	100	103	106	109	112	115
Professional Services	3	Labor Cost Inflation	1,272	1,125	1,153	1,188	1,223	1,260	1,298
Travel / Training	1	General Cost Inflation	406	1,000	1,025	1,056	1,087	1,120	1,154
Repair & Maintenance	1	General Cost Inflation	-	100	103	106	109	112	115
Miscellaneous	1	General Cost Inflation	62	200	205	211	217	224	231
Equipment	1	General Cost Inflation	1,530	1,200	1,230	1,267	1,305	1,344	1,384

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Actual	Budget	Projection	Projection	Projection	Projection	Projection
Finance / Customer Service									
Personnel	3	Labor Cost Inflation	32,250	33,200	34,030	35,051	36,102	37,185	38,301
Overtime	3	Labor Cost Inflation	40	250	256	264	272	280	288
Benefits	4	Benefit Cost Inflation	10,447	11,700	12,870	14,157	15,573	17,130	18,843
Supplies	1	General Cost Inflation	-	500	513	528	544	560	577
Professional Services	3	Labor Cost Inflation	3,434	4,600	4,715	4,856	5,002	5,152	5,307
Communications	1	General Cost Inflation	628	50	51	53	54	56	58
Travel / Training	1	General Cost Inflation	598	800	820	845	870	896	923
Repair & Maintenance	1	General Cost Inflation	-	50	51	53	54	56	58
Miscellaneous	1	General Cost Inflation	-	50	51	53	54	56	58
Intergovernmental	1	General Cost Inflation	4,183	4,600	4,715	4,856	5,002	5,152	5,307
Equipment	1	General Cost Inflation	1,655	100	103	106	109	112	115
Meter Reading									
Personnel	3	Labor Cost Inflation	6,920	5,500	5,638	5,807	5,981	6,160	6,345
Overtime	3	Labor Cost Inflation	-	100	103	106	109	112	115
Benefits	4	Benefit Cost Inflation	2,582	2,200	2,420	2,662	2,928	3,221	3,543
Supplies	1	General Cost Inflation	33	100	103	106	109	112	115
Fuel	1	General Cost Inflation	863	1,000	1,025	1,056	1,087	1,120	1,154
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Repair & Maintenance	1	General Cost Inflation	2,033	2,100	2,153	2,217	2,284	2,352	2,423
Miscellaneous	1	General Cost Inflation	81	50	51	53	54	56	58
Equipment	1	General Cost Inflation	7,160	600	615	633	652	672	692
Treatment									
Personnel	3	Labor Cost Inflation	106,022	112,000	114,800	118,244	121,791	125,445	129,208
Overtime	3	Labor Cost Inflation	40,817	40,000	41,000	42,230	43,497	44,802	46,146
Benefits	4	Benefit Cost Inflation	38,898	35,600	39,160	43,076	47,384	52,122	57,334
Supplies	1	General Cost Inflation	50,830	60,000	61,500	63,345	65,245	67,203	69,219
Fuel	1	General Cost Inflation	1,823	2,500	2,563	2,639	2,719	2,800	2,884
Small Tools	1	General Cost Inflation	-	250	256	264	272	280	288
Professional Services	3	Labor Cost Inflation	5,669	7,750	7,944	8,182	8,428	8,680	8,941
Communications	1	General Cost Inflation	2,707	3,050	3,126	3,220	3,317	3,416	3,519
Travel / Training	1	General Cost Inflation	3,827	1,500	1,538	1,584	1,631	1,680	1,730
Advertising	1	General Cost Inflation	68	50	51	53	54	56	58
Equipment Rental	1	General Cost Inflation	-	250	256	264	272	280	288
Utilities	1	General Cost Inflation	58,202	60,000	61,500	63,345	65,245	67,203	69,219
Repairs & Maintenance	1	General Cost Inflation	66,937	112,800	115,620	119,089	122,661	126,341	130,131
Miscellaneous	1	General Cost Inflation	446	900	923	950	979	1,008	1,038
Intergovernmental	1	General Cost Inflation	4,665	5,200	5,330	5,490	5,655	5,824	5,999
Improvements	1	General Cost Inflation	-	32,500	15,000	15,450	15,914	16,391	16,883
Equipment	1	General Cost Inflation	9,827	8,325	8,533	8,789	9,053	9,324	9,604

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Actual	Budget	Projection	Projection	Projection	Projection	Projection
Distribution									
Personnel	3	Labor Cost Inflation	116,315	150,800	154,570	159,207	163,983	168,903	173,970
Overtime	3	Labor Cost Inflation	6,467	5,500	5,638	5,807	5,981	6,160	6,345
Benefits	4	Benefit Cost Inflation	44,424	58,800	64,680	71,148	78,263	86,089	94,698
Supplies	1	General Cost Inflation	31,588	25,000	25,625	26,394	27,186	28,001	28,841
Fuel	1	General Cost Inflation	5,887	6,500	6,663	6,862	7,068	7,280	7,499
Small Tools	1	General Cost Inflation	41	250	256	264	272	280	288
Professional Services	3	Labor Cost Inflation	9,614	8,250	8,456	8,710	8,971	9,240	9,518
Communications	1	General Cost Inflation	1,491	1,500	1,538	1,584	1,631	1,680	1,730
Travel / Training	1	General Cost Inflation	2,039	5,000	5,125	5,279	5,437	5,600	5,768
Advertising	1	General Cost Inflation	68	50	51	53	54	56	58
Equipment Rental	1	General Cost Inflation	-	100	103	106	109	112	115
Utilities	1	General Cost Inflation	15,175	15,400	15,785	16,259	16,746	17,249	17,766
Repairs & Maintenance	1	General Cost Inflation	17,063	7,800	7,995	8,235	8,482	8,736	8,998
Miscellaneous	1	General Cost Inflation	168	1,250	1,281	1,320	1,359	1,400	1,442
Intergovernmental	1	General Cost Inflation	1,962	2,300	2,358	2,428	2,501	2,576	2,653
Improvements	1	General Cost Inflation	5,283	11,000	11,275	11,613	11,962	12,320	12,690
Equipment	1	General Cost Inflation	2,332	10,675	10,942	11,270	11,608	11,956	12,315
Cross Connection									
Personnel	3	Labor Cost Inflation	24,727	23,800	24,395	25,127	25,881	26,657	27,457
Overtime	3	Labor Cost Inflation	66	100	103	106	109	112	115
Benefits	4	Benefit Cost Inflation	5,511	6,400	7,040	7,744	8,518	9,370	10,307
Supplies	1	General Cost Inflation	89	100	103	106	109	112	115
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Professional Services	3	Labor Cost Inflation	332	450	461	475	489	504	519
Communications	1	General Cost Inflation	144	-	-	-	-	-	-
Travel / Training	1	General Cost Inflation	519	500	513	528	544	560	577
Miscellaneous	1	General Cost Inflation	10	50	51	53	54	56	58
Intergovernmental	1	General Cost Inflation	-	50	51	53	54	56	58
Watershed									
Personnel	3	Labor Cost Inflation	504	100	103	106	109	112	115
Small Tools	1	General Cost Inflation	-	50	51	53	54	56	58
Professional Services	3	Labor Cost Inflation	2,246	3,400	3,485	3,590	3,697	3,808	3,922
Communications	1	General Cost Inflation	-	-	-	-	-	-	-
Travel / Training	1	General Cost Inflation	-	100	103	106	109	112	115
Equipment Rental	1	General Cost Inflation	-	500	513	528	544	560	577
Miscellaneous	1	General Cost Inflation	-	50	51	53	54	56	58
Intergovernmental	1	General Cost Inflation	1,208	1,250	1,281	1,320	1,359	1,400	1,442
Improvements	1	General Cost Inflation	4,897	-	-	-	-	-	-
Equipment	1	General Cost Inflation	-	8,100	8,303	8,552	8,808	9,072	9,345

Friday Harbor
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Actual	Budget	Projection	Projection	Projection	Projection	Projection
Other Operating									
Physical / CDL Costs	1	General Cost Inflation	241	200	205	211	217	224	231
Supplies	1	General Cost Inflation	245	200	205	211	217	224	231
Professional Services	3	Labor Cost Inflation	-	100	103	106	109	112	115
Personnel Issues	1	General Cost Inflation	17,116	-	-	-	-	-	-
Communications	1	General Cost Inflation	1,538	3,000	3,075	3,167	3,262	3,360	3,461
Advertising	1	General Cost Inflation	137	200	205	211	217	224	231
Equipment Rental	1	General Cost Inflation	760	800	820	845	870	896	923
Insurance	1	General Cost Inflation	40,609	41,950	42,999	44,289	45,617	46,986	48,395
Repairs & Maintenance	1	General Cost Inflation	66	200	205	211	217	224	231
Miscellaneous	1	General Cost Inflation	1,748	2,900	2,973	3,062	3,154	3,248	3,346
Intergovernmental	1	General Cost Inflation	294	1,000	1,025	1,056	1,087	1,120	1,154
Main Extension									
Professional Services	3	Labor Cost Inflation	15,819	500	513	528	544	560	577
Connection Costs									
Personnel	3	Labor Cost Inflation	1,156	500	513	528	544	560	577
Benefits	4	Benefit Cost Inflation	474	100	110	121	133	146	161
Supplies	1	General Cost Inflation	-	1,500	1,538	1,584	1,631	1,680	1,730
Legal	1	General Cost Inflation	-	100	103	106	109	112	115
Professional Services	3	Labor Cost Inflation	-	500	513	528	544	560	577
Miscellaneous	1	General Cost Inflation	-	100	103	106	109	112	115
Intergovernmental	1	General Cost Inflation	-	-	-	-	-	-	-
Improvements									
Professional Services	3	Labor Cost Inflation	-	500	513	528	544	560	577
Improvements	7	General Inflation plus Growth	-	13,500	10,000	10,341	10,694	11,059	11,436
Other Uses (Transfers)									
To Separation Reserve	8	No Escalation	3,850	500	500	500	500	500	500
To Wellness Reserve	8	No Escalation	1,611	1,500	1,500	1,500	1,500	1,500	1,500
To Bond Redemption	8	No Escalation	137,300	-	-	-	-	-	-
To Public Works Fund	8	No Escalation	20,000	20,000	20,000	20,000	20,000	20,000	20,000
To Capital Projects Fund	8	No Escalation	400,000	500,000	500,000	500,000	500,000	500,000	500,000
To Repair Reserve	8	No Escalation	19,500	19,500	19,500	19,500	19,500	19,500	19,500
To Land Reserve	8	No Escalation	-	100	100	100	100	100	100
To Studies Reserve	2	Construction Cost Inflation	20,000	20,000	33,333	34,667	36,053	37,495	38,995
To Equipment Reserve	8	No Escalation	34,600	34,600	34,600	34,600	34,600	34,600	34,600
Non Expenditures									
Prior Year Refund	8	No Escalation	204	100	-	-	-	-	-
Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-	-
Total Cash O&M Expenditures			**$ 1,669,004**	**$ 1,756,017**	**$ 1,784,045**	**$ 1,828,614**	**$ 1,875,550**	**$ 1,925,027**	**$ 1,977,234**
Depreciation Expense in	2012	$ -							
Depreciation Expense [b]	*Last year's plus annual additions from CIP*		$ 8,163	$ 16,325	$ 21,681	$ 137,632	$ 277,594	$ 322,537	$ 358,472
TOTAL EXPENSES			**$ 1,677,167**	**$ 1,772,342**	**$ 1,805,726**	**$ 1,966,246**	**$ 2,153,144**	**$ 2,247,564**	**$ 2,335,707**

Friday Harbor
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2012

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	2013	2014	2015	2016	2017	2018	Life in Years
1	**2013 BUDGET - Water Capital**							50
2	Water System Improvement Advertising	500						50
3	Sodium Hypochlorite System (Treatment 2)	-						50
4	Water Mains	-						50
5	Media Change (repairs)	1,000						50
6	Leak Detection (repairs)	1,000						50
7	Complete Comprehensive Plan	13,000						50
8								50
9	**CIP - BROWN AND CALDWELL**							50
10	Source – 1							50
11	Treatment – 1							50
11	Treatment – 2	75,000						50
12	Storage – 1					355,000		50
13	Water Supply Pipeline – 1	65,000		3,611,000	3,611,000			50
14	Water Supply Pipeline – 2	65,000			1,492,000	1,492,000		50
15	Distribution – 1			731,000				50
16	Distribution – 2						1,251,000	50
17	Distribution – 3						169,000	50
18	Distribution – 4	160,000	160,000					50
19	Distribution – 5	90,000	90,000					50
20	Distribution – 6			812,000				50
21	Distribution – 7				879,000			50
22	Management – 1							50
23								50
24								50
50								50
	Total Capital Projects	**$ 470,500**	**$ 250,000**	**$ 5,154,000**	**$ 5,982,000**	**$ 1,847,000**	**$ 1,420,000**	
	Total Upgrade/Expansion Projects	468,500	250,000	5,154,000	5,982,000	1,847,000	1,420,000	
	Total R&R Projects	2,000	-	-	-	-	-	
	Projects by Grants / Developer Donations							
	Projects by Enterprise Fund							

Friday Harbor
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2012

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	TOTAL ESCALATED COSTS	2013	2014	2015	2016	2017	2018
1	**2013 BUDGET - Water Capital**	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Water System Improvement Advertising	516	516	-	-	-	-	-
3	Sodium Hypochlorite System (Treatment 2)	-	-	-	-	-	-	-
4	Water Mains	-	-	-	-	-	-	-
5	Media Change (repairs)	1,032	1,032	-	-	-	-	-
6	Leak Detection (repairs)	1,032	1,032	-	-	-	-	-
7	Complete Comprehensive Plan	13,415	13,415	-	-	-	-	-
8		-	-	-	-	-	-	-
9	**CIP - BROWN AND CALDWELL**	-	-	-	-	-	-	-
10	Source – 1	230,918	-	-	-	-	-	-
11	Treatment – 1	230,918	-	-	-	-	-	-
11	Treatment – 2	77,395	77,395	-	-	-	-	-
12	Storage – 1	431,912	-	-	-	-	431,912	-
13	Water Supply Pipeline – 1	8,353,319	67,076	-	4,061,884	4,224,359	-	-
14	Water Supply Pipeline – 2	3,627,751	67,076	-	-	1,745,429	1,815,246	-
15	Distribution – 1	822,276	-	-	822,276	-	-	-
16	Distribution – 2	1,582,914	-	-	-	-	-	1,582,914
17	Distribution – 3	213,839	-	-	-	-	-	213,839
18	Distribution – 4	336,505	165,109	171,396	-	-	-	-
19	Distribution – 5	189,284	92,874	96,410	-	-	-	-
20	Distribution – 6	913,390	-	-	913,390	-	-	-
21	Distribution – 7	1,028,306	-	-	-	1,028,306	-	-
22	Management – 1	1,017,571	-	-	-	-	-	-
23		-	-	-	-	-	-	-
24		-	-	-	-	-	-	-
50		-	-	-	-	-	-	-
	Total Capital Projects	**$ 19,072,292**	**$ 485,524**	**$ 267,806**	**$ 5,797,549**	**$ 6,998,094**	**$ 2,247,158**	**$ 1,796,753**
	Total Upgrade/Expansion Projects	19,070,228	483,460	267,806	5,797,549	6,998,094	2,247,158	1,796,753
	Total R&R Projects	2,064	2,064	-	-	-	-	-
	Projects by Grants / Developer Donations	-	-	-	-	-	-	-
	Projects by Enterprise Fund	19,072,292	485,524	267,806	5,797,549	6,998,094	2,247,158	1,796,753

Friday Harbor
Water Utility Rate Study
Existing Debt Input

Existing Debt Service - Revenue Bonds	2013	2014	2015	2016	2017	2018
2004 Water Bond						
Annual Interest Payment	$ 8,410	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment	155,000	-	-	-	-	-
Total Annual Payment	$ 163,410	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service	163,410	-	-	-	-	-
TOTAL REVENUE BONDS						
Annual Interest Payment	$ 8,410	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment	155,000	-	-	-	-	-
Total Annual Payment	$ 163,410	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service	163,410	-	-	-	-	-
Annual Debt Reserve Target on Existing Revenue Bonds	-	-	-	-	-	-

Friday Harbor
Water Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2013	2014	2015	2016	2017	2018
EXPENSES						
Cash Operating Expenses	$ 1,256,017	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	1,025,598	1,025,598	1,025,598	1,025,598
Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
Total Expenses	$ 1,756,017	$ 1,784,045	$ 2,854,212	$ 2,901,148	$ 2,950,625	$ 3,002,833
REVENUES						
Rate Revenue	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Other Revenue	8,520	8,576	8,639	8,703	8,768	8,834
Operating Fund & Debt Reserve Fund Interest Earnings	500	662	1,348	9,771	13,186	13,377
Total Revenue	$ 1,746,020	$ 1,753,186	$ 1,760,910	$ 1,776,401	$ 1,786,913	$ 1,794,230
NET CASH FLOW (DEFICIENCY)	**$ (9,997)**	**$ (30,859)**	**$ (1,093,302)**	**$ (1,124,747)**	**$ (1,163,712)**	**$ (1,208,602)**

Coverage Sufficiency Test	2013	2014	2015	2016	2017	2018
EXPENSES						
Cash Operating Expenses	$ 1,256,017	$ 1,284,045	$ 1,328,614	$ 1,375,550	$ 1,425,027	$ 1,477,234
Revenue Bond Debt Service	163,410	-	1,025,598	1,025,598	1,025,598	1,025,598
Revenue Bond Coverage Requirement at 1.25	40,853	-	256,400	256,400	256,400	256,400
Total Expenses	$ 1,460,279	$ 1,284,045	$ 2,610,612	$ 2,657,548	$ 2,707,025	$ 2,759,232
ALLOWABLE REVENUES						
Rate Revenue	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Other Revenue	8,520	8,576	8,639	8,703	8,768	8,834
Interest Earnings - All Funds	3,000	8,316	21,162	87,348	54,609	40,497
Total Revenue	$ 1,748,520	$ 1,760,839	$ 1,780,724	$ 1,853,978	$ 1,828,336	$ 1,821,350
Coverage Realized	3.01	n/a	0.44	0.47	0.39	0.34
COVERAGE SURPLUS (DEFICIENCY)	**$ 288,241**	**$ 476,795**	**$ (829,888)**	**$ (803,570)**	**$ (878,689)**	**$ (937,882)**

Friday Harbor
Water Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2013	2014	2015	2016	2017	2018
Sufficiency Test Driving the Deficiency	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ 9,997	$ 30,859	$ 1,093,302	$ 1,124,747	$ 1,163,712	$ 1,208,602
less: Net Revenue From Prior Rate Increases	-	(115,937)	(561,219)	(1,121,710)	(1,210,268)	(1,302,050)
Revenue Deficiency	$ 9,997	$ -	$ 532,084	$ 3,038	$ -	$ -
Plus: Adjustment for State Excise Tax	529	-	28,175	161	-	-
Total Revenue Deficiency	**$ 10,526**	**$ -**	**$ 560,259**	**$ 3,199**	**$ -**	**$ -**

Rate Increases	2013	2014	2015	2016	2017	2018
Rate Revenue with no Increase	$ 1,737,000	$ 1,743,948	$ 1,750,924	$ 1,757,927	$ 1,764,959	$ 1,772,019
Revenues from Prior Rate Increases	-	122,076	590,937	1,181,108	1,274,356	1,370,997
Rate Revenue Before Rate Increase (Incl. previous increases)	1,737,000	1,866,024	2,341,861	2,939,035	3,039,315	3,143,016
Required Annual Rate Increase	0.61%	0.00%	23.92%	0.11%	0.00%	0.00%
Number of Months New Rates Will Be In Effect	6	12	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*1.21%*	*0.00%*	*23.92%*	*0.11%*	*0.00%*	*0.00%*
Policy Induced Rate Increases	7.00%	25.00%	25.00%	3.00%	3.00%	3.00%
ANNUAL RATE INCREASE	**7.00%**	**25.00%**	**25.00%**	**3.00%**	**3.00%**	**3.00%**
CUMULATIVE RATE INCREASE	**7.00%**	**33.75%**	**67.19%**	**72.20%**	**77.37%**	**82.69%**

Impacts of Rate Increases	2013	2014	2015	2016	2017	2018
Rate Revenues After Rate Increase	$ 1,797,795	$ 2,332,530	$ 2,927,326	$ 3,027,206	$ 3,130,494	$ 3,237,307
Full Year Rate Revenues After Rate Increase	*1,858,590*	*2,332,530*	*2,927,326*	*3,027,206*	*3,130,494*	*3,237,307*
Additional State Taxes Due to Rate Increases	3,057	29,600	59,161	63,832	68,673	73,689
Net Cash Flow After Rate Increase	47,741	528,124	23,939	80,699	133,150	182,996
Coverage After Rate Increase	3.37	n/a	1.53	1.64	1.66	1.69

Friday Harbor
Water Utility Rate Study
Fund Activity

Funds	2013	2014	2015	2016	2017	2018
OPERATING FUND						
Beginning Balance	$ 188,000	$ 206,469	$ 211,076	$ 218,402	$ 226,118	$ 234,251
plus: Net Cash Flow after Rate Increase	47,741	528,124	23,939	80,699	133,150	182,996
less: Transfer of Surplus to Capital Fund	(29,272)	(523,516)	(16,612)	(72,984)	(125,017)	(174,414)
Ending Balance	**$ 206,469**	**$ 211,076**	**$ 218,402**	**$ 226,118**	**$ 234,251**	**$ 242,833**
Minimum Target Balance	*206,469*	*211,076*	*218,402*	*226,118*	*234,251*	*242,833*
Maximum Funds to be Kept as Operating Reserves	*206,469*	*211,076*	*218,402*	*226,118*	*234,251*	*242,833*
Info: No of Days of Cash Operating Expenses	*60*	*60*	*60*	*60*	*60*	*60*
CAPITAL PROJECTS FUND						
Beginning Balance	$ 2,867,350	$ 3,061,448	$ 3,962,750	$ 10,343,607	$ 4,142,233	$ 2,711,995
plus: Rate Funded System Reinvestment	500,000	500,000	500,000	500,000	500,000	500,000
plus: Transfer from Major Repairs Reserve	19,850	19,500	19,500	19,500	19,500	19,500
plus: Transfer from Equipment Reserve	-	-	-	-	-	-
plus: Transfer from Study Reserve	13,000	-	-	-	-	-
plus: Transfer from Land Acquisition Reserve	-	-	-	-	-	-
plus: Grants / Donations / CAIC	-	-	-	-	-	-
plus: Additional Proceeds (Costs)	-	-	-	-	-	-
plus: General Facilities Charge	115,000	118,439	122,480	126,659	130,980	135,450
plus: Revenue Bond Proceeds	-	-	11,500,000	-	-	
plus: PWTF Loans	-	-	-	-	-	-
plus: Other Low Interest Loan Proceeds	-	-	-	-	-	-
plus: Interest Earnings	2,500	7,654	19,814	77,577	41,422	27,120
plus: Transfer of Surplus from Operating Fund	29,272	523,516	16,612	72,984	125,017	174,414
Total Capital Funding Sources	**3,546,972**	**4,230,557**	**16,141,156**	**11,140,327**	**4,959,153**	**3,568,478**
less: Capital Expenditures	(485,524)	(267,806)	(5,797,549)	(6,998,094)	(2,247,158)	(1,796,753)
Ending Balance	**$ 3,061,448**	**$ 3,962,750**	**$ 10,343,607**	**$ 4,142,233**	**$ 2,711,995**	**$ 1,771,725**
Minimum Target Balance	*$ 204,844*	*$ 210,200*	*$ 326,151*	*$ 466,113*	*$ 511,056*	*$ 546,991*

Friday Harbor
Water Utility Rate Study
Fund Activity

Funds	2013	2014	2015	2016	2017	2018
DEBT RESERVE FUND						
Beginning Balance	$ 84,350	$ 58,340	$ 58,486	$ 1,084,377	$ 1,092,509	$ 1,103,435
plus: Transfer from Water Bond Reserve	137,300	-	-	-	-	-
plus: Reserve Funding from New Debt	-	-	1,025,598	-	-	-
plus: Interest Earnings	100	146	292	8,133	10,925	11,034
less: Use of Reserves for Debt Service	(163,410)	-	-	-	-	-
Ending Balance	**$ 58,340**	**$ 58,486**	**$ 1,084,377**	**$ 1,092,509**	**$ 1,103,435**	**$ 1,114,469**
Minimum Target Balance	-	-	*1,025,598*	*1,025,598*	*1,025,598*	*1,025,598*
STUDY RESERVE						
Beginning Balance	$ 36,900	$ 44,000	$ 77,333	$ 112,000	$ 148,053	$ 185,549
plus: Reserve Funding from Operations	20,000	33,333	34,667	36,053	37,495	38,995
plus: Interest Earnings	100	-	-	-	-	-
less: Use of Reserves	(13,000)	-	-	-	-	-
Ending Balance	**$ 44,000**	**$ 77,333**	**$ 112,000**	**$ 148,053**	**$ 185,549**	**$ 224,544**
LAND ACQUISITION RESERVE						
Beginning Balance	$ 224,000	$ 224,500	$ 224,600	$ 224,700	$ 224,800	$ 224,900
plus: Reserve Funding from Operations	100	100	100	100	100	100
plus: Interest Earnings	400	-	-	-	-	-
less: Use of Reserves	-	-	-	-	-	-
Ending Balance	**$ 224,500**	**$ 224,600**	**$ 224,700**	**$ 224,800**	**$ 224,900**	**$ 225,000**

Appendix P: Formal Review Comments, Consistency Determinations, and Public Input

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent, Washington 98032-2388

RECEIVED
APR 12 2013
BROWN AND CALDWELL
SEATTLE

April 10, 2013

WAYNE HAEFELE PE
FRIDAY HARBOR TOWN OF
PO BOX 219
FRIDAY HARBOR WA 98250

Subject: Friday Harbor, Town of (ID# 26595)
San Juan County
February 2013 Water System Plan
Submittal #13-0307

Dear Mr. Haefele:

Thank you for submitting the Water System Plan (WSP) for the Town of Friday Harbor (the Town) water system, received in this office on March 4, 2013. We have reviewed the plan and offer the following comments. These comments must be adequately addressed prior to approval of the WSP.

Description of Water System

1. Please provide a determination of local government consistency from the Town of Friday Harbor and from San Juan County Planning Department.

System Analysis

2. The plan indicates that the maximum design service pressure is 100 psi. This is a very high level for your 'optimum' pressure range. High pressures in excess of 80 psi require your customers to install individual PRVs. High pressures can also lead to increased leaks and will result in higher leaking flow rates. The Town should reconsider the upper pressure limit that it considers optimal.

Operations and Maintenance

3. An up-dated coliform monitoring plan (CMP) is required. Please include a revised plan. The CMP should be a separate document and does not need to be included in the WSP.

4. Public Notification (PN) requirements require customer notification within 24 hours for acute health concerns. The operations plan must detail how the Town will conduct mandatory public notification to its residential, commercial and transient users.

5. Does the Town's Cross Connection Control Plan (CCCP) meet the requirements of WAC 246-290-490(3); have all elements been implemented?

Distribution Facilities Design and Construction Standards

6. I recommend adding a section in **7.5 Construction Certification and Follow-Up Procedures** that addresses the construction completion report procedure for main distribution projects as specified in WAC 246-290-120 (5).

Miscellaneous Documentation

7. Provide signed SEPA Checklist and a SEPA Threshold Determination with the final WSP submittal.

8. The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.

9. The Town's elected governing body must adopt the final WSP prior to DOH approval of the document.

Please submit the revised WSP on or before **July 11, 2013**. In order to expedite the review of your revised submittal, please include a cover letter summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.)

Regulations establishing a schedule of fees for review of planning, engineering and construction documents have been adopted (WAC 246-290-990). An itemized invoice for **$3705.00 is** enclosed. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **DOH, Revenue Section, and P.O. Box 1099, Olympia, WA 98507-1099.**

If you have any questions please give me a call at (253) 395-6771.

Sincerely,

Richard Rodriguez
Regional Planner
NW Drinking Water Operations

Steve Deem, P.E.
Regional Engineer
NW Drinking Water Operations

cc: San Juan County Health Department
San Juan County Planning Dept.
Tammy Hall, WSDOE-NWRO
Matthew Maring, P.E., Brown and Caldwell

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: Town of Friday Harbor PWS ID: 265950
Town of Friday Harbor

Planning/Engineering Document Title: Water System Plan Update Plan Date: June 2013

Local Government with Jurisdiction: San Juan County

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	COMP PLAN CH. 6 pg 3-10	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	COMP PLAN CH. 3 pg. 5-6	Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	FHMC 13.08	Yes
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	FHMC 13.04-16	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.		N/A

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature

8.8.13
Date

MIKE BERTRAND, LAND USE ADMINISTRATOR, TOWN OF FRIDAY HARBOR
Printed Name, Title, & Jurisdiction

San Juan County
Community Development & Planning

135 Rhone Street P.O. Box 947 Friday Harbor, WA. 98250
(360) 378-2354 (360) 378-2116 Fax (360) 378-3922
permits@co.san-juan.wa.us www.sanjuanco.com

June 19, 2013

TOWN OF FRIDAY HARBOR
JUN 19 2013
RECEIVED

Mr. Wayne Haefele, P.E.
Town of Friday Harbor
PO Box 219
Friday Harbor, WA 98250

RE: Friday Harbor Water System Plan Consistency Review

Dear Mr. Haefele, P.E.,

Attached is the completed Local Government Consistency Review Checklist pertaining to the February 2013, draft Friday Harbor Water System Plan (Plan) and San Juan County Comprehensive Plan. The draft Plan is consistent with the County's Comprehensive Plan land use designations, development regulations and water system service policies. However, several planning inconsistencies were identified and are addressed in the review documentation provided in this letter. It is recommended that these inconsistencies be addressed during the periodic update of the Town and County Comprehensive Plans required by the Growth Management Act by 2016.

First, the population projections in the draft Plan and Town Comprehensive Plan are inconsistent with those in the County Comprehensive Plan. This inconsistency has been determined to be insignificant in terms of the draft Plan because the Town's projections are better aligned with current population growth trends. Secondly, the water storage level of service for fire suppression described in the Town and County Comprehensive Plans appears to be higher than the amount allocated in the draft Plan. Other minor inconsistencies related to the water system inventory have also been identified.

The consistency determination is forwarded with the recommendation that the draft Plan be amended to reference the San Juan County Comprehensive Plan, April 27, 2010, in Section 1.4, *Related plans and documents* (Page 1-19). The following portions of the County's Comprehensive Plan are relevant to the draft Plan:

- Element 2: Land Use, April 2010
- Appendix 1: Population Projections, Buildout Analysis and Land Use Inventory, June 9, 2009
- Appendix 2: Joint Planning Policies with the Town of Friday Harbor, and other County-wide Planning Policies, December 2, 2008
- Appendix 3: Friday Harbor Unincorporated Growth Management Agreement, July 8, 2008

- Appendix 7: Inventory of Capital Facilities, June 3, 2009
- SJC Code: 18.30.020(D)(12)

The following consistency documentation supports the attached consistency checklist:

a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.

Yes, the proposed service area depicted in draft Plan Figure 1-2 *Town Boundaries and Urban Growth Areas* is consistent with the San Juan County Comprehensive Plan Land Use Map and County land use designations. The water system map in Figure 1-4 on page 1-9 of the draft Plan is consistent with the County's development regulations. Although the land use designations for service areas located outside of Town are not depicted in the draft Plan, there is no need to include the maps. Water system facilities may be developed in any land use designation when the applicable permits are obtained under Chapter 18.30 of the San Juan County Code. Development in Harborview Place in the Town's UGA is subject to the Town's development regulations.

b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.

No, the population projections of the Town and County are not consistent. The Town of Friday Harbor and County Comprehensive Plans use different average annual population growth rates (1.7 and 2.2 percent) to project population growth. The growth rate used in the draft Plan is consistent with the rate adopted in the Friday Harbor Comprehensive Plan and is used to forecast water demand in the entire water service area (Section 2.2.2, page 2-11). Based on a review of the latest data from the Office of Financial Management (OFM) provided below, the inconsistency in the Town and County population growth rates and projections is not deemed to be a concern because the Town's projections are better aligned with the most current Census and OFM forecast data than County projections. The Town's population projections used in the draft Plan are appropriate for use through the draft Plan's planning horizon.

The growth projections in the Town Comp Plan and draft Plan are based on the latest census data. The projected population in the draft Plan is based on the 2010 Census Town population of 2180. OFM projections attribute an average annual growth rate of 0.8 percent between 2010 and 2011 to the Town. The OFM projection for 2012 projected a reduction in Town population of 40 people. These rates are lower than the Town's average annual projected growth rate used in the Plan.

Population forecasts are contained in Appendix 1 of the County's Comprehensive Plan (beginning on page 5), Table 8, (page 7). Section F contains Urban Growth Areas population projections. The County projection for 2010 is 2,580 people. The County's population forecast for 2010 was 17,316. The latest OFM Census data shows that the 2010 population was 15,769. This figure falls within OFM's medium series of projections. In 2025, the OFM medium projections show a significantly smaller population in the County than currently projected. The County's currently adopted 2025 projection (22,534) is higher than OFM's "high" population projection in 2025 (21,204). By 2025, County Comprehensive Plan population projection for the Town is estimated to be 3,821. The draft Plan projects an estimate population of 3,106 by 2032, a lower projection than the County projects for 2025.

Given the recent OFM data, the limited development area in the Town's Urban Growth Area, and Town regulations that prohibit expansion of service outside of the Town's boundaries, the use of the Town's population projections to estimate water demand is sensible in spite of the

inconsistencies with the County's Comprehensive Plan. The inconsistency in Town and County population projections will be addressed during the periodic update of the Town and County Comprehensive Plans required by the Growth Management Act in 2016. The County looks forward to working with the Town to reconcile inconsistent population projections during this update process.

c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.

Not applicable to San Juan County.

d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of San Juan County.

Yes, the service area policies contained in Section 1.8 (page 1-26) of the draft Plan are consistent with the San Juan County Comp Plan Policies for Joint County and Town Planning and Promotion of Contiguous and Orderly Development adopted in Appendix 2 of the San Juan County Comprehensive Plan and Chapter 6 of the Town's Comprehensive Plan (pages 4-9). The Plan is also consistent with the County's Comprehensive Plan, Appendix *3 Friday Harbor Unincorporated Growth Management Agreement.* These policies are implemented in San Juan County Code Title 18, the County's Unified Development Code.

e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area, Management plans, and Capital Facilities Element of Comprehensive plans.

No, relevant elements of the County Comprehensive Plan Capital Facilities Element Plan and Town Comprehensive Plan, Chapter 6 are not addressed in the draft. San Juan County Policy 7.2.B. 1 addresses capital facilities in the Friday Harbor UGA (page 9). The Town's water system inventory and level of service standards are found in the Appendix 7 Capital Facilities Inventory in Section 2 *Community Water Systems* (Page 4-5).

The Town and County Comprehensive Plans contain an inconsistency in the amount of water distribution lines identified in the draft Plan. In addition, the water storage information in the draft Plan is not aligned with the level of service for fire suppression water storage that is contained in the Town and County Comprehensive Plans. Both Comprehensive Plans indicate that the adopted level of service standard for Town water storage is 600 GPC with a base of 0.24 MG. This information is found on page Appendix 7, page 4-5 of the County's Comprehensive Plan and in Chapter 6, page 7 of the Town's Comprehensive plan. This level of service standard is higher than the 2011 baseline provided in the draft Plan for fire suppression storage and could potentially restrict development. In the draft Plan, Table 3-6 *Entire Water System Storage Requirements,* (page 3-1) identifies the 2011 baseline storage amount for fire suppression is 0.135 MG. By the years 2018 and 2032, the needed storage capacity for fire suppression is projected to be 0.165 MG. These fire suppression figures are based upon the National Fire Protection Association's fire flow and duration time requirements. If these requirements are more appropriate that the existing level of service standard, the Town may wish consider adjusting their level of service.

These inconsistencies with the draft Plan can be addressed and updated during the 2016 Comprehensive Plan updates. The amount of water distribution lines inventoried in the Town (Chapter 6, page 3) and County's Comprehensive Plan (Appendix 7, page 5) should be updated

from 9 miles to 30 miles of distribution lines consistent with the information contained on page 1-17 of the draft Plan. If the Town amends its level of service standard for fire suppression storage adopted in the Town Comprehensive Plan, the County's Comprehensive Plan should be amended for consistency.

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations or the inconsistency has been explained and the manner of reconciling the inconsistencies has been identified.

Linda Kuller 6/19/13

Signature Date

Linda Kuller, Planner IV San Juan County

Printed Name, Title, & Jurisdiction

Attachments:

Local Government Review Checklist
Excerpts from the Town and County Comp Plans: Water Supply and Community Water Systems- Friday Harbor
Table 8 County Population Forecast 2005-2025 (2.2% Average Annual Growth Rate) SJC Comp Plan
Office of Financial Management 2012 estimate for San Juan County

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: Town of Friday Harbor PWS ID: 26595

Planning/Engineering Document Title: Draft Water System Plan Plan Date: Feb 2013

Local Government with Jurisdiction: San Juan County

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	*	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	*	No*
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	*	NA
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	*	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.	*	No*

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Linda Kuller
Signature

6·19·13
Date

Linda Kuller Planner IV
Printed Name, Title, & Jurisdiction * See attached letter

Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the retail service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place of use. If no water right place of use expansion is requested, a consistency review is not required.

For **engineering documents**, a consistency review is required for areas where a municipal water supplier wants to expand its water right's place of use (water system plan amendment is required). For non-community water systems, a consistency review is required when requesting a place of use expansion. All engineering documents must be submitted with a service area map per WAC 246-290-110(4)(b)(ii).

A) Documenting Consistency: Municipal water suppliers must document all of the elements in a consistency review per WAC 246-290-108.

1 a) Provide a copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that are related to water supply planning.

1 b) Include a copy of the **six-year growth projections** that corresponds to the service area. If the local population growth rate projections are not used, provide a detailed explanation on why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

1c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. This applies to cities and towns only.

1 d) Include all **service area policies** for how new water service will be provided to new customers.

1 e) **Other relevant elements** related to water supply planning as determined by the department (DOH). See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and provide direction on how this inconsistency can be resolved.

C) Documenting Lack of Consistency Review by Local Government: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for their review. Please include: name of contact, date, and efforts made (letters, phone calls, and e-mails). In order to self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Management Agreement adopted jointly with San Juan County in 1996.

CFE-12 Friday Harbor should develop capital facilities within the Urban Growth Area that are coordinated and phased through inter-jurisdictional agreements with San Juan County, the Port of Friday Harbor, and WSDOT.

CFE-13 Friday Harbor should support the capital facility planning efforts of special purpose districts and other facility providers that are consistent with the goals and policies of the Comprehensive Plan.

Concurrency

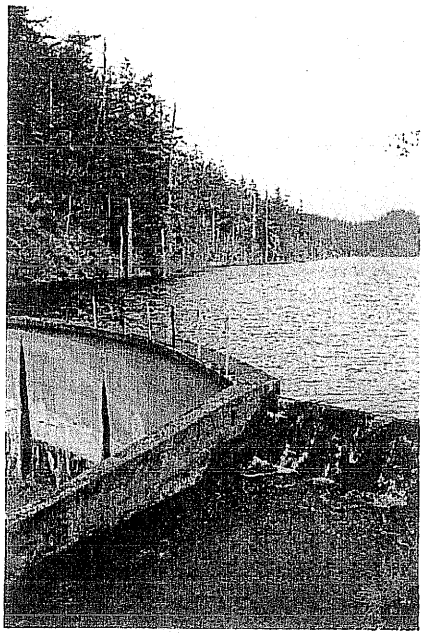
CFE-14 Friday Harbor should issue development permits when it determines that there is sufficient capacity of capital facilities to meet adopted LOS standards.

CFE-15 Capital facilities required to support development should be installed and fully operational prior to the issuance of a permit for construction of the development.

CFE-16 New development required to meet the concurrency test includes any construction or expansion of a building, structure, or use; any change in the use of a building or structure; or any changes in the use of land that creates an additional demand for capital facilities.

CFE-17 Friday Harbor should adopt level of service standards recommended in this plan for water supply, wastewater, storm drainage, solid waste, fire protection, law enforcement, emergency medical service and parks and recreation.

WATER SUPPLY



Trout Lake

Existing Facilities

System Description Friday Harbor's water is supplied from three surface water sources: the Trout Lake drainage basin, overflow from Lake 310 which is pumped into the Trout Lake watershed, and seasonal diversion of water from a creek in Section 17 east of Trout Lake. Water is distributed throughout the system by approximately 9 miles of pipeline. The piping ranges in size from 2 to 12 inches with most of the old 4 - 10 inch pipe being asbestos cement or cast iron. All the new pipes are polyvinyl chloride (PVC) except the 12-inch mains, which are ductile iron. The existing in Town water system is shown in FIGURE 6-1. In addition to the Town's system, irrigation needs are augmented by private water supplies. There are currently 57 private wells within the areas on the water system.

Until 1979 Friday Harbor's water supply came from one water surface source: Trout Lake. Trout Lake is located west of

Town in an isolated, undeveloped drainage basin of approximately 860 acres. The Town owns about 600 acres of the watershed. The natural lake was increased in size and depth with construction of the existing concrete dam.

In 1979, the Lake 310 augmentation project, called "Aug 1," was constructed to supplement Trout Lake with more surface water runoff. The project entailed building a diversion near the southeast end of Lake 310 to collect overflow water from a 290-acre watershed. The Lake 310 overflow water is captured in a small storage impoundment, then pumped over a hill into Trout Lake Creek which drains into Trout Lake. In 1988 the Town began construction of a second augmentation project called "Aug 2." Aug 2 consists of a stream diversion, pump station and force main. Runoff water is diverted from a creek and pumped to Trout Lake. While the Aug 1 and Aug 2 watersheds are not owned or protected by the Town of Friday Harbor, there is little development currently within them. The Town will need to coordinate future planning and development in these areas with San Juan County in order to protect water quality within the watersheds.

In 1993 construction began to replace the pressure filtration system with a 700-gpm gravity filtration system. Following filtration, water is chlorinated with contact time achieved in a 70,000-gallon clearwell, which also provides water to periodically backwash the filtration units. Finished water is carried via a 10-12-inch main to the Town's 0.5 million-gallon standpipe located at Spring Street and Marguerite Place. During high system demands, three 350-gpm pumps at the treatment plant maintain the standpipe at a hydraulic grade line elevation of 207 feet. During low system demands, a single 50-gpm pump maintains the standpipe elevation at 207 feet.

The annual water flow entering the system from Trout Lake varied from 112.8 million gallons in 2000 to 160.0 million gallons in 1990. Maximum daily demand has varied from 0.45 million gallons per day (mgd) in 2000 to .52 mgd in 1990. The highest water use over the past ten years typically occurs during the months of July, August, and September when approximately one third of the annual volume is consumed.

Single Family Residential use made up the largest portion of annual water use in Friday Harbor accounting for approximately 36.1 percent. Commercial users make up the next largest usage of water at approximately 25.3 percent per year. Multi-Family Residential and Public Authority use both account for approximately 15 percent per year each. Total industrial water use is approximately 2.7 percent of total water produced. The gravel pit accounted for approximately 90 percent of the industrial water use. The gravel pit ceased operations in March 1999.

The Town of Friday Harbor experienced severe drought conditions in 1993 and 1994, receiving approximately 32 percent of the annual average rainfall at their Trout Lake reservoir. As it did in the 1988 drought, the Town implemented voluntary and mandatory conservation efforts. The 1994 conservation efforts resulted in an average 25 percent reduction in demand as compared to the 1993 average monthly demand.

Current Capacity Due to the 1993 drought conditions, which continued into 1994, the active storage volume in the Trout Lake reservoir dropped to its lowest level since the 1988 drought. The problem was severe enough to raise concerns as to whether the Town would have a sufficient water storage for the 1994 year. Since the estimates of total reservoir storage volume vary and, since the reservoir level was 12

feet below the spillway elevation, the Town commissioned a study of the Trout Lake capacity to determine the actual storage volume.

Based on construction document records, the elevation of the Trout Lake spillway at the dam is 262.5 feet above sea level and the upper and lower water supply outlet pipes in the dam are situated at centerline elevations of 251.5 and 240.0 feet, respectively. The reservoir capacity analysis concluded that the lake covers 62 acres when filled. The study estimated total storage volume to be 468 million gallons including the live and dead storage. "Live storage" is the volume of water above the reservoir lower outlet pipe and was estimated to be 370 million gallons. The reservoir volume below the lower outlet pipe is considered "dead storage" and was estimated to be 98 million gallons.

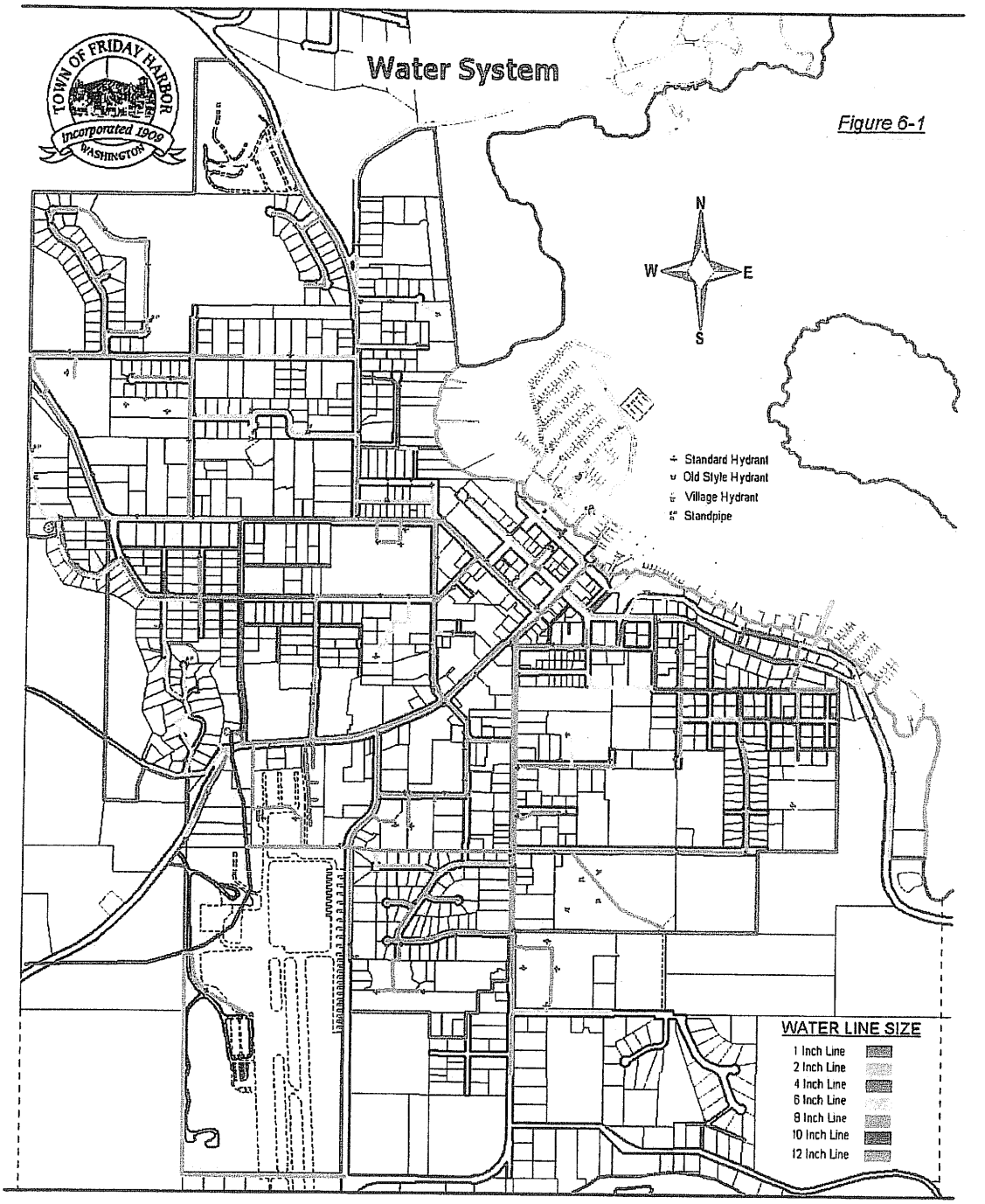
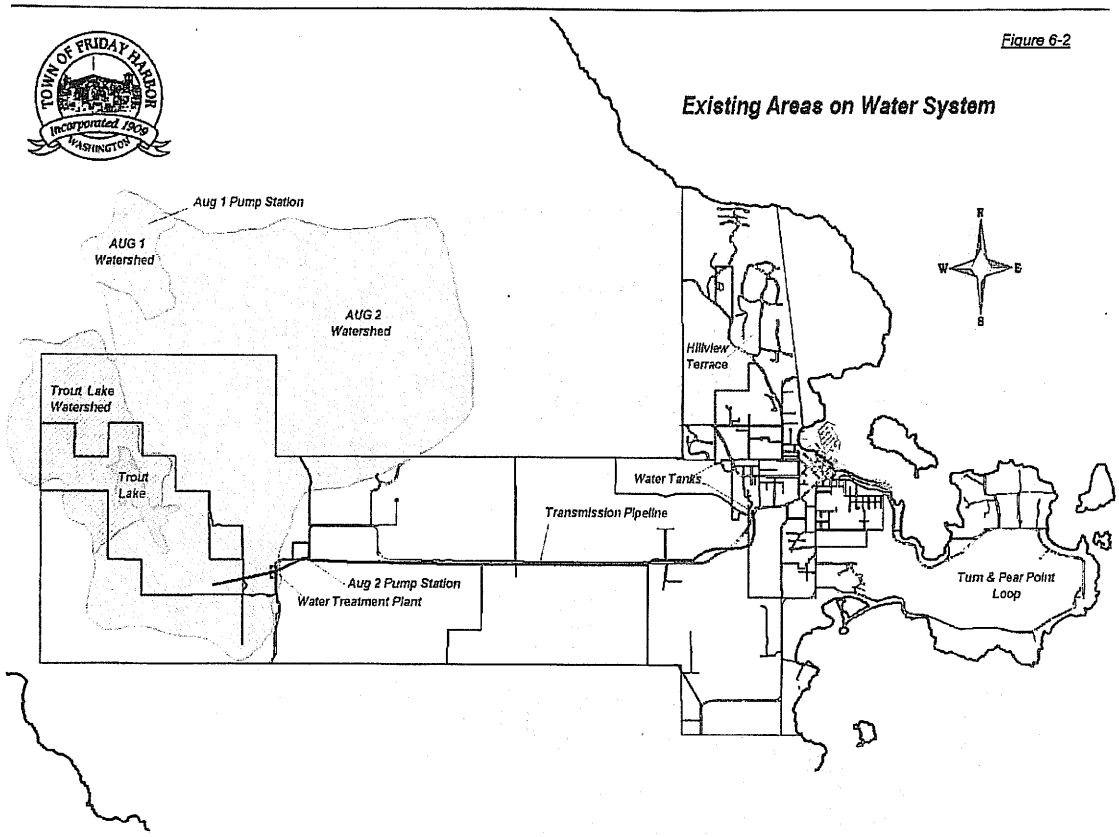


FIGURE 6-1
Existing Water System



Future Water Supply Needs

Level of Service The following LOS standards were used to estimate source, treatment, distribution and storage costs for water supply in the Comprehensive Plan:

- Source: 168 million gallons annually. This is a standard in the 1997 Comprehensive Water System Plan (Resolution No. 1060, February 1997) and source approval consistent with WAC 246-290-130.

- Treatment: 340 GPCD. This is a standard in the 1997 Comprehensive Water System Plan (Resolution No. 1060, February 1997) and source approval consistent with WAC 246-290-130.

- Distribution: State requirements for minimum fire flow are defined in the 1997 Comprehensive Water System Plan (Resolution No. 1060, February 1997). It is assumed 8-inch pipe will be used unless warranted due to high fire flow requirements.

- Storage: The standard is 600 GPC, with a base of 0.24 MG for fire protection.

Proposed In-Town Improvements

The 1997 Comprehensive Water System Plan is the basis for the impact analysis and cost estimates for the current town limits. This document hereby references that Plan, the Water Conservation Plan, as well as the Town of Friday Harbor's 2002 Budget. These documents, along with the 2002-2007 Capital Facilities and

Expenditures Summary, outline the proposed improvements.

Goals

CFE-18 To develop and maintain a safe, efficient, and cost-effective water supply treatment and distribution for Friday Harbor.

CFE-19 To promote water conservation as a means to ensure protection and availability of Friday Harbor's water supply.

CFE-20 To ensure that future water system improvements and service extensions are provided in a manner consistent with the goals and policies of the Comprehensive Plan.

CFE-21 To encourage the research and use of water conservation technology.

CFE-22 To exhaust potential cost effective conservation measures before seeking new resources.

General Policies

CFE-23 Friday Harbor should establish water conservation measures that apply to both water supply development and water use.

CFE-24 Friday Harbor should consider and support the best available options for water sources and supply to ensure that its citizens have adequate and reliable supplies of drinking water.

CFE-25 Friday Harbor should ensure that all the costs attributable to development of new water supplies or the extension of water supply facilities are equitably shared by those who benefit.

CFE-26 Friday Harbor should review and implement all viable methods of conservation, included but not be limited to:

- Water efficient devices
- Energy efficient devices
- Recycling
- Composting

CFE-27 Friday Harbor should establish a Conservation Program Manager to collect, maintain and distribute conservation information; educate the public on new conservation technology; evaluate conservation systems; and encourage the public to adopt conservation measures.

CFE-28 Friday Harbor should explore utility rate structures that encourage conservation.

CFE-29 Friday Harbor should encourage the voluntary adoption of conservation measures and purchase of conservation devices through education and incentive programs.

Land Use and Development

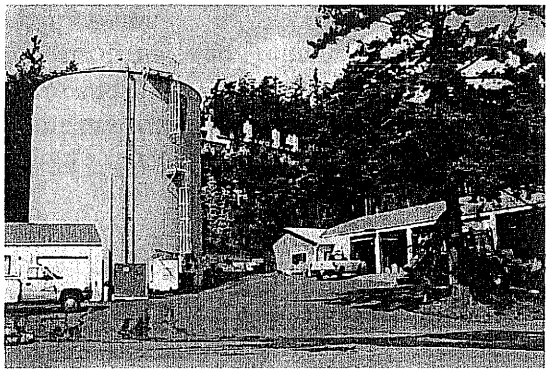
CFE-30 New development should be contingent upon demonstration by the Town that water supply and related distribution facilities are both available and adequate for proposed uses.

- Water supply should be considered "available" when it is demonstrated that water of sufficient quantity and quality for the intended use can be delivered to the proposed development.

- Water supply should be considered "adequate" when peak demand and the quantities of water necessary to satisfy that demand have been demonstrated.

CFE-31 Friday Harbor should revise its land use, development and building regulations to encourage water conservation. Measures should include, but not be limited to:

- Point-of-use demand management and water meters; and
- Water-efficient landscaping.



Water tank and Public Works Department

Level of Service

CFE-32 In evaluating water supply system improvements, or the impact of new development on the Town's water supply system, Friday Harbor should apply the following LOS standards:

- Source : 168 million gallons annually. This is a standard in the 2001 Comprehensive Water Plan.
- Treatment: 340 GPCD. This is a standard in the 2001 Comprehensive Water Plan.
- Distribution: State requirements for minimum pressure and fire flow are defined in the 2001 Comprehensive Water Plan.
- Storage: The standard is 600 gallons per capita (GPC), with a base of 0.24 MG for fire protection.

CFE-33 Friday Harbor should adopt a concurrency management ordinance that prohibits development approval if development causes the demand to exceed the adopted LOS unless improvements or strategies to accommodate the impacts of development are made concurrently with the development.

CFE-34 If demand exceeds 85% of adopted LOS standards Friday Harbor should respond in one or more of the following ways:

1. Decrease demand for water system facilities or services in one or more of the following ways:

- Implement substantial demand reduction regulations; and
- Re-evaluate the goals and policies in the Land Use Element that affect the rate of residential and non-residential growth; or
- Re-evaluate the concurrency policies contained in this Element and revise if necessary; or
- Limit the number of water service hookups approved by the Town pending funding and/or completion of identified water system improvements; or
- Implementing a moratorium on new water connections to the Town's water supply system.

2. Increase water supply system capacity by:

- Expanding water system facilities; or
- Improve the existing system to correct deficiencies; or

County Comp. Plan

Juan Sanitation also offers rural recycling pickup for their customers. This is accomplished with boxes placed along the sides of the hauler's 20-yard packer truck. The materials collected are taken to County Recycling Centers for transport to the mainland.

The Town of Friday Harbor operates a municipal refuse collection service for its residents, using a compactor truck. Collection service is mandatory within town limits and rates, rules, and regulations for solid waste handling, collection, and disposal are established by ordinance. In general, residential refuse is collected once per week, and commercial establishments that generate large amounts of refuse are provided more frequent collection service as needed. Town refuse is deposited at the County's San Juan Island transfer facility on Sutton Road.

Hazardous Waste

No industry on the island has been identified as a hazardous waste generator. There are Conditionally Exempt Small Quantity Generators in the County and Household Hazardous Waste generators. These wastes are handled through annual collection events offered on San Juan, Lopez and Orcas Islands. These are one-day events that are advertised in local media and accept waste from all the islands. A private contractor is engaged to package, ship and arrange treatment or disposal of the waste.

2. COMMUNITY WATER SYSTEMS - ACTIVITY CENTERS

Water supply is a critical natural resource in the San Juan Islands. Available fresh water supplies result only from precipitation, which is relatively low due to the county's Olympic Mountain rain shadow in which the islands are located. San Juan County does not have rivers fed by distant mountain runoff or snowmelt and the situation is further complicated by a general lack of many lakes which can store runoff from rainfall.

Background

Only a small percentage of the water that falls on the islands actually percolates into localized underground aquifers, and drinking water supplies are variable across the county and each island, with some areas experiencing limited or declining supplies. Surface and ground water resources are not well-documented and future supplies are uncertain. Most of the County's land base is undeveloped and represents potential additional demands on the county's water resources. San Juan County does not provide water treatment or distribution services to residents.

The majority of water use in the County is for consumptive purposes, and is supplied by the many small public water systems, from both ground and surface sources. Single domestic supplies (from wells and small surface impoundments) are a lesser, but significant, source of domestic supply. Irrigation for agriculture is the smallest portion of consumptive use in the county.

Surface water sources provide water supplies to the majority of the population in San Juan County, primarily in the Friday Harbor, Eastsound, and Roche Harbor areas. On Orcas, Blakely, and San Juan Island, several large surface water sources supply the majority of the population.

There are approximately 246 small public water systems (Group A and B systems) in the County and an unknown number of individual domestic users supplied by groundwater wells. Lopez, Decatur, and Shaw Islands rely heavily on groundwater sources for potable water supplies. Additional information on water resources is contained in the Water Resources Element (Element 4) and Appendix 4 of the *Comprehensive Plan*.

Friday Harbor

The Town of Friday water system is supplied by three sources: (1) the Trout Lake drainage basin, (2) overflow from Lake 310 which is pumped into the Trout Lake watershed, and (3) seasonal diversion of water from a creek in Section 17 east of Trout Lake. Water is distributed throughout the system by 9 miles of pipeline ranging in size from 2 to 20 inches with most of the old 4-10 inch pipe being asbestos cement or cast iron. All the new pipes are polyvinyl chloride (PVC), except the 12 inch mains. In addition to the Town's system, irrigation needs are augmented by 57 private wells within the areas of the water system.

Trout Lake total water storage capacity is 468 million gallons. The Town's water supply system level of service (LOS) standards for water treatment, distribution, and storage include the following:

- Source of Supply: 168 million gallons annually, which is the standard for the currently adopted *Water System Plan* per WAC 246-290.
- Treatment: 340 GPCD (gallons per capita per day)
- Distribution: State requirements for minimum fire flow as defined the *Water System Plan.*
- Storage: 600 GPC (gallons per capita) with a base of 0.24 MG (million gallons) for fire protection.

Roche Harbor

The Roche Harbor area is provided with water service by Roche Harbor Water System, Inc. (RHWS). This system is a Group A Community (Class 1) water system approved to serve up to 468 residential connections and the Roche Harbor Resort. This approval assumes a maximum water use by the area of 190,000 gallons per day. The water system currently provides service to 530 residential customers, which includes approximately 100 inactive hookups.

The source for the RHWS water system is Roche Harbor Lake (a.k.a. Briggs Pond). The lake is located in the hills southeast of Westcott Bay, about two miles southeast of the Roche Harbor Resort. From the lake, raw water is conveyed by gravity through two parallel transmission pipes to a water treatment plant located on Roche Harbor Road at the head of Westcott Bay. From the treatment plant the water is pumped to the system's primary storage reservoir located on a hill east of the treatment plant. From the primary storage reservoir the water is distributed to three other reservoirs and the system's customers. The service area for the water system is mostly located within a radius of about 1.5 miles of the primary storage reservoir.

Based on a reported 2005 total treated water production of 27,000,000 less 10% backwash (2,7000,000 gallons) = 24,300,000 net gallons. Of that amount 30% (7,290,000 gallons) is used by the Resort, and 70% (17,010,000 gallons) serves 375 non-resort connections. Assuming 375 non-resort connections, the average daily use per connection would be about 125 gallons per day (gpd) actual use per connection. The RHWS current water plan (2003) will be updated in 2008.

Eastsound

The Eastsound Water User's Association (EWUA) provides water to association members in the greater Eastsound area, which includes the 2005 proposed Eastsound Urban Growth Area (UGA). The EWUA system currently consists of ten groundwater wells in four locations, Purdue Lake, a 175 gallons per minute (gpm) treatment plant, two distribution mains, two 100,000-gallon storage tanks and a 79,000-gallon storage tank at the Lake.

According to the EWUA 1996 Water System Plan Update, as of June 1995 there were a total of 780 residential and commercial memberships served by the system, 653 of these were active memberships. The EWUA 1996 Water System Plan shows that the entire Eastsound subarea is located within the boundaries of the EWUA service area, and long-range planning includes water supply for the total potential buildout forecasted in the 2003 Eastsound Subarea Plan.

The EWUA 1996 Water System Plan Update builds on the 1990 *Water System Plan.* The 1990 *Plan*'s short-term recommendations focused on distribution system improvements and assumed an adequate source capacity of 126.8 million gallons/year (MG/yr), 80.4 MG/yr groundwater, and 46.4 MG/yr surface water. The past five years of monitoring source capacity resulted in a reassessment of that assumption.

The 1990 *Plan* and 1996 Update estimate potential buildout for the Eastsound Water Service Area to be between 3,500 and 4,000 units. Department of Ecology approved annual source production is 126.8 MG. The available ground and water surface water production is considerably less than the approved amount. The system produced 51

Table 8
County Population Forecast 2005-2025 (2.2% Average Annual Growth Rate)

Island	2005 Population	Population by Island (%)	Population Projections (OFM) 2010	2015	2020	2025
San Juan (unincorp.)	5,214	30.6%	5,645	6,085	6,491	6,885
Orcas	4,894	31.6%	5,467	6,052	6,592	7,115
Lopez	2,396	15.5%	2,677	2,963	3,227	3,483
Shaw	245	1.6%	272	303	330	356
Subtotal (unincorp.)	12,749	82.3%	14,241	15,766	17,172	18,535
Town of Friday Harbor	2,150	17%	2,582	3,022	3,428	3,821
Total Ferry-Served Islands	14,899	96.1%	16,643	18,425	20,068	21,660
Blakely	62	0.4%	69	77	84	90
Brown	14	0.1%	16	17	19	20
Center	54	0.3%	60	67	73	79
Crane	22	0.1%	25	27	30	32
Decatur	78	0.5%	87	96	105	113
Johns	6	0.0%	7	7	8	9
Pearl	8	0.1%	9	10	11	12
Stuart	52	0.3%	58	64	70	76
Waldron	115	0.7%	128	142	155	167
Other Islands	191	1.2%	214	235	256	276
		0.0%				
Total Non-Ferry-Served Islands	601	3.9%	673	743	810	874
TOTAL	**15,500**	**100.0%**	**17,316**	**19,168**	**20,877**	**22,534**

Source: Washington State OFM (2002 & 2005) (Ord 16-2009)

F. Urban Growth Areas (UGAs) Population Forecasts

Although the County has selected to use a 20-year average annual population growth rate of 2.2% for planning purposes during 2005-2025, each year's growth rate will actually fluctuate higher or lower than the projected *average* annual growth rate for the 20-year time period. This will be particularly true for the County's urban growth areas at Orcas Eastsound Village and Lopez Village. As a result, population forecasting for the urban growth areas considers growth factors that are somewhat different than the criteria used in forecasts for the Countywide population.

UGA Goals for Growth

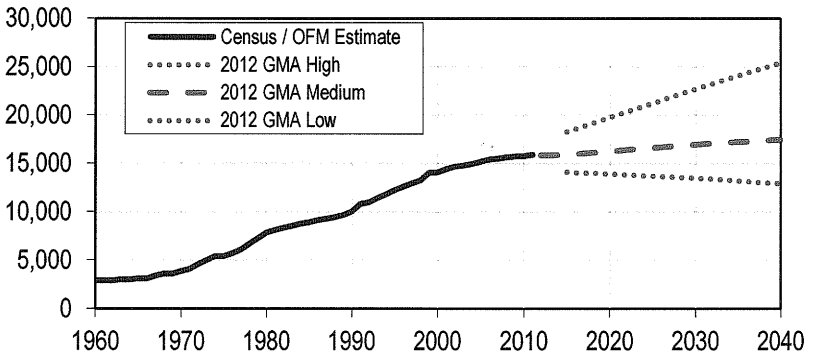
Population forecasts for the UGAs are based on projections per the Washington State Growth Management Act (GMA) mandated goal of accommodating 50% of the County's total increase in population growth over a 20-year planning period. This means that a certain amount of land available for urban level housing density (e.g., 4 units per acre or more) that can also be served by utilities at the time of development (per GMA concurrency

Monday, April 23, 2012

Dear San Juan County Elected Officials and Planning Director,

In accord with RCW43.62.035, OFM has developed the 2012 Growth Management Act (GMA) provisional population projections for county review. Note these county projections reflect Census 2010 information and include consideration of the current recession's effect on migration and fertility behavior, which impacts many counties' projections. The preliminary county projections (low, middle, and high series) are shown in the table below, along with a graph illustrating the projections and the historical population trend.

Year	Population (Low)	Population (Medium)	Population (High)
2010 (Census)		15,769	
2015	14,104	15,907	18,270
2020	13,896	16,256	19,736
2025	13,688	16,606	21,204
2030	13,464	16,939	22,654
2035	13,189	17,216	24,043
2040	12,868	17,443	25,378



In compliance with the Paper Reduction Act (RCW 70.95.725), the complete review packet will not be mailed; instead, the relevant documents -- methodology description, provisional projections, age pyramids, and other GMA projection related demographic data -- will be posted on the OFM website at http://www.ofm.wa.gov/pop/gma/projections2012.asp.

Please review this preliminary population projection. If you would like to comment or have any questions, please send them to pop.gma@ofm.wa.gov or contact me by phone 360-902-0592. The comment period for county GMA projections will end on **Friday, May 11, 2012**.

Yours Truly,

Yi Zhao, Washington State Chief Demographer

Affidavit of Publication.

STATE OF WASHINGTON

County of San Juan

NOTICE OF PUBLIC HEARING
Notice is given that the Town Council of Friday Harbor, Washington will hold a PUBLIC HEARING for review of the 2013 Town Water Comprehensive Plan at 5:30 p.m., Thursday, June 20, 2013 at Town Hall, 60 Second Street, Friday Harbor, WA 98250. Copies of the Plan are available for public review online at www.fridayharbor.org or by contacting Town Hall at 360-378-2810.
LEGAL NO. FH493836
Published: The Journal of The San Juan Islands. July 3, 2013.

The undersigned, being first duly sworn, says on oath that she is the principal clerk of THE JOURNAL OF THE SAN JUAN ISLANDS, a weekly newspaper approved as a legal newspaper by order of the Superior Court of the State of Washington for San Juan County; that said newspaper is now and has been published in the English language continuously as a weekly in Friday Harbor for six months prior to the first date of publication of the notice hereto attached; that said

Town of Friday Harbor
2013 Town Wate FH493836

is a true copy and was published by her in one successive copies of said paper on the following dates:

July 3, 2013

and was printed in full in said newspaper and not in supplement thereof.

That the publication cost thereof the sum of $ 27.20 and has been paid in full at the rate of $ 8.00 per column inch for each insertion.

Rosanne L Lee

Subscribed and sworn before me this 17th *day of* July, *2013.*

Frances E Bacon

Notary Public in and for
The State of Washington
residing at Friday Harbor, WA

FRANCES E BACON NOTARY PUBLIC COMMISSION EXPIRES SEPTEMBER 21, 2015 STATE OF WASHINGTON

Affidavit of Publication.

STATE OF WASHINGTON

County of San Juan

NOTICE OF PUBLIC HEARING
The Council of the Town of Friday Harbor will hold a Public Hearing to review updates to the Water Comprehensive Plan.
Said meeting will be held at 12:00 PM, July 11, 2012 at Town Hall, 60 Second Street, Friday Harbor, Washington.
Copies of the plan are available for review at Town Hall, 60 Second Street, Friday Harbor, Washington between 8:00 AM and 4:30 PM, Monday through Friday or visit the Town web page at www.fridayharbor.org. Written comments may be addressed to PO Box 219, Friday Harbor, WA 98250.
LEGAL NO. FH491826
Published: The Journal of the San Juan Islands, June 26, July 3, 2013.

The undersigned, being first duly sworn, says on oath that she is the principal clerk of THE JOURNAL OF THE SAN JUAN ISLANDS, a weekly newspaper approved as a legal newspaper by order of the Superior Court of the State of Washington for San Juan County; that said newspaper is now and has been published in the English language continuously as a weekly in Friday Harbor for six months prior to the first date of publication of the notice hereto attached; that said Town of Friday Harbor Water Comprehensive Plan FH 491826 is a true copy and was published by her in two successive copies of said paper on the following dates: June 26, July 3, 2013

and was printed in full in said newspaper and not in supplement thereof.

That the publication cost thereof the sum of $ 38.40 and has been paid in full at the rate of $ 8.00 per column inch for each insertion.

Frances E Bacon

Subscribed and sworn before me this 17th *day of* July, *2013.*

Frances E Bacon

Notary Public in and for
The State of Washington
residing at Friday Harbor, WA

FRANCES E BACON NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES SEPTEMBER 21, 2015

AGENDA - TOWN COUNCIL
Town Council Chambers
- 60 Second Street
Thursday, July 11, 2013

12:00 PM Call to Order / Roll Call / Flag Salute / Public Access
(Est. 10 min.) County Council Update
(Est. 20 min.) Presentation by Brown & Caldwell regarding updates to the Town Water System Plan
(Est. 10 min.) PUBLIC HEARING - To consider updates to the Town Water System Plan
(Est. 5 min.) Resolution No. 1960 - Authorizing the Mayor to execute an agreement with Lawson Construction, Inc. for improvements to the public right-of-way at the corner of Spring Street and Marguerite Place
(Est. 5 min.) Resolution No. 1961 - Authorizing the Mayor to execute an interlocal agreement with the Port of Friday Harbor regarding the Mullis Street curb, gutter & sidewalk improvements from Market Street to Friday Harbor Airport
(Est. 5 min.) Resolution No. 1962 - Authorizing the Mayor to execute a contract with Atlantis Construction for stormwater improvements on Warbass Way
(Est. 5 min.) Resolution No. 1963 - Authorizing the Mayor to execute a contract with Atlantis Construction for stormwater improvements on Hillcrest Place
(Est. 10 min.) Resolution No. 1964 - Authorizing the Mayor to execute a contract with Island Gardens, Inc. for landscape and plantings in the Front Street right of way
(Est. 30 min.) Administrator's Report
Payment of Claims and Payroll
Approval of Minutes
Future Agenda Items
Citizen Response
Adjourn

5:30 PM Call to Order / Roll Call / Flag Salute / Public Access
(Est. 10 min.) PUBLIC HEARING - To consider the 2014 through 2019 Six Year Transportation Improvement Plan
(Est. 5 min.) Resolution No. 1964 - Adopting the 2014 through 2019 Six Year Transportation Improvement Plan
(Est. 5 min.) Ordinance No. 1512 - Authorizing a utility assistance program
(Est. 10 min.) Council discussion concerning Town Shoreline Master Plan updates
Future Agenda Items
Citizen Response
EXECUTIVE SESSION - RCW 42.30.110(1)(i) - Potential litigation
Adjourn

LEGAL NO. FH495465
Published: The Journal of the San Juan Islands. July 10, 2013.

Affidavit of Publication.

STATE OF WASHINGTON

County of San Juan

The undersigned, being first duly sworn, says on oath that she is the principal clerk of THE JOURNAL OF THE SAN JUAN ISLANDS, a weekly newspaper approved as a legal newspaper by order of the Superior Court of the State of Washington for San Juan County; that said newspaper is now and has been published in the English language continuously as a weekly in Friday Harbor for six months prior to the first date of publication of the notice hereto attached; that said Town of Friday Harbor agenda FH 495465 is a true copy and was published by her in one successive copies of said paper on the following dates: July 10, 2013

and was printed in full in said newspaper and not in supplement thereof.

That the publication cost thereof the sum of $ 0
and has been paid in full at the rate of $ 0 per column inch for each insertion.

Frances E Bacon

Subscribed and sworn before me this 17th *day of* July, *2013.*

Frances E Bacon

Notary Public in and for
The State of Washington
residing at Friday Harbor, WA

FRANCES E BACON
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
SEPTEMBER 21, 2015

TOWN OF FRIDAY HARBOR
Post Office Box 219 • Friday Harbor, Washington 98250
(360) 378 – 2810 • FAX: (360) 378 – 5339 • www.fridayharbor.org

AGENDA – TOWN COUNCIL

Town Council Chambers - 60 Second Street

Thursday, July 11, 2013

12:00 PM Call to Order / Roll Call / Flag Salute / Public Access

(Est. 10 min.) County Council Update

(Est. 20 min.) Presentation by Brown & Caldwell regarding updates to the Town Water System Plan

(Est. 10 min.) PUBLIC HEARING - To consider updates to the Town Water System Plan

(Est. 5 min.) Resolution No. 1960 - Authorizing the Mayor to execute an agreement with Lawson Construction, Inc. for improvements to the public right-of-way at the corner of Spring Street and Marguerite Place

(Est. 5 min.) Resolution No. 1963 - Authorizing the Mayor to execute an interlocal agreement with the Port of Friday Harbor regarding the Mullis Street curb, gutter & sidewalk improvements from Market Street to Friday Harbor Airport

(Est. 5 min.) Resolution No. 1961 - Authorizing the Mayor to execute a contract with Atlantis Construction for stormwater improvements on Warbass Way

(Est. 5 min.) Resolution No. 1962 - Authorizing the Mayor to execute a contract with Atlantis Construction for stormwater improvements on Hillcrest Place

(Est. 10 min.) Resolution No. 1964 - Authorizing the Mayor to execute a contract with Island Gardens, Inc. for landscape and plantings in the Front Street right of way

(Est. 30 min.) Administrator's Report

Payment of Claims and Payroll

Approval of Minutes

Future Agenda Items

Citizen Response

Adjourn

SUMMARY OF THE MINUTES
TOWN COUNCIL

Thursday, July 11, 2013 – Council Chambers – Afternoon Session

CALL TO ORDER
Mayor Lacher called the regular session of the Town Council to order at 12:00 p.m.

ROLL CALL
Councilmembers: Position No. 1, Steve Hushebeck; Position No. 2, Noel Monin; Position No. 3, Anna Maria de Freitas; and Position No. 5, Barbara Starr.

Others Present: Mayor, Carrie Lacher; Treasurer, Wendy Picinich; Town Administrator, Duncan Wilson; and Clerk, Amy Taylor.

Position No. 4, Felix Menjivar, and Attorney, Adina Cunningham, were not present.

EXECUSED ABSENCE
Mayor Lacher asked if the Council wished to excuse the absence of Councilmember Menjivar. Council unanimously excused his absence.

FLAG SALUTE
Mayor Lacher conducted the flag salute.

PUBLIC ACCESS TIME
There were no public access items forthcoming.

SJC COUNCIL UPDATE
At 12:01 p.m., San Juan County Councilmember Bob Jarman provided the Council with an update on issues of mutual concern. Mr. Jarman discussed the County Council establishing regular Monday meetings; solid waste lease at the San Juan Island Transfer Station; and update on the marina fire at Roche Harbor. Discussion followed regarding the fire on July 10, 2013. The Council and Mayor thanked Mr. Jarman.

ACTION AND DISCUSSION ITEMS
Water System Plan Presentation

At 12:13 p.m., Mayor Lacher introduced discussion of updates to the Town Water System Plan (WSP). Administrator Wilson introduced Matthew Maring, Brown & Caldwell engineer, to present the Plan. Mr. Maring explained that it is a requirement to update the WSP every six years under WAC 246-290-100. Mr. Maring provided an overview of content; progress and improvements; and long-term needs for the system. It was noted that the overall state of the water utility and operations is good. Those long-term items result from pressure on the system from growth; supply expansion; utility rate impacts and funding; and capital improvement needs. Discussion and inquiry followed regarding findings and recommendations of the report. Mayor Lacher directed the consultant to include an Executive Summary as part of the report. [See public hearing.]

PUBLIC HEARING

Water System Plan

At 1:01 p.m., Mayor Lacher opened the public hearing concerning updates to the Town Water System Plan. Mayor Lacher opened the hearing to public comment.

Marilyn O'Connor, Executive Director for the Port of Friday Harbor, commented that the phasing and construction of Town's Water Transmission Line effects operations at the FH Airport. The Port is unable to develop portions of airport property until Town abandons the active transmission line because the line runs through their development site. Ms. O'Connor requested that Town continue to coordinate with the Port and take their needs into consideration.

At 1:03 p.m., hearing no other comment, Mayor Lacher closed the public comment portion of the hearing. The Council offered no comment for the record. Mayor Lacher closed the public hearing. No action was taken.

ACTION AND DISCUSSION ITEMS (cont.)

Resolution No. 1960

At 1:04 p.m., Mayor Lacher introduced draft Resolution No. 1960, *authorizing the Mayor to execute an agreement with Lawson Construction, Inc. for improvements to the public right-of-way at the corner of Spring Street and Marguerite Place.* The purpose of the project is to install overlay and soften the turning radius at the northeast corner of the intersection. Administrator Wilson explained that additional right-of-way was not needed from the Catholic Church for the improvements. Survey of the area identified that the corner and parking area, thought to be property of the church, are already in the Town right-of-way. Discussion followed regarding the condition of Marguerite Place and if additional improvements, such as patching, could be done while equipment was mobilized for this project.

Moved by Monin, seconded by de Freitas, to adopt Resolution No. 1960, authorizing the Mayor to execute an agreement with Lawson Construction, Inc. for improvements to the public right-of-way at the corner of Spring Street and Marguerite Place. Motion passed 4-0 with Menjivar absent.

Resolution No. 1963

At 1:09 p.m., Mayor Lacher introduced draft Resolution No. 1963, *authorizing the Mayor to execute an interlocal agreement with the Port of Friday Harbor regarding the Mullis Street curb, gutter & sidewalk improvements from Market Street to Friday Harbor Airport.* The Port of Friday Harbor is constructing a Visitor Aircraft and Lounge Facility Project on Mullis Street and is required to make certain improvements in the public right of way abutting the Friday Harbor Airport property as a condition of construction. The Port and Town verbally agreed to jointly fund additional curb, gutter and sidewalk improvements on Mullis Street from Market Street to the Airport to enhance pedestrian safety. Administrator Wilson explained that the agreement formalizes the arrangement between the Port and Town; and provided an update on the project. No discussion followed.

Moved by de Freitas, seconded by Starr, to adopt Resolution No. 1963, authorizing the Mayor to execute an interlocal agreement with the Port of Friday Harbor regarding the Mullis Street curb, gutter & sidewalk improvements from Market Street to Friday Harbor Airport. Motion passed 4-0 with Menjivar absent.

Resolution No. 1961

At 1:14 p.m., Mayor Lacher introduced discussion of draft Resolution No. 1961, *authorizing the Mayor to execute an agreement with Atlantis Construction for stormwater improvements on Warbass Way.* Wayne Haefele, Public Works Director, explained that the purpose of the agreement was for installation of approximately 131 feet of concrete "valley gutter" to direct additional stormwater runoff on the roadway to a catch basin nearby. No discussion followed.

Moved by Monin, seconded by Starr, to adopt Resolution No. 1961, authorizing the Mayor to execute an agreement with Atlantis Construction for stormwater improvements on Warbass Way. Motion passed 4-0 with Menjivar absent.

Resolution No. 1962

At 1:18 p.m., Mayor Lacher introduced discussion of draft Resolution No. 1962, *authorizing the Mayor to execute an agreement with Atlantis Construction for stormwater improvements on Hillcrest Place.* Wayne Haefele, Public Works Director, explained that the purpose of the agreement was for installation of approximately 95 feet of "rolled curb and gutter" to direct stormwater runoff on the roadway to a catch basin nearby. No discussion followed.

Moved by Starr, seconded by de Freitas, to adopt Resolution No. 1962, authorizing the Mayor to execute an agreement with Atlantis Construction for stormwater improvements on Hillcrest Place. Motion passed 4-0 with Menjivar absent.

Resolution No. 1964

At 1:20 p.m., Mayor Lacher introduced discussion of draft Resolution No. 1964, authorizing the Mayor to execute an agreement with Island Gardens Company for installation of landscape and irrigation on Front Street. Administrator Wilson explained that pursuant to direction from the Council on May 16th, the Town solicited bids using the small works roster and Island Gardens Company was the most responsive bid. Wayne Haefele, Public Works Director, provided the Council with an update and timeline for the project, including repair of water fountain and irrigation at Memorial Park. Discussion followed regarding budgeting for the project.

Moved by Hushebeck, seconded by de Freitas, to adopt Resolution No. 1964, authorizing the Mayor to execute an agreement with Island Gardens Company for installation of landscape and irrigation on Front Street.

ADMINISTRATOR'S REPORT

At 1:26 p.m., Administrator Wilson presented the Town Council with an update of the following:

- AWC conferences - Attended annual conference. Attended business workshops in Olympia upon return.
- Loss Prevention Grant - Town was granted $350 for purchases of equipment.
- Trout Lake water level - Reservoir is at minus 10.5 inches below the spillway.
- Town benches - Treasurer Picinich provided an overview of the bench program.
- July 4th holiday - Aside from the parade accident, it was a fairly uneventful day in terms of emergency calls.
- Recycling receptacles - Photos were distributed for review. Options and styles of cans were discussed.
- Public Restrooms - The cleaner has been directed to make additional cleanings on peak visitor days through summer.
- Salary Ordinance - A draft Ordinance was distributed for review.

- Water Ordinance - Staff will bring an ordinance to consider an alternative rate for sale of tank water under 200 gallons.
- Solid Waste - The County has requested alternative terms for consideration. The solid waste lease will be added to the next agenda.

PAYMENT OF CLAIMS

Moved by Monin, seconded by de Freitas, to approve the payment of Claim Warrant Nos. 38148 through 38220 in the amount of $244,960.67; and affirm the payment of Payroll Warrant Nos. 15843 through 15873 and the direct deposit run in the amount of $214,030.16. Motion passed 4-0 with Menjivar absent.

APPROVAL OF MINUTES

Minutes were postponed until the evening session.

FUTURE AND NON-AGENDA ITEMS

Mayor Lacher encouraged the Council and public to review the Port's Master Plan concept.

CITIZEN RESPONSE

No citizen response was forthcoming.

ADJOURNMENT – Hearing no further business and no objection, Mayor Lacher adjourned the meeting at 2:02 p.m. The next regular meeting is scheduled for Thursday, July 11, 2013 at 5:30 p.m.

* * * * * * * * * * * * * * *

These minutes were approved on July 18, 2013. The original document is retained by the Clerk in the Town Council's permanent records. Attest: Amy Taylor, Town of Friday Harbor Clerk

Appendix Q: SEPA Checklist and Threshold Determination

Town of Friday Harbor
PO Box 219 / Friday Harbor / WA / 98250
(360) 378-2810 / fax (360) 378-5339 / www.fridayharbor.org

TOWN OF FRIDAY HARBOR
MAY 29 2013
RECEIVED

ENVIRONMENTAL CHECKLIST
WAC 197-11-960

Purpose of checklist:
The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:
This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

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.

Use of checklist for non-project proposals:
Complete this checklist for non-project proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NON-PROJECT ACTIONS (part D).

For non-project actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable: WATER SYSTEM PLAN UPDATE

2. Name of applicant:
DUNCAN WILSON, TOWN ADMINISTRATOR
TOWN OF FRIDAY HARBOR

3. Address and phone number of applicant and contact person:

DUNCAN WILSON, TOWN ADMINISTRATOR	MATT MARING
TOWN OF FRIDAY HARBOR	BROWN AND CALDWELL CONSULTANTS
PO BOX 219	701 PIKE ST, SUTIE 1200
FRIDAY HARBOR, WA 98250	SEATTLE, WA 98101
(360) 378-2390	(206) 749-2257

4. Date checklist prepared: MAY 22, 2013

5. Agency requesting checklist: WASHINGTON STATE DEPARTMENT OF ENVIRONMENTAL HEALTH

6. Proposed timing or schedule (including phasing, if applicable): This checklist addresses a non-project proposal to establish a long-range plan for water system planning, operation and management in the Town of Friday Harbor. On March 8, 2013, the draft plan was sent to the Department of Environmental Health, Drinking Water Section. On June 21 2013, it will be accepted at a public meeting and sent back to DOH for approval.
The review and adoption process includes a public meeting before the Town Council. Following public and agency review and comment, the final draft plan will be corrected in response to technical review and given to the Town Council for resolution of adoption. The Town's adopted final draft plan will then be transmitted to the State Department of Health for final review and approval following DOH approval, the final plan may be implemented.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. Using the date of State Department of Health approval, the Plan will be reviewed and potentially updated every six years,

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

NONE

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.
N/A

10. List any government approvals or permits that will be needed for your proposal, if known. Adoption by the Friday Harbor Town Council and acceptance by the State Department of ~~Ecology~~ Health WSH are necessary prior to implementation of this plan.

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.)

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, and TAX PARCEL number. 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. Within the services area and watershed of Town of Friday Harbor Water System as shown on the Water System Map available at www.fridayharbor.org/maps/

TO BE COMPLETED BY APPLICANT	EVALUATION FOR AGENCY USE ONLY
B. ENVIRONMENTAL ELEMENTS 1. **Earth** a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other **N/A**	
b. What is the steepest slope on the site (approximate percent slope)? **N/A**	
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 prime farmland. **N/A**	
d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. **N/A**	
e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill. **N/A**	

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. **N/A**	
g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? **N/A**	
h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: **N/A**	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
2. Air a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known. **N/A**	
b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. **NO**	
c. Proposed measures to reduce or control emissions or other impacts to air, if any: **NOT APPLICABLE**	
3. Water **a. Surface** 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. **TROUT LAKE**	

2) Will the project require any work over, in or adjacent to (within 200 feet) the described waters? If yes, please describe and attach plans. **NO**	
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. **NOT APPLICABLE**	
4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. **NOT APPLICABLE**	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. **NO**	
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. **NOT APPLICABLE**	
b. Ground: 1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known. **NO**	
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. **NOT APPLICABLE**	

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. **NOT APPLICABLE**	
2) Could waste materials enter ground or surface waters? If so, generally describe. **NO**	
3) Proposed measures to reduce or control surface, ground, and runoff water impacts, if any: **NOT APPLICABLE**	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
4. Plants a. Check or circle types of vegetation found on the site: NOT APPLICABLE. A NON-PROJECT ACTION IS PROPOSED ———— deciduous tree: alder, maple, aspen, other ———— evergreen tree: fir, cedar, pine, other ———— shrubs ———— grass ———— pasture ———— crop or grain ———— 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? **NONE**	
c. List threatened or endangered species known to be on or near the site. **NOT APPLICABLE**	
d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: NONE	

5. Animals a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site: NOT APPLICABLE. A non-project, non-site-specific action is proposed. Birds: hawk, heron, eagle, songbirds, other: _____ Mammals: deer, bear, elk, beaver, other _____ Fish: bass, salmon, trout, herring, shellfish, other _____	
b. List any threatened or endangered species known to be on or near the site. NOT APPLICABLE	
c. Is the site part of a migration route? If so, explain. NOT APPLICABLE	
d. Proposed measures to preserve or enhance wildlife, if any: NOT APPLICABLE	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
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. NOT APPLICABLE	
b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. 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: NOT APPLICABLE	
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. NO	
1) Describe special emergency services that might be required. 2) NOT APPLICABLE	
2) Proposed measures to reduce or control environmental health hazards, if any: NOT APPLICABLE	
b. Noise 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? NOT APPLICABLE	
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. NOT APPLICABLE	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
3) Proposed measures to reduce or control noise impacts, if any: NOT APPLICABLE	
8. Land and shoreline use a. What is the current use of the site and adjacent properties? NOT APPLICABLE	

b. Has the site been used for agriculture? If so, describe. NOT APPLICABLE	
c. Describe any structures on the site. NOT APPLICABLE	
d. Will any structures be demolished? NO	
e. What is the current zoning classification of the site? NOT APPLICABLE	
f. What is the current comprehensive plan designation of the site? NOT APPLICABLE SAME AS ABOVE	
g. If applicable, what is the current shoreline master program designation of the site? NOT APPLICABLE	
h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify. NO	
i. Approximately how many people would reside or work in the completed project? NOT APPLICABLE	
j. Approximately how many people would the completed project displace?. NONE	
k. Proposed measures to avoid or reduce displacement impacts, if any. NOT APPLICABLE	
l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any. NOT APPLICABLE	

TO BE COMPLETED BY APPLICANT	EVALUATION FOR AGENCY USE ONLY
9. Housing a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. **NONE**	
b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. **NONE**	
c. Proposed measures to reduce or control housing impacts, if any: NOT APPLICABLE	
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? **NOT APPLICABLE**	
b. What views in the immediate vicinity would be altered or obstructed? **NONE. NOT APPLICABLE**	
c. Proposed measures to reduce or control aesthetic impacts, if any: **NOT APPLICABLE**	
11. Light and glare a. What type of light or glare will the proposal produce? What time of day would it mainly occur? **NONE**	
b. Could light or glare from the finished project be a safety hazard or interfere with views? **NOT APPLICABLE**	
c. What existing off-site sources of light or glare may affect your proposal? **NOT APPLICABLE**	

d. Proposed measures to reduce or control light and glare impacts. **NOT APPLICABLE**	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
12. Recreation a. What designated and informal recreational opportunities are in the immediate vicinity? **NOT APPLICABLE**	
b. Would the proposed project displace any existing recreational uses? If so, describe. **NO**	
c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: **NOT APPLICABLE**	
13. Historic and cultural preservation a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe. **NOT APPLICABLE**	
b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site. **NOT APPLICABLE**	
c. Proposed measures to reduce or control impacts, if any: **NOT APPLICABLE**	
14. Transportation a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any. **NOT APPLICABLE**	

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop? **NO. NOT APPLICABLE**	
c. How many parking spaces would the completed project have? How many would the project eliminate? **NONE**	
d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private). **NO**	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. **NO**	
f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur. **NOT APPLICABLE**	
g. Proposed measures to reduce or control transportation impacts, if any: **NOT APPLICABLE**	
15. Public services a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe. **NO**	
b. Proposed measures to reduce or control direct impacts on public services, if any. **NOT APPLICABLE**	
16. Utilities a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other. **NOT APPLICABLE**	

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. **NOT APPLICABLE**	

C. SIGNATURE

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 Eugene R Zapfle DATE 5-23-2013

TO BE COMPLETED BY APPLICANT **DO NOT USE THIS SHEET FOR PROJECT ACTIONS**	**EVALUATION FOR AGENCY USE ONLY**

D. SUPPLEMENTAL SHEET FOR NON-PROJECT ACTIONS
(do not 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? Proposed measures to avoid or reduce such increases are: **N/A**	
2. How would the proposal be likely to affect plants, animals, fish, or marine life? **N/A** Proposed measures to protect or conserve plants, animals, fish, or marine life are: **N/A**	

3. How would the proposal be likely to deplete energy or natural resources? Proposed measures to protect or conserve energy and natural resources are: N/A	
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? Proposed measures to protect such resources or to avoid or reduce impacts are: N/A	
TO BE COMPLETED BY APPLICANT	**EVALUATION FOR AGENCY USE ONLY**
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? Proposed measures to avoid or reduce shoreline and land use impacts are: N/A	
6. How would the proposal be likely to increase demands on transportation or public services and utilities? Proposed measures to reduce or respond to such demand(s) are: N/A`	
7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment. Adoption of the Friday Harbor Water System Plan Update will not conflict with local, state, or 7federal laws or requirements for the protection of the environment.	
SIGNATURE 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 Eugene K Varfis DATE 5-23-2013

TOWN OF FRIDAY HARBOR
Post Office Box 219 • Friday Harbor, Washington 98250
(360) 378-2810 • FAX: (360) 378-5339 • www.fridayharbor.org

NOTICE OF DETERMINATION OF NONSIGNIFICANCE

DESCRIPTION OF PROPOSAL: The Town of Friday Harbor intends to establish a long-range plan for water system planning, operation and management in the Town of Friday Harbor, known as the Water System Plan Update. The review and adoption process includes a public hearing before the Town Council. The Town's adopted final draft plan will then be transmitted to the State Department of Health for final review and approval prior to implementation.

PROPONENT: Town of Friday Harbor

LOCATION: Within the services area and watershed of the Town of Friday Harbor Water System, San Juan Island, San Juan County, Washington.

LEAD AGENCY: Town of Friday Harbor
PO Box 219
Friday Harbor, WA 98250

The lead agency for this proposal has determined that this proposal does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed Environmental Checklist and other pertinent information on file with the lead agency. This information is available to the public on request. This DNS is issued under WAC 197-11-340. **Appeals may be made to the Department of Ecology and all other applicable agencies with jurisdiction. This 14 day appeal period ends June 11, 2013.**

RESPONSIBLE OFFICIAL: Mike Bertrand, Land Use Administrator,
PO Box 219, Friday Harbor, WA 98250

DATE: May 29, 2013

SIGNATURE: _____
Mike Bertrand, Land Use Administrator

TOWN OF FRIDAY HARBOR
RECEIVED
JUN 24 2013
FINANCE OFFICE

NOTICE OF DETERMINATION OF NONSIGNIFICANCE

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PO Box 219
Friday Harbor, WA 98250

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RESPONSIBLE OFFICIAL: Mike Bertrand, Land Use Administrator,
PO Box 219, Friday Harbor, WA 98250

LEGAL NO. FH486133
Published: The Journal of the San Juan Islands. June 5, 2013.

Affidavit of Publication.

STATE OF WASHINGTON

County of San Juan

The undersigned, being first duly sworn, says on oath that she is the principal clerk of THE JOURNAL OF THE SAN JUAN ISLANDS, a weekly newspaper approved as a legal newspaper by order of the Superior Court of the State of Washington for San Juan County; that said newspaper is now and has been published in the English language continuously as a weekly in Friday Harbor for six months prior to the first date of publication of the notice hereto attached; that said Town of Friday Harbor Water System Plan FH486133 is a true copy and was published by her in one successive copies of said paper on the following dates: June 5, 2013

and was printed in full in said newspaper and not in supplement thereof.

That the publication cost thereof the sum of $ 48.80 and has been paid in full at the rate of $ 8.00 per column inch for each insertion.

Rhonda L Hyde

Subscribed and sworn before me this 20th *day of* June, *2013.*

Frances E Bacon

Notary Public in and for
The State of Washington
residing at Friday Harbor, WA

FRANCES E BACON NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES SEPTEMBER 21, 2015

Appendix R: Plan Adoption Resolution and Approvals

RESOLUTION NO. 1974

A RESOLUTION by the Council of the Town of Friday Harbor adopting the updates to the Water System Plan.

WHEREAS, the Town of Friday Harbor has a need to update its existing Comprehensive Water System Plan dated June 2003; and

WHEREAS, the engineering firm of Brown & Caldwell, the water engineers for the Town of Friday Harbor, have prepared a plan as authorized by Resolution No. 1729 adopted June 2009; and

WHEREAS, Brown & Caldwell has submitted to the Town a document entitled "Town of Friday Harbor Water System Plan" dated June 2013; and

WHEREAS, the Town Council held a duly advertised hearing on July 11, 2013 for the purpose of taking public comment on said plan; and

WHEREAS, the Town Council of the Town of Friday Harbor has reviewed and accepted said document,

NOW, THEREFORE, BE IT RESOLVED by the Council of the Town of Friday Harbor that the "Town of Friday Harbor Water System Plan Update" dated June 2013 is hereby adopted and the Mayor is authorized and directed to affix her signature to said document.

ADOPTED this 6th day of August 2013.

TOWN OF FRIDAY HARBOR

Carrie Lacher

Carrie Lacher, Mayor

SEAL of the
Town of Friday Harbor

ATTEST:

Amy Taylor, Town Clerk

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

September 6, 2013

WAYNE HAEFELE, P.E.
FRIDAY HARBOR, TOWN OF
PO BOX 219
FRIDAY HARBOR WA 98250

RECEIVED
SEP 11 2013
BROWN AND CALDWELL
SEATTLE

Subject: Friday Harbor, Town of (ID# 26595)
San Juan County
February 2013 Water System Plan - APPROVAL
Submittal #13-0307

Dear Mr. Haefele:

The Town of Friday Harbor water system plan (WSP), received in this office on March 4, 2013, with a subsequent submittal on August 27, 2013, has been reviewed and in accordance with the provisions of WAC 246-290-100, is hereby APPROVED.

Approval of this WSP is valid as it relates to current standards outlined in Washington Administrative Code (WAC) 246-290 revised March 18, 2012; WAC 246-293 revised September 1997, and is subject to the qualifications herein. Future revisions in the rules and statutes may be more stringent and require facility modification or corrective action. An approved update of this WSP is required on or before **September 6, 2019**, unless ODW requests an update or plan amendment pursuant to WAC 246-290-100(9).

APPROVED NUMBER OF CONNECTIONS

The analysis provided in this WSP shows the water system has sufficient capacity to meet the growth projections during this planning period. The Town of Friday Harbor water system can support an **"unspecified"** designation for its approved number of connections. A specific number of approved connections will not be applied at this time. Development may occur in compliance with the schedule and information provided in this WSP. This designation may be rescinded (and replaced with a specified number of approved connections) if ODW determines that the WSP is no longer representative of system activities.

LOCAL GOVERNMENT CONSISTENCY

This document meets local government consistency requirements for WSP approval pursuant to RCW 90.03.386 and RCW 43.20.

SERVICE AREA AND DUTY TO SERVE

Pursuant to RCW 90.03.386(2), the service area identified in this WSP service area map may now represent expanded "place of use" for this system's water rights. Changes in service area should be made through a WSP amendment.

The Town of Friday Harbor has a duty to provide new water service within its retail service area. This WSP includes service policies to describe how your system plans to provide new service within your retail service area.

CONSTRUCTION WAIVERS

Standard Construction Specifications for distribution main extensions in this WSP are approved. Consistent with WAC 246-290-125(2), this system may proceed with the installation of distribution main extensions provided this system completes and keeps on file the enclosed construction completion report form in accordance with WAC 246-290-125(2) and WAC 246-290-120(5) and makes it available for review upon request by ODW.

WATER RESOURCES

Below is the general regulatory language that applies to all water system approvals:

This approval does not provide any guarantee and should not be considered to provide any guarantee concerning legal use of water or subsequent water rights decisions by the Department of Ecology. Questions concerning water rights should be directed to the Department of Ecology.

Thank you for your cooperation. San Juan County is being notified of the terms of this approval and the determination of the approved number of connections. If you have any questions or wish to check our records, you may contact either of us at the numbers listed below.

Sincerely,

Richard Rodriguez
WSDOH Regional Planner
(253) 395-6771

Steve Deem, P.E.
Regional Engineer
(253) 395-6767

Encl: Construction Completion Report

cc: San Juan County Health Department
San Juan County Planning Dept.
Tammy Hall, WSDOE-NWRO
Matthew Maring, P.E., Brown and Caldwell

CONSTRUCTION COMPLETION REPORT FOR DISTRIBUTION MAIN PROJECTS

In accordance with WAC 246-290-120(5), a ***Construction Completion Report*** is required for all construction projects. Under the submittal exception process for distribution main projects, designed by a professional engineer but not submitted to DOH for approval, the report does not need to be submitted. **However, the purveyor must keep the Construction Completion Report on file and make it available for review upon request by DOH in accordance with WAC 246-290-125 (2)(b).** Furthermore:

(1) The report form **must** bear the seal, date and signature of a professional engineer (PE) licensed in the state of Washington; and

(2) Per WAC 246-290-120(5)(c), the amount of change in the physical capacity of a system must be documented, if the project results in a change in physical capacity.

FRIDAY HARBOR, TOWN OF
Name of Water System

DOH System ID No.: **26595**

MICHAEL DEEGAN
Name of Purveyor (Owner or System Contact)

Date Water System Plan that includes Standard Construction Specifications

PO BOX 219
Mailing Address

Date Standard Specifications Approved by DOH: **9/6/2013**

FRIDAY HARBOR, WA 98250
City State Zip

PROJECT NAME AND DESCRIPTIVE TITLE:
(Include the name of any development project and number of services.)

Date Project or Portions Thereof Completed

PROFESSIONAL ENGINEER'S ACKNOWLEDGMENT

The undersigned professional engineer (PE), or his/her authorized agent, has inspected the above-described project that, as to layout, size and type of pipe, valves and materials, and other designed physical facilities, has been constructed and is substantially completed in accordance with construction documents reviewed by the purveyor's engineer. In the opinion of the undersigned engineer, the installation, physical testing procedures, water quality tests, and disinfection practices were carried out in accordance with state regulations and principles of standard engineering practice.

I have reviewed the disinfection procedures, pressure test results, and results of the bacteriological test(s) for this project and certify that they comply with the requirements of the construction standards/specifications approved by DOH.

P.E.'s Seal

Date Signed

Name of Engineering Firm

Name of PE Acknowledging Construction

Mailing Address

City State Zip

Engineer's Signature

State/Federal Funding Type (if any) _____

Please keep a completed, signed, and stamped copy on file.

☒ **NWRO Drinking Water** **Department of Health** **20425 72nd Ave. S, Ste 310** **Kent, WA 98032-2358** **(253) 395-6750**	☐ **SWRO Drinking Water** **Department of Health** **PO Box 47823** **Olympia, WA 98504-7823** **(360) 236-3030**	☐ **ERO Drinking Water** **Department of Health** **16201 E Indiana Ave, Suite 1500** **Spokane Valley, WA 99216** **(509) 329-2100**

For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).